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Universität Mannheim
Fakultät für Sozialwissenschaften

Returns to education in West Germany over time

Educational expansion, occupational upgrading
and the job matching process

Inauguraldissertation zur Erlangung des akademischen Grades eines
Doktors der Sozialwissenschaften der Universität Mannheim

vorgelegt von
Dipl. Soz. Markus Klein

Dekan der Fakultät für Sozialwissenschaften
Prof. Dr. Michael Diehl

Gutachter
Prof. Dr. Dres. h. c. Walter Müller
Prof. Dr. Irena Kogan

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Chapter 1 Returns to education in West Germany, 1976-2008

1.1 Introduction

Throughout the last decades West Germany and virtually all developed societies have undergone - earlier or later on - a massive expansion of their higher education system (Schofer & Meyer, 2005). This expansion has usually been accompanied by a differentiation of higher education institutions and tertiary-level study programs (Shavit, Arum, & Gamoran, 2007; Mayer, Müller, & Pollak, 2007; Teichler, 2005). The channeling of a growing supply of higher education graduates into increasingly different, heterogeneous study programs is due to the expanding organizational size and is intended to prepare students for the more strongly specialized labor division in the labor market (Müller, Pollak, Reimer, & Schindler, 2009).

According to micro- and macro-theoretical variants of human capital theory (Becker, 1993 [1964]; Schultz, 1961; Hanushek & Welch, 2006), higher education expansion results from the expectation that investments in education involve productivity and welfare gains both in individual, firm-level and societal respect. Individual investments in schooling are driven by the aspiration towards higher income and status. Employers demand more highly skilled employees because of technological changes, professionalization and upgrading of skill requirements. Nations increasingly provide or subsidize educational opportunities in order to increase the material output of their economy and to bolster international competitiveness. Investments in education also generate public returns from higher levels of income in the form of income taxes, increased social insurance payments and lower social transfers (OECD, 2012b).

In the West German context, the debate about the so-called ‘educational crisis’, analyzed and documented by Picht (1964), provided a substantial stimulus for educational reforms in the 1960s. From a macroeconomic point of view, Picht argued that West Germany would only be able to ensure sustained economic growth and long-term economic prosperity when strongly investing in the expansion of higher education. By contrast, Dahrendorf (1965) justified the demand for an educational expansion solely based on the ‘civil right for education’. Educational reforms and educational expansion have the primary aim to democratize the population so that individuals are aware of their rights and participate in the democratic process in an autonomous and competent way. Moreover, Dahrendorf expected that increasing participation in further education reduces inequalities in educational

opportunities and, consequently, results in a freer and more just society. Hence, Dahrendorf recognized the benefits of educational expansion independently from its economic returns. In this regard, the average educational attainment in a society can therefore never be high enough. Educational expansion yields socially positive outcomes as evidenced by the advantages that individuals reap in many aspects of life including perceived health, life satisfaction or civic engagement in social, cultural and political life (OECD, 2012b). Despite this, it is important to know the labor market value of investments in education and its changes across time as public and private investments in education involve high costs.

Educational reforms aimed at increasing the share of highly educated individuals in the population may frequently be guided by misconceptions about the skill demand in modern economies and by employers' requirements (Jackson, Goldthorpe, & Mills, 2005). As the risk for university graduates to face unemployment rose by the end of the 1970s, scientific circles as well as public debates increasingly emphasized the potential negative consequences of educational expansion both in terms of individual and societal costs (Müller, 1998a).¹ The expansion of higher education has been increasingly perceived as *credential inflation* (Collins, 1979; Fürstenberg, 1978), i.e. the educational system produces an oversupply of higher education graduates that is not required from the labor market.² Access to the social hierarchy of labor market positions is not only dependent on individuals' own educational attainment but on the educational resources of all other job candidates that compete for jobs. Given that the occupational hierarchy surrounding labor market positions is relatively fixed, education becomes a *positional good* (Hirsch, 1977), meaning that some highly educated graduates have to enter positions with lower job rewards. Thus, the proponents of *credential inflation* argue that national labor markets are unable to place the growing share of educated graduates in high-skilled positions. If an increasing share of individuals in the population obtains a university degree, the relative value of this certificate will decline. As a consequence, higher education certificates become *devalued*, such that higher education is no longer a guarantee of occupational success. In turn, this triggers competition surrounding coveted jobs in the labor market, requiring ever increasing education to obtain access to the most privileged occupational positions (Collins, 1979; Boudon, 1974).

¹ Among debates on consequences of educational expansion, analytical propositions are often mixed up with normative considerations (Müller 1998a: 82). Therefore, Müller (1998a: 107) concludes that the diagnostic capability of sociology on the effects of educational expansion has still not proven to be sustainable.

² Scenarios of *credential inflation* were circumscribed with catchphrases like *cabdriver*, *PhD (Dr. phil, Taxifahrer)* already in the 1970s. Due to rising unemployment risks and a lack of training places the *lost generation* was a common phrase in the 1980s. In the 2000s, university graduates' labor market integration has frequently been termed *generation internship (Generation Praktikum)*.

This *devaluation* of higher education may have serious negative consequences both for individuals and society. Highly educated graduates that are selected into jobs with lower skill requirements not only underutilize their skills and have lower wage returns to schooling than their counterparts in highly-skilled positions, but these individuals may also become frustrated and dissatisfied with their job (Burris, 1983).³ Individuals that are dissatisfied with their job exhibit counterproductive workplace behavior and are generally less productive (Tsang & Levin, 1985). Overeducated workers also do not appear to recover from initial wage penalties in later stages of their career (Korpi & Tahlin, 2009). At the societal level, the relationship between educational expansion and economic growth is not universal and depends on the structure and conditions of national labor markets.⁴ If countries experience a mismatch between labor supply and demand in the sense that the supply of high-skilled exceeds the demand, increasing levels of educational attainment in the population are not accompanied by further economic growth (Pritchett, 2001). Higher education graduates that are not able to fully use their skills in the labor market would have stayed in school for a longer time without this contributing to their country's economic growth (Walters & Rubinson, 1983).

However, the assumption of a more or less fixed positional hierarchy in the labor market that resides behind the *devaluation* argument appears to be rather unrealistic. Proponents of the *credential inflation* notion ignore the fact that demand for higher skills has also risen amidst a growth in the supply of educated graduates. The primary explanation for increasing skill requirements in the labor market is the so-called *Skill-Biased Technological Change (SBTC)* hypothesis, which posits that technical progress and the spread of computer technology lead to an increase in labor demand for highly-skilled workers relative to low-skilled workers (Autor, Katz, & Krueger, 1998; Autor, Levy, & Murnane, 2003; Acemoglu, 2002; Spitz-Oener, 2006). In the course of computerization, jobs or occupations involve higher levels of non-routine cognitive and creative tasks than routine manual and routine cognitive tasks. Thus, employers increasingly demand general analytic and task-solving skills rather than job-specific skills. Moreover, labor markets have turned into more professional and service-sector based economies which require high levels of specialized knowledge and expertise (Gallie, White, Cheng, & Tomlinson, 1998; Penn, Rose, & Rubery, 1994). Particularly (service sector) managerial positions involve more individual work autonomy and greater job complexity in more cooperative and interconnected work settings (Mayer & Solga,

³ See the vast literature on *overeducation* in the economics of education (e.g. Borghans & de Grip, 2000; Büchel, de Grip, & Mertens, 2003; Dolton & Vignoles, 1996).

⁴ For a review on this reciprocal relationship between educational expansion and economic growth see Chabbott and Ramirez (2000).

2008). That is, high-skilled labor market positions that are associated with higher job rewards appear to have clearly expanded over the course of time. Accordingly, labor demand forecasts in Germany consistently indicate that high-skilled positions will further increase in the future, while low-skilled positions will substantially decrease (Bonin, Schneider, Quinke, & Arens, 2007). Moreover, Germany is known to lag behind other modern societies in terms of the strength of higher education expansion (OECD, 2011a; Müller, et al., 2009). Given this moderate expansion and other supply-side demographic changes, skill demand may even increase at a higher rate than skill supply in Germany, particularly in occupations requiring technical skills (Autorengruppe Bildungsberichterstattung, 2010; Biersack, Kettner, & Schreyer, 2008; Reinberg & Hummel, 2003). From time to time, concerns about a shortage of skilled labor also come up in German public debates. A permanent shortage of skilled labor to fill high-skilled vacancies will have serious negative consequences for the economic performance of a given national economy (OECD, 2012a).

Therefore, educational expansion and occupational upgrading have contradictory effects on job matching processes. While educational expansion leads to stronger competitive pressures among high-skilled individuals in terms of finding adequate jobs, occupational upgrading increases the availability of high-skilled positions and therefore mitigates job competition. Hence, the relative strength of these macrostructural developments determines the net changes in returns to education in terms of occupational attainment (Gangl, 2003b).

It is important to know - both from a macroeconomic as well as individual point of view - how the interplay of educational expansion and occupational upgrading affects the changes in returns to education at the micro-level over time. Do we really see a *devaluation* of higher education or are there even indications for an undersupply of highly skilled individuals in the West German labor market? Assessing changes in the returns to education over time gives us indirect hints at the balance between labor supply and demand and thus may be useful for educational planning and coordination, i.e. trends in returns to education in the past may indicate plausible supply-demand scenarios for the future. Assuming a consistent *devaluation* of higher education certificates over the last decades, a strategy aimed at substantial growth in the proportion of higher education students might be less reasonable according to an economic perspective. When the returns to education have been rather stable or even increased, investments in the continued expansion of higher education appear to be on more valid grounds, as the labor market has always been able to absorb the increasing supply of highly skilled individuals in the past and will likely do in the future.

Trends in returns to education do not only depend on purely structural relations between educational expansion and occupational upgrading but also on changes in the *relative* value that is attached to educational qualifications in the labor market net of opportunity structures (Müller, Brauns, & Steinmann, 2002). Do higher education graduates have increasing or decreasing advantages over lower educational groups in terms of occupational attainment across time? In the *origin-education-destination (OED) triangle*, educational attainment is a crucial intervening factor between social origin and the subsequent class destinations (Goldthorpe, 2007c). While educational attainment is an important channel for social mobility between generations, it may also sustain the reproduction of social inequalities. According to *liberal theory of industrialism* (Treiman, 1970; Blau & Duncan, 1967; Kerr, Dunlop, Harbison, & Myers, 1973), educational attainment is supposed to increasingly mediate intergenerational class mobility over the course of time. Due to technical progress and pressures towards economic efficiency in modern societies, a steady growth in social fluidity can be attributed to three partial developments in the OED triangle. First, the strength of the relationship between individuals' class origins and their educational attainment (OE) decreases over time. In line with Dahrendorf's expectation, the liberal theory posits that educational expansion enhances equality of educational opportunity since economic advancement requires a more efficient breeding and exploitation of talents and human resources. Second, the association between individuals' educational qualifications and their class destinations (ED) strengthens over time because modern economies require a more efficient use of able and motivated individuals. While ascriptive traits are less and less relevant in job matching processes, individual achievement, most importantly educational attainment, becomes the dominant criterion for selections into the positional hierarchy. In turn, the association between individuals' class origins on class destinations (OD) weakens over the course of time. The direct impact of class origins on class destinations net of educational attainment diminishes. In line with the *liberal theory of industrialism*, modern societies are heading towards ideal *education-based meritocracies* in which educational attainment becomes the legitimate indicator of merit and social stratification in the labor market (Goldthorpe & Jackson, 2008).

By contrast, the *post-modern variant of modernization theory* (Beck, 1986; Beck, 1999; Giddens, 1994) posits that existing vertical patterns of social inequality are about to dissolve. While individual life courses are less and less determined by social characteristics such as educational attainment or occupational class, social inequality would be better understood as individual life course risks that are unrelated to classical determinants of social

stratification. In a post-modern world, life course risks more or less affect anyone regardless of his or her social standing. Based on this framework, educational attainment is decreasingly able to provide labor market benefits and to protect individuals from labor market risks. This is also because higher educational certificates become more widespread in the population and therefore forfeit their unique characteristic and labor market value.⁵ Instead, other individual characteristics, inter alia ascriptive traits, such as social background, become increasingly important (again) in job allocation decisions. As a consequence, the association between educational attainment and class destinations is increasingly *decoupled*, i.e. access to the positional hierarchy of job rewards becomes less and less dependent on educational attainment across time. Beck (1986: 244; 1985: 317) concludes that in a *risk society* the educational system loses its predominant role of status allocation.

Both *liberal theory of industrialism* and *post-modernization theory*, however, lack a micro-theoretical foundation as well as empirical corroboration. Jackson et al. (2005) criticize these approaches for assuming that macro-level changes in the OED triangle evolve quite automatically and independently of individual actions. Educational qualifications are associated with labor market rewards only if employers take them into account in hiring decisions. Yet it is employers who decide which characteristics are relevant for individual merit. Depending on the institutional and structural context, employers may have very different perceptions and beliefs about which individual traits best indicate the potential productivity of job applicants (Pollak, 2009). Institutional and, in particular, structural conditions may substantially vary over time and thus provide different macro-level environments for job matching processes. Hence, if we want to understand changes in the *relative* returns to education on a country's labor market, we need to consider the macro-level conditions under which employers make inferences about the productive value of educational qualifications.

By assessing the ED association⁶ in more detail across time, we thus learn more about the changing nature of the West German labor market and employers' requirements in terms of 'merit'. Do selections in the West German labor market become increasingly or decreasingly meritocratic in terms of educational attainment? Knowing this will help us understand whether the ED association in West Germany is furthering development towards an *education-based meritocracy* or not (Goldthorpe & Jackson, 2008).

⁵ For instance, Geißler (1978: 82) argues that characteristics which are shared by many people cannot be the crucial determinant for the distribution of privileges on a few people.

⁶ The term ED association refers to the association between educational attainment and class destinations in the OED triangle and is used throughout the book.

Aside from that, changes in the returns to education may impact individual decisions whether or not to invest in educational attainment as well as affect this decision differently among various social groups. According to economic and sociological models of educational decision-making, the instrumental benefits of educational certificates play a crucial role (Becker, 1993 [1964]; Polachek & Siebert, 1993; Erikson & Jonsson, 1996; Breen & Goldthorpe, 1997). Individual investments in education involve prospective elements and are strongly based on expectations about future rewards in the labor market. For instance, Wilson, Wolfe and Haveman (2005) show that the expected income returns to high school graduation in the US have a strong impact on youths' educational choices. Furthermore, groups with differing social origins, race or gender characteristics may perceive and evaluate the same information on returns to education in different ways, thereby influencing their responses to changes in the labor market value of education (Beattie, 2002). The theory of relative risk aversion (Breen & Goldthorpe, 1997) suggests that individuals from higher class origin are less sensitive to decreasing returns to education in their investment decisions than individuals from lower class origin because they need to maximize the chances of maintaining their class position. Rather, these individuals from higher social origin are more concerned with educational investment in order to secure their status amidst credential inflation (Van de Werfhorst & Andersen, 2005).⁷ Assessing the changing returns to education can be used to model the objective benefits in educational decision-making and thus may contribute to an understanding of changes in individual investment behavior, be it general or class-specific.

1.2 Objectives and research questions

With these social developments in mind, the book concentrates on a detailed empirical assessment of changes in the individual-level returns to education on the labor market in West Germany from the 1970s to the present. This book asks whether investments in educational attainment still pay off in terms of *absolute* or *relative* labor market returns in the present as in former times. *Has there been a structural devaluation of higher education degrees over the course of educational expansion in West Germany? Do we see a decoupling of educational credentials and occupational attainment in the West German labor market over the last*

⁷ For Germany, Reimer (2011) shows that female students from lower social origin tend to be more responsive to changes in relative unemployment rates in their postsecondary enrollment decisions than female students from higher social origin. For the US, Beattie (2002) indicates that men from lower social origin are much more influenced by changing monetary returns to college degrees in their enrolment decisions than their peers from higher social origin. In line with relative risk aversion theory, Van de Werfhorst & Andersen (2005) find that students from higher social origin particularly enroll in postgraduate education when the labor market value of postgraduate degrees is low.

decades? Studies analyzing the relationship between education and labor market outcomes focus less on *absolute* returns to education than on *relative* returns, but these *absolute* returns are equally important indicating the actual labor market chances of individuals holding specific degrees. By looking at trends in *relative* returns to education the book concentrates on one important partial association in the OED triangle. Despite this, I neither analyze the effects of educational expansion on GDP growth or international competitiveness nor do I consider the important effects educational attainment has on various other life domains, e.g. social, cultural and political life.

While there has been much research focusing on how educational attainment (E) depends on origin (O), theoretical accounts of the ED association are rather underdeveloped and difficult to test empirically (Goldthorpe, 2009). Typically, economists are concerned with the general mechanisms behind education effects on the labor market. Social stratification and mobility research also appears to attach less value to a more profound understanding of trends in the ED association, as the mechanisms for such developments have not been extensively investigated. Changes in the ED association are only considered in so far as they are embedded in the broader research on trends in intergenerational class mobility (e.g. Breen, 2004). If sociologists investigate the relationship between educational credentials and labor market outcomes in more detail, they mainly consider institutional differences in the effects of education in cross-national comparisons (e.g. Shavit & Müller, 1998; Allmendinger, 1989b; Andersen & Van de Werfhorst, 2010). Aside from one important reference study (Gangl, 2003b), studies on the returns to education do not take the macrostructural and macroeconomic context seriously into account when assessing the value of individuals' educational attainment in the labor market at given points in time. This is surprising because all theoretical accounts assume that changes in the ED association across time are driven by macro-level developments. While stressing the necessity of considering the micro-level action of employers, Jackson et al. (2005) recognize, at the same time, that their behavior is strongly shaped by educational expansion and occupational upgrading in the labor market. While cross-country comparisons are extremely helpful to get to know how institutions impact the strength of the ED association, cross-temporal comparisons within individual countries are thus useful for getting a better understanding of how changes in the macro-level conditions, be it institutional, macrostructural or macroeconomic developments, affect changes in individual job allocation outcomes in a national setting (Gerber, 2003).

Hence, this book contributes to the literature by assessing long-term trends in the relationship between educational attainment and labor market outcomes by conducting a case

study of West Germany. Beside purely descriptive concerns, it aims to shed light on the mechanisms behind changes in returns to education over time by taking the interplay between macro-level conditions and micro-level actions into account both theoretically and if possible empirically.⁸ I follow Müller and Gangl (2003b) regarding cross-national comparisons and pursue a micro-macro framework by analyzing cross-temporal comparisons. However, the theoretically relevant effects of macro-level changes such as educational expansion or occupational upgrading on job matching outcomes in a given country can usually not be disentangled from various other macro-level processes that take place simultaneously (Müller, 1998a: 95). Hence, I am not able to prove any causal relationships between specific macro-level factors and changes in the individual-level returns to education. Nevertheless, my attention is to find adequate research designs for the empirical testing of specific hypotheses and thus to hint at plausible mechanisms behind changes in the returns to education. *Can changes in the individual returns to education be attributed to specific macro-level changes?* This book focuses on changes in the gross returns to education under differing macro-level conditions, though it does not address general mechanisms behind education effects in the labor market. Consequently, I do not claim any causal effects of education on labor market outcomes. Thus, although this analysis is unable to provide a full picture on the (changing) nature of the ED association, I present a unique description of trends in ED association and, more generally, contribute to an understanding of the interplay between macrostructural and macroeconomic changes and the returns to education in West Germany.

Compared to most previous studies which use earnings as the dependent variable, I make use of a *multidimensional concept of labor market outcomes* that takes several important aspects of returns in the labor market equally into account (Müller, Steinmann, & Ell, 1998; Gangl, 2003b). Research in social stratification and mobility usually concentrates either on occupational status or social class and neglects other outcomes. A multidimensional concept appears to be highly appropriate as the returns to education can develop in very different ways depending on the specific labor market outcome that is analyzed (Müller, 1998a: 106). This is possibly because changes in specific macro-factors can have a different impact on different labor market outcomes (Gangl, 2003b). Therefore, a multidimensional concept of returns will also help to disentangle the effects of different macro-level developments on job allocation outcomes.

⁸ So far, studies on the German context seem to lack such an approach. For instance, Handl (1996: 252, own translation) states: 'To offer and proof such an explanation at the micro-level is explicitly not the intention of the article' and concludes: '[...] a clarification of the theoretical perspectives dealing with the nexus of educational and occupational system is still required' (Handl, 1996: 271, own translation).

In regards to labor market outcomes, I consider the *risk of unemployment*, *social class destinations* as well as *occupational prestige*. Hence, I follow the sociological tradition focusing on occupational outcomes rather than earnings (Hauser & Warren, 1997). The most evident reason is that the underlying theoretical modeling of the book assumes that the occupational or job returns to education are prior to the earnings returns to education. From a sociological standpoint, individuals do not directly compete for wages but for jobs that are associated with different job rewards. The impact of macro-level changes such as educational expansion or occupational changes on the returns to education is better modeled with a job competition or job matching approach than with wage competition.⁹ Thus, it appears to be more reasonable to directly assess the occupational returns rather than the earnings returns.

Since the expansion of higher education in West Germany has accompanied the institutional differentiation into university and *Fachhochschule* (university of applied sciences) as well as a more heterogeneous supply of study programs, a major focus of the book will be the returns to different horizontal and vertical forms of higher education. Aside from Müller et al. (2002), previous studies on the German context did not consider the differentiation between returns to education from the first-tier (university) and second-tier institution (*Fachhochschule*). *Do the labor market returns of Fachhochschule graduates converge onto the returns to university education across time?* Some authors posit that throughout educational expansion horizontal differentiations such as one's field of study have become increasingly important selection criteria in job matching processes (Van de Werfhorst, 2002; Jackson, et al., 2005). While researchers extensively use one's field of study to explain the gender wage gap and explore the mechanisms behind labor market outcomes associated with various fields of study, empirical research on trends over time is sparse. *Do higher education graduates from different fields of study increasingly differ in terms of labor market outcomes when higher education becomes more widespread in the population?* I will also use one's field of study as a potential mediating factor for differences in labor market returns between *Fachhochschule* and university graduates as well as differences between the sexes. Additionally, the book considers a further vertical differentiation in higher education which is often neglected in the empirical assessment of the returns to education: *Do graduates with a PhD have additional advantages over university graduates in terms of labor market returns?*

⁹ Even if we assume a wage competition, the impact of supply-side or demand-side changes on wage returns to education may be difficult to assess as they are also shaped by wage-setting institutions, the regulation of labor, macroeconomic conditions or active labor market policies (Gebel & Pfeiffer, 2007:4).

Thanks to gender segregation in the West German labor market, trends in returns to education will be assessed separately for men and women. This analysis strategy also allows for comparisons between the sexes. *Do absolute returns become more equal for both sexes over time and is this due to a less gender-segregated choice of fields of study? Does educational attainment structure labor market rewards in equal ways for both sexes independently of different opportunity structures?*

In this study I use a long series of large-scale cross-sectional data, the *German Microcensus*. It consists of 23 Scientific-Use-Files spanning the years 1976 to 2008. These *Microcensus* data suit my research questions extremely well and have, until now, not been used for the analysis of changes in the returns to education. For instance, Gangl (2003b) uses EULFS-data that range from the end of the 1980s to the end of the 1990s. Previous studies on the ED association using the *Microcensus* have only been able to compare two *Microcensus* years and therefore cannot be sure about the assessment of ‘real’ trends (e.g. Müller, et al., 2002). For developments in the 2000s, there are no studies available at all. In the empirical analyses, I concentrate on the comparison of *labor market entry cohorts* across points in time, as job matching outcomes upon labor market entry appear to be most immediately affected by macro-level changes such as educational expansion or occupational upgrading (Gangl, 2003b; Müller, et al., 2002; Blossfeld, 1983).

1.3 Outline

The outline of this book is as follows. In the *second* chapter, I will present the general theoretical framework. The first part of this chapter addresses several theoretical approaches that explain the relationship between educational attainment and labor market returns at the micro-level. The second part presents a theoretical model illustrating that micro-level job allocation outcomes depend on macro-level conditions at given points in time. Before assessing the individual returns to education over the course of time, it is, however, reasonable to describe the relevant macro-level developments in West Germany. This provides a base of understanding of the specific context conditions under which different labor market entry cohorts and employers face job matching decisions.

Therefore, the *third* chapter describes the institutional setting in West Germany and its changes over time. Subchapters differentiate between the education and training system, the labor market structure and labor market regulation.

Since the assessment of the macrostructural and macroeconomic developments will also rely on *Microcensus* data, the *fourth* chapter provides a description of this data, the

sample of labor market entrants and the consistently used independent variables. As the theoretical approaches on the relationship between education and the three dimensions of labor market returns depend on the specific aspects of measuring returns, their operationalization is presented in the respective chapters on each outcome.

The *fifth* chapter illustrates changes in the macroeconomic and macrostructural context conditions between the 1970s and the present in West Germany. It will consider temporal changes in labor force participation, the business cycle, educational expansion and occupational upgrading.

Chapters *six* through *eight* consider the relationship between educational attainment and the multidimensional labor market returns in West Germany across time. The *sixth* chapter elaborates on the relationship between educational attainment and unemployment risks. The *seventh* chapter deals with *absolute* and *relative* returns to education in terms of social class destinations. The *eighth* chapter rounds out the multidimensional outcomes and addresses the association between educational attainment and occupational prestige. Each chapter not only includes a research design and presents empirical analyses but also offers more specific theoretical considerations and hypotheses which motivate the research design. These different theoretical approaches on each outcome are derived from the micro-macro modeling, which serves as the general theoretical background. Depending on the respective outcome, these chapters stress the role of different macro-level factors for changes in the returns to education.

The *ninth* chapter concentrates on horizontal and vertical differentiations in higher education and their effects on the multidimensional labor market outcomes over the course of time. This chapter also focuses in more detail on gender differences in returns to higher education.

Finally, the *last* chapter gives an overall summary of the results and discusses the conclusions.

Chapter 2 General theoretical framework

Prior literature provides a variety of theoretical approaches that attempt to explain the positive relationship between educational attainment and labor market rewards. In the first part of this chapter, I will present several general micro-theoretical models that explain why labor market returns depend on individuals' educational qualifications. In the second part, I will stress the necessity for a micro-macro framework, that is to say, the strength of the micro-level relationship between educational attainment and labor market returns varies depending on the macro-theoretical framework conditions at given points in time.

2.1 Micro-theoretical explanatory models

2.1.1 *Human Capital Theory*

The *human capital theory* belongs to the most important advancements of neoclassical labor economics and has been most prominently introduced by the work of Gary S. Becker (1993 [1964]).¹⁰ Basically, neoclassical economics argues that - under certain premises - the 'invisible hand' of the market (Smith, 1977 [1776]) will always lead to a state of equilibrium that is defined by an optimal allocation of factors and goods.¹¹ The neoclassical analysis of equilibria goes back to Say's law postulating that the production of goods always creates its own demand: supply of and demand for goods sooner or later achieve a balanced relationship. Neoclassical labor economics treats the production factor work in the same way as the production factor goods. Consequently, the wage is regarded as the price for work and is determined by labor supply and demand: The market wage equals the marginal product of labor. According to this theory, a pure free market equilibrium between labor supply and demand is only possible if individuals behave economically rationally and under several institutional premises (Sesselmeier & Blauermel, 1997: 47f.; Hinz & Abraham, 2005: 20ff.).¹² Firstly, there must be perfect competition on the labor market without market imperfections (e.g. distortions from unions or employer associations). Secondly, workers must be perfectly mobile. Thirdly, there has to be perfect and symmetric information about wage offers and wage claims. Fourthly, employees must be perfectly homogeneous, i.e. all workers have the

¹⁰ See also Mincer (1958) and Schultz (1961).

¹¹ For a more detailed description of neoclassical economics, in particular labor economics see Sesselmeier and Blauermel (1997: chapter 3).

¹² Aside from Say's law, neoclassical labor economics relies on two other theorems. According to the *theorem of marginal utility*, workers offer labor according to a balance between work utility and leisure utility. Similarly, the *theorem of marginal productivity* states that employers demand as much manpower from the labor market as is necessary in order to maximize profit (the marginal revenue corresponds to the marginal costs).

same productivity level and are thus always substitutable. Because workers receive wages that are equivalent to their marginal productivity, all workers receive the same wage. Hence, the original version of neoclassical labor economics posits that individuals' educational attainment has no relevance for the returns in the labor market. Moreover, the theory rules out the possibility of involuntary unemployment (Hinz & Abraham, 2005: 21). Obviously, some of these premises are far away from reality. Therefore, scholars have developed several theoretical advancements which alter these assumptions in order to come closer to the actual mechanisms that prevail in labor markets.

Arguably, the most salient theoretical advancement was *human capital theory*, which abandons the assumption of perfectly homogeneous workers and is based on the more realistic idea that a worker's productivity is determined by his or her *human capital* endowment.¹³ In order to increase their productivity level and thus realize higher wages, individuals are able to invest in *human capital*, factoring in investment costs.¹⁴ Basically, the theory claims that actors behave rationally and face an optimization decision with regard to investments in *human capital*. According to this idea, actors attempt to maximize their expected lifetime earnings by investing in *human capital* until the marginal costs of the investment is equivalent to the present value of the marginal returns to *human capital*. Hence, different investments in *human capital* and consequently different productivity levels account for wage differences between workers. In line with neoclassical labor economics, investments in *human capital* and the demand for qualifications find a self-regulating equilibrium in the labor market. If the supply of educational qualifications increases at a faster rate than the demand for such qualifications, wage returns as the price for qualifications decrease until a new equilibrium between supply and demand is reached. In turn, the same tendency towards equilibrium can be seen in the case of an undersupply of qualifications.

Human capital investments can be of a *general* or *specific* kind. The distinction is crucial in as much as it considers who will pay for the training costs. Becker (1993: 30) predominantly refers to investments in *on the job training* as a more general case when illustrating the effects of *human capital* on wages. The acquisition of *general training* not only increases employees' productivity in firms that organize the training, but in all other firms. Since employers fear that employees who take part in general training in their firm might change to another firm that offers a higher wage, employers are less willing to invest in

¹³ A worker's *human capital* can be any stock of skills, knowledge or other characteristics – whether innate or acquired – that determines his or her productivity level.

¹⁴ Investment costs can be differentiated in direct training costs (pecuniary costs, time exposure or intellectual efforts) and opportunity costs that come along with foregone earnings and leisure time (Becker, 1993: 52; Sesselmeier & Blauermel, 1997: 66).

their employees' *general training*. If employees change firms after having received *general training*, the employer would forego the benefits of this investment. Consequently, employees bear the costs for firms' investment in *general human capital* by receiving a lower wage than they would receive without an investment in *general training* (Becker, 1993: 34f.).

By contrast, the acquisition of *specific human capital* only increases workers' productivity in the firm that is responsible for that *specific training*. Since *specific training* does not easily transfer to other firms and strengthens worker dependence on their existing employer, employees have a disincentive to invest in *specific training*. Likewise, the employer risks a loss of productivity if the employee with *specific human capital* quits his or her job. Thus to prevent the loss of productive employees, employers offer them partial returns to their investment in specific training by paying them a higher wage. Since the higher wage leads to a larger supply of job applicants than is demanded, part of the investment costs has to be borne by the employee in order to establish a state of equilibrium (Becker, 1993: 44). Investments in *specific training* mutually pay off only with a long-term perspective and thus have stabilizing effects on employment relationships (Franz, 2003: 87).

However, *human capital* cannot only be generated with *training on the job*. A substantial part of training takes place in the educational system before entering the labor market. The knowledge and skills that are acquired through *schooling* usually result in *general human capital* endowments. Nevertheless, it is often difficult to differentiate between *general* and *specific* human capital. For instance, in apprenticeship systems *human capital* is generated in *general* and *specific* ways. As labor market entrants have not yet received any firm-specific training, *human capital* that is acquired during schooling is the primary determinant of individual productivity and wages at the beginning of one's career.¹⁵ Furthermore, the more closely the acquired *human capital* corresponds to the specific requirements of a firm or job, the more productive the worker is upon labor market entry. During the employment career, *general* or *specific human capital* within firms plays an increasingly important role in determining job rewards and job tenure. However, analogous to real capital, *human capital* is subject to an amortization rate, i.e. knowledge becomes gradually obsolete or is forgotten (Franz, 2003: 75; Hinz & Abraham, 2005: 33).

Overall, the primary difference between *human capital theory* and neoclassical labor economics is that it drops the assumption of perfectly homogeneous workers. Sociological approaches commonly criticize the neoclassical view of labor as equal to the production factor

¹⁵ Of course, internships, other work experience before graduation or extracurricular activities increase the stock of human capital as well.

goods and stress the distinctiveness of the economics of labor (Goldthorpe, 2009: 8). As they argue, employers do not necessarily have complete control over the commodity of labor, as assumed by neoclassical theory. Employment contracts need to regulate complex social relationships and therefore always contain a degree of implicitness which is subject to *non-contractual factors*. A major critique of *human capital theory* is therefore the one-sided concentration on the labor supply. Yet workers are always matched to specific jobs that are embedded in a structure of jobs, occupations or classes and these structural conditions have an impact on the arrangements of the employment relationship (Granovetter, 1981; Sørensen & Kalleberg, 1981). Hence, demand-side characteristics on the part of the employer are no less important for stratification processes in the labor market. Besides, *human capital theory* assumes a unique, homogeneous labor market and thus cannot account for labor market segmentations that result from different institutional regulatory structures. The labor market value of educational attainment may differ between occupations, industries or labor markets and strongly depends on employers' perceptions and beliefs about the productive value of educational qualifications (Stinchcombe, 1979; Breen, Hannan, & O'Leary, 1995; Jackson, et al., 2005). In order to describe labor market processes in a more realistic way, further modifications of the neoclassical model are necessary.¹⁶

2.1.2 Signaling Theory

Signaling theory (Spence, 1973, 1981) further drops the unrealistic assumption of perfect information with regard to individuals' potential productivity. This theory explicitly takes the problematic realization of employment relationships into account and allows for a more active role of employers in processes of job allocation.¹⁷ Because employers lack information about the future productivity of job applicants, they are unable to observe or measure the real productivity of potential workers. Hence new hires are always viewed as an 'investment under uncertainty' (Spence, 1973: 356). In order to cope with the problem of asymmetric information employers use observable characteristics such as educational attainment, gender, age, work experience, unemployment duration or other personal characteristics to evaluate job

¹⁶ Of course, *human capital theory* involves other critical limitations. While productivity is seen as equivalent to wages, it is hardly measured independently from wages. Also, it usually does not measure the extent to which various forms of human capital actually increase productivity (Bills, 2003). In this regard, the causal mechanism between education and productivity and wages can be spurious: preexisting factors influence both educational attainment and marginal productivity.

¹⁷ The relevance of the demand side is even more pronounced in complementary *screening* (Stieglitz, 1975) or *filtering models* (Arrow, 1973). While job seekers signal, employers *screen* and *filter* job applicants. For Weiss (1995) the difference between *signaling* and *screening* is that in the former job applicants are first-movers, while it is firms in the latter.

applicants' potential productivity.¹⁸ Which of these characteristics are relevant regarding future productivity depends on the individual employer. Conversely, employers may also use different kinds of employee attributes for different kinds of labor market positions.

One key differentiation is between *indices* and *signals* (Spence 1973: 357). While *indices* refer to ascriptive traits that individuals are unable to influence like age, gender or social background, *signals* such as educational credentials are achieved attributes that individuals can manipulate and invest in anytime. In contrast to *human capital theory*, the *signaling* approach assumes that labor market participants do not deal with their stock of human capital but with *signals* and *indices* that indicate their productive endowments.

The relationship between *signals* and wages on the labor market can be characterized by equilibrium between investment costs for the acquisition of *signals* on the one hand and the wage structure that is offered by employers based on the perceived productivity expectations on the other hand. Employers calculate various combinations of *indices* and *signals* based on their previous experiences and a job applicant's attributes, using these to guide their expectations concerning the expected marginal productivity value of a given employee and his or her particular wage (Spence, 1973: 358). Employers rely on *informational feedback* over time and permanently revise and update the expected values of marginal productivity (Spence, 1973: 359). Potential employees attempt to maximize their wage returns to the *signaling costs* and may, in turn, change their investment decision for a *signal* when the wage offer is newly adjusted. Hence, the *signaling equilibrium* will be balanced out again and again based on fresh information about job applicants' signaling decisions regarding an investment and employers' observations of the real productivity of employees. 'An equilibrium is best thought of as a set of beliefs that are confirmed or at least not contradicted by the new data at the end of the loop just described' (Spence, 1973: 368).

A potential signal becomes an actual signal only if the *signaling costs* - the investment costs for achieving a *signal* - are negatively correlated with an individual's productivity level (Spence, 1973: 358, 367). The higher the preexisting abilities of an individual, the lower the *signaling costs* to acquire the *signal*, i.e. the highly skilled already show a greater productivity or learn more readily in the investment into education. If the assumption does not hold, every

¹⁸ If employers use common characteristics of employee groups in order to evaluate the qualification of an individual, one also speaks of *statistical discrimination* (Phelps, 1972). This is because the use of group characteristics can lead to incorrect or discriminatory decisions in individual cases.

individual would equally invest in *signals* and therefore would not enable employers to effectively differentiate between job applicants.¹⁹

According to Spence (1973: 364), investments in *signals* such as educational attainment do not directly increase the stock of human capital. Based on his modeling, the acquisition of educational credentials eventually leads, on average, to a higher productivity only because of the negative correlation between innate abilities and *signaling costs*. Hence, investments in educational qualifications are rather a mechanism by which individuals with higher innate abilities are able to signal these abilities to the employer and thus capture their *ability rents* (Stiglitz, 1975: 287). In turn, employers are able to identify unobserved attributes that are supposed to increase worker productivity thanks to workers' educational qualifications. Hence, both signaling and human capital theory would expect the same effects of educational attainment on wages but via different mechanisms.²⁰ As Goldthorpe (2009: 12) puts it: 'What is at issue is not whether, but *how*, education relates to productivity'. Nevertheless, signaling theory does not necessarily exclude the possibility that educational attainment increases future productivity (e.g. Stiglitz, 1975: 294). If so, it enhances the differences in preexisting abilities between those who acquire an educational degree and those who acquire not.²¹ Since education may be a *signal* for both preexisting skills and increasing productivity via schooling, *signaling* and *human capital theory* could be seen as complementary approaches rather than contradictory ones (Bills, 2003).²²

In this regard, Jackson et al. (2005) differentiate between a *certifying* and a *signaling* role of educational attainment in the labor market. While educational credentials *certify* knowledge, expertise or specific skills that are acquired in the educational system, they may also *signal* unobservable traits such as motivation, diligence or the ability to learn quickly. Whether employers give more weight to the *certifying* or *signaling* of educational credentials depends on the one hand on the occupational specificity of the educational system, i.e. to what extent prepare educational qualifications for specific occupations, and on the other hand on

¹⁹ Effective or reliable *signals*, however, do not only depend on this negative correlation, but on a sufficient number of signals within the appropriate range of costs (Spence, 1973: 367).

²⁰ Empirical analyses that attempt to separate the *human capital* explanation from the *signaling* explanation are difficult and - so far - do not come to firm conclusions (for reviews see Chevalier, Harmon, Walker & Zhu, 2004; Bills, 2003).

²¹ While Spence (1973: 368) generally agrees, he also indicates the following relation: If educational qualifications are too productive relative to the signaling costs, everybody would invest in educational attainment, and consequently educational credentials would lose their signaling capacity.

²² Psacharopoulos (1979) differentiates between a *strong* and *weak* version of *screening*. According to the *strong* version, education does not increase economic performance but is exclusively used as a *screening* device. According to the *weak* version, education functions as a *screening* device but increases productivity at the same time. Arrow's *filtering* model (1973) can be regarded as a strong version, in which education is a double filter: students have to be admitted to an institution and then must graduate from it.

the skill requirements among jobs or occupations. Overall, *signaling theory* provides a more realistic picture of the wage setting process but still relies on the neoclassical assumptions of perfect market relations and wage competition. The differentiation between *signaling* and *certifying*, however, already hints at the relevance of structural conditions in the labor market and definitely calls for a more profound consideration of demand side characteristics.

2.1.3 Job Competition Model

The *job competition model* (Thurow, 1975, 1979) questions the wage competition assumption in mainstream economics and gives more attention to the demand side.²³ Basically, it posits that the marginal productivity is not determined by employee characteristics but by the requirements of a specific job. In contrast to *human capital theory*, individuals do not directly compete for wages but for jobs that are associated with marginal products identifying the wages in a *training market*.²⁴

Employers face the operative problem of selecting job applicants that are capable of fulfilling the desired marginal product of a specific job with the least investment in their training costs. A variety of *background characteristics* such as education, age, sex or personal habits give employers hints about job applicants' general skills, learning abilities or motivation. These characteristics may not be directly used in the production process but imply lower training costs for learning the specific requirements of the job (Thurow, 1975: 86).²⁵ Hence, this model assumes that the skill requirements for a job, be it more general or specific, are predominantly acquired during training on the job. But this is not a crucial assumption in this *job competition model*. Employers may also take into account that schooling directly enhances trainability or reduces the training costs for adequately performing on the job. Hence, it can be regarded as a weak version of *screening*.

Employers rank the supply of job seekers in a *labor queue* according to the amount of training costs for each worker and match this to a second queue of vacant jobs, which is ordered by skill requirements and rewards. The best occupational positions go to job applicants that signal the lowest training costs, the worst occupational positions to those that

²³ As Sørensen (1996: 1335) explains, 'Even if we know everything there is to know about individual behavior and performance, we cannot fully account for observed inequality without knowing about the properties of the positions people occupy'.

²⁴ 'As we shall see, a large body of evidence indicates that the American labor market is characterized less by wage competition than by job competition. That is to say, instead of people looking for jobs, there are jobs looking for people – for "suitable" people' (Thurow, 1972: 68). However, Thurow (1975: 76; 1979: 17) also recognizes at some point that wage competition and job competition are not mutually exclusive but coexist in national economies.

²⁵ The *job competition model* does not explicitly refer to *screening* or *signaling* models but argues in a similar way regarding the matching process.

signal the highest training costs (Thurow, 1979: 21; Thurow, 1975: 95). Since educational attainment can be regarded as a strong signal for trainability, it is crucial in determining the relative position in the *labor queue* (Thurow, 1975: 88).

However, the sorting of a national *labor queue* is more complex than it seems. Different employers have a different behavior regarding the sorting of the *labor queue*. Some characteristics may have greater relevance for one employer while other employers do not see any association between these same characteristics and training costs. Furthermore, employers may consider various background characteristics simultaneously. Due to search costs or market imperfections, employer searches may not result in finding an ideal employee, and job applicants may not find the best job available. As a consequence, an educational group's relative position in a national *labor queue* can be rather seen as the 'weighted average of its position with each individual employer' (Thurow, 1979: 20). This implies that not every individual with the same educational attainment has access to the same position in the *labor queue*; educational groups may thus be better characterized by a distribution around the mean.

Returns to education are not only shaped by the supply of educational credentials among individuals in the *labor queue* but also by the *job queue* and its job opportunities and rewards. While background characteristics such as educational attainment determine the relative position in the *labor queue*, they do not necessarily shape the *job queue*. Although labor supply can create its own demand, there are various other influences that have an impact on the distribution of job opportunities. Since firms have more or less stable organizational structures that are designed to efficiently maximize profits, job structures may not easily be changed and employers cannot immediately adapt the skill requirements of jobs to an increasing supply of highly qualified workers. Hence, labor demand must be regarded as independent of the labor supply. The distribution of workers in the *labor queue* may not be mirrored in the distribution of jobs in the *job queue*. Individuals with higher educational credentials may be, on average, ranked at the top of the *labor queue*, but not everyone may find a position that requires a high level of skills. 'Training opportunities only occur when there is a job opening that creates the demand for the skills in question' (Thurow, 1975: 79). Thanks to technical or social determinants of job structures, employees may have control over jobs, meaning that current job seekers may only get access to jobs if incumbents leave or retire or a new job is added (Sørensen & Kalleberg, 1981). After being selected into different jobs with different skill requirements individuals with identical *background characteristics* receive a different training-on-the-job that leads to unequal abilities and thus a different marginal productivity. Consequently, the distribution of wages is not reflected by the

distribution of the *labor queue* but by the distribution of employment opportunities (Thurow 1979: 22). In contrast to *human capital theory*, individuals with identical characteristics do not necessarily earn the same wage (Thurow, 1979: 20; Sørensen & Kalleberg, 1981: 55). The *job competition model* can therefore provide an explanation for the observed earnings variance between individuals with identical abilities (Thurow, 1975: 92). The model also takes into account that individuals at the bottom of the *labor queue* will become unemployed in times of labor scarcity (Thurow, 1979: 21).

Compared to the wage competition model, Thurow's (1979: 23) *job competition model* likewise implies that equalizing educational attainment does not come along with a lower wage inequality. In the wage competition model, an increasing supply of highly skilled people will reduce the wage rate for highly skilled and increase the wage rate for the lower skilled. In the job competition model, educational expansion may decrease the dispersion in the *labor queue*, but these more homogeneous job applicants will still be distributed across a wide range of jobs and wages. In fact, throughout educational expansion the lower educated are worse off because they are ranked into a lower relative position in the *labor queue* and thus are selected into lower skilled positions in the *job queue*. Hence, in this *job competition model*, it is the relative position in relation to others that matters. If the supply of highly educated increases, investments in education become a *defensive necessity* in order to stay ahead of the *labor queue* (Thurow, 1975: 96). Given the matching of a *labor queue* and a *queue of vacant jobs*, education clearly has to be regarded as a *positional good* (Hirsch, 1977).

Summing up, compared to both theories of *human capital* and *signaling*, the *job competition model* is advantageous by more adequately modeling the relation between labor supply and demand. By doing so, this model takes into account that educational expansion and occupational upgrading do not need to follow the same pattern. Moreover, it stresses that an individual's job returns do not depend on the absolute amount of education he or she acquires but on the relative investment in relation to others. Critics, however, indicate that the assumptions of the *job competition theory* rather pertain to labor markets that are segmented along firm lines than occupational lines (Brauns, Steinmann, Kieffer, & Marry, 1999). Moreover, *job competition theory* underrates the role of job seekers and their application behavior with regard to job matching processes.

2.1.4 Matching models

Sociological *matching models* (Sørensen & Kalleberg, 1981; Sørensen, 1977; Coleman, 1991; Granovetter, 1981; Logan, 1996a; Eliason, 1995) strongly rely on the assumptions of the *job competition* model as described in the previous section, but more explicitly emphasize that employers as well as job seekers are equally important in the job matching process.²⁶ While the *job competition model* has rightly put more focus on the demand side and job characteristics, job matching at the micro level - the matching of individuals to jobs - can be eventually seen as the result from a series of events that is shaped by individual perceptions, expectations and actions among both employers and job applicants. Not only employers have difficulties in directly evaluating job applicants and their productivity in the *labor queue*, job applicants also face the problem of not having all necessary information regarding job characteristics to evaluate the adequacy of job vacancies in the *job queue*.

In this regard, sociological *matching models* describe allocation outcomes as a two-sided, mutual evaluation and decision-making process of two contradicting actors - job seekers and employers - that arise from the interplay between their preferences and the opportunity structures.²⁷ Individual outcomes of job matching will come about if employers regard job applicants as adequate for the specific job at hand and, at the same time, job seekers perceive the job characteristics of a vacancy as appropriate and in line with his or her preferences. Given a joint decision of job matching, employers then decide against the choice of an alternative candidate, while job applicants opt against being unemployed or continuing participation in further education.

On the one hand, employers attempt to select workers they assume to have the lowest training costs for the specific vacancy given its skill requirements. In order to evaluate job applicants' potential training costs they use educational qualifications or other observable traits as *signals* for the future productivity. Hence, sociological *matching models* explicitly take the *job competition model* and *signaling* approaches into account. On the other hand, job applicants with given preferences strive to acquire jobs that promise the best possible returns for their investment in educational attainment, be it monetary or non-pecuniary such as job security, working conditions or other job quality indicators. Given that, the most attractive workers will be generally allocated to the most attractive positions (Coleman, 1991). Eventually, job matching outcomes depend on the opportunity structures, i.e. the overall

²⁶ In fact, Thurow's *job competition model* is often mentioned under the heading of *matching models*.

²⁷ See also economic job search theory (e.g. Pissarides, 1985; Mortensen, 1986, 1988), where job applicants continuously seek for acceptable jobs and employers continuously seek for adequately skilled job seekers for vacant jobs.

distribution of jobs and workers with particular skills or resources. Labor market returns to individual workers are strongly dependent on the relative value of his or her resources in relation to others. The overall result of two-sided allocation decisions is reflected in the social stratification of labor market positions according to worker characteristics such as educational attainment, gender, age or ethnicity.

Matching models are frequently seen as the most useful theoretical approach to understand job allocation processes and the relationship between educational qualifications and labor market positions at the micro-level (Müller & Gangl, 2003a; Gangl, 2004a; Müller & Jacob, 2008). It is also a good starting point for acknowledging the relevance of contextual factors at the macro-level and how they shape or influence micro-level matching processes. Macro-level conditions particularly come into play when considering changes in allocation outcomes over time. Along these lines, the following subchapter will indicate how individual expectations and actions that shape job matching processes at the micro level can be affected by macro-level opportunity structures or institutional circumstances.

2.2 A micro-macro modeling

The aim of the preceding section has been to give a general micro-theoretical explanation for the association between individuals' educational qualifications and labor market positions, i.e. why educational attainment generates different returns on the labor market. The overall purpose of the book, however, is to assess trends in returns to education in a specific national setting over time. To account for changes in job allocation outcomes in West Germany I pursue a *micro-macro* framework of analysis and use the theoretical modeling of an influential reference study for explaining cross-country variations in job allocation outcomes in Europe (Müller & Gangl, 2003b, 2003a).

The micro-level approaches to job competition and job matching already acknowledge the relevance of contextual factors at the macro-level for labor market returns to education. Individual expectations and actions that lead to mutual allocation decisions of employers and job applicants are always shaped by macro-level opportunity structures. Varying macro-level conditions are particularly important when considering differences in returns to education between countries or across time. But even at a given point in time in a given country analyses on the relationship between educational attainment and labor market outcomes always have to consider the currently prevailing contextual factors in order to understand job matching processes.

Within this *micro-macro* model, I assume that the general *micro*-mechanisms that result in matches between individual job seekers and particular jobs upon labor market entry do not substantially vary over the course of time. The underlying social processes determining the returns to education remain constant as employers and job applicants will always attempt to achieve satisfactory job allocation outcomes: Employers aim to recruit the best possible workers for a given vacancy while job seekers – given their resources and preferences - attempt to achieve the best possible labor market positions with the highest rewards. However, the macro-level contextual factors under which individual actors come to a decision and which shape the terms of vacancy competition may change considerably over time. Depending on the specific institutional, macrostructural or macroeconomic context, the magnitude of returns to education may vary substantially. The *interplay* between *macro*-level conditions and employers' and school-leavers' expectations and actions, leading to joint allocation decisions at the *micro* level, are crucial for understanding changes in returns to education upon labor market entry. To what extent may changes in the institutional setting or macrostructural and macroeconomic conditions be reflected in a changing social stratification of job allocation outcomes?

In general, it is the employers who decide which applicant characteristics are valuable when hiring new workers at the micro-level (Jackson, et al., 2005; Jackson, 2007; Goldthorpe & Jackson, 2008). In this regard, Jackson et al. (2005: 10) argue that 'In any attempt at understanding the role or, changes in the role, of education in class mobility, the actions of employers must therefore have a central place.' Thus, the returns to education are strongly dependent upon employers' perceptions and beliefs regarding how educational qualifications affect productivity in a given job with specific skill requirements. The use of educational attainment as a signal for productivity may strongly differ between different employers, industries or countries (Stinchcombe, 1979; Breen, et al., 1995). When considering the relationship between educational attainment and productivity, employers do not do this without factoring in time-specific contextual matters. To reduce uncertainties in hiring decisions, employers take their knowledge of macrostructural and institutional context conditions into account when evaluating the signaling value of individual characteristics such as educational attainment.

From a *micro-macro* model, we can therefore expect that changes in the relative value of educational attainment in job matching processes arise when employers attach an increasing or decreasing signaling value to educational attainment over time thanks to changes in macrostructural and macroeconomic conditions or institutional regulations.

Likewise, job seekers may adapt their preferences, job search behavior and eventually job decisions to these same contextual factors.

Institutional conditions have an impact on the *signaling capacity* of educational qualifications and thus determine the extent to which employers rely on educational attainment in their hiring decisions. Whether employers use educational attainment as a reliable and useful indicator for productivity among new hires strongly depends on the configuration of the *education and training system*. National education and training systems vary depending upon how stratified and standardized a particular educational system is. They also differ with regards to the qualifications they provide for specific jobs, that is how applied the skills and knowledge are for a particular job or whether additional training at the workplace is necessary. Such variations may also be intertwined with different *structures or segmentations of the labor market* that are crucial for the relevance of educational attainment in job matching processes.²⁸ The clearer educational credentials indicate what students have learned and the closer the link between specific qualifications and occupational requirements, the higher the *signaling capacity* of educational attainment and the higher the returns to education in the labor market. Job allocation outcomes may also depend on *labor market regulations* that govern the rights and obligations of employers and employees. For instance, entry into some occupations may be restricted to those school-leavers that have the formal and legal requirements in terms of specific educational certificates. Given occupational closure, employers are clearly not free to choose any adequate job applicant (Weeden, 2002). Institutional settings may also vary according to the wage setting process or the level of employment protection legislation (EPL), which determines the costs for employers that arise when hiring or dismissing employees. Given a high level of employment protection legislation, employers may be more risk-averse in their hiring decisions and thus may more strongly take individual characteristics such as educational qualifications into account. Hence, labor market institutions also affect the job matching process. Institutional differences are not only relevant for explaining cross-country variations; changes in these institutions across time may also account for trends in the returns to education within a country. More specifically, changes in employers' perceptions and beliefs about the signaling capacity of educational attainment may be driven by changes in the set-up of the education and training system, labor market structure or labor market regulations.

²⁸ Since labor market segmentations result from macro-level institutional conditions, *labor market segmentation theories* are not presented as micro-theoretical models (see chapter 2.1). Instead, I present them in chapter 3.2 regarding the *labor market structure* in West Germany.

With regard to *macrostructural* and *macroeconomic conditions*, the micro-level *matching models* already emphasize that an individual's chances of attaining a (promising) vacancy at a given point in time is not only dependent on his or her own educational resources but on their relative position in the *labor queue* and the overall availability of vacancies in the *job queue*. Returns to education may vary based on the macroeconomic conditions, i.e. the up- and downturns in the business cycle, the labor supply, i.e. the strength of educational expansion and the labor demand, i.e. the strength of occupational upgrading.

Across periods, young people at labor market entry can be faced with different macroeconomic situations that shape their opportunity structures. During economic downturns labor demand is slack and vacancy competition tightens. As a result, some job seekers have increasing difficulties of finding employment. Variations in the business cycle, however, do not necessarily have an impact on all educational groups in the same way. When job competition becomes more severe, employers may raise their hiring standards in terms of skill requirements, while, at the same time, job applicants lower their reservation wage and claims regarding job characteristics. The changes in individual preferences and behavior during worsening macroeconomic conditions may result in lower educated labor market entrants not finding a vacancy and remaining jobless.

Returns to education will also vary over time depending on the relation between *labor supply* and *labor demand* in a given country. Among the labor supply, access to positions in the *job queue* is not only determined by labor market entrants' absolute level of educational attainment but also by the level of educational resources distributed across all other individuals in their labor market entry cohort. Similarly, labor demand is structured by the distribution of jobs in the *job queue* and the demand for certain levels of skills. A highly educated individual may still have difficulties finding an adequate high-skilled position upon labor market entry because too many others in his or her cohort have obtained the same degree. Amidst an oversupply of highly skilled job seekers, employers may raise their hiring standards and select highly skilled individuals into low-skill jobs. Higher education graduates may therefore need to decide whether they are willing to accept a job for which they are overqualified or remain unemployed. Given that the highly educated opt for lower skilled jobs, this may crowd-out other educational groups. However, the *upgrading of the occupational structure* is able to mitigate potentially negative effects of *educational expansion* on job allocation outcomes. If highly skilled jobs in the *job queue* expand at the same rate as highly skilled individuals in the *labor queue*, then these two processes should offset one another, minimizing vacancy competition and ensuring that the highly educated are

able to find adequate occupational positions. Conversely, occupational upgrading may outpace educational expansion. In this case, some individuals with intermediate education – even though being not at the top of the *labor queue* – possibly have access to occupational positions in the *job queue* for which they are normally under-qualified.

Educational expansion and *occupational upgrading* in a given country do not only have potential structural consequences but may also affect the signaling capacity of educational attainment over time. If educational expansion has increased immensely, employers may have little faith in the signaling value of higher education as many people have entered the labor market with the same degree. Since individuals are increasingly able to obtain these degrees, the signaling costs may be less and less negatively correlated with individuals' real abilities. Hence, employers may have increasing difficulties accepting higher education degrees as reliable indicators for unobserved characteristics such as general abilities. Consequently, the ordering of relative positions in the *labor queue* would become less dependent on educational qualifications than in former times.

By contrast, *technological changes* may prompt occupational upgrading, increasing the skill requirements in the labor market and thereby raising the demand for highly educated workers. According to this idea, employers could increasingly take educational qualifications in job allocation decisions into account. Occupational upgrading among national labor markets may also experience *structural shifts in the occupational distribution*, i.e. occupations, occupational sectors, industries or partial labor markets with specific institutional regulations become more dominant in relation to others. Such qualitative changes may also have consequences on the development of returns to education as employers in different occupational sectors place differing emphasis on educational qualifications as a selection criterion. Employers' divergent evaluations of educational attainment can result from variation in institutional constraints, e.g. occupational closure, employment relations, employment protection etc., or differences in job requirements, which align more or less with unobserved attributes that are correlated with formal education.

Before developing specific theoretical arguments and hypotheses on the relationship between educational attainment and different labor market returns across time, it is worthwhile to start with a description of these changes in macro-level context conditions in West Germany. Thus, the following chapters present a description of the *institutional setting* and its changes over time as well as the relevant *macroeconomic* and *macrostructural* trends.

Chapter 3 The institutional setting in West Germany

Industrial societies differ substantially in their institutional arrangements that determine stratification processes (Kerckhoff, 1995) and shape the transition from school to work in particular (Müller & Shavit, 1998; Allmendinger, 1989b; Ryan, 2001; Andersen & Van de Werfhorst, 2010; Wolbers, 2003). The institutional framework in a given country at any point in time is strongly determined by historical practices used to allocate individuals to jobs, resulting in persistent societal idiosyncracies (Müller & Shavit, 1998).²⁹ The job matching process and the value of education upon labor market entry are strongly shaped by institutional arrangements as employers or firms have strong incentives to adapt the organization of work, personnel recruitment policies and the sorting and awarding of credentials to the configuration of the educational system and labor market institutions. National education and training systems can differ according to differentiation in school tracks, curricula, the certifying of credentials or formal entry rules for specific occupations. Similarly, national labor markets may vary in the role of collective actors such as unions or professional organizations, the wage setting process or employment protection legislation (EPL). Although the national institutional setting is typically known to be more stable and persistent than structural conditions, institutional features may change over time and thus have an impact on the trends in returns to education. Moreover, the institutional framework itself may channel or filter the impact of structural or macroeconomic changes on matching processes in a national economy (Müller & Gangl, 2003a; DiPrete, deGraaf, Luijkx, Tahlin, & Blossfeld, 1997). Therefore, it is necessary to analyze West Germany's institutional characteristics and their developments over time. While the first subsection deals with the *education and training system*, the second and third subsection present the general *labor market structure* as well as the form of *labor market regulation*.³⁰

3.1 Education and training system

The literature on school-to-work transitions identifies three dimensions of education and training systems that are assumed to have a large impact on the association between educational credentials and labor market returns upon labor market entry: *stratification*,

²⁹ For instance, the German states (especially Prussia) established bureaucracies at a very early stage that relied on specific qualifical requirements for gaining access into different levels of the administrative hierarchy. It followed the principle 'no office without proper examination' (Müller, 1994: 127, own translation).

³⁰ Beside these institutional features, Müller and Gangl (2003a) also consider *active labor market policies for youths and youth schemes* as institutional determinants of school-to-work patterns in Europe. However, such youth programs have been used widely in Great Britain and France, though less so in Germany.

standardization and *occupational specificity* (Müller & Shavit, 1998; Kerckhoff, 2001; Allmendinger, 1989b, 1989a).³¹ While *stratification* refers to degree and design of tracking at the secondary level, *standardization* indicates the extent to which educational standards are implemented nationwide (Allmendinger, 1989b). *Occupational specificity* indicates the degree to which training in the educational system provides students with occupation-specific skills rather than general knowledge. All three dimensions are supposed to enhance the signaling capacity of educational credentials in the labor market. While the organization of training in different institutions and tracks enables employers to differentiate better among graduates with different levels of abilities, standardized teaching curricula provide more reliable signals of educational qualifications and thus make hiring decisions less risky. The more occupation-specific the skills that individuals learn in the educational system are, the lower the training costs for employers and the more applicable these skills are in specific jobs. In this regard, a further important differentiation is whether vocational training is school-based or consists of a combination of firm-based and school-based training such as apprenticeships.

The education and training system in West Germany is characterized by a high degree in all three indicators (Müller, et al., 1998; Kerckhoff, 2001). Regarding *stratification*, a historical tripartite system sorts children at a very early stage (around age 10) into three different secondary school types.³² The *Hauptschule* (lower secondary school) has the least demanding curriculum and represents the earliest exit from the general education system. The *Realschule* (intermediate secondary school) is a somewhat more demanding track, leading to the degree of *Mittlere Reife*. The third type, the *(Fach-)Gymnasium* ((subject-specific) upper secondary school), is academically oriented and the only track that enables individuals access to higher education once they have completed their *Abitur*, the final exam.

As to *standardization*, the Standing Conference of State Education Ministers (*Kultusministerkonferenz*), the primary organization for coordinating educational policy nationwide, ensures a relatively high degree of comparability of educational attainment across

³¹ *Standardization* appears to have no independent effect on labor market returns, i.e. when controlling for either of the two other institutional characteristics the effect of *standardization* becomes insignificant (Müller & Shavit, 1998). The *skill transparency* of the educational system – measured as a combination of *stratification* and *occupational specificity* - has a positive impact on the returns to education even when controlling for the level of *labor market coordination* (Andersen & van de Werfhorst, 2010).

³² In the 1970s, some West German *Länder* (mostly ruled by Social Democrats) aimed at restructuring the old tripartite system by integrating these tracks into a comprehensive school of secondary education (*Gesamtschule*). However, this school still offers these degrees but in one single school context. Overall, the proportion of these comprehensive schools in West Germany is still rather small.

German *Länder*.³³ Educational standards refer to ‘variables such as teacher’s training, school budgets, curricula, and the uniformity of school-leaving examinations’ (Allmendinger, 1989b: 233).

Finally, *occupational specificity* transpires by providing occupation-specific skills for hundreds of occupational titles. This is mainly coordinated between vocational schools and the workplace in the so-called *dual system of apprenticeship*.³⁴ While apprentices spend one to two days at a vocational school learning formal skills, they receive occupation-specific practical skills three to four days at a workplace.³⁵ In general, apprentices are trained for three years in the *dual system*. Employers create and administer on-the-job training and are free to decide which applicant to hire and which not. This school and work combination evolved historically from the guild system, relying upon training and recruitment policies as well as other laws to regulate their duties (Müller, et al., 1998: 145; Hillmert, 2001: 106f.). Likewise, the state as well as employers and worker representatives (overwhelmingly trade unions) are jointly responsible for the organization and implementation of vocational training. Typically, this structure is labeled a corporatist negotiation system. The chambers of trades, industry, and commerce are given the authority to carry out day-to-day training and certification processes. Thanks to this corporatist regulation, the German apprenticeship system is characterized by a relatively high degree of formal standardization in curricula, length of training or examination and certification process (Raggatt, 1988). Thus, employees are able to move relatively easily between organizations without experiencing a devaluation of firm-specific human capital. Furthermore, the *dual system of apprenticeship* facilitates the job matching process upon labor market entry and reduces job mobility in early work life (Allmendinger, 1989a). Apprenticeship training also tends to provide a certain amount of general skills that can be used outside the specific occupation (Witte & Kalleberg, 1995). Nevertheless, quality of training greatly varies between different types of apprenticeships, particularly between the craft sector and the industrial and commercial sector (Soskice, 1994).³⁶ The *dual system of apprenticeship* is widely accepted as a useful tool for providing

³³ In general, the German *Länder* have the legislative and administrative authority in educational affairs (*Kulturhoheit der Länder*).

³⁴ For a more extensive review of the German apprenticeship system see Franz and Soskice (1995) or Steinmann (2000).

³⁵ School-leavers that are not able to gain a training place in the *dual system of apprenticeship* can or must (until the age of 17) pass a *Berufsgrundbildungsjahr* (BGJ) or *Berufsvorbereitungsjahr* (BVJ) at a full-time vocational school in order to bridge the time until finding a training place. For *Hauptschule* graduates, these forms of preparatory courses have become increasingly important due to a tightened competition for training places with higher educated school-leavers.

³⁶ Accordingly, Pollmann-Schult and Büchel (2005) show that apprentices in the craft sector have a higher risk of unemployment and overeducation compared to apprentices in the other sectors.

occupation-specific skills and thus is the dominant form of vocational training in Germany (Blossfeld, 1991).

By contrast, full-time vocational schools - mostly preparing for commercial and administrative occupations – and schools which concentrate on health professions, including nurses, therapists, midwives or masseuses, play only a minor role in the German vocational training system. Once individuals have completed an apprenticeship, graduates are allowed to participate in further training programs at professional schools for health care or social services, become a master craftsman in a traditional craft (*Meister*) or a highly qualified technician (*staatlich geprüfter Techniker*).³⁷ These additional qualifications are required if an individual wishes to establish his or her own craft enterprise. Hence, in contrast to other European countries, educational credentials play a significant role among the self-employed.

Compared to countries where elite universities play a larger role (e.g. United Kingdom or US), the German state universities are quite homogenous in terms of quality and prestige. Akin to secondary educational requirements, German universities are bound to administrative and legal provisions, which stipulate a rather standardized, subject-specific training program. Because the German higher education system does not offer any sequential programs such as in the successive steps model (e.g. France, Belgium or Spain), the German system is comparably unstratified. Hence, a university degree in West Germany is generally a reliable signal for a high level of knowledge and competency. Likewise, many traditional universities offer curricula which prepare students for specific occupational careers. Particularly in traditional professions such as medicine and law university education and occupational destinations are closely linked. While universities are responsible for professional training and state-controlled examination, leading to *Staatsexamen*, the state handles residency training requirements (*Referendariat*).³⁸ Students who want to become, for instance, a lawyer or doctor must first acquire the official occupational title to work in these professions. Since the state is highly involved in the allocation process and enforces supply-side restrictions, this can be interpreted as one form of occupational closure that Weeden (2002) labeled as *licensing*.³⁹

³⁷ While these degrees do not count as tertiary education in West Germany, similar training programs in other countries are counted as such. Accordingly, these higher vocational qualifications in Germany are categorized as ISCED 5B (first stage of tertiary education).

³⁸ Aside from human medicine and law, studies of veterinary medicine, dentistry, pharmacology, teacher's training and food chemistry are completed with a *Staatsexamen* degree.

³⁹ 'Licensure requires that individuals obtain permission from the state in order to identify themselves by an occupational title (e.g., psychologist) and, in many cases, practice a particular set of skills (e.g., counseling). It thus restricts access to an occupation to candidates who have met a predefined set of criteria, where such criteria may include obtaining a specified educational credential or voluntary certification [...]' (Weeden, 2002: 62).

Legally recognized professional associations act on behalf of the interests of their professional occupations and members and attempt to maintain their privileges.

Likewise, Prussian bureaucratic practices dating back to the early 18th century established a recruitment and promotion system for civil servants based strictly upon educational credentials. In order to access higher public service grades, individuals were required to possess a university degree. Although recruitment into the lower grades is less stringent, the public service offers career possibilities that are hierarchically linked to educational certificates (Blossfeld & Becker, 1989). While occupational specificity is clearly less pronounced among tertiary education than among the apprenticeship system, many higher education segments contain a high degree of occupational orientation, too (Leuze, 2007).

Are there any significant changes in the institutional framework of the education and training system that may have impacted changes in the signaling capacity of educational credentials in West Germany over time? The answer is largely no. Basically, the German education and training system has maintained the same institutional arrangements since World War II. Among secondary education institutions, there have been no major institutional changes which could have significantly altered the stratifying nature of the German system. Graduates with a degree from *Hauptschule*, *Realschule* or *Gymnasium* remain distinctive even today.⁴⁰ Although variation in school organization and curricula (e.g. in the length of primary education) has grown over time among the German *Länder*, the *Kultusministerkonferenz* is still able to ensure relatively similar teaching and examination procedures, resulting in comparable educational certificates nationwide. Thus, the German education and training system can still be regarded as highly standardized in comparison to other countries.

Likewise, the German apprenticeship system has proved largely resilient, despite structural shifts among training programs (Konietzka, 2009).⁴¹ The *dual system of apprenticeship* remains flexible in terms of innovations and adaptations to changing market demands and new technologies. This is due to the fact that employers feel constant pressure to minimize training costs, thereby encouraging them to adapt training practices to the changing needs of the labor market. The most significant change concerns the entry requirements to gain access to the *dual system of apprenticeship*: In the 1980s it became more common among

⁴⁰ Most recently, the West German *Länder* Schleswig-Holstein, Rhineland-Palatinate, Hamburg and Bremen decided to combine *Hauptschule* with *Realschule* in one single school type. Nevertheless, pupils can still decide to graduate with *Hauptschulabschluss* or *Mittlere Reife*. Moreover, the vocational paths to *Abitur* have gained in quantitative importance over time. For a description of different institutional access paths beyond the classic direct pathway via *Gymnasium* see Schindler (2012).

⁴¹ Since the beginning of the 1970s the number of officially recognized apprenticeships has nearly halved. In 2012 the *dual system* comprises 345 apprenticeships in (see <http://www.bibb.de/de/wlk26560.htm>, last access 30.05.2012).

school-leavers to start vocational training once they had received their *Abitur*. This certificate has become a major selection criterion to gain access to prestigious training places, which possibly indicates an increase in skill requirements in the training market.⁴²

The tertiary education system in Germany has also not been affected by severe restructurings.⁴³ Based on agreements of the German *Länder*, the most important change was the foundation of a special form of second-tier institution, the *Fachhochschule* (university of applied sciences or polytechnics), at the beginning of the 1970s.⁴⁴ Since then, higher education in West Germany can be classified as a binary system with two segmented tracks, university and *Fachhochschule*, which clearly differ in terms of organization and training profile. The *Fachhochschule* is much more occupationally oriented than traditional universities. Moreover, the length of training (mostly 4 years) is considerably shorter than at university. As a consequence, the introduction of *Fachhochschulen* has clearly strengthened the level of occupational specificity in German higher education. Nevertheless, since formal entry requirements have been raised and training is primarily school-based, the *Fachhochschule* is considerably more than just another form of advanced vocational training. Rather, their curricula tend to converge onto universities, producing a separate but equivalent institution (Müller, et al., 2002).⁴⁵

Overall, the education and training system has remained persistent over time in West Germany. Thus, changes in these institutional arrangements cannot be responsible for changes in the relationship between educational attainment and labor market outcomes. Instead, the high signaling capacity of educational credentials may rather preserve the strong association between these and the rewards upon labor market entry.

⁴² Schindler (2012: 71f.) indicates that in prestigious apprenticeships, such as banking or insurance, the proportion of apprentices with *Abitur* or *Fachhochschulreife* has substantially increased from 5 per cent in the mid-1970s to 60 per cent at the end of 2000. Among the new apprenticeship of data processing experts it almost amounts to 70 per cent.

⁴³ In recent years, the German higher education system has undergone several transformations. Throughout the *Bologna Process*, higher education in Germany was differentiated into Bachelor's and Master's degrees. The so-called *Exzellenzinitiative* initiated by the federal government and the *Länder* attempts to bolster competition among universities and is aimed at establishing stronger qualitative differences between universities in order to improve their research quality. These developments cannot be covered by the empirical analyses in this book though, as comprehensive data are not yet available.

⁴⁴ The *Fachhochschule* introduction has been accompanied by the introduction of a new form of secondary school, the *Fachoberschule*, which allows pupils to study at *Fachhochschule* only.

⁴⁵ The *Fachhochschule* has been allowed to change its label into *Hochschule* or *Hochschule für angewandte Wissenschaften* (university of applied sciences) in most of the German *Länder*. Still, the *Fachhochschule* does not have a right to award doctorates or professors. Nevertheless, Master graduates from *Fachhochschule* are, in principal, allowed to pursue a PhD at universities. Despite this, few students actually transfer between institutions.

3.2 Labor market structure

Several labor market typologies suggest that differences in the institutional setting of the education and training system go hand in hand with different arrangements of national labor markets and the degree of labor market segmentation (Müller & Gangl, 2003a). These various typologies aim to integrate differences in the link between educational system and labor market in more or less comprehensive labor market types.

Earlier typologies mainly emphasize the dichotomy between *qualificational spaces* and *organizational spaces* (Maurice, Sellier, & Silvestre, 1986; Müller & Shavit, 1998) or *occupational labor market systems (OLM systems)* and *internal labor market systems (ILM systems)* (Marsden, 1990, 1999; Marsden & Ryan, 1995). According to both approaches, the crucial distinction among labor market types is that employers are more or less able to rely on educational credentials as signals for productivity.

Occupational labor markets (OLM) are segmented along occupational lines, i.e. access to labor market positions and promotion chances are strongly determined by vocational qualifications. Depending on the type of vocational training, job applicants can access only specific occupational sectors and typical career paths. While employers heavily rely on workers' educational qualifications in their hiring decisions, the impact of work experience or seniority on job matching processes is substantially weaker. Accordingly, thanks to their occupation-specific skills, labor market entrants face less job mobility since their prospects of finding an adequate initial occupational position is generally decent (Allmendinger, 1989a). Overall, *OLM* systems are characterized by a strong orientation towards external recruitment patterns and inter-firm mobility.

By contrast, in *internal labor markets (ILM)*, the matching between educational credentials and occupational positions upon labor market entry is less pronounced. Since the educational system overwhelmingly produces graduates with general skills, employers are less confident about job applicants' productivity. Hence employers attempt to fill vacancies with individuals from the existing pool of employees in the firm, since they already were screened during probationary periods and have acquired firm-specific skills and knowledge.⁴⁶ Labor market entrants usually start their working career in low occupational positions and

⁴⁶ In a labor market where employees' productivity is to a large extent dependent on the quality of training on the job, the prevailing of *firm internal labor markets* appears to be reasonable. Given no internal career ladders, experienced employees would strongly hesitate in passing their firm-specific knowledge and skills to younger employees because of fearing the loss of their position in the firm (Sørensen & Kalleberg, 1981: 60; Thurow, 1975: 81). *Internal labor markets* and seniority principles thus prevent that, due to their higher marginal productivity, younger employees replace experienced employees in their positions and ensure an adequate training on the job.

receive on-the-job-training, enabling them to move up internal promotional ladders when showing high levels of job productivity. Thanks to the prevailing of firm-specific skills, inter-firm mobility - if occurring - frequently leads to downward mobility, i.e. individuals need to start in *entry jobs* in the new firm again. By contrast, due to occupation-specific skills that are transferable across workplaces, workers in *occupational labor markets* are less affected by such downgrading when changing the firm.⁴⁷

Internal labor markets are more common in countries with a less developed vocational training system where educational credentials are typically rather weak productivity signals. Conversely, *occupational labor markets* are more common in countries with higher occupational specificity where educational credentials provide valid signals (Maurice et al., 1986; Marsden 1990). In these labor markets, employers will strongly rely on educational attainment in their job allocation decisions compared to *internal labor markets* where they base their decisions much more on work experience or tenure. Hence, labor market entrants are less disadvantaged compared to prime-age workers in *occupational labor market* relative to *internal labor market* systems (Ryan, 2001; Gangl, 2003c, 2003d). While *occupational labor market* systems clearly stabilize employment careers among employees in skilled positions, they have negative consequences for workers who are initially selected into low-skilled positions: These individuals have fewer upward mobility chances than their counterparts in *internal labor markets* (König & Müller, 1986; Scherer, 2004).

West Germany is regarded as a prototypical *qualificational space* or *occupational labor market (OLM)* system in which the education and training system provides school-leavers with vocational skills and knowledge that employers then use to allocate individuals according to their occupation-specific degrees.⁴⁸ West Germany's corporatist structure and the *dual apprenticeship system* strengthen the formation of occupationally segmented labor markets and prevent a greater use of internal mobility patterns among firms (Marsden, 1990, 1999). A recent cluster analysis confirms that in countries with a well-functioning apprenticeship system such as Germany, Austria, the Netherlands or Denmark *occupational labor markets* indeed prevail (Gangl, 2003d, 2001).

Although economies are often classified as one or two, both types of labor markets can coexist in one country. These typologies mainly focus on the organization of vocational training in secondary education. West Germany belongs especially to the group of

⁴⁷ For a short but revealing discussion of differences between *OLMs* and *ILMs* on four exemplary country cases see Marsden (1990).

⁴⁸ 'Workers are trained young and acquire the credentials they will carry with them throughout the careers. Workforce stratification in Germany is therefore largely autonomous with respect to the labor market, firms, and the industrial job structure' (Maurice et al., 1986: 18).

occupational labor market systems because of the strong *dual apprenticeship system*. Since *entry jobs* access in *internal labor markets* requires a high level of general trainability, ILMs are most prevalent in large firms, the public sector and particularly found among university graduates (Blossfeld & Mayer, 1988: 264). Thanks to tertiarization, *firm internal labor markets* may also play an increasingly greater role in West Germany since general skills and further education rise in demand (Marsden, 1997).

These typologies are also strongly related to *theories of labor market segmentation* (Doeringer & Piore, 1971; Lutz & Sengenberger, 1974). Accordingly, *dual* and *internal labor market* theories (Doeringer & Piore, 1971) assume that the labor market as a whole is composed of partial labor markets that result from different institutionalized regulatory structures which are not equally open to every market actor. For instance, partial labor markets differ in recruitment processes, labor conditions, wage structures or promotional opportunities. Institutional barriers prevent worker mobility between these partial labor markets for a considerable share of workers. On the one hand, Doeringer and Piore (1971) differentiate between *internal* and *external labor markets*; on the other hand recognize a dualism of *primary* and *secondary labor markets*. While their definition of *internal* labor markets is equivalent to the foregoing description, *external labor markets* are fully guided by market principles of labor supply and demand. As such, *external labor markets* are not constrained by any mobility barriers or wage rigidities. Further, *external labor markets* are seen as a gathering place for individuals currently not filling *closed positions* in *internal labor markets*.⁴⁹ *Primary labor markets* offer relatively high wages, stable employment, good working conditions and promotion opportunities; *secondary labor markets* are characterized by low wages, poor working conditions, low chances of advancement, high turnover and less employment protection (Piore, 1975: 126). Hence, the theory of dual labor markets primarily distinguishes between *good* and *bad jobs* (Kalleberg & Sørensen, 1979: 357). While the *primary* sector is supposed to consist of a series of *internal labor markets*, most jobs in the *secondary* sector coincide with *external labor markets*.

For West Germany, Lutz and Sengenberger (1974) developed a segmentation approach that is based on the skill requirements of workplaces. They differentiate the West German labor market into three partial labor markets whose respective characteristics have already been discussed: *secondary labor markets* (*Jedermannsarbeitsmärkte*), *occupational*

⁴⁹ The notion of *closed* and *open* relationships goes back to Max Weber's work (1972 [1922]). *Closed* employment relationships exist if market relations are invalidated and employees have full control over the job (Sørensen & Kalleberg, 1981: 52). In this sense, a job becomes an open vacancy only if the current incumbent of the job voluntary leaves the firm or retires.

labor markets (fachspezifische Arbeitsmärkte) and *firm internal labor markets (betriebsspezifische Arbeitsmärkte)*. In a refinement, Blossfeld and Mayer (1988) use skill requirements and firm size in order to adequately describe labor market segmentations in West Germany. While *secondary labor markets* are characterized by low level of skill requirements, they are further differentiated between small and large firms. Moreover, within the qualified segment, jobs in small firms are classified as *occupational labor markets*; jobs in large firms are classified as *firm internal labor markets*. Overall, they show that *occupational labor markets* are the dominant labor market segment in West Germany; *firm internal labor markets* are clearly less pronounced. As expected, the placement in one of these different segments upon labor market entry has long-lasting effects on the employment biography in the sense that there are strong mobility barriers between them (see also Mayer & Carroll, 1987). Based on the work of Blossfeld and Mayer, Becker (1990) indicates that the ideal-typical attributes of *internal labor markets* in West Germany are more common in public service than in private industry. As the structure of *internal labor markets* prevents access to public service in later career stages, there is low mobility between public service and private industry (Blossfeld & Becker, 1989).

Similarly, DiPrete, deGraaf, Luijckx, Tahlin and Blossfeld (1997) show that strong occupational segmentations and tight labor market regulations in the West German labor market impede structural adjustments by individual mobility patterns. In a *collectivist mobility regime* such as Germany, structural changes overwhelmingly take place through retirement and cohort replacement. Other authors have likewise found that job or occupational mobility in mid-career stages is particularly low in Germany (DiPrete & McManus, 1996, 2000; Gangl, 2004b). By contrast, in an *individual mobility regime* such as the US, structural adaptations in the labor market, e.g. the diffusion of technology, more immediately result in individual mobility processes for all age groups.

A newer typology within the framework of *Varieties of Capitalism* (Hall & Soskice, 2001; Soskice, 1999) has a somewhat wider scope and differentiates between *Coordinated Market Economies (CME)* vs. *Liberal Market Economies (LME)*. The approach is aimed at providing a better understanding of institutional similarities and differences among modern economies. By identifying *institutional complementarities*, Hall and Soskice (2001) attempt to demonstrate the inherent logics of single political economies.⁵⁰

⁵⁰ ‘Two institutions can be said to be complementary if the presence (or efficiency) of one increases the returns from (or efficiency of) the other (Hall & Soskice, 2001: 17). And further: ‘Nations with a particular type of coordination in one sphere of the economy should tend to develop complementary practices in other spheres as well.’ (Hall & Soskice, 2001: 18).

Coordinated market economies (CME) involve long-term collaborative relationships based on strategic interaction and trust. A variety of institutional features establish incentives and constraints that help to maintain this trust relationship. *Coordinated market economies* combine a stratified educational system that signals occupation-specific skills with a labor market that is segmented along occupational lines. At the same time, the labor market is strongly regulated and employees are comparatively well protected in terms of employment, unemployment and wages (Estevez-Abe, Iversen, & Soskice, 2001).⁵¹ By contrast, in *liberal market economies (LME)*, market relations are strongly shaped by competitive market arrangements. These are characterized by an unstratified education and training system that provides students with rather general skills, *firm internal labor markets* and a low degree of labor market regulation. Thanks to *institutional complementarities*, the differing role of educational credentials in both types of economies is preserved throughout individuals' careers (Hall & Soskice, 2001).

Germany's economy is classified as a *coordinated market economy (CME)*, where institutional actors aim to promote labor relations that ensure long-term exchange and trust (Hall & Soskice, 2001: 21-27). For instance, the corporatist negotiation system between employer associations, trade unions and the state builds trustworthy, cooperative employment relationships. These cooperative relationships ensure that both the training fits firms' skill requirements and minimizes the free rider problem among firms (Culpepper, 2001). Consequently, the probability for a good match between vocational training and occupational positions is high. Moreover, works councils are involved in important firm decisions, including personnel planning, worker protection or working hours, and thus enhance cooperative relations between employees and employers. Collective bargaining autonomy likewise helps employers and employees regulate the terms of their employment relationship. Wages are mostly set by collective bargaining agreements between employer associations and trade unions on an industry-wide level.⁵² These regional collective agreements are binding for all employers in a specific industry who are members of the negotiating employers' association. Hence, collective bargaining agreements mitigate wage conflict within firms. Furthermore, Germany's financial system provides firms with long-term capital rather than forcing firms to rely on current profitability, helping to preserve long-term employment

⁵¹ Estevez-Abe et al. (2001) show that skill formation is closely related to social protection: Countries with high employment and unemployment protection also have the most developed vocational training systems.

⁵² In the early 2000s, more than 60 per cent of wage earners in Germany worked in firms that were covered by collective agreements (Visser, 2007). In Germany, the level of bargaining coverage has somewhat declined over time as small firms and firms in East Germany withdraw from employer's associations and multi-employer agreements (Visser, 2007: 140).

relationships. Lastly, a *coordinated market economy* involves inter-company relations that help to spread technology and innovations across the economic system.

Since the labor market structure closely parallels the persistent institutional setting of the education and training system, we also see no tremendous changes regarding the type of economy in West Germany. Thanks to the prevalence of Germany's *dual system*, it can still be regarded as a labor market that is mainly segmented along occupational lines. As other modern economies, however, Germany has experienced some labor market deregulation over time (see the next chapter 3.3). Yet in cross-national comparisons the degree of labor market deregulation can be regarded as quite moderate. Hence, it is still valid to consider West Germany as a strongly *coordinated market economy*.

3.3 Labor market regulation

In general, labor market regulation establishes institutional regulations of employment contracts in order to protect existing labor market relations between employers and employees. Regulations may concern the legal status of employment contracts, the regulation of individual and collective layoffs, income support to the unemployed, the legal status of unions and employer representatives, collective bargaining agreements or employee rights to participate within firms. The degree of labor market regulation has a strong impact on the bargaining power of employees in terms of job security, working hours, wage protection or minimum payment. Institutional regulations may also constrain the hiring process through anti-discrimination laws, quota systems or positive discrimination. Additionally, occupational closure in the form of licensing (Weeden, 2002) can be considered among the various forms of labor market regulations. The most widely cited forms of labor market regulations are strict wage-setting mechanisms or employment protection legislation (EPL). The former refer to forms of collective bargaining agreements. The latter obliges employers to give reasons for the layoff of employees, to give prior notice, to inform employee representatives or make severance payments.

Countries differ widely in their use of labor market regulations. From an historical point of view, labor market regulations have been much more pronounced in continental Europe than in United States (Esping-Andersen & Regini, 2000). Nevertheless, the degree of labor market regulation in Europe is quite varied. While in *coordinated market economies* or *conservative welfare regimes* the state intervenes in market activities and strongly regulates the labor market, the economy in *liberal market economies* or *liberal welfare states* generally functions without state intervention (Esping-Andersen, 1990). However, this does not mean

that conservative regimes are more normatively concerned with redistribution and inequality reduction; rather, they attempt to maintain existing social hierarchies and class privileges.

Labor market regulation can strongly affect the employment possibilities among labor market entrants by reducing labor demand. While employment protection legislation (EPL) increases the job security among current employees, it imposes additional labor costs and restrictions on employers, thereby reducing their willingness to hire new personnel. To cope with this, employers may look for experienced workers or raise their hiring standards in order to reduce the risk of hiring job applicants with inadequate skills. Moreover, regulation increases labor costs because employers cannot adapt worker pay to their marginal productivity on an individual basis. Consequently, labor market entrants may have severe difficulties finding employment in *external labor markets*. Yet, strict employment protection legislation also increases their average job tenure once they receive their first real job (Wolbers, 2007). Hence, EPL reduces job turnover but may have ambiguous effects on youths' unemployment rate by lowering the chance of entry into employment and exit out of employment at the same time. While earlier research largely agreed that strict employment protection legislation contributes to high youth unemployment, recent work using more sophisticated methods has challenged this causal relationship in general and among different educational groups (Noelke, 2011).

Labor market regulations not only affect youths' employment opportunities and job turnover rates, but may also have an impact on the quality of the two-sided matching process in *external labor markets*. Aside education and training systems, Gangl (2004a) argues that there are other institutional characteristics responsible for a strong relationship between educational attainment and labor market outcomes among individuals further into their career. In this regard, labor market regulations such as strict employment protection legislation or high unemployment benefits strengthen processes of allocation and hiring based on educational qualifications in *external labor markets*. From a demand side perspective, employers faced with strict employment protection legislation are more risk-averse in their hiring decisions thereby raising their hiring standards and being more careful in the selection of new employees. Consequently, strict employment protection legislation should lead to better matches between educational qualifications and skill requirements upon recruitment into *external labor markets*. From a supply side perspective, unemployed workers who receive income support from the state have the financial resources to more carefully look for better fitting jobs and thereby take longer to find adequate re-employment. Thanks to lower opportunity costs for job search, they do not need to immediately accept less beneficial job

offers. Hence, welfare state transfers in favor of unemployed workers should also improve the quality of job match in *external labor markets* since job applicants have the financial endowment to follow their preferences. In fact, Gangl (2004a) shows that both mechanisms contribute to lower rates of occupational mobility among unemployed workers in Germany compared to the United States, i.e. strong labor market regulations promote better skill-based matching in *external labor markets*. While the supply-side mechanism may be less relevant for labor market entrants, the demand-side mechanism may encourage employers to more carefully select career starters according to educational qualifications. Overall, the matching between educational attainment of job applicants and skill requirements of jobs should be higher in countries with strong labor market regulations than in countries with less stringent regulations.

West Germany as a *conservative welfare state* can be considered a highly regulated institutional system, which strengthens the relevance of educational credentials for individual job allocations in the labor market. For instance, Germany's corporatist system guarantees that apprentices are well trained for the occupational requirements within firms. Moreover, industry-wide collective agreements on labor contracts are used to protect skilled workers by encouraging employers to make personnel recruitment and pay scales dependent on educational qualifications. Likewise, *licensing* requirements in access to the professions restrict the pool of job applicants to those who acquired the necessary occupational title among labor market entrants.

West Germany is also characterized by a high degree of employment protection among regular employees and a considerable level of unemployment protection (Estevez-Abe, et al., 2001; OECD, 2004). The system of statutory and collectively bargained dismissal restrictions is rather complex. In general, the majority of the workforce in regular employment is highly protected from dismissals. Employers are obliged to give workers who are employed in full-time or part-time (15 hours or more) jobs at least two weeks' notice⁵³ and need to mention a *just-cause* reason for the layoff (e.g. disciplinary dismissals that required prior warnings or layoffs due to economic reasons). Moreover, employers are required to consult with the works council before dismissing an employee. Since the works council can disagree with a layoff and employees are able to sue their employers for improper dismissal, dismissals are oftentimes difficult and costly. However, these regulations apply only to workers with at

⁵³ Two weeks refer to a dismissal without notice, while four weeks are the basic period of notice for a termination with notice. Job tenure increases protection against dismissal in general and in the case of mass layoffs (seniority-graded prenotification periods). Accordingly, dismissals are more common among less tenured workers (Büchtemann & Walwei, 1996).

least six months' job tenure and who work in firms with at least 10 employees. Legal employment protection is weaker for young people because age and family situation are considered in severance schemes. Germany also has a rather generous unemployment-benefit system in terms of high replacement rates and government expenditures for unemployment benefits (Estevez-Abe, et al., 2001).⁵⁴

Over time, globalization and internationalization has pressured many states to deregulate their labor markets to various degrees. Deregulation implies either a weakening of employment protection and collective agreements or the promotion of fixed-term employment contracts, which are not affected by employment protection rules. Hall and Soskice (2001) argue that globalization promotes labor market deregulation to a greater degree among *liberal market economies (LMEs)* compared to *coordinated market economies (CMEs)*. Specifically, they argue that governments in *coordinated market economies* are less willing to deregulate the labor market since they fear losing the country's comparative institutional advantage. Likewise, employers in *CMEs* may apply less pressure on governments because they see the benefits of the existing institutional setting and its corporatist relations for the production of high-skill goods. In fact, modern nations have reacted in different ways towards a growing demand for flexibilization. In comparison to other countries, e.g. Great Britain or Denmark, labor market deregulation in Germany has been rather moderate (Esping-Andersen & Regini, 2000: 336). Because deregulation in Germany has not affected employment protection among permanent employees, it can be rather seen as a *controlled experiment* (Regini, 2000: 12).

Nevertheless, German labor market policy responded to increasing international competition and rising youth unemployment in the early 1980s by partially deregulating the labor market. The purpose was to bolster external hiring, particularly among labor market entrants, and give employers options to adapt to rapidly changing macroeconomic conditions. In this regard, the two of the most prominent deregulatory efforts have been the introduction of *opening clauses* and the *1985 Employment Promotion Act* (Fuchs & Schettkat, 2000).

Opening clauses have existed since 1997 in Germany, allowing individual establishments to deviate from industry-wide collective bargaining agreements. For instance, firms that are in serious economic jeopardy are permitted to pay workers less than the agreed upon industry wage. *Opening clauses* also require the approval of establishments' works council. Although *opening clauses* increase wage heterogeneity, they do not change the

⁵⁴ Since the association between education and labor market rewards among labor market entrants should be less affected by changes in unemployment protection, I refrain from describing the recent changes regarding unemployment compensation such as the 'Hartz' reform here. For a recent review on these institutional changes in West Germany see Wörz (2011).

general wage-setting procedure in Germany. While the share of firms in Germany not covered by bargaining agreements has increased, a substantial portion of non-organized firms nevertheless is guided by industry-wide agreements in terms of pay and working time (Visser, 2007).

Prior to the *1985 Employment Promotion Act*, firms were usually allowed to use fixed-term contracts with a maximum duration of six months only in a few specific cases, e.g. probationary periods, seasonal fluctuations or the substitution of temporarily absent workers. The *1985 Employment Promotion Act* and subsequent legislation⁵⁵ allowed employers to provide individuals with fixed-term contracts of up to 24 months without specific reason. Within this period, fixed-term contracts can be extended up to three times. However, employers can only arrange fixed-term employment with new employees who have not been employed fixed-term in the same firm before then. For employees over the age 52, the maximum duration of fixed-term contracts is unlimited if they had not received a fixed-term contract with the same employer within the past six months. New establishments are allowed to give employees a fixed-term contract of up to four years without specific reasons. Since fixed-term contracts have an automatic termination date, they enable employers to circumvent employment protection legislation for permanent employees, involve lower labor adjustment costs and allow for flexible staffing strategies (Hagen, 2003). Not surprisingly, labor market entrants face particularly high risks of holding a temporary contract compared to older workers (Mertens & McGinnity, 2004). Fixed-term contracts are particularly prevalent among low educated individuals and university degree holders (McGinnity, Mertens, & Gundert, 2005; Giesecke & Groß, 2003). Over time, the relative risk of holding a fixed-term contract has even increased among labor market entrants and low educated individuals (Gebel & Giesecke, 2009). Moreover, these deregulations facilitated the expansion of temporary agency work, allowing temporary workers to be lent out for up to two years. When the lending firm takes part in collective bargaining agreements, there is even no temporal limitation for lending employees on the part of the receiving establishment. As with fixed-term contracts, temporary work makes it possible to reduce the workforce in the short term.

The preceding section offers an extensive overview of the institutional structures in West Germany, which most greatly affect the job matching process upon workers' entry to the labor market. The crucial question is whether these institutional changes may have had an

⁵⁵ The description encompasses more developments up to the present. While the original legislation was temporary and has since been altered several times, a newer 2001 law on part-time employment and fixed-term contracts abolished the original *Employment Promotion Act*, making legislation permanent. For a detailed overview of this *Employment Promotion Act* and its several amendments see McGinnity et al. (2005) or Gebel and Giesecke (2009).

impact on the job matching process over the last thirty years, i.e. the relationship between educational qualifications and labor market positions. As shown in this chapter, changes in the institutional framework have been rather marginal in cross-country comparisons. The only significant change has been the increased use of fixed-term contracts, enabling employers to circumvent strict employment protection legislation when hiring on a permanent basis. Nevertheless, the overall prevalence of fixed-term contracts has only marginally increased between 1989 and 2005 (Gebel & Giesecke, 2009). Given the persistent effects of all other institutional features, the impact should be, if at all, rather modest.⁵⁶ Overall, the institutional setting in West Germany is still highly conducive to a strong association between educational qualifications and labor market outcomes.

⁵⁶ While the relation of increasing flexibilization, including a growing use of fixed-term contracts, and the linkage between educational qualifications and labor market positions upon labor market entry may not be obvious, I give this greater attention in the eighth chapter.

Chapter 4 Data and basic concepts

4.1 The German *Microcensus*

In order to study temporal developments in the association between educational attainment and occupational outcomes I use a long series of large-scale, cross-sectional data from the *German Microcensus*, a representative survey of the German population and its economic activity.⁵⁷ The *Microcensus* covers one per cent of all German households and has been conducted annually in the former federal territory since 1957; in the new Eastern *Länder* since 1991.⁵⁸ Using compiled statistical data from each German state, the data are collected by the Federal Statistics Office. According to *Microcensus* law, each selected household is obliged to participate in the survey, ensuring the *Microcensus* is highly representative. The sample population comprises all foreign and domestic individual residents living in Germany in either private households or communal accommodations. The *Microcensus* relies upon a single-level stratified sampling design, sampling households within a given geographical area and requiring all members within that household to complete the survey. Every household remains in the sample for four years.⁵⁹ Each year, one quarter of the households are replaced by new, randomly selected households according to a partial rotation strategy.⁶⁰ Until 2004, the survey has been conducted yearly in a pre-determined reference week (usually in the last holiday-free week of April). Since the 2005 survey, however, the *Microcensus* has been carried out continuously over all calendar weeks of the year.

The Microcensus is a multi-purpose sample and thus contains a large set of variables. By default the data provide information on respondents' socioeconomic characteristics, household and family context, educational attainment, labor market status, income and occupational position. It also includes annual supplementary programs, which ask more specific questions, e.g. on (previous) employment. Moreover, the survey offers four-yearly supplementary programs, including information on the detailed employment status (*Stellung im Betrieb*), which is used to operationalize the *EGP* class schema (see chapter 7.4.1). For the most part, the survey is conducted via personal interviews (using CAPI (Computer Assisted

⁵⁷ Among others, the description relies on the following source: GESIS (Microdata information system *missy*): <http://www.gesis.org/missy/studie/erhebung/rechtliche-und-allgemeine-informationen/was-ist-der-mikrozensus/> (last access: 21.04.2012).

⁵⁸ Recent *Microcensus* surveys collect data from 370.000 households and 820.000 individuals. The European Union Labor Force Survey (EULFS) utilizes a 0.5% subsample of the *Microcensus* from 1996 wave onward.

⁵⁹ Respondents that move out from the respective household or housing space are not followed up. Instead, the new residents of the housing space are obliged to answer the surveys until the household is replaced.

⁶⁰ For a detailed description of the sample design see Lüttinger & Riede (1997: 24f.)

Personal Interviews) software since 2005). Respondents are free to fill out the questionnaire in written form as well; each year, almost 20 per cent of the household members take advantage of this. Similarly, 20 to 25 per cent of the cases contain third-party information on individuals, which is permitted under certain circumstances.

For the empirical research in this book, I use *Scientific-Use-Files*, containing 70 per cent of the original household sample from the full *Microcensus* (Boehle & Schimpl-Neimanns, 2010; Wirth, 1992). Currently, *Scientific-Use-Files* contain 25 *Microcensus* years, dating back to 1973. Since 1995, yearly files are available; previously, they were only available in intervals of two or three years due to data protection provisions. The 1973 *Microcensus*, however, cannot be used for this analysis as information on both general and vocational education is not included in the survey questionnaire. The following *Scientific-Use-Files* are used: 1976, 1978, 1980, 1982, 1985, 1987, 1989, 1991, 1993, 1995-2008. As the majority of these *Microcensus* years have only become available in most recent times, few analyses have made use of this greater data availability. Earlier analyses on the returns to education (e.g. Müller et al. 2002) relied on a comparison of only two *Scientific-Use-Files*.

Using the *Microcensus* has several major advantages (Wirth & Müller, 2006; Lüttinger & Riede, 1997) for this analysis on long-term trends in returns to education in West Germany. *First*, the *Microcensus* is the only reliable dataset that enables an investigation of long-term trends in the relationship between educational attainment and labor market outcomes from the mid-1970s onward. The large number of years available makes it possible to differentiate between short-term effects or just arbitrary data fluctuations. Moreover, it allows for a detailed consideration of diverse educational groups or migration groups. *Second*, the large sample size of the *Microcensus* exceeds other typical social science surveys, allowing for more precise statistical estimations. The resulting small sampling error is particularly advantageous for trend studies such as this because the identification of ‘real’ long-term trends requires that the sampling error is smaller than the change itself. Thanks to its large sample size, the *Microcensus* is frequently used as reference statistics for sample surveys in the empirical social research. *Third*, randomly sampled individuals in households are obliged to complete most of the questionnaire, thereby limiting unit non-response and ensuring representativeness.⁶¹ In contrast to other non-official data, the *Microcensus* tends to be less affected by systematic biases such as the well-known *middle class bias*. Information is optional only in a few instances. *Fourth*, the *Microcensus* contains highly consistent questions

⁶¹ The yearly response rate is around 97 per cent (Schimpl-Neimanns, 2002: 3). Nevertheless, missing values are still possible including missed questions, question refusal or false statements.

over time. Thus, I am able to operationalize educational attainment and the dependent variables risk of unemployment, social class or occupational prestige in a time-consistent way.

4.2 The sample: labor market entrants

Because the primary aim of the book is to analyze long-term developments in the relationship between education and the labor market, I concentrate all analyses on the West German population only. *Microcensus* data for East Germany are only available since 1991, a comparably shorter time period. Moreover, due to differential historical conditions, the association between educational attainment and labor market rewards may differ between Eastern and Western Germany. Thus, empirical analyses should not combine education effects across both labor markets.⁶²

A comparison of returns to education over time should focus on respondents who are in a very similar stage of their working and family career. For several reasons, I concentrate the investigation on the transition from school to work. *First*, individuals upon labor market entry are considered *outsiders* without any work experience, compete with *insiders* who already have established positions around job vacancies and – if they receive a job – this will be in rather unprotected labor market positions (Lindbeck & Snower, 1988).⁶³ Hence, they have rather weak labor market statuses and thus tend to be most vulnerable to period effects such as changing macrostructural and macroeconomic conditions (Gangl, 2003b).⁶⁴ By contrast, prime-age workers in *closed positions* or promotion ladders are relatively well protected against changes in the macro-level context.

In this regard, scholars have found that labor market entrants are among the strongest hit by increasing market uncertainties and labor market flexibilization (Blossfeld, et al., 2007). Labor market entrants are also more greatly affected by worsening macroeconomic conditions than prime-age groups (Ryan, 2001). Moreover, changes in the educational supply

⁶² For recent research on the transition from school to work in Eastern Europe, including East Germany, see Kogan, Noelke and Gebel (2011b). For comparisons of labor market processes before and after the Wall using *German Life History Data (GLHS)* see Mayer, Diewald and Solga (1999), Solga and Diewald (2001) and Diewald, Solga and Goedicke (2002). For comparisons of the East and West German labor market see Solga and Konietzka (1999), Rosenfeld and Trappe (2002) and Uunk, Mach and Mayer (2005).

⁶³ For an extensive discussion of the *insider-outsider-theory* see Giesecke (2006).

⁶⁴ Gangl (2003b: 253) argues that ‘young people just about to begin their employment careers have the greatest exposure to the effects of current labor market changes, as their labor market status is highly volatile and they are not yet well protected by either genuine employer interests, employment protection legislation, or union action.’ In this regard, Müller and Pollak (2004a: 96) stress: ‘For example, educational reforms, educational expansion or changing competition in the labor market among groups with different qualification levels will affect mainly cohorts which are in school, pursuing higher education, or making the transition from school to work when the respective changes take place.’

of the working population and changes in the skill demand at the occupational level are mainly generated through cohort replacement (Schubert & Engelage, 2006).⁶⁵ Therefore, changes to the qualifications and the occupational structure proceed much slower in the total labor force than among labor market entrants. Hence, macrostructural effects of educational expansion and occupational upgrading on the matching of qualifications and occupational positions is more immediate with labor market entry cohorts (Blossfeld, 1983: 207; Müller, et al., 2002: 44). This is particularly true for *occupational labor markets* and *collectivist mobility regimes* such as West Germany (DiPrete, et al., 1997). As macro-level changes are expected to induce changes in the behavior of employers and job seekers at the micro-level, they thus should have the strongest impact on returns to education upon labor market entry.

Second, the impact of educational credentials on occupational attainment is most apparent at the start of one's career because qualifications and skills can be more directly linked to labor market returns. Hence, returns to education 'can be grasped in its purest form' (Müller & Shavit, 1998: 14). Conversely, it is much more difficult to assess the direct effects of education later in workers' careers thanks to the increasing relevance of intervening factors such as work experience, social networks or other life-course factors (Gerber, 2003; Müller, 2005).

Third, the transition from school to work is a highly influential episode in individuals' lives. Labor market integration difficulties in terms of unemployment or lower-status positions have long-term negative consequences on workers' later careers (e.g. Scherer, 2004; Steijn, Need, & Gesthuizen, 2006). By contrast, a smooth transition from school to work positively shapes the further development of individuals' careers. Particularly in West Germany, the first job strongly impacts later career stages (König & Müller, 1986; Mayer & Blossfeld, 1990). Therefore, understanding changes between educational attainment and labor market returns upon labor market entry may also have an impact on long-term returns to education over the life course among different entry cohorts.

Fourth, focusing on the labor market entry phase allows for a more advantageous comparison of returns to education between the sexes. Women participating in the labor force in later career stages become an increasingly more self-selected group, making comparisons with men notoriously difficult.

⁶⁵ Individuals in Germany overwhelmingly acquire their highest educational credentials in initial education. Explicit and formal forms of further education and training are not yet common in most of the total labor force (Müller & Jacob, 2008). The implementation of further training in Germany is possibly small because employees already receive occupation-specific training in their initial training phase and are therefore able to more easily adapt to new task requirements. Moreover, participation rates in further education systematically decline with age.

The *Microcensus* questionnaires only ask respondents about their employment status and current or last occupational position at the time of the interview. Hence, the data neither provide information on the process of labor market entry nor on the first significant job. Therefore, I approximate the start of workers' careers by restricting the sample to individuals in younger ages. More specifically, I select individuals with different educational attainment in different ages according to their length of educational career, thereby ensuring that educational groups are similar in terms of their potential work experience.⁶⁶ Choosing individuals from all educational groups in the same age group (e.g. 30-34) could bias the returns to education upon labor market entry due to their different labor market statuses. Since I do not have information on the exact timing of labor market entry, individuals are considered at one point in time throughout their labor market integration phase.⁶⁷ The transition from school to work is hence measured in a five-year time frame for all educational groups (see also Gangl, 2003b, 2003c).

Table 1 Sample definition

Educational groups	Sample selection
<i>CASMIN</i> 1ab, 1c, 2a and 2b	Age 20-24
<i>CASMIN</i> 2c_gen and 2c_voc	Age 25-29
<i>CASMIN</i> 3a and 3b	Age 30-34

Notes: For a description of the *CASMIN* educational scale see chapter 4.3.1.

Table 1 shows the allocation of age groups according to *CASMIN* educational groups (for a detailed description of the *CASMIN* scale see chapter 4.3.1). Graduates from *Hauptschule* (lower secondary school) or *Realschule* (*intermediate secondary school*) with or without an apprenticeship or school-based vocational training are included between the ages of 20 and 24. *Abitur* graduates who additionally completed vocational training or not are included into the sample when they are between 25 and 29 years old. For individuals with a tertiary degree, either from university or *Fachhochschule*, labor market entry is approximated when they are between 30 to 34 years of age.

⁶⁶ For a similar approach with *Microcensus* data see Brauns et al. (1999); with *European Labor Force Data (EULFS)* see Gangl (2003b, 2003a) and Noelke (2011).

⁶⁷ In general, it is rather difficult to define labor market entry as a single event since it involves a broad diversity in regards of timing and extent of labor market integration (Light, 1998; Kerckhoff, 1995).

Table 2 Sample size of male and female labor market entrants

	Sample size (N)	
	Men	Women
1976	11105	11070
1978	11909	11462
1980	12594	11755
1982	13477	12193
1985	15028	14421
1987	15980	14776
1989	13816	13022
1991	12114	11734
1993	10959	10859
1995	10735	10463
1996	9759	9486
1997	9663	9282
1998	9391	8915
1999	9132	8583
2000	9001	8203
2001	9076	8288
2002	9093	8424
2003	8686	8241
2004	8410	8202
2005	7608	7665
2006	7785	7944
2007	7460	7570
2008	7414	7765
Overall	240195	230323

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* individuals in full-time education or apprenticeship programs are excluded from the sample.

The age groups are defined at slightly later ages than one would expect from typical years of schooling in order to reduce the share of individuals who are still enrolled in educational programs and keep the sample loss rather constant across *Microcensus* years.⁶⁸ This is because students graduate at an even later age across birth cohorts (Hillmert & Jacob, 2004). Further, the proportion of individuals with double qualifications or more complex educational careers has substantially increased (Jacob, 2004). In general, a substantial share of German higher education students finishes their studies well into their thirties (Müller & Wolbers, 2003: 39). Choosing tertiary graduates aged 25 to 34 would heavily underestimate the strength of educational expansion, as increasingly larger shares of younger students remain in tertiary education and thus exclude from the sample (see Table A1). Thanks to an

⁶⁸ Typically, *Hauptschule* pupils graduate school after nine years, *Realschule* pupils graduate after ten years and *Gymnasium* pupils after thirteen years. While apprenticeships last for three years, *Fachhochschule* studies normally take four years. Regarding university studies researchers typically assume five years.

increasing average graduation age, tertiary graduates in the sample encompass less and less students with a higher duration of study and thus may have become a more selective group across labor market entry cohorts. This is because a short duration of study is plausibly correlated with student characteristics such as motivation, commitment, ambition or diligence. Hence, this extended sample definition could heavily bias the returns to education. Overall, approximating labor market entry by using different age ranges for differently educated individuals and postponing their typical graduation ages seems to be justified.⁶⁹

The analysis sample further excludes all individuals that participate in any kind of full-time initial education or apprenticeship-type training programs at the time of the interview.⁷⁰ Hence, individuals are counted as labor market entrants only if they have, at least preliminary, completed their initial educational career.⁷¹ Table 2 shows the sample sizes for both male and female labor market entrants in each survey year.⁷² Overall, the sample of labor market entrants comprises 240,195 men and 230,323 women.

4.3 Independent variables

In this section of the book I only present the independent variables, most importantly the measurement of educational attainment over time. Since the theoretical considerations on the relationship between education and the three dimensions of labor market rewards coincide with the specific measuring of these returns, I describe each dependent variable measurement in each respective book chapter (for unemployment see chapter 6.3.1; for social class see chapter 7.4.1; for occupational prestige see chapter 8.4.1).

4.3.1 *The CASMIN educational classification*

Educational attainment as the central independent variable is operationalized according to the *CASMIN* educational classification in all survey years. This classification was developed for comparative social stratification and social mobility research (Brauns, Scherer, & Steinmann,

⁶⁹ Nevertheless, this strategy cannot fully overcome the continually rising average age of tertiary graduates. Another consequence of this trend is that earlier cohorts have likely worked longer in the labor market compared to later cohorts. This implies that earlier graduates may have had more time to find beneficial starting positions than in more recent periods.

⁷⁰ These individuals are identified with information on their current school attendance and as such excluded from the sample. This exclusion does, however, not apply to other informal forms of education such as evening schools or firm-based training.

⁷¹ It is known that reentry into the educational system is less pronounced in binary stratified higher education systems such as Germany than sequential ones such as the US (Jacob & Weiss, 2011).

⁷² *Länder*-level analyses in the sixth chapter reveal that the 1976 *Microcensus* Scientific-Use-File incorrectly coded variables on educational attainment for the city state *Hamburg*. 96.95% of all respondents in *Hamburg* are supposed to have completed an *Abitur* as the highest general degree. At the same time, almost no one in *Hamburg* had a university degree or a *Fachhochschule* degree. Due to these unrealistic and inconsistent measures, all 1976 *Hamburg* cases were excluded from the analysis.

2003; for the original conception see König, Lüttinger, & Müller, 1988).⁷³ It aims to capture both selection effects in the educational system, i.e. educational origin effects on educational attainment, and differences among educational groups in terms of labor market rewards, i.e. differences in the signaling value of educational credentials (König et al., 1988: 2). While the *CASMIN* classification relies upon *functional equivalence* (König et al., 1988: 54) between educational categories across countries, it likewise attempts to capture relevant institutional peculiarities in the national education and training systems. Following this, the *CASMIN* scale is strictly oriented towards educational certificates and differentiates them on the basis of two major dimensions. On the one hand, the scale distinguishes three hierarchical levels of educational attainment, elementary education (1), secondary education (2) and post-secondary education (3) according to length and quality of educational pathways. On the other hand, it further differentiates between academic, general education and vocationally oriented education. The first dimension takes the length of educational experiences, the required cognitive skills and the hierarchy of educational certificates into account. The second dimension considers whether educational programs focus on general knowledge or prepare students for specific occupations.

Due to recent developments in modern educational systems, the original conception has been updated and partly revised (Brauns & Steinmann, 1999). Over time, more and more graduates with *Abitur* (full maturity certificate) opt for the vocational track instead of attending university or immediately going to the labor market. Participating in the labor market with or without a vocational degree at the *Abitur* level clearly makes a difference in terms of labor market rewards. Due to this, the original *CASMIN* category 2c was split up in a 2c-general and 2c-vocational category.

Table 3 shows the eight-category version of the classification that is also the most differentiated version used throughout the book. Depending on the specific analysis, single *CASMIN* categories are occasionally aggregated into fewer groups. *CASMIN* 1ab contains individuals with inadequately completed general education, who drop out before achieving the primary certificate (1a) and completed elementary education (1b) that corresponds to the legal minimum of education in a given society and represents a *Hauptschule* degree in the German context.⁷⁴ Since students in this level follow the least demanding educational course,

⁷³ It was originally developed and owes its name to the *Comparative Analysis of Social Mobility in Industrial Nations* (1983-1998) project at University of Mannheim. This scale can be applied to the educational systems of West Germany, France, England, Wales, Scotland, Northern Ireland, Ireland, Sweden, Poland and Hungary.

⁷⁴ *CASMIN* 1b is frequently labeled as *compulsory schooling* because individuals need to stay in school up until the legally fixed age in order to graduate from elementary education. I do not further differentiate between *CASMIN* 1a and *CASMIN* 1b since individuals not completing the *social minimum* of education (1a) are a very

this *CASMIN* group is frequently referred to as the *less-educated* throughout the book. Graduates in *CASMIN* 1c have completed compulsory elementary education and an additional apprenticeship or graduation as *Meister* or *Techniker*.

Table 3 *CASMIN* educational classification

<i>CASMIN</i>	Description
1ab	Inadequately completed general education (1a) Completed (compulsory) elementary education (<i>Volks- or Hauptschule</i>). Social minimum of education (1b)
1c	Basic vocational training above and beyond compulsory schooling - graduation from <i>Haupt- or Volksschulabschluss</i> and additional apprenticeship or graduation as <i>Meister or Techniker</i>
2a	Secondary, intermediate vocational qualification, or secondary programs in which general intermediate schooling is combined by vocational training - graduation from <i>Realschule (Mittlere Reife)</i> and additional apprenticeship or graduation as <i>Meister or Techniker</i>
2b	Secondary, intermediate general education. Academic or general tracks at the secondary intermediate level – graduation from <i>Realschule (Mittlere Reife)</i>
2c_gen	Full maturity certificate (<i>Abitur</i>) – graduation from <i>Gymnasium (Abitur/Fachabitur)</i> or <i>Fachhochschulreife</i>
2c_voc	Full maturity certificate including vocationally-specific schooling or training – graduation from <i>Gymnasium (Abitur/Fachabitur)</i> or <i>Fachhochschulreife</i> and additional apprenticeship or graduation as <i>Meister or Techniker</i>
3a	Lower tertiary education: lower level tertiary degrees, generally of shorter duration and with a vocational orientation – graduation from <i>Fachhochschule (FH)</i> , engineering college (<i>Ingenieurschule</i>) or <i>Verwaltungsfachhochschule</i> ¹
3b	Higher tertiary education: the completion of a traditional, academically oriented university education or having a doctoral degree ²

Source: Brauns, Scherer and Steinmann, 2003: 223; *Notes:* vocational training at all respective levels include *dual system of apprenticeship* (the largest group), full-time vocational schools (*Berufsfachschulen*), *Anlernausbildung*, *berufliches Praktikum* (at least one year practical firm-based training), *Berufsgrundbildungsjahr* or *Berufsvorbereitungsjahr*. *Meister* or *Techniker* include equivalent degrees from professional schools (*Fachschulen*); since 2002 the original *Meister* or *Techniker* category also contains graduates from university of cooperative education (*Berufsakademie*) backgrounds. ¹ Separately coded in the question on the highest vocational track from 2002 *Microcensus* onwards; ² University degrees and PhD degrees are separately coded from 1999 *Microcensus* onwards.

CASMIN 2a entails graduates that possess a secondary degree (*Mittlere Reife*) from *Realschule* and further completed an apprenticeship or graduated as *Meister* or *Techniker*. Graduates in *CASMIN* 2b have completed intermediate general education (*Realschule*) only

small group in industrialized societies. Moreover, in 1976-1980 *Microcensus* I am not able to build *CASMIN* category 1a, as all individuals that accomplish compulsory schooling are automatically assigned to *Volks- or Hauptschule* (*CASMIN* 1b).

and thus entered the labor market without additional vocational training. Individuals in *CASMIN* 2c graduated from *Gymnasium* and have passed their *Abitur* (full maturity certificate). As already said, *CASMIN* 2c is further differentiated between individuals who directly enter the labor market and individuals who participate in vocational training before labor market entry. *CASMIN* 3a indicates lower-level tertiary degrees which are characterized by a shorter length of study and a stronger practical orientation. In West Germany, this contains graduates from a second-tier tertiary institution, predominantly the *Fachhochschule* (*FH*), but also *Ingenieurschule* or *Verwaltungsfachhochschule*.⁷⁵ Finally, *CASMIN* 3b represents graduates that successfully complete a traditional, academically oriented university program.

Scholars have shown that the *CASMIN* educational classification is a valid measurement system for West Germany according to several outcome criteria (Müller & Klein, 2008; Braun & Müller, 1997).⁷⁶ While any regrouping or collapsing of single educational credentials leads to some loss of predictive power, the *CASMIN* scale fares quite well by aggregating very homogeneous groups.⁷⁷ This is largely due to the fact that the classification factors in both general education and vocational training. Particularly in countries such as West Germany where vocationally oriented training represents a substantial segment in the education and training system, this differentiation is crucial (Braun & Müller, 1997).

In *Microcensus* data, the updated version of the *CASMIN* educational classification relies upon Software-tools that record the *CASMIN* scale in *Microcensus* data, combining information on respondents' highest general educational achievement with information on respondents' highest vocational track at the time of the interview in all *Microcensus* years (Lechert, Schroedter, & Lüttinger, 2006).

Respondents' obligation to give information should reduce the possibility of item non-response on educational attainment. However, Table A2 clearly indicates that the proportion of missing values in the *CASMIN* variable is far from negligible among both male and female labor market entrants. In 1991 and 1993 *Microcensus* the share of missing values is particularly high, with more than 10 per cent. This is due to the fact that the obligation to give

⁷⁵ As *Fachhochschule* graduates comprise the predominant part of school-leavers coded in *CASMIN* 3a, this *CASMIN* group is referred to as '*Fachhochschule* graduates' throughout the book. The German *Fachhochschule* is also labeled as university of applied sciences, technical college or polytechnics in international publications.

⁷⁶ Among others, educational background effects on acquiring the *Abitur* or labor market returns such as occupational prestige, socio-economic status, the risk of unemployment or income.

⁷⁷ The *CASMIN* scale also involves a smaller decline in variance explained than years of schooling (Braun & Müller, 1997: 186). Compared to credentialist measures, years of schooling appear to be the most powerful measure of education only in the United States.

information has been suspended for several questions in *Microcensus* 1991-1995, including questions concerning the highest general education and vocational track.⁷⁸ Using 1991 *Microcensus* data, Emmerling and Riede (1994) show that this suspension had negative effects on data quality since item non-responses were not equally distributed across socio-structural attributes. It is therefore reasonable to assume that the *Microcensus* years 1991-1995 show a ‘middle class bias’ with regard to item non-response. Although we may underestimate the share of lower educated individuals, the potential bias should only affect the relationship between educational attainment and occupational outcomes if lower educated individuals who refuse to partake in the survey systematically differ from those who partake in terms of unemployment or class position. Nevertheless, such restrictions in single *Microcensus* years stress the importance of using a long-series of data points in order to be sure about actual trends.

4.3.2 Control variables

Unfortunately, *Microcensus* data do not include information on respondents’ social background.⁷⁹ Hence, I am not able to consider the relative importance (partial correlations) of education and class origin but only look at the strength of the association between educational attainment and class destinations (Jonsson, 1996). Though, in West Germany, effects of social origin on status attainment are almost completely mediated by educational attainment (Müller, 2001; Gundert & Mayer, 2012). Furthermore, social origin effects on labor market participation are almost entirely mediated by educational attainment as well (Müller et al., 1998: 160). Direct effects of social origin on occupational prestige and class destinations also have declined over the course of time for both men and women (Müller, 2001; Müller et al. 1998). Only one direct effect of social background appears to be evident: Sons of unskilled workers have a higher risk of becoming unemployed than sons of self-employed fathers. Regardless of this evidence, the omission of social origin appears to have no impact on changes in the association between educational attainment and class destinations (Van de Werfhorst, 2007). As prior studies for West Germany have found, controlling for social background has little effect on the relationship between educational attainment and

⁷⁸After 1995, respondents younger than age 51 were obliged to provide information on both variables again.

⁷⁹ Information on social origin, whether measured as father’s or mother’s educational attainment or occupational position, is not provided in *Microcensus* surveys, since the *Microcensus* framework is guided by official and administrative needs. Social origin can be extracted from the household surveys only as long as children live together with their parents. This is overwhelmingly not possible for the research questions in this book as I consider mostly individuals who already moved out of their parental home.

occupational outcomes (Müller, et al., 1998).⁸⁰ Thus, I conclude that the omission of social origin should not bias trends in the returns to education in West Germany.

Nevertheless, I control for *migration status*, in order to disentangle the estimated effects of educational attainment on labor market returns from those that are due to ethnic stratification. Previous studies on returns to education in West Germany have not controlled for migration status. They either argue that considering migration status would ‘introduce complexity which cannot be dealt with here for reasons of space’ (Müller et al., 1998: 154) or assume that immigrants are not comparable to natives and thus have to be excluded. This is based on the belief that compared to Germans migrants are not equally able to convert their educational credentials achieved in their home country into labor market returns (Müller et al., 2002: 44). On the one hand, this exclusion of migrants may eliminate bias stemming from heterogeneity among similar educational credentials.⁸¹ On the other hand, it might also produce bias because migrants are a substantial part of the West German society, especially since the 1990s (see Table A3). Furthermore, a growing share of ethnic labor market entrants belongs to second or third generation and has thus received training in the West German educational system.⁸² Hence, the argument that educational credentials are incomparable between natives and immigrants tends to become less valid as well. Overall, ignoring migrants in the analysis seems to be increasingly unjustified.

Regarding migration effects, Kogan (2004) indicates that the higher relative unemployment risk among first generation migrants, recent non-EU immigrants and resettled ethnic Germans compared to Germans can only be partially attributed to their lower educational attainment. Their relative disadvantages are largely due to the fact that these immigrant groups are allocated into less advantageous occupations and industries in the *secondary labor market* that are disproportionately affected by economic downturns and occupational restructurings. Nevertheless, she found that second generation migrants do not substantially differ in their unemployment dynamics compared to German natives. With regard to occupational attainment, Kalter, Granato and Kristen (2007) show that labor market disadvantages among second generation migrants in West Germany are strongly mediated by

⁸⁰ For the same argumentation on the robustness of education effects across European countries see Gangl, Müller and Raffé (2003: 302).

⁸¹ Particularly for immigrants from the second migratory wave, higher educational credentials are largely discounted in the German labor market (Kogan, 2010). A proper modeling would call for interaction terms between migration status and educational qualifications or separate models for the different ethnic groups throughout the book (as in the case of gender). However, this would go far beyond the scope of the book and complicate the analyses.

⁸² While in 1976 *Microcensus* eight per cent of male migrants and six per cent of female migrants among labor market entrants were born in West Germany or immigrated at age 6 or younger, in 2008 *Microcensus* the share has substantially increased to 44 per cent among men and 34 per cent among women.

educational attainment. Moreover, ethnic disadvantages net of educational attainment have been decreasing over time for almost all groups.⁸³ Only Turks continue to suffer from strong labor market penalties and remain severely disadvantaged net of educational controls. Ethnic penalties in the labor market are mainly due to lower German language understanding and a lack of access to German social networks rather than discrimination (Kalter, 2006).

Having no information on parents' country of birth before *Microcensus* 2005, controlling for respondents' formal citizenship necessarily acts as a proxy variable for migration status. Hence, I am unable to account for naturalized citizens.⁸⁴ I operationalize six groups similar to previous studies (Klein, Schindler, Pollak, & Müller, 2010; Müller & Klein, 2008): *West German, West European, Turkish, Italian, Greeks or individuals from FSU (Former Soviet Union) and other formal citizenships*.⁸⁵

Occupational gender segregation is a striking and stable phenomenon in societies worldwide (Charles & Grusky, 2004; Charles, 2011).⁸⁶ In this regard, the West German labor market is no exception (e.g. Brückner, 2004; Rosenfeld & Trappe, 2002; Blossfeld, 1987).⁸⁷ Men and women tend to enter different partial labor markets and rarely change occupational positions. This may be particularly true in a labor market such as West Germany, which is heavily segmented along occupational lines. Due to these persistent characteristics, labor market developments and, in particular, trends in returns to education must be considered distinctively between sexes. Hence, both descriptive and multivariate analyses are conducted separately for men and women.

⁸³ This holds also true for first generation migrants who arrived during the first migratory wave after World War II (Kalter & Granato, 2007). Interestingly, for new immigrants in the 1990s, while being better educated than immigrants from the first wave, ethnic disadvantages in the labor market increase once educational attainment is taken into account (Kalter & Granato, 2007; Kogan, 2010). Although being able to enter more high-skilled jobs than migrants from the first wave, new immigrants suffer from larger disadvantages in terms of accessing employment.

⁸⁴ Naturalized migrants tend to be a positively selected group. Moreover, we include a substantial number of resettled ethnic German immigrants from Eastern European countries into the West German group. While resettled ethnic Germans are better off in terms of labor market integration than non-Western immigrants, they clearly fare worse than Western immigrants (Kogan, 2010).

⁸⁵ While the larger group of Spanish and Portuguese people is coded as *West Europeans*, immigrants from *former Yugoslavia* are found in other citizenships. It would be possible to further differentiate among foreign citizens born in West Germany or not in all survey years. However, I refrain from using a more complicated measure of migration status.

⁸⁶ Of course, countries differ in which jobs are typically male or female and in the strength and pattern of occupational gender segregation, both in horizontal and vertical terms. West Germany appears to have a rather high level of occupational sex segregation in cross-national comparisons; substantially higher than in the US, but lower than, for instance, in Sweden (Dolado, Felgueroso & Jimeno, 2002). Charles and Grusky (2004) identify three characteristics of contemporary occupational gender segregation that account for cross-national variability in this pattern. A strong horizontal dimension: women are dramatically overrepresented in the non-manual sector; a vertical dimension in the manual segment: men are better able to attain the best occupational positions than women; a vertical dimension in the non-manual segment that seems to become weaker in some industrial countries: men have advantages over women in accessing top-level positions.

⁸⁷ For an overview on occupational sex segregation in Germany see Achatz (2005).

Similar to most of the reference studies on occupational returns to education over time (e.g. Müller, et al., 1998; Müller, et al., 2002; Brauns, et al., 1999; Gangl, 2003b), I do not factor in further individual controls. Since *Microcensus* data are aimed at providing descriptive evidence on the economic and social situation of the German population, they do not include information on individual attributes or resources that are relevant for the job matching process, such as social background, cognitive and non-cognitive abilities or personality traits. Consequently, I do not posit any findings of a *causal* effect of educational attainment on labor market outcomes.⁸⁸ This cannot be the purpose of the work. As outlined in the micro-macro framework, I am rather interested in changes in the gross effects of educational qualifications - both in absolute and relative terms - throughout macrostructural and macroeconomic developments. Seriously considering *signaling theory*, Weiss (1995: 135) explained: ‘Rather, firms use education choices to draw inferences about unobserved attributes. The coefficient of education is fully capturing the effects of that inference process and would not be affected by the inclusion of additional explanatory variables that are not observed by the firm’. As such, identifying gross changes in the relative value of educational attainment over time would already indicate changing perceptions and beliefs among employers about the productive value of education.

⁸⁸ ‘In the absence of experimental evidence, it is very difficult to know whether the higher earnings observed for better-educated workers are caused by their higher education, or whether individuals with greater earning capacity have chosen to acquire more schooling’ (Card, 1999: 2).

Chapter 5 Empirical trends in macroeconomic and macrostructural conditions

Returns to education in the labor market not only depend on a country's institutional setting but also on aggregate labor market conditions (Gangl, 2003b). Educational expansion and occupational upgrading are crucial factors determining both the association between educational attainment and labor market outcomes as well as changes in the value of specific educational credentials (Goldthorpe 2009: 30). While in the course of technological changes the labor market may increasingly require new skills available through specific higher qualifications, other educational credentials may be devalued due to over-availability. Furthermore, changing macroeconomic conditions tighten or mitigate job competition, thereby affect matching processes and education-specific labor market outcomes. Overall, it is worthwhile to start with a description of trends in macrostructural and macroeconomic conditions in West Germany. The following proceeds similar to Gangl (2003b) and concentrates on the *business cycle*, *educational expansion* and *the upgrading of the occupational structure*. However, I do not consider macrostructural changes in the demographic size of youth cohorts as Gangl (2003b: 271) showed, demographic pressures do not yield a significant impact on youth labor market outcomes. Before concentrating on the relevant macro-level changes though I start with a description of trends in *labor force participation* for both sexes.

5.1 Labor Force Participation

Female labor force participation is commonly assumed to be lower than men's across modern societies. Although large cross-country differences persist, almost all OECD countries have experienced an increase in female labor force participation over time (Jaumotte, 2003). The growth in female labor force participation is the most important factor accounting for increasing aggregate employment participation rates (Burniaux, Duval, & Jaumotte, 2003).

Cross-country differences in female employment are based on differences in women's level of educational attainment, aggregate economic conditions, service sector shifts, culture and social norms. Since women's decision to participate in the labor market depends much on the costs and benefits, economic incentives play a decisive role. As a consequence, differing national policies have a significant impact on differences in female labor force participation rates. Based on panel data of 17 OECD countries between 1985 and 1999, Jaumotte (2003)

finds that spousal tax incentives, part-time work, generous childcare subsidies and paid parental leaves significantly increase female employment rates.

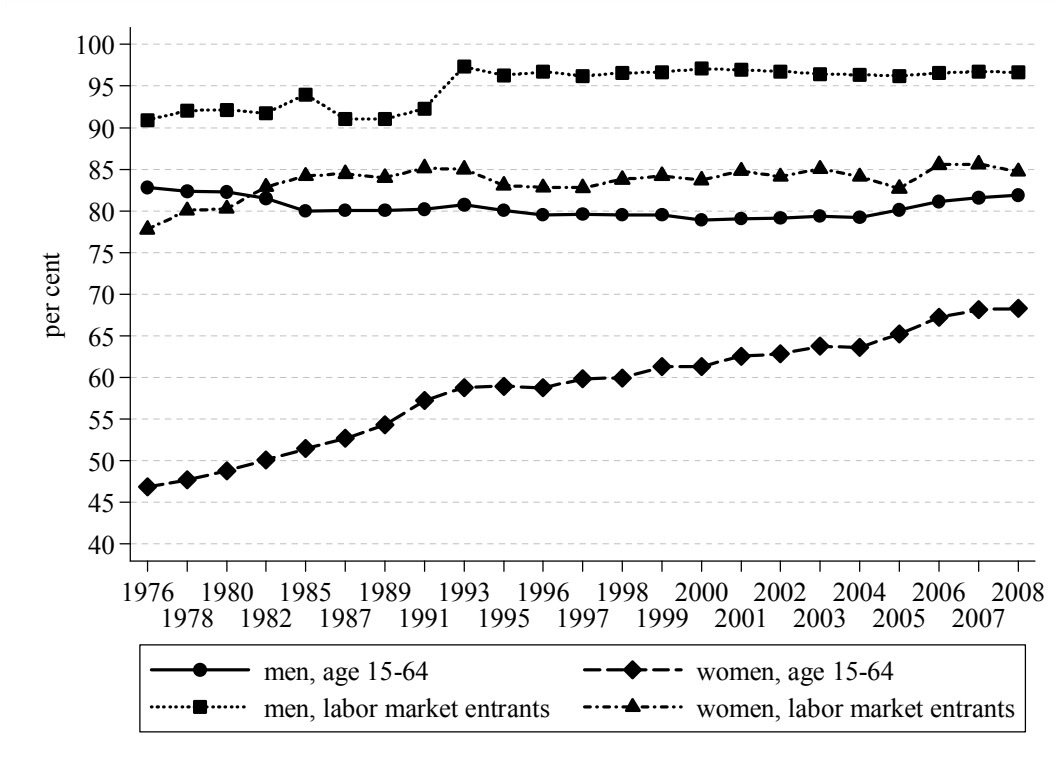
West Germany is considered a *conservative welfare regime* (Esping-Andersen, 1990), where gender relations still tend to follow the classic male breadwinner/female home-maker model. According to this model, women are rewarded more for providing care than for employment (Sainsbury, 1999). Many German welfare policy features provide strong incentives for married women and mothers to concentrate their efforts on family work. On the one hand, the model is characterized by a system of joint income taxation, which unfavorably taxes second earners and provides free health insurance for non-employed spouses. On the other hand, childcare subsidies are rather low and schools are traditionally part-time.⁸⁹ Joint taxation among married couples encourages spouses to specialize in their marital roles (Barg & Beblo, 2012). Likewise, a large proportion of mothers with young children take time off from paid employment after childbirth (Kurz, 1998) and do not even return to the labor market (Aisenbrey, Evertsson, & Grunow, 2009). A *conservative welfare regime* also limits the marketization of traditional female work, thereby preventing service sector growth and a higher involvement of women in this sector. Consequently, female labor force participation remains historically low in Germany while part-time employment is extremely common among German women (OECD, 2012a). Nevertheless, Germany appears to have experienced one of the largest increases in female employment among other European countries (e.g. Spain, Ireland or Netherlands).

Empirically, Figure 1 depicts labor force participation rates among men and women over time. Individuals are considered as not participating in the labor force when inactive according to ILO (International Labour Organisation) definition (ILO, 2005). Conversely, individuals are counted as participating in the labor market not only when working but also when currently unemployed (according to ILO criteria). Among women aged 15-64, their employment level has grown strongly from under 50 per cent in the mid-1970s to almost 70 per cent today. This growth remained particularly strong up until the beginning of the 1990s, after which time it remained largely stable. Hence, this demonstrates the relatively strong growth in female labor force participation for West Germany. Still, more than 30 per cent of women did not participate in the labor force in recent periods. Among men, around 80 per cent of the population actively participated in the labor market across time. While male labor

⁸⁹ Since the 1990s, German policymakers have instituted some reforms: a legal right for children to have a kindergarten spot (1993); the introduction of more flexible parental leave, facilitating part-time work (2001); and the introduction of tax allowances for household aid and childcare (2003).

force participation slightly decreased at the beginning of the 1980s and increased slightly in the mid-2000s, it has remained largely consistent.

Figure 1 Trends in labor force participation rates



Source: German *Microcensus*, Scientific-Use-Files 1976-2008. Notes: for operationalization of labor market entrants sample see chapter 4.2.

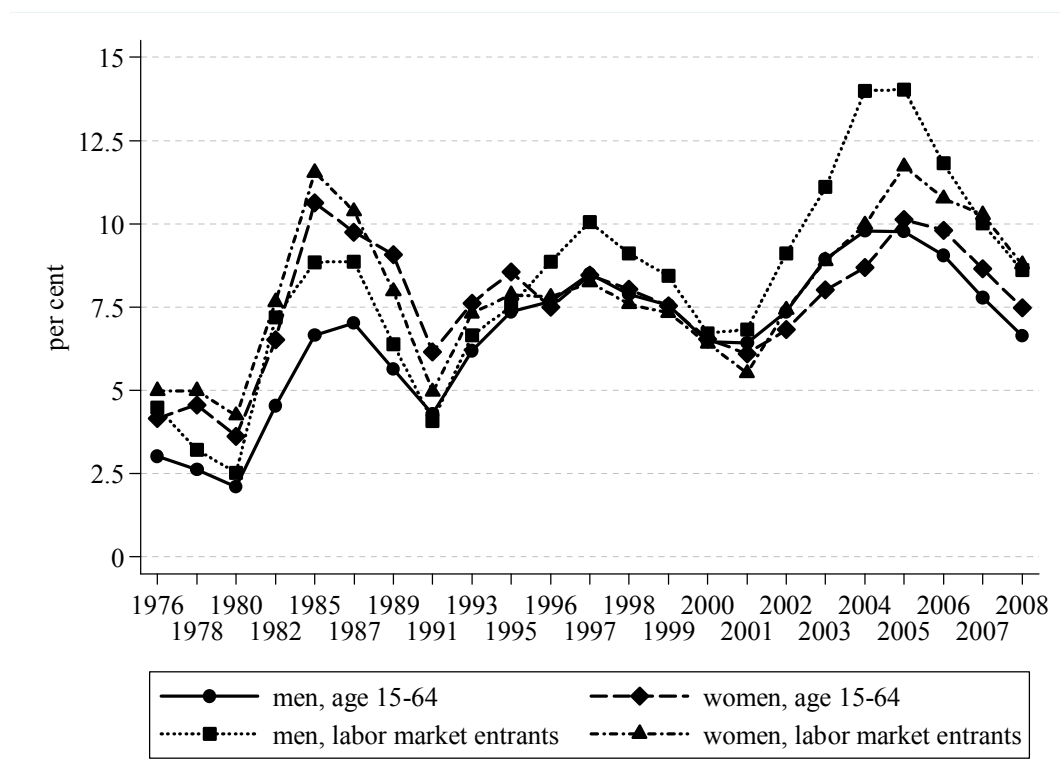
Not surprisingly, labor force participation rates for both sexes, particularly women, are substantially higher upon labor market entry. For female labor market entrants, their labor force participation rate increased substantially between the mid-1970s and mid-1980s, but did not consistently increase afterwards. For over the past 20 years, the number of inactive labor market entrants has remained constant around 15 per cent. Hence, the continual growth in female labor force participation has tended to be driven by women in later career stages. Among men, participation among labor market entrants was already very high in the mid-1970s. Aside from a strong increase between 1991 and 1993, male labor force participation did not change over time.⁹⁰ At present, more than 95 per cent among labor market entrants are actively participating in the labor market. Comparing the sexes, at all times men show stronger participation in the labor market than women even among labor market entrants.

⁹⁰ The strong increase cannot be attributed to a methodological artifact, as labor force participation was measured consistently in 1991 and 1993. Further, the share of missing values on educational attainment in the sample of labor market entrants is high in both years (see Table A2).

5.2 Business cycle

Figure 2 displays trends in the total unemployment rate among individuals aged 15 to 64 and unemployment among labor market entrants for both men and women. Unemployment is operationalized following ILO definition (ILO, 2005; for details see chapter 6.3.1). In the following chapters, the aggregate unemployment rate in the total labor force is used as a macro-level measure for the *business cycle*.⁹¹

Figure 2 Trends in unemployment rates



Source: German *Microcensus*, Scientific-Use-Files 1976-2008. *Notes:* for operationalization of labor market entrants sample see chapter 4.2.

Despite cyclical up- and downturns, the unemployment rate in the labor force generally grew for both sexes between 1976 and 2008. While for men, the unemployment rate more than doubled from 3.0 to 6.6 per cent, it almost doubled from 4.2 to 7.5 per cent for women. Periods of increasing joblessness can be seen at the beginning of all three decades: 1980-1985, 1991-1995 and 2001-2005. While the unemployment rate rather moderately increased at the beginning of the 1990s, it rose sharply at the beginning of the 1980s and particularly at the start of the 2000s. The periods around 1985, 1995 and 2005 are peak

⁹¹ Typically, an increase in unemployment follows an economic recession with a slight time lag, while a decrease in unemployment is preceded by a growth in the gross domestic product (GDP) (European Commission, 1998).

economic downturn years. The increasing unemployment rates in the 1980s can be attributed to the economic downturn in the second oil crisis. The second phase of increasing joblessness resulted from a post-reunification recession. The sharp increase in unemployment at the beginning of the 2000s can be partially attributed to the end of the IT boom. In all three decades, the economic conditions seem to substantially improve again by the second half of the decade. This also holds true to a minor degree at the end of the 1970s. Currently, unemployment rates for both sexes appear to be decreasing again.⁹² While unemployment levels differ between sexes, unemployment rates in the total labor force more or less follow the same pattern for men and women. Although women have a higher unemployment rate than men until the mid-1990s, from this point forward the sexes do not substantially differ. Particularly during the recession at the beginning of the 1980s, women in the total labor force have been disproportionately affected by unemployment.

Not surprisingly, unemployment rates among labor market entrants are generally higher than among the total population. Nevertheless, unemployment differences between labor market entrants and other age groups are not considerably large. In West Germany, exclusion from the labor market tends to be much more concentrated among individuals aged 50 or above, where levels of unemployment are higher than the average (Federal Employment Agency, 2012). Youth unemployment trends follow the same pattern as the total labor force. Nevertheless, labor market entrants are more strongly impacted by unemployment in times of worsening economic conditions. This is attributable to the fact that labor market entrants can be more easily dismissed as they are disproportionately likely to occupy unstable employment relationships. In this regard, earlier research has shown that youth unemployment or joblessness is *supercyclical* (Ryan, 2001; Gangl, et al., 2003).

Overall, Figure 2 emphasizes that West Germany has one of the lowest levels of youth unemployment in Europe (e.g. OECD, 2011b). Despite strict employment protection legislation for permanent employees (Estevez-Abe, et al., 2001), the school-to-work transition in Germany is rather smooth compared to other European countries (Blanchflower & Freeman, 2000). This fact is due to the German education and training system, particularly its strong apprenticeship emphasis, which provides employers clear and reliable signals about job

⁹² The descriptive figure on business cycles is fully confirmed when considering yearly register-based numbers from the Federal Employment Agency (see Figure C1). We see the same up-and downturns in the respective periods for both sexes. Prior to the period of observation, the unemployment rate sharply decreased throughout the 1950s from a very high base level. Apart from a slight increase in 1967/68, unemployment was very rare in the 1960s. Just before our observation period, the unemployment rate had already increased markedly thanks to the first oil crisis. Despite the modern financial and economic crisis, the unemployment rate in West Germany has continued to decrease in most recent times.

applicants' abilities and skills (Breen, 2005a).⁹³ While unemployment more strongly affected female labor market entrants relative to males during the 1980s economic recession, the reverse has happened in subsequent recessions in the 1990s and particularly since the 2000s.

5.3 Educational expansion

Almost all developed nations have experienced a massive expansion of higher education since World War II (Schofer & Meyer, 2005).⁹⁴ As prior researchers have stressed (e.g. Müller, et al., 2009: 285ff.; Müller & Wolbers, 2003; OECD, 2011a), higher education expansion in West Germany has been rather moderate by international comparisons. While the absolute number of students rose greatly between 1960 and 1990, it has remained rather constant since the beginning of the 1990s. Describing this development, Klemm and Weegen (2000) coined the phrase of a *slowed down educational expansion*. This phasing out of educational expansion is observable in the educational distributions among labor market entrants across periods.

Table 4 Distribution of *CASMIN* qualifications among labor market entrants (in per cent)

Men	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b	N
1976-1980	13	50	15	4	1	3	5	9	35608
1982-1987	12	42	20	3	1	6	6	10	44485
1989-1993	10	34	23	3	2	9	8	12	36889
1995-1999	10	25	19	3	3	11	12	17	48680
2000-2004	12	21	20	4	3	11	13	17	44266
2005-2008	13	21	20	4	3	12	11	16	30267
Women	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b	N
1976-1980	20	43	23	5	1	2	2	5	34287
1982-1987	17	29	32	4	1	7	2	8	41390
1989-1993	12	22	33	4	2	14	4	10	35615
1995-1999	12	17	27	4	3	17	7	14	46729
2000-2004	12	13	26	5	3	16	8	16	41358
2005-2008	12	11	25	5	3	19	7	17	30944

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

This distributional comparison also stresses the tremendous change in educational participation between the sexes in West Germany. As in several other European countries,

⁹³ Breen (2005a) revealed that a clear educational attainment signal more than compensates for the elevated youth unemployment rate associated with strong employment protection legislation (EPL). Countries, particularly in Southern Europe, in which educational credentials exhibit low signaling capacity and which have high employment protection are the ones with the highest levels of youth unemployment.

⁹⁴ For a description of the causes of educational expansion see Müller et al. (2009: 282f.) and Müller (1998a: 84f.). For an excellent overview on the evolution of educational expansion in West Germany see Schindler (2012: chapter 2).

women substantially caught up with men in terms of educational attainment and have even partially outperformed them (Breen, Luijkx, Müller, & Pollak, 2010).

Table 4 indicates these distributional changes of educational qualifications among male and female labor market entrants in West Germany over time (for a detailed description per single year see Tables C1-C2). For men, the proportion of university (*CASMIN* 3b) and *Fachhochschule* (*CASMIN* 3a) graduates increased until the mid-1990s and has even slightly decreased since then. The most substantial phase of higher education expansion took place at the beginning of the 1990s. Since the mid-1990s, the share of tertiary graduates has remained flat. Slightly more than one fourth of male labor market entrants had acquired a tertiary degree by the end of the 2000s. At the bottom of the educational distribution, the picture is completed by the fact that the proportion of less-educated men (*CASMIN* 1ab) has not substantially decreased over the large time span. As this indicates, a persistently high share of low-educated men continues to enter the labor market. The most substantial changes in the educational distribution appear to have taken place in vocational training. While more than half of male labor market entrants in West Germany are still vocationally qualified job seekers in recent times, there has been a significant upgrading of qualificational requirements. Compared to the 1970s when more than half of male labor market entrants belonged to *CASMIN* 1c, this proportion has shrunk substantially over the last thirty years to a proportion around 20 per cent. At the same time, the share of *CASMIN* 2b graduates rose until the beginning of the 1990s and slightly decreased afterwards. More significantly, the share of vocationally qualified school leavers with *Abitur* (*CASMIN* 2c_voc), has increased fourfold: While this share was very low in the mid-1970s, it sharply increased afterwards, particularly throughout the 1980s. Apparently, more and more young people who have acquired an *Abitur* opt for vocational training instead of going on to university. On the one hand, this stresses the outstanding role of the *dual apprenticeship system* as well as its attractiveness for young people, particularly for individuals from lower social background (e.g. Shavit & Müller, 2000; Hillmert & Jacob, 2003; Müller & Pollak, 2004b). On the other hand, it may reflect increasing skill requirements that vocational training places on individuals due to technological changes. By contrast, the shares of graduates in *CASMIN* 2b and 2c_gen directly entering the labor market after general education were small and have only marginally increased over time.

For women, higher education expansion has been somewhat more pronounced than for men. The share of university graduates has increased from 5 per cent in the mid-1970s to 17 per cent in recent years. Nevertheless, educational expansion has slowed down since mid-1990s also for women. As a consequence of a faster expansion, female labor market entrants

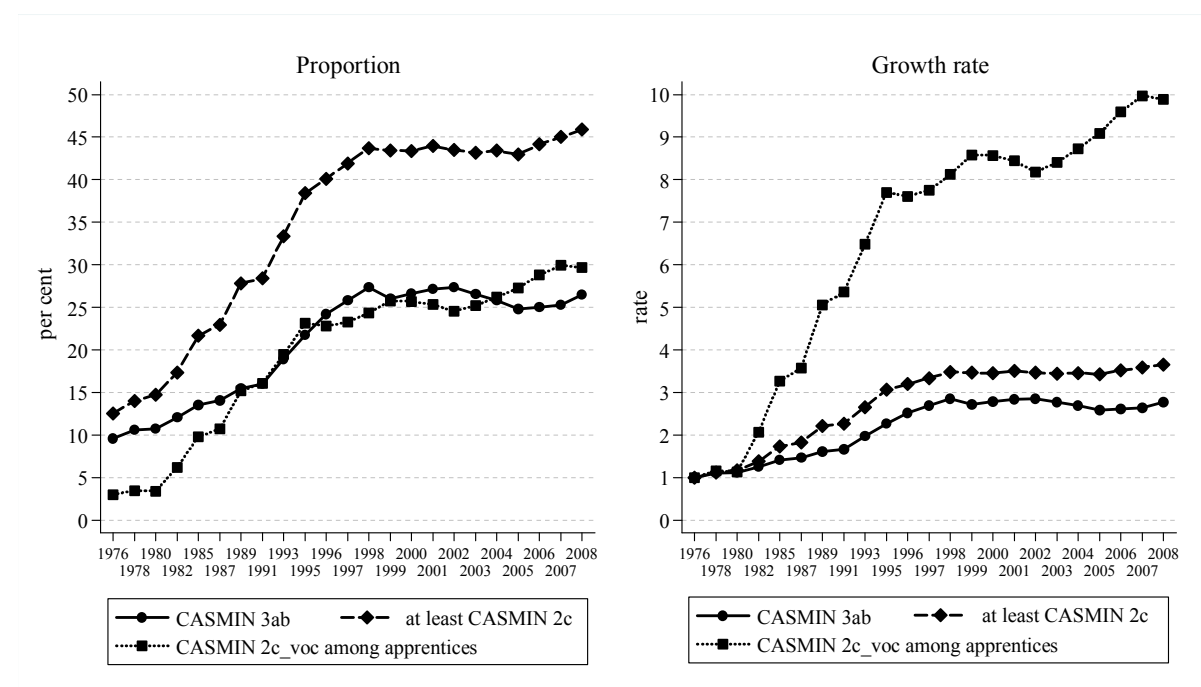
slightly outnumbered male labor market entrants in terms of university education in recent years.⁹⁵ However, similar trends do not apply to *Fachhochschule* graduates (*CASMIN* 3a) where men are still more prevalent. Likewise, the expansion of second-tier tertiary degrees came to a standstill in the mid-1990s. In contrast to men, the share of female less-educated (*CASMIN* 1ab) decreased over the 1980s but has remained constant since. In recent times, the share of less-educated individuals is nearly identical for men and women. Again, the most salient developments have taken place in the apprenticeship system. For women, we see a strong increase in the proportion of vocationally qualified school leavers with an *Abitur*, increasing from 2 per cent in the mid-1970s to 19 per cent in the mid-2000s. While the upgrading of qualificational requirements in vocational training mainly took place during the 1980s for both sexes, the share of female *Abitur* holders has continued to grow. Starting at the end of the 1980s, female *Abitur* holders graduated from vocational training even more frequently than from university. Again, this possibly indicates tightened competition around advantageous training positions where general degrees have become an increasingly important selection criterion for employers. In turn, the share of apprentices with only *Hauptschule* degree (*CASMIN* 1c) has substantially decreased. While *CASMIN* group 2a also increased in size until the beginning of the 1990s, the share has declined from then on as well. As with men, female labor market entrants with general education only (*CASMIN* 2c_gen and 2b) are a rather small group. Comparing *Abitur* attainment rates between sexes, women (46 per cent) clearly outnumber men (42 per cent) in the most recent period.

Overall, educational expansion in West Germany has been rather modest and did not follow a consistently increasing trend over the last thirty years. While higher education expansion among labor market entrants has completely stopped for men in the last 10 to 15 years, it has also slowed down for women.⁹⁶ The overall educational expansion in West Germany has in large parts been driven by women's increased educational attainment, particularly among women from a working class background (Becker & Müller, 2011).

⁹⁵ This phenomenon is also seen in the US in terms of college completion. The growing female advantages can be attributed to the fact that returns to education have risen faster for women than for men (DiPrete & Buchmann, 2006) as well as to gender differences in resources related to social origin and academic performance (Buchmann & DiPrete, 2006).

⁹⁶ Looking at a different sample definition of labor market entry that comprises larger age groups (*CASMIN* 1ab, 2ab: age 15-24; *CASMIN* 2c: age 20-29; *CASMIN* 3ab: age 25-34) reveals more or less the same trend in higher education expansion over time but on a higher base level, particularly among women (see Table B1). This is due to the fact that we included younger birth cohorts in this kind of sample.

Figure 3 Educational thresholds among labor market entrants



Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

The left graph of Figure 3 stresses that educational expansion has been much more pronounced at the *Abitur* level than at university level. This is especially evident from the beginning of the 1980s to the beginning of the 1990s.⁹⁷ In relative terms, however, growth rates for both levels of educational attainment have closely followed each other (right graph of Figure 3). Among other factors, the small number of higher education students in all German-speaking countries is frequently attributed to the successful *dual apprenticeship system* (Müller et al., 2009: 287).⁹⁸ Countries with a well-established vocational training program such as Germany's appear to have experienced low expansion rates, as graduating with vocational training offers good labor market prospects for individuals and thereby attracts substantial parts of each entry cohorts. At the end of the 1990s, however, even the proportion of individuals that completed an *Abitur* has stagnated, but slightly growing again in recent years. While the proportion of *Abitur* holders among apprentices more or less parallels the general increase of *Abitur* holders in absolute terms (left graph), the relative growth rate is substantially larger among apprentices than in the total sample (right graph): The proportion of *CASMIN 2c* graduates among apprentices is ten times higher than in the

⁹⁷ The overall increase in individuals that completed the *Abitur* is significantly driven by an increase in individuals with *Fachhochschulreife* (the entitlement to study at *Fachhochschule*) (Müller et al., 2009: 289).

⁹⁸ Müller et al. (2009) also mention a low permeability of the secondary education school system, the restricted access to popular fields of study, the existence of only a few private higher education institutions and minor public subsidies to pay for studies, which are not socially well balanced.

reference year, while it increases almost four times higher only among all labor market entrants. Whereas *Abitur* graduates were rather an exception in the German apprenticeship system in the 1970s, at present the recruitment of *Abitur* holders in vocational training places appears to have become more and more common.

Given the empirical trend of educational expansion in West Germany, how may it have affected the returns to education over time? First of all, credential inflation in West Germany has not transpired. Individuals with a tertiary degree are still a comparatively small group. Hence, employer devaluation of higher education credentials due to a declining signaling capacity is rather unrealistic in the German case. Although educational expansion has been moderate, job competition among higher education graduates in the West German labor market may have increased. As opportunity structures depend on the balance between educational expansion and occupational upgrading, job competition among higher education graduates may have tightened if occupational upgrading in West Germany has developed even more slowly than educational expansion. Thus, in the following I concentrate on the occupational upgrading.

5.4 Occupational upgrading

Since changes in the occupational structure are a direct consequence of the interplay between demand- and supply-side factors, single causal mechanisms for occupational changes are always hard to identify. Moreover, the interaction between demand- and supply-side factors depends on labor market structures and institutional regulations.

From a demand-side perspective, *skill-biased technological change (SBTC)* generally predicts that the exogenous expansion of computer-based technology increases demand for high-skilled compared to low-skilled individuals (Autor, et al., 1998; Acemoglu, 2002, 2003; Katz & Autor, 1999; Card, Kramarz, & Lemieux, 1999).⁹⁹ Hence, basic *SBTC* theory proposes a continuous upgrading across the whole occupational structure. Most recently, this *SBTC* framework has been challenged by the *routinization* hypothesis (Manning, 2004; Autor, et al., 2003). Building on the original *SBTC* explanation, the *routinization* approach argues that low-paid service jobs at the bottom of the occupational structure requiring low-skilled interpersonal tasks cannot as easily be substituted or routinized by computers or machines as

⁹⁹ *SBTC* is the most prominent explanation for the rising wage inequality among skill or education groups (Katz & Autor, 1999). In turn, increasing relative earnings are assumed to indicate a labor supply that is outpaced by labor demand. For a critique of this argument see Card and DiNardo (2002). In the German context, the *SBTC* tends to be no valid reason for the recent rise in wage inequality (Antonczyk, Fitzenberger, & Leuschner, 2009).

intermediate-level manual production or offices jobs.¹⁰⁰ As a consequence, computerization complements both high-skilled analytical, non-routine cognitive tasks and low-skilled interactive tasks, thereby polarizing the employment structure and reducing the share of intermediate-level jobs in routine manual and clerical positions (Autor, Katz, & Kearney, 2008; Goos & Manning, 2007). Hence, *routinization* predicts job polarization at both ends of the occupational hierarchy at the cost of intermediate-skilled jobs.

From a supply-side perspective, firms adapt their production techniques and skill requirements to the changing skill composition among labor market entrants. If labor supply skills increase or decrease, the skill level in the occupational structure also increases or decreases. While a technology-driven increase in the demand for skills grows more consistently over time, a growing supply of skills depends on the extent and pattern of educational expansion (Goldin & Katz, 2007). In this regard, occupational upgrading should more or less parallel educational expansion in a given society.

From a country-specific perspective, supply- and demand-side factors are significantly shaped by national institutions such as educational systems, labor market structures or labor market regulations (e.g. DiPrete & McManus, 1996). For instance, the impact of a supply-driven mechanism on skill upgrading in the labor market may depend on the signaling capacity of educational credentials and thus the (perceived) usefulness of education-based skills and knowledge for employers and firms. Given this tight linkage, occupational upgrading should more closely follow educational expansion in West Germany than in other European countries. Regarding job polarization, countries with flexible wage-setting institutions such as Anglo-Saxon countries are assumed to be substantially more able to create low-paid (service) jobs than economies with high wage rigidity such as Germany (Scharpf, 2000). Due to their more rigid structure and comparatively low wage inequality, low-paid service sector jobs may be too expensive in countries like Germany, resulting in fewer of these jobs in these more rigid countries. Accordingly, job polarization tendencies tend to be less likely in West Germany.

What does the existing literature say about the contrasting predictions of *SBTC* and *routinization* in West Germany? Basically, the empirical studies do not deliver a consistent picture. If job quality is measured in terms of skills, studies either reveal consistent occupational upgrading (Tahlin, 2007b) or polarization, that is, high- and low-skilled jobs have tremendously expanded relative to mid-skilled jobs (Spitz-Oener, 2006; Oesch &

¹⁰⁰ Manning (2004: 584) refers to cleaning and restaurant work as examples for low-skilled jobs that cannot be routinized as technology has less impact on the work tasks.

Rodríguez Menés, 2011). When job quality is measured according to average occupational earnings, studies find clear-cut evidence for occupational upgrading (Oesch & Rodríguez Menés, 2011) or a weak trend towards polarization (Dustmann, Ludsteck, & Schönberg, 2009). Since Germany shows a strong correlation between changes in skill supply and changes in the occupational structure, Oesch and Rodríguez Menés (2011) also appear to find evidence for a supply-side mechanism.

In order to detect shifts in the occupational structure over time I consider changes in the distributions among class destinations for both sexes (Müller, et al., 2002). Social class is operationalized by an approximated *EGP* or *Goldthorpe* class schema (Erikson & Goldthorpe, 1992).¹⁰¹ For good reasons, the class distributions concentrate on the sample of economically active labor market entrants (see chapter 4.2.; Schubert & Engelage, 2006). Table 5 shows the percentage distributions of the nine different social classes over six pooled periods (for detailed numbers in single periods see Tables C3-C4).

Table 5 Class distributions among labor market entrants (in per cent)

Men	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1976-1980	12	8	20	3	2	2	2	44	7	30956
1982-1987	13	8	19	3	1	1	2	45	8	36958
1989-1993	16	7	18	3	1	1	2	44	7	31624
1995-1999	24	10	18	4	1	1	3	34	5	41523
2000-2004	27	10	17	4	1	0	3	32	5	37578
2005-2008	26	10	15	4	1	0	3	33	7	25120
Women	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1976-1980	3	17	37	19	1	2	1	12	8	25774
1982-1987	5	18	35	19	1	1	1	13	8	31071
1989-1993	7	18	37	17	1	0	1	13	6	27753
1995-1999	12	23	40	12	1	0	2	8	3	35374
2000-2004	14	23	37	12	1	0	1	8	3	31907
2005-2008	15	24	37	12	1	0	1	7	3	23236

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

First of all, we focus on de-industrialization and service sector growth over the last thirty years. As an indicator of this development we differentiate between the proportion of skilled and unskilled manual workers (*EGP* classes V-VIIab) and the proportion of non-manual employees (*EGP* classes I-IIIab). For men, the level of industrialization remained more or less stable across the 1980s and into the beginning of the 1990s. In the mid-1990s, the proportion of non-manual classes grew strongly: While at the beginning of the decade more

¹⁰¹ For an extensive description of the *EGP* class schema and its theoretical rationale see chapter 7.4.1.

men worked in manual positions (53 per cent) than non-manual positions (43 per cent), the picture has completely reversed at the end of the decade (55 per cent non-manual employees vs. 43 per cent manual workers). Since the 2000s, male service sector involvement has stopped to grow. Most recently, the share of positions in the manual sector has even somewhat increased again.

Among women, more than three fourth worked in non-manual positions in the first period of observation. This reflects the high degree of gender segregation in the West German labor market, which can be still seen at present. While nearly half of women are employed in routine non-manual positions (IIIab), nearly half of men fill manual worker jobs (V-VIIab). Hence, the service sector is clearly female-dominated, while the industry sector clearly male-dominated. As in the case of men, the 1990s were decisive in terms of service sector growth. In the 1980s and 2000s, however, de-industrialization did not proceed any further for women. Nevertheless, in the most recent period, almost 90 per cent of West German women were employed in non-manual occupations.

For both men and women entering the labor market at the end of the 1970s, the share of farmers or agricultural workers (*EGP IVc*) and small proprietors (*EGP IVab*) was already quite low. While the primary sector (agricultural sector) has become almost irrelevant over time, there seem to be no tremendous changes among small proprietors. Nevertheless, other researchers emphasize compositional changes within the petty bourgeoisie: while the share of traditional groups such as small proprietors, craftsmen or merchants decreased, new types of self-employed, offering knowledge-intensive, social, consulting or entertaining services, have increased (Lohmann & Luber, 2004).

Aside from these sectorial changes, it is more important to ask whether educational expansion and the upgrading of the occupational structure have developed in a similar way in West Germany. The most significant indicator for occupational upgrading, in line with *SBTC* and *routinization*, is a growing number of advantageous service class positions (*EGP I-II*). Nevertheless, *SBTC* proposes a consistent upgrading throughout the occupational structure, while *routinization* expects an increase in the proportion of low-skilled jobs (*EGP VIIab* and *EGP IIIb*) and a decrease in the proportion of intermediate skilled jobs (in particular *EGP IIIa*).

For men, the proportion of individuals employed in the upper service class (*EGP I*) more than doubled from 12 per cent to 26 per cent over the last thirty years. Similar to upgrading in the educational distribution, the most pronounced increase in upper service class positions can be found in the 1990s. While occupational upgrading was less prevalent in the

1980s, it came to a near standstill in recent times. Male labor market entrants less often enter service class positions in the lower part (*EGP* II) than in the upper part (*EGP* I). If at all, the increase in lower service class positions has been rather modest. Nevertheless, in the most recent period, more than one third of male labor market entrants were employed in a service relationship. Despite substantial upgrading at the upper end of the class structure, the proportion of unskilled workers (*EGP* VII + IIIb) remained rather constant across periods. In the course of de-industrialization, occupational structure upgrades led to a substantially reduced proportion of available positions in higher-grade routine non-manual jobs (*EGP* IIIa) and particularly skilled manual worker jobs (*EGP* VI). Apparently, occupational upgrading is not a continuous process throughout the class structure for men. However, as the share of low-skilled jobs, particularly in sales and services (*EGP* IIIb), did not really expand over time, one cannot speak of a strong job polarization in the male employment structure in West Germany. Still, in the most recent period, more than half of the male labor market entrants were employed in intermediate classes (*EGP* IIIa, V and VI). While due to their large number particularly mid-range jobs decrease at the cost of service class employment growth, this does not give indication of a polarizing employment structure.

For women, the proportion of upper service class positions even increased fivefold, but from a substantially lower base level. As with men, the most significant increase in upper service class positions took place across the 1990s. While moderate occupational upgrading began in the 1980s, it slowed down for women in the 2000s. Although women more than caught up with men in terms of educational attainment, women still have tremendous disadvantages in terms of accessing the most advantageous positions of the class structure (*EGP* I) compared to men. In absolute terms, the growth in upper service class positions is even stronger for men than for women (14 to 12 percentage points). However, women are substantially more abundant in the lower than the upper service class section. Consequently, the proportion of overall service class positions is higher for women than for men across almost all periods. In contrast to men, the share of positions in the lower service class has increased somewhat more for women. As in the case of educational expansion, occupational upgrading in terms of expansion of the whole service class has been slightly more pronounced for women (20 to 39 per cent) than for men (20 to 36 per cent) over the last thirty years. In contrast to men, the expansion of the service class largely comes at the cost of skilled (*EGP* VI) and unskilled (*EGP* VII and IIIb) positions among women. Over the last thirty years, the proportion of women working in unskilled positions has almost halved (from 27 to 15 per cent). Hence, a consistent occupational upgrading appears to be more evident among

women's class structure than men's. For women, occupational changes are more in line with the expectations of *SBTC* rather than *routinization* hypothesis.

Overall, we see substantial upgrading in the upper part of the class structure for both sexes that comes at the expense of intermediate classes for men and intermediate and low-skilled classes for women.¹⁰² Despite this, the share of low-skilled jobs remained constant for both sexes.¹⁰³ This may in fact be attributed to more rigid wage-setting institutions in West Germany (Oesch & Rodríguez Menés, 2011). In turn, the relative decline in mid-level positions has been not as pronounced as *routinization* hypothesis would suggest. Hence, the empirical changes in the occupational structure appear to be more consistent with *SBTC* than *routinization*, especially among women.

The labor market can be further differentiated into partial labor markets. Particularly, public service and private industry jobs represent two distinct labor markets that differ strongly according to economic incentives, tasks and the structure of occupational positions. Moreover, job mobility between these sectors is a very rare phenomenon (Blossfeld & Becker, 1989). Most importantly, recruitment and promotion decisions in the public service are strictly based on educational credentials, while employers in private industry are freer to consider other characteristics among job applicants. University graduates are overly prevalent in the public service because university education traditionally prepares for academic and professional positions. Since the public sector coordinates demand for services in modern societies, increasing professionalization tendencies and service sector growth has particularly been induced in the public service. Accordingly, the increasing share of university graduates was mainly absorbed by the public service (particularly education) in the early phases of educational expansion (Becker, 1993; Blossfeld & Becker, 1989). However, the public service has been hit by staff reduction and hiring freezes from the mid-1990s onwards (Schubert & Engelage, 2006: 108). Given that, the supply of service class positions in the private industry may have become increasingly important for higher education graduates. Thus, it seems

¹⁰² Table B2 additionally indicates changes in the occupational structure when applying the standard version to operationalize the *EGP* class schema. This is restricted to the use of 11 *Microcensus* years (see chapter 7.4.1). These class distributions reflect the general differences as compared to the approximated version, discussed in footnote 171. With regard to occupational upgrading, the changes do not call for significantly different interpretations as those already given. Nevertheless, the increase in upper service class positions tends to be more substantial, particularly among women. By contrast, the share of lower service class positions remains more stable. While the share of unskilled workers (*EGP* VIIab) is substantially larger in the standard *EGP* version than in the approximated version, it also decreases across periods for men instead of remaining stable. Hence, we see a more consistent upgrading and therefore even less evidence of job polarization among men when using detailed information on the employment status.

¹⁰³ For both sexes, the finding that the share of low-skilled non-manual jobs (*EGP* IIIb) in West Germany remained stable is consistent with results by Oesch and Rodríguez Menés (2011). Likewise, they state that occupational changes in Germany are more consistent with *SBTC* than *routinization*.

worthwhile to consider both changes in the overall size of the public and private sectors in West Germany as well as class structure upgrading for both segments separately. The *Microcensus* has asked respondents about the employment sector they are currently working in since 1989.

Table 6 indicates the share of public and private sector positions among labor market entrants (overall %) and separate class distributions for these sectors by sex. Moreover, the figures in parentheses provide the proportions of classes in the respective employment sector on the labor market as a whole. While more than one fifth of male labor market entrants were employed in the public sector at the beginning of the 1990s, nearly one fourth of female career starters were. Over time, the share of men employed in the public sector has continuously declined; for women it has only marginally decreased. Hence, the Schubert and Engelage (2006) shrinking public sector findings are evident mainly for men. Not surprisingly, the class distributions indicate that most individuals in the public service are employed in non-manual positions, with workers representing a very small group. While manual positions dominate the private sector for men, non-manual positions also prevail in the private sector for women. In general, the proportion of service class positions is higher in the public sector than in private industry for both sexes. Hence, the public sector is clearly a more professionalized and high-skilled labor market than the private sector.

Over time, both sectors have experienced an upgrading in terms of an increasing share of service class positions. However, the share of public sector service class positions in the labor market as a whole (in parentheses) remained constant. Thanks to the shrinking size of the public service for men, occupational upgrading in terms of service class expansion is needed to sustain the overall proportion of public sector service class positions in the labor market. In other words, high-skilled positions in the public service have not been hit by staff reduction among men; rather manual worker positions and routine non-manual positions have been shed. Hence, the public service has not contributed to occupational upgrading in the labor market for men but has simply preserved the existing amount of service class positions. Conversely, changes in the overall proportions (in parentheses) demonstrate that class structure upgrading for men transpired fully among private industries, particularly in the 1990s. Since the size of the public sector remained constant for women, the increasing share of upper service class positions within the public sector somewhat contributes to occupational upgrading. Nevertheless, occupational upgrading in terms of service sector expansion has predominantly taken place in the private sector also among women.

Having reviewed these descriptive class distributions, what are we able to say about the relationship between supply and demand for higher education over time? For both sexes, occupational upgrading appears to have more or less paralleled the expansion of higher education (see also Oesch & Rodríguez Menés, 2011). When educational expansion was strongest in the 1990s, occupational upgrading was greatest during this time as well. When the growth in the number of tertiary graduates slowed down in the 2000s, the expansion of the service class came nearly to a standstill as well. While this does not refute the prevalence of demand-side factors such as *SBTC*, it possibly hints at a supply-side mechanism in the West German labor market. In both 1990s and 2000s, the West German labor market – particularly the private industry – should have been able to absorb the increasing number of tertiary graduates in adequate occupational positions. Service class positions expanded at a slower rate than the number of tertiary graduates only in the 1980s; thus occupational upgrading lagged somewhat behind educational expansion only in this period. This is particularly the case for women where the expansion of higher education was more pronounced than service class growth. Hence, job competition among tertiary graduates for scarce service class positions should have been most pronounced across the 1980s. Accordingly, *absolute* returns to higher education, as being directly influenced by the balance between educational expansion and occupational upgrading, should be most susceptible of change in the 1980s. In line with supply-side explanations, Gangl (2003b: 275f.) shows that changes in the educational system and the labor market are interrelated: educational expansion is able to induce the upgrading of the occupational structure after a time lag. Given this, labor demand needed some time in the 1980s to adjust to the changing supply and to shift accordingly. Possibly due to learning experiences and adaptation strategies among private establishments, this adjustment time has become much faster since. Overall, the private sector seems to be capable of adapting to the occupational requirements of the labor supply. Since educational requirements are less strict in the private sector compared to the public, it will be interesting to see whether educational attainment results in similar occupational sorting patterns across sectors.

Table 6 Class distributions in public service and private industry (in per cent)

Men											
	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N	Overall (%)
<i>Public service</i>											
1989-1993	24 (5)	12 (3)	45 (10)	4 (1)	0 (0)	0 (0)	2 (0)	11 (3)	2 (0)	6620	21
1995-1999	29 (6)	13 (3)	47 (9)	2 (0)	0 (0)	0 (0)	2 (0)	6 (1)	2 (0)	7876	19
2000-2004	28 (5)	16 (3)	46 (8)	2 (0)	0 (0)	0 (0)	2 (0)	5 (1)	2 (0)	6389	17
2005-2008	34 (5)	16 (2)	38 (6)	2 (0)	0 (0)	0 (0)	2 (0)	6 (1)	2 (0)	3687	15
<i>Private industry</i>											
1989-1993	14 (11)	6 (5)	11 (8)	3 (3)	1 (1)	1 (1)	3 (2)	52 (41)	8 (7)	24628	79
1995-1999	23 (19)	9 (7)	11 (9)	4 (3)	1 (1)	1 (1)	4 (3)	41 (33)	6 (5)	33431	81
2000-2004	27 (22)	9 (8)	12 (10)	4 (4)	1 (1)	1 (1)	4 (3)	37 (31)	6 (5)	31181	83
2005-2008	24 (21)	9 (8)	12 (10)	4 (4)	2 (1)	0 (0)	4 (3)	37 (32)	7 (6)	21432	85
Women											
	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N	Overall (%)
<i>Public service</i>											
1989-1993	11 (3)	38 (9)	37 (9)	8 (2)	0 (0)	0 (0)	1 (0)	4 (1)	1 (0)	6558	24
1995-1999	18 (4)	37 (9)	39 (9)	3 (1)	0 (0)	0 (0)	1 (0)	2 (0)	0 (0)	8342	24
2000-2004	20 (5)	41 (10)	35 (8)	2 (0)	0 (0)	0 (0)	1 (0)	1 (0)	0 (0)	7474	23
2005-2008	23 (5)	40 (9)	33 (8)	2 (0)	0 (0)	0 (0)	1 (0)	1 (0)	1 (0)	5307	23
<i>Private industry</i>											
1989-1993	6 (4)	12 (9)	37 (28)	20 (15)	1 (1)	1 (0)	1 (1)	15 (12)	8 (6)	20867	76
1995-1999	10 (7)	18 (14)	41 (31)	14 (11)	1 (1)	0 (0)	2 (1)	11 (8)	4 (3)	27017	76
2000-2004	12 (9)	18 (14)	39 (30)	15 (12)	1 (1)	0 (0)	2 (1)	10 (8)	3 (3)	24420	77
2005-2008	13 (10)	19 (15)	38 (29)	15 (12)	1 (1)	0 (0)	1 (1)	9 (7)	4 (3)	17924	77

Source: German *Microcensus*, Scientific-Use-Files 1989-2008; *Notes:* Numbers in parentheses indicate proportions of classes in the respective sector on the labor market as a whole; Combining the number of cases (N) in public service and private industry per period does not add up to the overall N in Table 5 as the survey question on the employment sector involved additional missing values.

Chapter 6 Educational attainment and the risk of unemployment

6.1 Introduction

Over the last three decades, high unemployment rates have become a severe economic and social problem across nearly all European countries, especially for youths. Globalization and international competition has wrought structural uncertainty and labor market risks in modern societies, particularly among labor market entrants (Mills & Blossfeld, 2005). Labor markets have gone through several transformations and restructurings, including a sharp increase in the proportion of nonstandard employment arrangement as one major form of labor market flexibility (Kalleberg, 2009; Esping-Andersen & Regini, 2000).

Against this background, some authors (Beck, 1997; Giddens, 1994) argue that globalization and economic integration dissolve the link between economic and social inequalities across societies. In particular, Beck (1986) assumes that global insecurity leads to a so-called *individualization of social inequalities* where preexisting determinants of social inequalities such as educational attainment and social class become increasingly irrelevant. In this regard, job loss or unemployment are no longer restricted to individuals in disadvantaged educational or class positions but become more equally distributed among all educational groups and social classes. By contrast, authors like Breen (1997) and Goldthorpe (2007b) postulate that employers attempt to shift these increasing labor market risks to those individuals that have always received disadvantaged labor market positions. Hence, traditional social inequalities in unemployment risks should rather persist or even increase.

Nevertheless, social stratification research mostly concentrates on individuals' class or occupational destinations and frequently neglects the inequality-enhancing consequences of unemployment, the 'ultimate form of work precarity' (Kalleberg, 2009: 6). The decreasing association between educational attainment and class destinations in several European countries over the last decades (Breen & Luijkx, 2004) is assumed to be one central mechanism for societies to become increasingly 'non-meritocratic' (Goldthorpe & Jackson, 2008). Though, if one intends to strongly argue that the structuring of life chances is less dependent on educational attainment, one should also consider the educational sorting of unemployment and its potential changes over time. Among other substantial life course consequences, unemployment has persistent negative effects on individuals' subsequent

working career in terms of earnings losses (e.g. Gangl, 2006; Gregory & Jukes, 2001; Stevens, 1997; Ruhm, 1991).¹⁰⁴ Restricting the analysis on occupational attainment considerably limits the significance of an assessment on returns to education over time. During labor market downturns it seems insufficient to focus only on the association between educational attainment and ‘good’ jobs, but to further investigate whether education stratifies access to employment as in times of economic growth.

It is well-known that educational achievement mitigates labor market exclusion: individuals with low levels of education are substantially more exposed to unemployment than individuals with higher educational qualifications (Reinberg & Hummel, 2007; Allmendinger & Dietrich, 2003). Over time, economists argue that *skill-biased technological change* predominantly leads to rising wage inequality in the US, while thanks to rigid wage setting institutions it results in increasing low-skilled unemployment in Europe (Blau & Kahn, 2002). However, almost all countries in Western Europe show more or less stable or even decreasing trends in the skill divide of unemployment risks (Gebel & Giesecke, 2011). Accordingly, DiPrete, Goux, Maurin and Quesnel-Vallee (2006) argue that low-skilled workers in European labor markets do not become increasingly unemployed but are increasingly allocated to temporary employment positions.

Germany appears to be a unique case. Not only is it among OECD states the country with the highest unemployment rate among low-skilled workers (OECD, 2009). The less-educated in Germany have also experienced a sharp increase in relative employment risks compared to medium- and highly-educated workers from the 1990s onwards (Gebel & Giesecke, 2011; see also Noelke, 2008). For West Germany, Brauns, Gangl and Scherer (2003) also indicate that unemployment risks have become increasingly dependent on educational attainment between the 1980s and 1990s. Using longitudinal data, Gebel (2011) demonstrates that low educated in East Germany had increasing difficulties finding their first significant job upon labor market entry. Aside from these studies, there is only limited evidence on long-term changes in the relationship between educational attainment and unemployment risks in West Germany.¹⁰⁵ How does, for instance, the unemployment risk among graduates from vocational training develop in comparison to their counterparts with

¹⁰⁴ In Germany, however, scar effects of unemployment are much less pronounced than in Britain or the US (Gangl, 2004c; Burda & Mertens, 2001; Couch, 2001). DiPrete and McManus (2000) show that individuals in Germany were able to compensate for their earnings losses three years after an unemployment incidence, while it took more than seven years for people in the US.

¹⁰⁵ Müller et al. (1998) consider unemployment risks, too. But they refer to the age group 30-55 and do not analyze education effects over time. For comparative research on education-specific unemployment rates see Gangl (2003a), Noelke (2008), Gebel and Giesecke (2011).

general education? Is there a convergence of unemployment risks between university and *Fachhochschule* graduates? More importantly, we do not know why the less-educated at the bottom of the *labor queue* see a disproportionate increase in unemployment risks over time in West Germany.

Against this background, the chapter assesses unemployment risks by educational attainment in West Germany from 1976 to 2008. Aside from analyzing descriptive trends, the chapter attempts to identify the mechanisms that lead to increasing relative unemployment risks for the less-educated. Research has shown that labor market entrants are particularly vulnerable to structural or cyclical changes (e.g. Gangl, 2003b; Blanchflower & Freeman, 2000; Card & Lemieux, 2001). Do macrostructural or macroeconomic changes also have an impact on the distribution of unemployment risks among graduates with different educational credentials over time? Labor market research offers three potential reasons for decreasing employment opportunities among the less-educated: the *SBTC* explanation: a substantial decline of low-skilled jobs, *structural crowding-out* thanks to an over-supply of tertiary graduates and *cyclical crowding-out* thanks to a general shortage of jobs during recessions.

In the next section, I introduce theoretical perspectives and derive hypotheses before elaborating on the research design for this analysis. The following sections present empirical results and conclude with a discussion.

6.2 Theoretical considerations and hypotheses

6.2.1 The relationship between educational attainment and unemployment

Why are unemployment risks stratified by individuals' educational attainment? Basically, we can use the same micro-theoretical approaches assuming a relationship between educational attainment and occupational or earnings returns (see chapter 2.1). However, *human capital theory* appears to be an inadequate theoretical framework since it denies the possibility of involuntary unemployment or posits that it can only exist in the short term.

In this regard, *job competition theory* is a more realistic framework assuming that the *labor queue* does not necessarily mirror the *job queue*, i.e. the demand must be considered independently of supply. Hence, this theory suggests that individuals at the bottom of the *labor queue* will become unemployed in times of slack demand. In general, this modeling suggests that job seekers are ranked into a *labor queue* according to their amount of training costs. Since employers hire job seekers on the basis of imperfect information about their true productivity, they primarily use - among other indicators - educational credentials as a measure of performance ability. Thus, individuals' educational attainment determines their

relative position in the *labor queue*. Employers match individuals in the *labor queue* to vacant jobs in a second queue that are sorted according to their skill demands. *Matching models* additionally emphasize that job allocation outcomes are two-sided and equally depend on job seekers. In general, job applicants should be interested in avoiding unemployment and strive to attain jobs that offer the best possible outcome given the current labor market conditions.

Since graduates with the highest educational qualifications signal the lowest amount of training costs, they are allocated to the best occupational positions in the *job queue*. By contrast, job seekers with the lowest educational credentials are placed at the bottom of the *labor queue* and become unemployed in times of a labor surplus. Thus, *hypothesis 1* suggests that the higher one's educational achievement, the less likely individuals are to be unemployed. According to this job competition model, the less-educated clearly face the highest risk of unemployment.

Matching models' emphasis on training costs and trainability implies that employers search for career starters that already have some expertise or skills that match the future job tasks in order to lower training costs. In this regard, West Germany is characterized as a *qualificational space*, where specific vocational degrees match specific occupational entry points in the labor market and in which occupations have distinct occupational skill requirements (see chapter 3.2). The *dual apprenticeship system* is the most widespread vocational training form in the German education and training system and prepares students for specific occupations both in school-based and on-the-job-based training. Consequently, school-leavers with vocational qualifications have occupation-specific skills and are, further, familiar with the organizational culture and working habits in a specific company. Moreover, vocational training serves as a screening device as employers have three years to evaluate workers prior to making final hiring decisions (Dustmann & Schöneberg, 2008; Acemoglu & Pischke, 1998). Hence, employers in West Germany should clearly give more weight to the *certifying* role of educational credentials rather than the *signaling* role (Jackson et al., 2005). Employers' likelihood of hiring a given worker also depends on supply and demand balances in each occupational field. Because the availability of training places in the *dual system of apprenticeship* depends on employers' demand, school leavers who took part in an apprenticeship have therefore good chances of being offered a permanent position afterwards. Last, as the *dual system of apprenticeship* is overly standardized in West Germany, vocational qualifications are highly reliable credentials that can be used by employers from other companies as well (Winkelmann, 1996). Thus, vocational training can be regarded as a safety

net in terms of avoiding unemployment and entering low-skilled positions (Arum & Shavit, 1995; Shavit & Müller, 2000).

As to higher education, *Fachhochschulen* have a more applied orientation compared to universities. While *Fachhochschule* graduates lag behind graduates from traditional universities in terms of class and prestige returns (Müller, et al., 2002; Müller, 2001), a *Fachhochschule* degree should be relatively more beneficial against joblessness. This is because *Fachhochschule* graduates have a more distinct occupational profile and signal lower training costs for specific occupations. Therefore, *hypothesis 2* suggests that vocationally qualified job-seekers have relatively lower unemployment risks than school-leavers with general education upon labor market entry.

6.2.2 Trends in the educational stratification of unemployment

After having presented two general hypotheses on the relationship between education and unemployment, I give some theoretical considerations on potential unemployment stratification trends by educational attainment over time. Which developments may affect hiring and dismissing decisions over time, leading to changes in the value of educational attainment? Since education and training system and labor market structure have not fundamentally changed over the last thirty years (see third chapter), educational attainment has clearly kept its strong *signaling* or *certifying* capacity. Instead, demand and supply changes for differently educated individuals may modify the matching process of individuals to jobs, thereby altering individual risks of becoming unemployed at the bottom of the *labor queue*. Moreover, macroeconomic developments reduce the job opportunities and thus may impact employers' sorting of the *labor queue* by educational attainment.

According to the *skill-biased technological change (SBTC)* hypothesis, information technology leads to a demand shift from a low-skilled to a high-skilled labor force (Autor, et al., 1998; Acemoglu, 2002; Berman, Bound, & Machin, 1998). Over time, this process is argued to contribute to a growth in high-skilled occupations and a decline in low-skilled occupations as well as higher skill demands across all levels of the job hierarchy (Mayer & Solga, 2008). For Germany, Spitz-Oener (2006) shows that occupations require more complex skills than in former times; analytical and interactive tasks increasingly replace routine cognitive and manual tasks. Moreover, computerization and skill requirements rose fastest in industries which relied most intensively on routine cognitive and routine manual tasks. Occupational upgrading in West Germany (see chapter 5.4) may therefore cause employers to more strongly sort and select individuals in the *labor queue* according to

educational credentials over time. Due to the greater match between educated individuals and skill requirements of jobs, unemployment risks at the bottom of the *labor queue* could become more dependent on lower educational attainment.

While *educational expansion* may result in a devaluation of higher education certificates at the upper end of the *labor queue*, it may have a different impact on the lower end.¹⁰⁶ In former times, school-leavers were largely homogeneous graduating from *Hauptschule*. Throughout educational expansion, however, the graduate population has become more heterogeneous and distributes on a variety of educational degrees or specific training programs in recent times. By increasing job competition and employers' hiring alternatives, educational upgrading and diversification may have strengthened rather than weakened the sorting of positions in the *labor queue* by educational credentials (Müller, 1998a). The fact that West Germany has undergone no substantial institutional changes further increased the reliability of educational credentials. Therefore, employers may have raised their hiring standards requiring ever more education as the standard norm to participate in the labor market. This is in accordance with *job competition theory* assuming that occupational skill requirements are responsive to changes in the distribution of educational credentials. The larger the relative supply of individuals with high educational achievement, the more intensive the job competition will be among differently educated individuals. For instance, prestigious and demanding apprenticeships such as in banking or accountancy increasingly require the *Abitur* to gain access to training places. Hence, employers may increasingly rely on educational certificates as signals for productivity in their decisions to hire or not to hire a job applicant for all kinds of vacancies in the *job queue*.

As to *macroeconomic changes*, employers may raise their hiring standards and more carefully select job applicants according to educational attainment when economic conditions worsen (Wolbers, De Graaf, & Ultee, 2001). The worse the labor market conditions are, the stronger the job competition and the more selective employers hire according to individual characteristics such as educational attainment. Moreover, dismissals may be more dependent on individuals' educational attainment during recessions since employers are more afraid of losing productive workers. By contrast, in economic upturns employers may put less emphasis on educational attainment in their hiring decisions. This implies that the association between education and unemployment is higher during economic downturns. As economic conditions became generally worse throughout the observation period (see chapter 5.2), this

¹⁰⁶ However, given moderate educational expansion and historically strong linkages between educational credentials and occupational positions, this is a rather unrealistic assumption for West Germany (see the following chapter).

trend may have contributed to increasing educational differentials in unemployment risks over time. Against this background, *hypothesis 3* proposes that the bond between educational attainment and unemployment risks has become tighter over the course of time.

6.2.3 Increasing labor market exclusion of the less-educated

Particularly for Germany it is known that the less-educated are most susceptible to unemployment among all educational groups. Moreover, the gap in unemployment risks between the less-educated and medium- and highly-educated has become larger in recent decades (Gebel & Giesecke, 2011). But what are the mechanisms responsible for increasing disadvantages of the less-educated in terms of job insecurity?

A decline of low-skilled jobs

Proponents of *SBTC* argue that technological changes and automation processes decrease the demand for unskilled labor and eventually lead to a withdrawal of jobs that are particularly adequate for lower educated people (Katz & Autor, 1999). Moreover, globalization is supposed to substantially reduce the share of low-skilled jobs in modern economies (Wood, 1995). While the importation of labor-intensive products from developing countries diminishes the price of such domestic products, production in domestic contexts is shifted to skill-intensive goods that, in turn, are exported to developing countries, raising the demand for skilled labor. Therefore, increasing unemployment exposure among the less-educated is often attributed to a decline in low-skilled employment (Berman, Bound, & Griliches, 1994; Nickell & Bell, 1995).

However, there is convincing doubt whether globalization as a component of *SBTC* is able to significantly change the nature of class structures cross-nationally and thus reduces the employment opportunities for the less-educated (Goldthorpe, 2007b). Furthermore, the transformation from an industrial to a service economy may also have produced a substantial share of low-skilled service jobs. Both the US (Autor, et al., 2008; Autor, Katz, & Kearney, 2006; Wright & Dwyer, 2003) and Great Britain (Goos & Manning, 2007) show an increasing job polarization. For Germany, Spitz-Oener (2006) and Dustmann, Ludsteck & Schönberg (2009) show rather modest tendencies towards polarization, but also no substantial decline in low-skilled jobs. Hence, it is rather unlikely that *SBTC* is the driving force behind decreasing employment chances among the less-educated in Germany.

Disadvantages in employment relations

Instead of attributing these increasing employment difficulties among the less-educated to demand-side changes, it seems reasonable to stress their general disadvantages in employment

relations and employee control over jobs. These disadvantages among the less-educated are derived from different, but similar theoretical strands. On the one hand, I refer to the *vacancy competition* model (Sørensen & Kalleberg, 1981; Sørensen, 1983) which combines and extends the *job competition model* (see chapter 2.1.3) with ideas from *labor market segmentation* theory (see chapter 3.2). On the other hand, we consider the theoretical rationale behind *social classes* (Goldthorpe, 2007d; see the following chapter).

In general, the *vacancy competition* model assumes that the type and quantity of vacancies determines the opportunity structures for job seekers. The creation of vacancies depends on the employment relations between employers and incumbents in existing jobs, i.e. whether they are *open* or *closed positions*. While *closed positions* restrict access for other potentially more productive job seekers and protect incumbents against external competition, access to *open positions* is generally possible for every job seeker at all times. *Closed positions* are connected to internal career ladders and overwhelmingly located in the *primary labor market*, offering relatively high wages and wage progression, good labor conditions, a high employment security and promotion opportunities. By contrast, *open positions* are usually found in the *secondary labor market*, characterized by high turnover and less employment protection.

Employers establish *closed positions* particularly in highly qualified jobs as they intend to avoid frequent labor turnover that involves high transaction costs thanks to much higher training costs in these jobs (Doeringer & Piore, 1971). Moreover, high-skilled jobs are highly intertwined in the firm-specific division of work and thus require a stronger stability of the personnel (Sørensen & Kalleberg, 1981). In his theoretical ideas that reside behind the *EGP* class schema, Goldthorpe (2007d) argues in similar ways. Identifying classes in terms of employment relations, he argues that the *service relationship* is equivalent to *closed positions*, with the labor contract resembling *open positions*. According to his definition, the labor contract is rather short-term and entails a specific exchange of money for effort, which compares to a service relationship, a rather long-term relationship comprising employment stability and well-defined career opportunities. The rationale behind the service relationship lies in the ‘principal-agent’-problem and asymmetry of information. That is, employers assign a *service contract* because they face problems of monitoring in professional and managerial jobs, thereby intending to gain employees’ commitment and maximize their efforts. Likewise, Sørensen (1983: 211) argues that promotion systems act as motivational devices for supervision problems. Moreover, in professional and managerial jobs, employers want to sustain a long-term relationship with employees in order to prevent a loss of highly job- or

firm-specific expertise or knowledge. Hence, employers have a keen interest to minimize the risk of recruiting an unproductive job seeker into a *closed position*. They do not only have an incentive to select the best possible candidate but also want to avoid ‘bad’ recruitment decisions. Unsurprisingly, they use educational certificates as signal for trainability and potential productivity in their hiring and dismissal decisions. As a consequence, the less-educated are systematically restricted to the *secondary labor market* and remain in *open positions* that offer less potential for upward mobility to *primary labor markets* (Blossfeld & Mayer, 1988). In the system of *open positions*, however, the less-educated at the bottom of the *labor queue* are exposed to market mechanisms and competitive markets in the neo-classical economic sense and thus have higher job insecurity, while the higher educated are more protected from job competition and involuntary layoffs.

Breen (1997) suggests that - even in times of high economic uncertainty - employers have reasonable incentives to maintain this service relationship with highly skilled people due to the robustness of this informational asymmetry problem. By contrast, employers transfer market risks to unskilled workers, who are already faced with a high level of job insecurity. These disadvantages in employment relations or employee control over the job should become more pronounced in times of an oversupply of skilled individuals who are forced to compete for lower skilled jobs. The less-educated may be increasingly pushed out of the labor market due to two different phenomena: *structural crowding-out* or *cyclical crowding-out*.

Structural crowding-out

Sociological literature emphasizes the role of *structural crowding-out*, which is directly based on the propositions of the *job competition model* (Blossfeld, 1985; Wolbers, et al., 2001; Åberg, 2003; Boudon, 1979). Assuming that the occupational upgrading lags behind educational expansion, an imbalance between supply and demand for graduates from higher education arises, i.e. the labor market cannot absorb the increasing share of higher education graduates upon labor market entry because there are not enough *entry jobs* to *closed positions* in *internal labor markets* either through retirement or skill upgrading.¹⁰⁷ As a consequence of this disequilibrium, a higher share of tertiary graduates becomes either unemployed or ends up in jobs previously held by individuals with intermediate educational credentials. Due to downward competition and displacement processes throughout the *labor queue*, this decreases, on average, the labor market returns among all educational groups. In a chain reaction, the less-educated are increasingly pushed out of the labor market and become

¹⁰⁷ *Entry jobs* are labor market positions that connect external labor markets with *internal labor markets* and guarantee internal promotion ladders within a firm (see chapter 3.2).

unemployed. Thus, *hypothesis 4a* suggests that the increase in relative unemployment risks for the less-educated is due to *structural crowding-out*.

However, this scenario does not always provide a realistic representation of job allocation mechanisms since existing intermediate-skill positions may also represent *closed positions* and thus prevent crowding-out from above. This may be particularly evident for countries such as West Germany, where employment protection legislation is particularly strong among skilled workers and vocational training creates highly specific occupational skills which are of immediate use for the designated job (Müller & Shavit, 1998; Breen, 2005a). Due to this strong prevalence of *occupational labor markets*, job applicants may not only be ranked on a *labor queue* along vertical but also horizontal lines in terms of occupational specificity. Therefore, vocationally qualified school-leavers may have clear advantages in terms of signaling trainability (Blossfeld & Mayer, 1988).¹⁰⁸ The so-called *proletarianization hypothesis* doubts the assumption of *structural crowding-out* and, instead, claims that higher education graduates become increasingly unemployed (Schlaffke, 1972). While the opposing assumptions on *structural crowding-out* vs. *proletarianization* both assume that occupational upgrading lags behind the degree of educational expansion and thus produces an oversupply of tertiary graduates, the *proletarianization hypothesis* proposes that the labor market is not capable of absorbing the oversupply in inadequate intermediate-skilled positions. Consequently, *hypothesis 4b* suggests that it is rather tertiary graduates that are affected by increasing unemployment risks in times of structural imbalances between labor supply and demand. However, when skilled workers enjoy a high level of employment protection in West Germany and thus cannot be displaced, it could also imply that the less-educated are even more strongly affected by structural crowding-out from above (Noelke, 2008). This would again speak for *hypothesis 4a*.

Cyclical crowding-out

The *job competition model* provides an entirely structural explanation for the increasing employment difficulties of the less-educated (Wolbers, et al., 2001: 44). Particularly the economic literature emphasizes another form of crowding-out that is dependent on the macroeconomic conditions. To begin with, unemployment among young workers is regarded as *supercyclical* (Ryan, 2001: 51), i.e. labor market entrants are generally more severely affected by economic downturns than prime-age groups (see also Blanchflower & Freeman, 2000). In this regard, hiring stops play an important role in German firms'

¹⁰⁸ As Noelke (2008: 7) notes: 'employers may not perceive university graduates as viable substitutes for graduates from the apprenticeship system'.

workforce adjustment policies throughout recessions (Büchtemann & Walwei, 1996). Furthermore, the institutional change of labor market deregulation in terms of allowing fixed-term contracts in Germany (see chapter 3.3) has contributed to increasing job security among labor market entrants. Empirically, they are more often employed in temporary contracts than prime-age workers in Germany (Gebel & Giesecke, 2009).

While cyclical changes have a generally strong effect on unemployment risks at the start of one's career, the effect should be particularly apparent among lower educational groups (Gangl, 2002, 2003b; Smyth & McCoy, 2011). In recessions, new vacancies become rare and vacancy competition at labor market entry becomes tighter. In line with job search theory, qualified workers that - due to an oversupply of labor - do not find a job that matches their qualification eventually lower their reservation wage and accept jobs for which they are overeducated in order to avoid unemployment. Therefore, employers are able to fill vacancies with a surplus of qualified workers - without increasing their wages - which would have otherwise been filled by low-skilled employees in economic equilibrium. Although overeducated employees should immediately change to jobs that match their qualification when macroeconomic conditions improve, employers or firms temporarily raise their hiring standards and prefer skilled over unskilled workers because these imply lower training costs and thus a higher productivity (Okun, 1981).¹⁰⁹ Moreover, when the economic climate improves, they can easily hire any unskilled worker that is capable of doing that job thanks to low training costs in low-skilled positions. Hence, the less-educated should have the greatest difficulties in finding employment when job competition tightens throughout worsening macroeconomic conditions.

Cyclical crowding-out may not only take place at the worker inflow but also at the worker outflow, i.e. lower educated people who initially gained employment upon labor market entry have a higher risk of being laid off than higher educated individuals during recessions (Van Ours & Ridder, 1995). This is probably due to the fact that lower educated individuals are easier to replace than the higher educated because of their disadvantaged employment relations in *secondary labor market* positions. Lower educated individuals have generally high risks of being employed in fixed-term contracts and have been increasingly allocated to these jobs over time in Germany (Gebel & Giesecke, 2009, 2011).¹¹⁰ By

¹⁰⁹ In light of an oversupply of labor, employers may also lower their wage offers in new vacancies in order to decrease wage expenditures. However, the upgrading of the skill structure is more likely since employers intend to avoid the costs and complexities of adjusting wages (Pollmann-Schult, 2005: 469).

¹¹⁰ In general, Gebel and Giesecke (2011) show that EPL reforms in the area of temporary employment did not improve the employment chances of the low-educated (see also Noelke 2011). By contrast, deregulating the use

definition, such jobs expire at a predetermined time point and facilitate the outflow of the less-educated during recessions. Moreover, as adjustment costs sharply increase with the educational level, dismissing the highly educated is more costly than dismissing lower educated individuals. Beyond that, the less-educated should have higher risks of becoming unemployed at each job complexity level due to their lower productivity (Gautier, Van den Berg, Van Ours, & Ridder, 1999). Hence, economic crises should result in cyclical *crowding-out* among the less-educated, both at the worker inflow and outflow. Likewise, thanks to their high occupation-specific skills and a strong competitive position against *insiders*, school-leavers with vocational training may also be less affected by *cyclical crowding-out* than their peers with general education.

Analyzing twelve European countries, Gangl (2003b, 2003a) concludes that the unemployment rate among the less-educated is particularly responsive to the current economic climate between the late 1980s and the late 1990s (see also Noelke, 2008). By contrast, studies of (predominantly) the Dutch labor market arrive at mixed conclusions: While Teulings and Koopmanschap (1989) and van Ours and Ridder (1995) find some support for the *cyclical crowding-out* hypothesis, Gautier et al. (2002) as well as Gesthuizen and Wolbers (2010) are not able to find any evidence. For West Germany, Pollmann-Schult (2005) shows that job competition between unskilled and skilled individuals at the worker inflow increases during recessions, i.e. unskilled have lower relative chances of being hired when the economic conditions worsen. Likewise for Germany, Büttner, Jacobebbinghaus and Ludsteck (2009) indicate that the skill level of newly hired employees within occupations significantly increases during recessions and decreases during upturns. Erlinghagen (2004) concludes that labor market mobility and unemployment risks among tertiary graduates are less dependent on the business cycle than among lower skilled groups. Moreover, the extent of involuntary lay-offs strongly depends on the business cycle (Erlinghagen, 2005).¹¹¹ Against this background, *hypothesis 5* suggests that the increase in relative unemployment risks among the less-educated over time is due to processes of *cyclical crowding-out*.

of temporary contracts actually increases the gap in unemployment risks between low-skilled and high-skilled workers.

¹¹¹ However, Erlinghagen (2005) does not test whether the unskilled are particularly exposed to involuntary lay-offs in times of economic insecurity. It is only shown that the less-educated have a higher risk of being fired in comparison to more educated people.

6.3 Research design

6.3.1 Dependent variable: risk of unemployment

With slight modifications, the status of *unemployment* at the time of the interview is defined according to ILO convention (ILO, 2005). The ILO definition comprises three criteria that have to be simultaneously fulfilled in order to be counted as unemployed. *First*, individuals, aged 15 onwards, do not work for a single hour during the reference week. Casual workers or individuals that are only marginally employed thus belong to the working population. *Second*, individuals need to have actively been seeking for a new job in the last four weeks. *Third*, individuals must be ready to work within two weeks.¹¹² Individuals that are without a job at the time of the interview but have finished their job search and will start a new job at a later point in time are also considered unemployed. In contrast to ILO definition, individuals that participate in school-based education, vocational programs and military or alternative services are not considered as belonging to the labor force irrespective of their employment status. Hence, the dependent variable *risk of unemployment* is measured as a binary indicator differentiating between unemployed and employed (dependent employment, self-employment or family workers).¹¹³ Hence, inactive individuals (out of the labor force) during the reference week are excluded from the analysis.¹¹⁴

The ILO definition does not require individuals to be receiving benefits from unemployment insurance or being registered with an official employment agency to be classified as unemployed. Hence, the *Microcensus* data bear the advantage that individuals can be counted as unemployed who are not officially registered and thus not included in the labor statistics. While Federal Employment Agency statistics treat individuals that are employed on short-term basis and do not work more than 18 hours a week as unemployed,

¹¹² However, information on respondents' availability in *Microcensus* Scientific-Use-Files prior to 1985 is lacking (Schmidt, 2000: 12). In order to ensure comparability in unemployment measures over time the third criterion cannot be used.

¹¹³ According to ILO definition, individuals are also counted as employed if temporarily or for an indeterminate duration (e.g. holidays, illness) not working in their job, but usually being in an employment relationship or having a guaranteed right for return (parental leave, temporary retirement).

¹¹⁴ Some researchers prefer analyzing non-employment instead of unemployment, thereby arguing that these statuses cannot be properly separated from each other. For instance, Erlinghagen and Knuth (2009) stress the usefulness of assessing employment rates for evaluating the performance of national employment systems in cross-national comparisons. For Germany, however, they show that non-employment forms that are associated with social benefits other than unemployment are rare. Considering non-employment would confound labor market developments with political and cultural dimensions since substantial parts of (married) women are voluntarily inactive opting for household and care (Oesch, 2010). Thus, a high unemployment rate tends to be the more unambiguous indicator for a nation's poor labor market performance (Kenworthy, 2002). Nevertheless, not participating in the labor market instead of being unemployed and actively searching for a new job may be particularly reasonable in tightening labor markets. Therefore, sensitivity analysis will also address the issue of non-employment (see chapter 6.4.6).

working more than one hour in the reference week is sufficient to be counted as employed according to ILO definition even when searching for a new job.

Following ILO convention, the operationalization of the binary variable *unemployment risk* can be easily implemented in *Microcensus* Scientific-Use-Files 1976-1995 by using a generated combination variable of type of labor participation and type of alimentation (for details on the used variables see Schmidt, 2000: 17ff.).¹¹⁵ Since 1996, the measurement of unemployment is based on a single variable indicating the type of labor participation only.¹¹⁶ Since 2005, the *Microcensus* survey has not been conducted in a specific reference week but carried out throughout the year (see chapter 4.1). While yearly averages cancel out seasonal fluctuations in unemployment rates, changes in the level of unemployment in reference to previous *Microcensus* years seem to be inevitable. Nevertheless, according to Reinberg and Hummel (2007), these methodical changes do not produce substantial bias in the pattern of qualification-specific unemployment risks between 2004 and 2005. Overall, since the measurement of the unemployment status is quite continuous over time and, if somewhat altered, does not bias the analysis, assessing changes in qualification-specific unemployment risks appears to be unproblematic with *Microcensus* data.

6.3.2 Statistical methodology

In a *first* step, I look at education-specific unemployment risks and their changes across time in a merely descriptive way. For both sexes and every *Microcensus* year separately, I conduct logistic regression models with the binary outcome unemployment as dependent variable and

¹¹⁵ A differentiation of short-term and long-term (12 months and over) unemployment is possible, since *Microcensus* surveys ask the unemployed about the date of termination of their previous employment. However, the unemployed who actively seek for a new job at the time of the interview may not have been on job search for the whole time between previous employment and time of the interview. Hence, the assumed duration of unemployment may comprise phases of inactivity. A comparison of long-term unemployment risks over time is also complicated. While in 1976-1995 *Microcensus* surveys, respondents indicated the months of being unemployed in predetermined categories, in surveys starting in 1996, they state the exact date of having left employment (in years and months). Since 1996, the duration of unemployment has to be calculated by subtracting date of determination in a given year from date of the interview. While the month of the interview (April) in a given year is basically known before *Microcensus* 2005, the continuous survey design throughout the year requires information on the respondents' month of the interview. However, 2005-2008 Scientific-Use-Files only include information on reporting quarters. Moreover, we are not able to calculate the duration of unemployment for individuals that have not been in employment before as we do not have information on the end of the schooling phase. This is particularly a problem among labor market entrants.

¹¹⁶ Moreover, guiding questions on minor and marginal employment have been supplemented. Also, the new *Microcensus* surveys explicitly ask respondents if and why an existing employment relationship has not been carried out in the reference week (see footnote 113). These methodical changes may have increased the number of individuals who are counted as employed after 1996. Thanks to having information on working hours, however, individuals in minor and marginal employment should be counted as employed before and after 1996. Hence, it is unrealistic that methodical effects bias comparison of qualification-specific unemployment risks before and after 1996.

the *CASMIN* educational groups as central independent variable.¹¹⁷ However, the logistic regression estimates do not only reflect actual effects of the independent variables but also the magnitude of residual variance in the model (for recent discussions see Mood, 2010; Auspurg & Hinz, 2011; Breen, Karlson, & Holm, 2011; Karlson, Holm, & Breen, 2012; Best & Wolf, 2012; see also Allison, 1999). Unlike linear regression coefficients, the *log-odds ratios* (*LnOR*) or *odds ratios* (*OR*) are confounded by unobserved heterogeneity even when the independent variables in the model are not correlated with the error term.¹¹⁸ Thus, comparing *log-odds ratios* or *odds ratios* across models within a sample, across samples or groups may bias the substantive effects. The *rescaling problem* even arises when comparing - as this is the case here - logistic regression estimates across different logistic models that include exactly the same independent variables. Assuming a constant model fit across all survey years appears to be rather unrealistic. Differences in *log-odds ratios* among *CASMIN* groups across survey years may therefore indicate changes in substantive effects on unemployment risks but also variations in unobserved heterogeneity over time. Due to this heteroscedasticity, the comparison of *log-odds ratios* over time may be biased and possibly leads to false conclusions about trends in the educational stratification of unemployment.

In order to cope with this problem, I calculate *average marginal effects* (*AMEs*), which represent population-averaged marginal effects, that is the average of each individual's marginal effect (Best & Wolf, 2012).¹¹⁹ *AMEs* are recommended for comparisons across groups or samples because these – such as linear regression coefficients - are unaffected by unobserved heterogeneity that is unrelated to the independent variables, as was shown in simulation studies (e.g. Mood, 2010; Cramer, 2007).¹²⁰ In this case, they indicate by how many *AME* points the probability of being unemployed ($y=1$), on average, changes when the

¹¹⁷ As the logistic regression is a statistical method that is well-established in economics as well as sociology, I refrain from starting with basic assumptions underlying the model. For a comprehensive description see Wooldridge (2002), Long (1997) and Long and Freese (2006).

¹¹⁸ Frequently, this characteristic is referred to as *rescaling problem*. This is because in a logistic regression the scale of the latent propensity, y^* , underlying a binary outcome, is only identified by constraining the unexplained or residual part of the variance to a fixed value. In logit models the residual variance is fixed to $\pi^2/3$; in probit models it is fixed to 1. As a consequence of a fixed residual variance, the total variance of y^* varies with the magnitude of unobserved heterogeneity in the logit model. Any increase or decrease in the explained variance or model fit also increases or decreases the total variance of y^* and necessarily increases or decreases the β coefficients as they reflect changes on this scale. Since the residual variance is fixed, the scale of the dependent variable is not fixed.

¹¹⁹ *Average marginal effects* (*AMEs*) should not be confused with *marginal effects at the mean* (*MEMs*). Since educational attainment is measured as a polytomous dummy variable, the effects can be interpreted as *average discrete change effects* (*ADCs*). They are estimated with STATA ado *margeff* (Bartus, 2005) and STATA command *margins, dydx* (*) that has been introduced by STATA version 11.0. Both ways of estimation lead to nearly identical values. The estimates I will show in figures are the values calculated with *margins*.

¹²⁰ The variable of interest is not the latent outcome, y^* , but the probability ($y=1$) and thus the exceeding of threshold τ is not influenced by the scale of y^* and β (Best & Wolf, 2012: 384).

explanatory variable changes from the reference group *CASMIN* 3b to another *CASMIN* group. If predictors are normally distributed, *average marginal effects* are approximated by coefficients of a linear probability model (LPM). As *average marginal effects* represent population-averages, they ignore the non-linear progression of the probability curve in logistic regressions.

In a *second* step, I want to shed further light on the mechanisms behind these descriptive trends and consider whether changes in the educational stratification of unemployment can be attributed to *structural* or *cyclical crowding-out* or both.¹²¹ Are these macro-level developments able to explain an increasing gap in the risk of unemployment between the less-educated and all other educational groups? In order to test this, I use the pooled sample across all *Microcensus* years and specify for both sexes a logistic regression model that includes the *CASMIN* groups, citizenship and measures of *business cycle* and *labor supply-demand ratio* as well as interaction terms between *CASMIN* groups and both macro-level factors.

Both macro-level variables are generated from the micro data. The first macro-level variable *business cycle* is captured by yearly changes of the aggregate unemployment rate in the total labor force, aged 15 to 64 (see Figure 2 in chapter 5.2).¹²² The *labor supply-demand ratio* is operationalized by yearly changes in the ratio of the proportion of tertiary graduates and the proportion of high-skilled positions. High-skilled positions are measured as positions in the service class. A service class relationship involves not only a salary and various perquisites but also prospective benefits such as promotion opportunities or employment security (Erikson & Goldthorpe, 1992) and thus is the desirable employment position for higher education graduates. The *labor supply-demand ratio* should reflect the balance between educational expansion and occupational upgrading and thus the potential for *structural crowding-out*. Both macro-level variables are measured as growth rates indicating relative changes in reference to the base level in 1976. Hence, macro-level values for the reference year 1976 are standardized to 1.

By introducing interaction terms between macro-level factors and *CASMIN* groups I test whether differently educated labor market entrants are differently affected in their

¹²¹ Of course, I am not able to capture the dynamic nature of unemployment with repeated cross-sectional data, that is, I cannot indicate whether crowding-out is more pronounced at the worker inflow or worker outflow. Nevertheless, I am able to test which of these two mechanisms – *structural* or *cyclical crowding-out* – is predominant in the German labor market.

¹²² Gangl (2003b), Breen (2005a) or Gesthuizen and Wolbers (2010) also use the aggregate unemployment rate in the non-entrant labor force as indicator for the *business cycle*. Relying on the micro data is advantageous as I am able to construct different macro-level measures for each sex separately.

unemployment risk by structural or cyclical changes. In particular, I aim at indicating whether *structural* or *cyclical crowding-out* or both contribute to the increasing gap between the lower educated and higher educated groups in unemployment risks. The logit coefficients of interaction terms, however, do not exclude from the *rescaling problem* as effect estimates are possibly dependent on differences in outcome model fit among the interacting categories (Mood, 2010). Furthermore, as evidenced by Ai and Norton (2003) the magnitude of the interaction effect derived from non-linear models may not equal the marginal effect of the interaction term and could even be of opposite sign. Interpreting interaction terms in non-linear models is also not straightforward since the magnitude and significance of the effect is conditional on all other covariates in the model (Ai & Norton, 2003). Instead of considering the logit coefficients of the interaction terms, I calculate for every *CASMIN* group the respective *marginal effect (ME)* of the *business cycle* and *labor supply-demand ratio* on the probability of being unemployed holding the other macro-level factor at the mean. In the Appendix, I also show how *predicted probabilities* among these educational groups change with one-unit changes in the two macro-level dimensions. This illustration is equivalent with indicating *marginal effects* since they are derivatives of predicted probabilities with respect to x , i.e. the slope of the curve predicting the probability. Nevertheless, predicted probabilities also include general differences in the level of unemployment between *CASMIN* groups and are more intuitive than *marginal effects*.

6.4 Empirical results

6.4.1 Absolute unemployment rates for tertiary graduates

It is not only the purpose of the book to assess trends in *relative* advantages of tertiary graduates over other educational groups but also to investigate *absolute* returns to higher education on a variety of outcomes. Thus, the empirical part in this chapter starts with a description of tertiary graduates' unemployment rates. Table 7 illustrates that unemployment upon labor market entry tends to be only a marginal problem for graduates from higher education at all points in time.

For men, the unemployment rate among graduates from both institutions never increases above 6 per cent. Over time, unemployment rates seem to follow trendless fluctuations. While these fluctuations may be attributed to the general business cycle, they clearly appear to be less marked. Male university graduates tend to have increasing difficulties in finding a job, particularly in the 1980s. At the beginning of the 2000s, the employment situation for male university graduates has clearly improved, became somewhat

worsened during the recession in the mid-2000s and has been improving again in more recent times. Male *Fachhochschule* graduates have an exceptionally low unemployment rate that shows no significant trends during the whole observation period. In almost all periods male *Fachhochschule* graduates have a lower unemployment rate than university graduates.

Table 7 Trends in unemployment rates among tertiary graduates upon labor market entry (in per cent)

	Men		Women	
	<i>CASMIN</i> 3a	<i>CASMIN</i> 3b	<i>CASMIN</i> 3a	<i>CASMIN</i> 3b
1976	1.97	1.21	4.69	3.12
1978	0.92	1.00	5.61	1.84
1980	0.66	1.49	3.26	2.40
1982	2.22	3.85	8.80	4.05
1985	4.41	5.80	9.24	7.53
1987	1.87	4.67	10.10	8.72
1989	2.50	5.92	10.61	11.18
1991	1.57	3.89	5.71	7.05
1993	3.72	3.51	6.30	7.35
1995	3.18	4.71	6.62	6.78
1996	3.16	3.94	5.69	4.73
1997	2.56	4.94	4.83	6.39
1998	2.65	5.01	5.25	6.61
1999	2.57	4.63	5.55	5.90
2000	1.67	2.09	2.68	4.32
2001	1.84	2.00	3.23	2.91
2002	1.80	3.11	3.51	3.66
2003	3.42	3.32	4.44	4.78
2004	2.59	4.02	5.82	4.56
2005	2.56	4.17	4.39	4.93
2006	2.42	3.29	2.83	4.20
2007	2.35	2.49	2.34	4.12
2008	1.00	3.03	4.40	4.11

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Among women, Table 7 indicates that tertiary graduates are more exposed to unemployment than their male counterparts at all points in time. Unemployment rates for tertiary graduates rose sharply during the 1980s above 10 per cent. Hence, the 1980s can be seen as a problematic decade in terms of employment difficulties for female graduates from higher education. At the beginning of the 1990s, the unemployment rate for graduates from both institutions was sharply reduced. With slight fluctuations, particularly in the 2000s, the unemployment rates showed a generally decreasing trend from then on. While female *Fachhochschule* graduates clearly had higher unemployment rates than female university graduates in earlier phases, the advantage was less pronounced in the following decades.

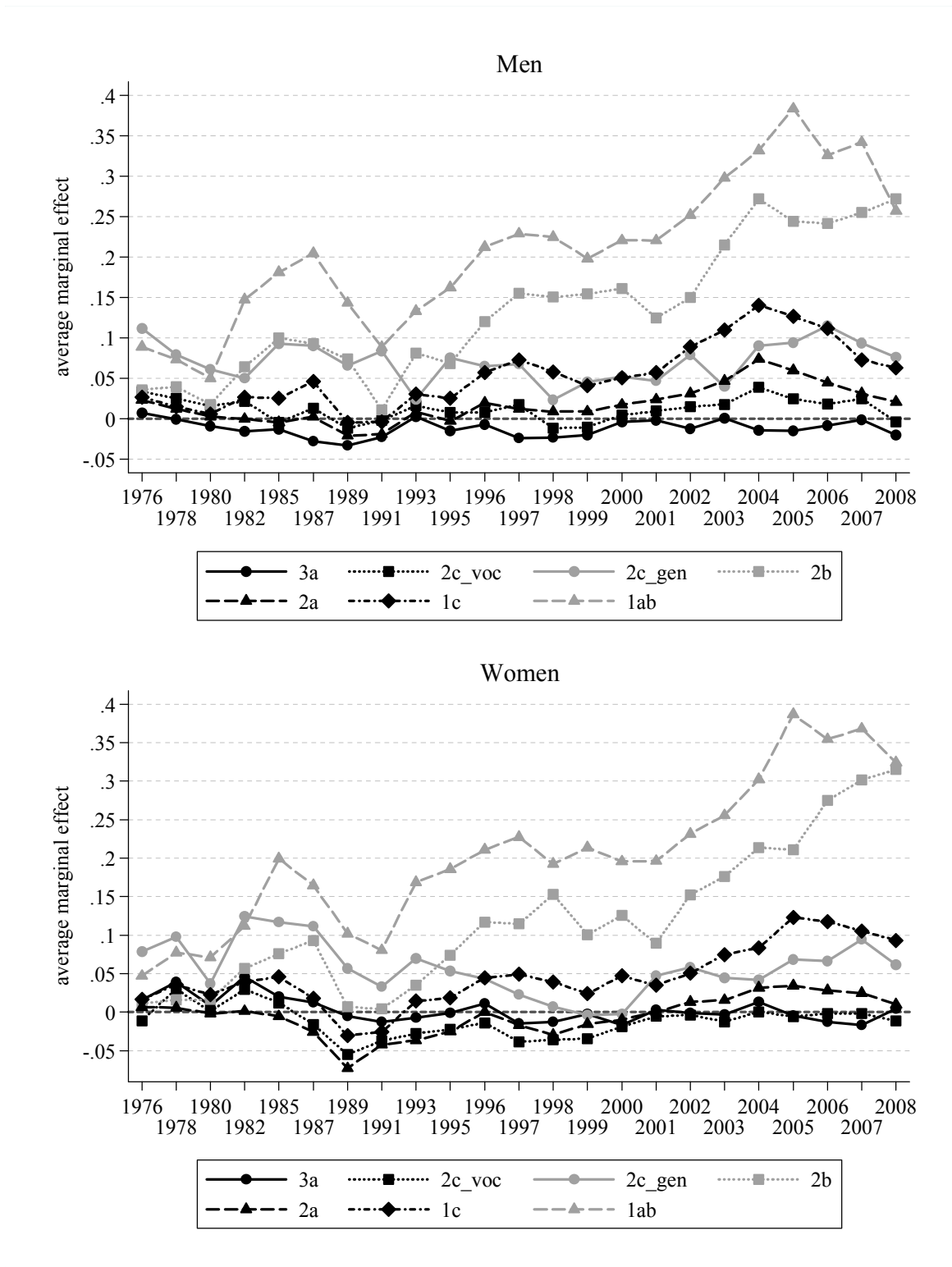
Overall, we do not see any indication that graduates from higher education have consistently increasing difficulties in finding employment upon labor market entry. Tertiary graduates, particularly women, were affected by higher unemployment rates only in the 1980s. Given that we see a general trend towards worsening economic conditions throughout the observation period, university and *Fachhochschule* graduates did extremely well in protecting themselves from a stronger exposure to unemployment.

6.4.2 Trends in the educational stratification of unemployment

Before starting to consider trends in the educational stratification of unemployment over time, we should clarify whether and to what extent selection into the sample of active labor market participants is dependent on educational attainment. Since investments in educational attainment increase individuals' employment preferences, labor force participation may be much more selective among lower educated groups. For both sexes, Figure C2 indicates the *average marginal effects (AMEs)* on the probability of being inactive for the different *CASMIN* groups. As expected, lower educated groups have a lower propensity of actively participating in the labor market upon labor market entry than higher educated groups.¹²³ However, this should not be a severe problem when being not concerned with causal estimates of educational attainment. Given that the less-educated are positively selected, the effects of educational attainment on the risk of unemployment appear to be rather conservative. Since the lower educated groups have become increasingly selective over time, particularly among women, the skill divide in unemployment risks tends to be somewhat underestimated as well.

¹²³ For both sexes, we see a skill divide in the risk of being inactive since the beginning of the 1990s. While tertiary graduates and graduates with vocational training do not substantially differ in terms of labor force participation, graduates without any vocational training have a much higher risk of being inactive. As to trends, male graduates with vocational training have become similar to male tertiary graduates in their low propensity of being inactive during the 1980s. Overall, the skill divide in inactivity risks remains rather constant for men. While female graduates in *CASMIN* 2a have had a substantially lower *AME* on the probability of being inactive at the start of the observation period, it was considerably higher for female graduates from *Fachhochschule*. Over time, female tertiary graduates and graduates from vocational training have become more equal in their propensity of being active. Still, female graduates with *Realschule* and vocational training have the highest propensity of being active among all educational groups. For graduates from *CASMIN* 2b, the risk of being inactive has been rather comparable with those of the higher educated groups until the mid-1990s, but sharply increased from then on. For the less-educated women (*CASMIN* 1ab) the *AME* on the probability of being inactive has always been high, but increases once again across the 1990s, while slightly decreasing again in the 2000s.

Figure 4 Trends in *AMEs* of educational attainment on the probability of being unemployed



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* Dark grey short-dashed line indicates the reference category university graduates (*CASMIN* 3b); Effect estimates shown as *average marginal effects (AMEs)*; controlling for citizenship.

Figure 4 shows qualification-specific *average marginal effects (AMEs)* on the probability of being unemployed in reference to university graduates (*CASMIN* 3b) from 1976

to 2008, while controlling for citizenship. In order to ease the interpretation with regard to *hypothesis 2*, the vocational tracks are shaded black; the general tracks are shaded grey. For a consideration of significant or non-significant education effects see additionally Table C5 in the Appendix. Since graduates from *CASMIN 2c_gen* are a very small group, their unemployment risk seems to be particularly volatile and should not be over-interpreted.

In the 1970s, the educational stratification of unemployment was rather limited for both men and particularly women. Female graduates in *CASMIN 2ab* or *2c_voc* as well as female *Fachhochschule* graduates did not have a significantly different *AME* on the probability of being unemployed compared to female university graduates (see Table C5). Although the divide in unemployment risks between graduates from general and vocational tracks was already evident in the 1970s, it was not substantially large. Particularly *CASMIN 2b* graduates did not strongly differ in their *average marginal affect* from their counterparts with vocational training (*CASMIN 2a*). Leaving *CASMIN 2c_gen* aside, the less-educated (*CASMIN 1ab*) already had the highest *AME* on the probability of being jobless in the 1970s.

During the 1980s the dependence of unemployment on educational attainment became more pronounced for both sexes. In particular, the unemployment divide between graduates from general and vocational tracks increased. Nevertheless, at the end of the 1980s, the educational stratification of unemployment had weakened again. In this period, all educational groups were improving their relative position compared to university graduates. This was particularly obvious for women. Female graduates in *CASMIN 2a* and *2c_voc* even started to have, on average, a significantly lower probability of being unemployed than female university graduates (see Table C5). Hence, the 1980s were a problematic decade for university graduates not only in terms of *absolute* employment chances but also in terms of *relative* advantages over other educational groups.

Across the 1990s, the less-educated (*CASMIN 1ab*) men and women became increasingly disadvantaged in terms of unemployment risks compared to university graduates. The same development was evident for graduates with a *Realschule* degree without further vocational training (*CASMIN 2b*). Hence, the skill divide in unemployment risks between graduates from general and vocational tracks became substantially larger.¹²⁴ At the end of the 1990s, however, the divide between the less-educated and the higher educated groups remained rather stable. Also, *CASMIN 1c* graduates started to have a slightly higher relative unemployment risk in the 1990s. As in the 1980s, the *CASMIN* groups *2a*, *2c_voc*, *3a* and *3b*

¹²⁴ By contrast, the heterogeneous group of graduates with *Abitur* only (*CASMIN 2c_gen*) improved their relative position in the 1990s. However, it has become worse again in the 2000s.

tend to have had a rather similar exposure to unemployment across the 1990s. Male *Fachhochschule* graduates and female graduates from *CASMIN* 2a and 2c-voc even had relative advantages - significantly in some years - over their counterparts with university degrees.

In the 2000s, the disadvantages among the less-educated in terms of the probability of being unemployed became most pronounced. In 2005, the *AME* has, on average, (almost) doubled to forty percentage points compared to university graduates for both sexes. 2005 was the peak point of the strong recession that began in the early 2000s. A tremendous growth in relative unemployment risks was also apparent among *CASMIN* 2b graduates. While the *AME* of the less-educated slightly decreased during the economic upturn again, it persists for *Realschule* graduates without an apprenticeship. At present, graduates from *CASMIN* groups 1ab and 2b, on average, do not differ in their probability of being unemployed. Apparently, the higher general track (*Realschule*) does not help graduates to prevent unemployment more often than those with the lower general track (*Hauptschule*). The common and decisive characteristic to be highly exposed to unemployment appears to be the lack of vocational training. In the mid-2000s - where economic conditions were most severe - differences in unemployment in terms of *AMEs* between graduates from vocational tracks below *Abitur* (*CASMIN* 2a and particularly 1c) and university graduates have increased as well. Under heavily tightened labor market conditions the educational level appears to become additionally important. Even male graduates in *CASMIN* 2c_voc had a significantly higher relative unemployment risk compared to university graduates at the peak point of the recession (see Table C5). At present, differences in unemployment risks between vocationally qualified school-leavers and tertiary graduates have been decreasing again. Figure 4 also illustrates that educational certificates structure the risk of unemployment in very similar ways for both sexes at all points in time. Both male and female graduates without vocational training (*CASMIN* 1ab and 2b) experience a strong increase in relative unemployment risks. In the 2000s, however, differences among higher educational degrees appear to be slightly more pronounced for men than for women.

What are we able to say about the hypotheses on the relationship between educational attainment and unemployment? This analysis provides rather weak evidence for the *first hypothesis*. While the less-educated without vocational training (*CASMIN* 1ab and 2b) face indeed the highest unemployment risks, the stratification of these risks cannot be hierarchically ranked by educational level only. General education clearly less determines unemployment than occupational positions. In most years, male *Fachhochschule* graduates

(*CASMIN* 3a) have a significantly lower probability of being unemployed compared to male university graduates (see Table C5). Except for the peak point of the recession in the 2000s, male *Abitur* holders with an apprenticeship (*CASMIN* 2c_voc) and university graduates do not significantly differ in their unemployment risks. Likewise, both *Fachhochschule* and university graduates do not significantly differ in their unemployment risks among women. Female graduates in *CASMIN* 2c_voc and 2a even have significantly higher employment chances than university graduates across the 1990s. In all other periods, female graduates from *CASMIN* 2c_voc and university graduates do not significantly differ in their unemployment risk. Overall, we rather identify a skill divide in unemployment risks between graduates without vocational training and graduates with either vocational training or a tertiary degree. That is, the *second hypothesis* cannot be rejected. Vocationally qualified job-seekers at all educational levels are less affected by unemployment than their peers with general education only. Even graduates from the vocationally oriented path of tertiary education, the *Fachhochschule*, have similar or better employment chances in comparison to university graduates.

We cannot reject the *third hypothesis* either. Although the association between educational credentials and unemployment did not increase consistently nor does it rose homogeneously across the educational structure, educational groups differ much more in their unemployment risks at the end of the observation period than in the 1970s. The most salient development is the sharp increase in the relative unemployment risks among the less-educated without vocational training (*CASMIN* 1ab and 2b). Having a vocational degree or a higher education degree became increasingly relevant for finding employment. The growing relative disadvantages among the less-educated appear to be mostly driven in economic downturns. Likewise, the educational level increasingly determines unemployment risks when recessions become most severe, such as at the beginning of the 2000s. In this period, graduates from *Realschule* and particularly *Hauptschule* with an apprenticeship (*CASMIN* 1c and 2a) were increasingly affected by unemployment compared to *CASMIN* 2c_voc graduates. For *Hauptschule* graduates, we see a trend of increasing relative unemployment risks since the beginning of the 1990s. This could be a consequence of the growing supply of vocationally qualified school-leavers with higher general tracks, thereby inducing increasing skill requirements in the labor market.

To sum up, the less-educated without any vocational training were increasingly pushed out of the labor market in West Germany over time. The crowding-out into unemployment tends to vary with the business cycle as being most pronounced when economic conditions

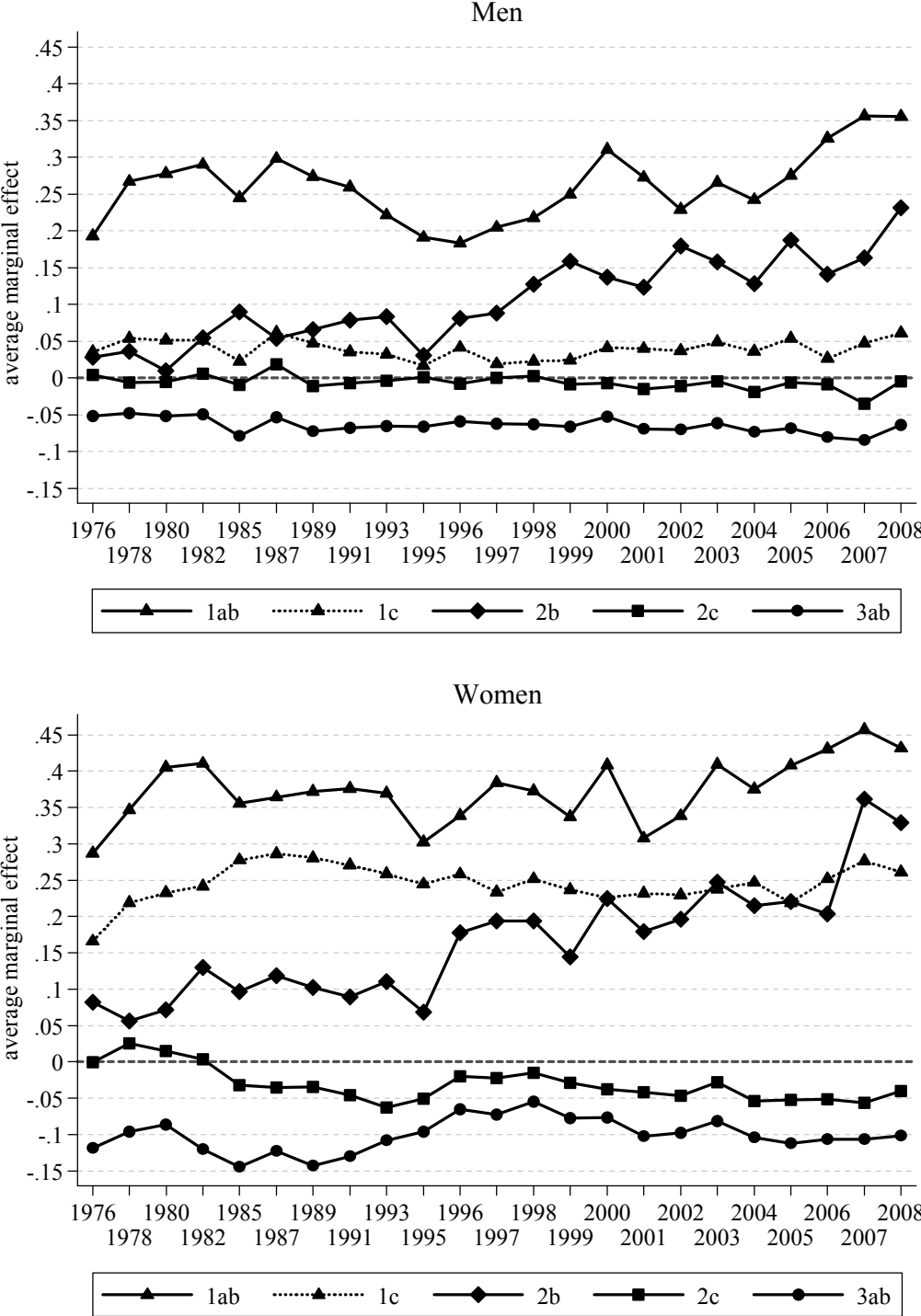
tighten. Since economic advance has generally slowed down, this may explain the increasing unemployment gap between the less-educated and higher educated groups. Before clarifying whether this is actually the case, we look at another outcome at the lower end of the *job queue*, *low-skilled employment*, in order to explore different aspects of changes in employment chances among the less-educated.

6.4.3 Educational attainment and access to low-skilled jobs

Figure 5 indicates average marginal effects (*AMEs*) on the probability of holding a low-skilled job for different *CASMIN* groups and their changes over time. In line with the definition in chapter 5.4, *low-skilled employment* is classified as *EGP* IIIb (routine non-manual employees; lower grade), *EGP* VIIa (non-skilled manual workers) and *EGP* VIIb (agricultural workers), whose employment relations are defined by a labor contract. These positions are clearly located in the *secondary labor market* (Doeringer & Piore, 1971) and are characterized by poorer job and career perspectives including lower wages, low stability of employment, high unemployment risks, inferior working conditions and low chances of gaining access to promotion ladders into *internal labor markets* (Blossfeld & Mayer 1988). With regard to *low-skilled employment*, *Realschule* school leavers with vocational training (*CASMIN* 2a) are chosen as the reference category for both sexes.

For men, the upper graph clearly shows that the less-educated (*CASMIN* 1ab) have the highest *AME* on the probability of being employed in low-skilled jobs compared to all other groups. This is consistent with previous research findings that lower educated men have strong relative disadvantages in accessing skilled occupations particularly in West Germany (Müller & Shavit, 1998: 31). While we do not see a consistent trend among the less-educated in the 1980s and 1990s, the *AME* became substantially larger at the end of the 2000s. Hence, less-educated men are increasingly faced with employment in low-skilled jobs compared to *Realschule* school-leavers with vocational training. As with unemployment risks, male *CASMIN* 2b graduates have an increasing relative risk of low-skilled employment from the mid-1990s onwards. Hence, the divide between school-leavers without vocational training and those with vocational training or higher education in terms of attaining low-skilled jobs has been increasing over time. Among men, the vocational training groups do not substantially differ in their risk of holding a low-skilled position. Male tertiary graduates have a significantly lower probability of being in low-skilled jobs than *CASMIN* 2a graduates, but this gap does not further increase over time.

Figure 5 Trends in *AMEs* of educational attainment on the probability of being in a low-skilled job



Source: German *Microcensus*, Scientific-Use-Files, 1976-2008; Notes: Dark grey short-dashed line indicates the reference category *CASMIN 2a* (*Realschule* and apprenticeship); Effect estimates shown as *average marginal effects (AMEs)*; controlling for citizenship.

As with men, the same development is apparent among less-educated women without vocational training (*CASMIN* 1a and 2b): increasing disadvantages in attaining skilled occupations in comparison to *Realschule* school-leavers with vocational training (*CASMIN* 2a), particularly in the 2000s. As female graduates from *CASMIN* 1c also experience an increase in their *AME* across the 1980s, *Realschule* graduates seem to increasingly displace *Hauptschule* graduates from skilled positions, a finding also reported in Blossfeld (1985: 85). Female graduates with vocational training at higher general levels (*CASMIN* 2a and 2c_voc) also tend to be somewhat more disadvantaged compared to female tertiary graduates in terms of the propensity of being in low-skilled employment than among men. Hence, the educational level appears to play an additional role in access to low-skilled vs. skilled positions among women.

Overall, these findings suggest that employers increased their hiring standards over time as access to skilled employment has become more dependent on educational achievement and occupation-specific training than in former times. The less-educated without vocational training not only are increasingly pushed out of the labor market, they also have a higher risk of ending up in low-skilled unemployment. Nevertheless, this growing occupational attainment disadvantages among the less-educated are less pronounced than unemployment trends.

6.4.4 *Relevant macro-level developments*

Chapter five covered empirical trends in macrostructural and macroeconomic changes in West Germany. But can they account for changes in education-specific unemployment risks over time? In the following, the first descriptive step considers potential mechanisms that may have stimulated an increasing gap in unemployment risks between the less-educated and all other educational groups. Although West Germany did not experience job polarization such as the US or Great Britain in terms of low-paid service sector job growth, low-skilled jobs did not substantially decrease either (see Table 5 in chapter 5.4). For women, occupational upgrading was more consistent over the class structure, though the proportion of low-skilled jobs did not tremendously decrease over time. Similar to the upper end of the class structure, chances for the less-educated to find employment in low-skilled positions depend on the balance between supply and demand. Regarding supply, the proportion of male labor market entrants with 1a *CASMIN* qualification stayed rather constant. Just as with the share of low-skilled jobs, the proportion of less-educated labor market entrants decreased among women.

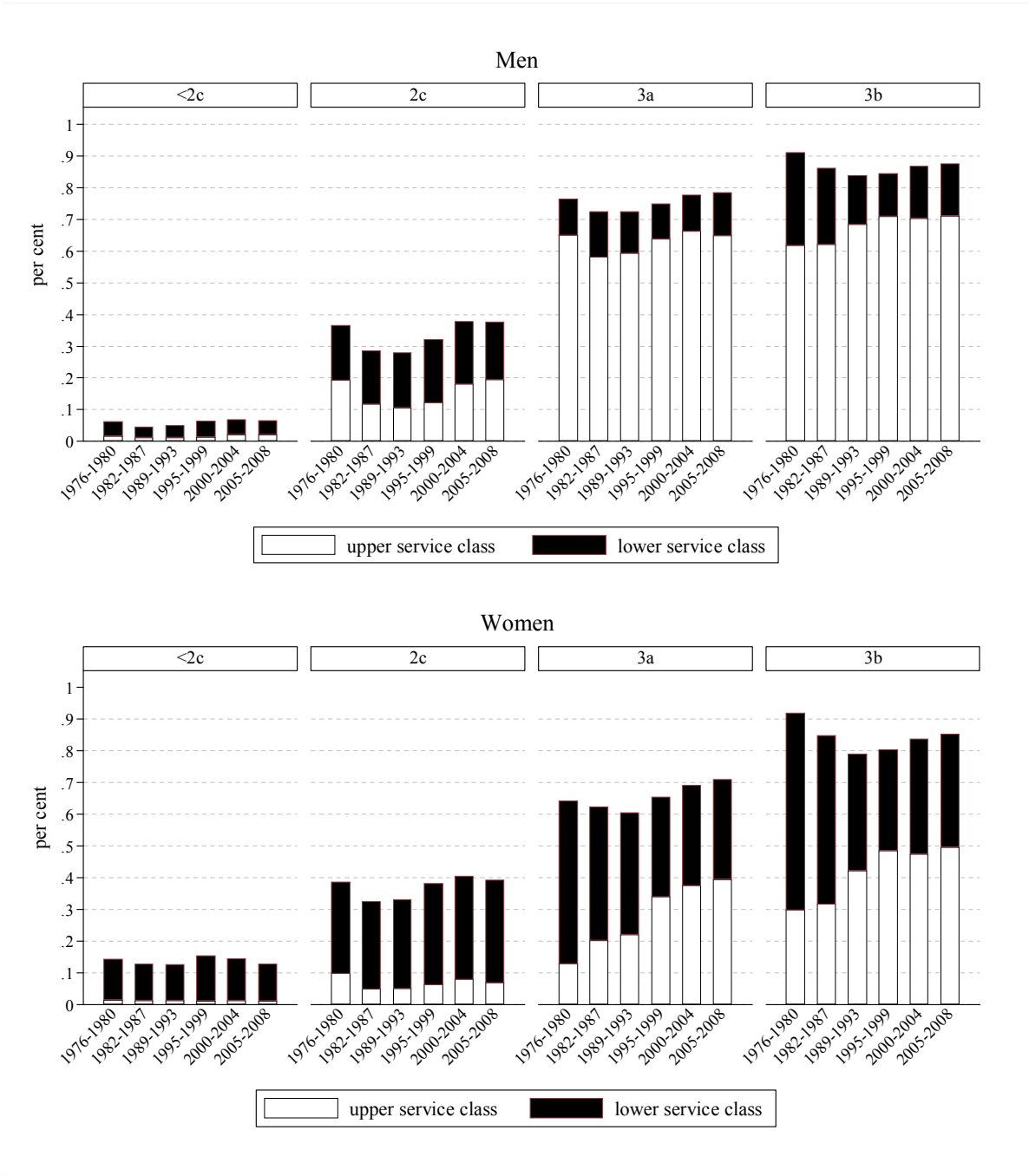
Table 8 Ratio between share of low-skilled positions and share of less-educated

	Men	Women
1976	0.67	1.14
1978	0.79	1.23
1980	1.02	1.78
1982	0.81	1.45
1985	0.99	1.67
1987	0.99	1.78
1989	1.13	2.03
1991	1.12	2.04
1993	1.00	1.60
1995	0.85	1.34
1996	0.81	1.15
1997	0.82	1.14
1998	0.83	1.18
1999	0.78	1.19
2000	0.84	1.15
2001	0.86	1.23
2002	0.76	1.11
2003	0.78	1.18
2004	0.78	1.28
2005	0.74	1.15
2006	0.85	1.24
2007	0.92	1.37
2008	0.88	1.26

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Table 8 shows proportional ratios between low-skilled positions (for operationalization see previous section 6.4.3) and less-educated labor market entrants across the observation period for both sexes. For men, the proportion of low-skilled jobs is lower than the proportion of low-skilled labor market entrants in most periods. Hence, job competition at the bottom of the *labor queue* seems to be rather strong among less-educated men. However, the ratio remains stable over time. If anything, job competition for low-skilled positions has somewhat improved over time. For women, the proportion of low-skilled positions remained higher than the proportion of low-skilled individuals over time. While the opportunity structures for female less-educated became even better in the 1980s, they leveled off at the starting point. For women, educational upgrading at the lower end of the class structure seems to have acted as a catalyst for the reduction of low-skilled jobs. Nevertheless, there are clearly enough low-skilled jobs for the respective number of female less-educated at all times. Thus, the descriptive results make it rather implausible that a reduction of low-skilled jobs over time causes increasing employment difficulties among the less-educated.

Figure 6 Absolute access rates into the service class



Source: German Microcensus, Scientific-Use-Files 1976-2008.

In order to see whether imbalances between educational expansion and occupational upgrading at the upper part of the *labor queue* potentially trigger processes of *structural crowding-out*, I consider changes in *absolute* service class returns which should indicate displacement processes from above (Müller, et al., 2002; Wolbers, et al., 2001). As service class positions represent adequate occupational positions for higher education graduates, Figure 6 illustrates qualification-specific access rates into the (upper and lower) service class over time.

For men, *absolute* returns in terms of service class attainment decreased for all educational groups until the beginning of the 1990s. This hints at a crowding-out process from above due to an oversupply of higher education graduates. From then on though, all educational groups, particularly *Abitur* holders, have been able to increase their proportion of labor market entrants working in service class positions again. This can be attributed to lessened competition surrounding high-skilled positions among higher education graduates since educational expansion and occupational upgrading were more balanced in the 1990s and 2000s. While male university graduates increasingly accessed the upper service class until the beginning of the 1990s, male *Abitur* holders and *Fachhochschule* graduates were less able to enter it. In the following periods, it is the reverse picture: particularly *Abitur* holders and *Fachhochschule* graduates were able to increase their attainment rates into the upper service class.

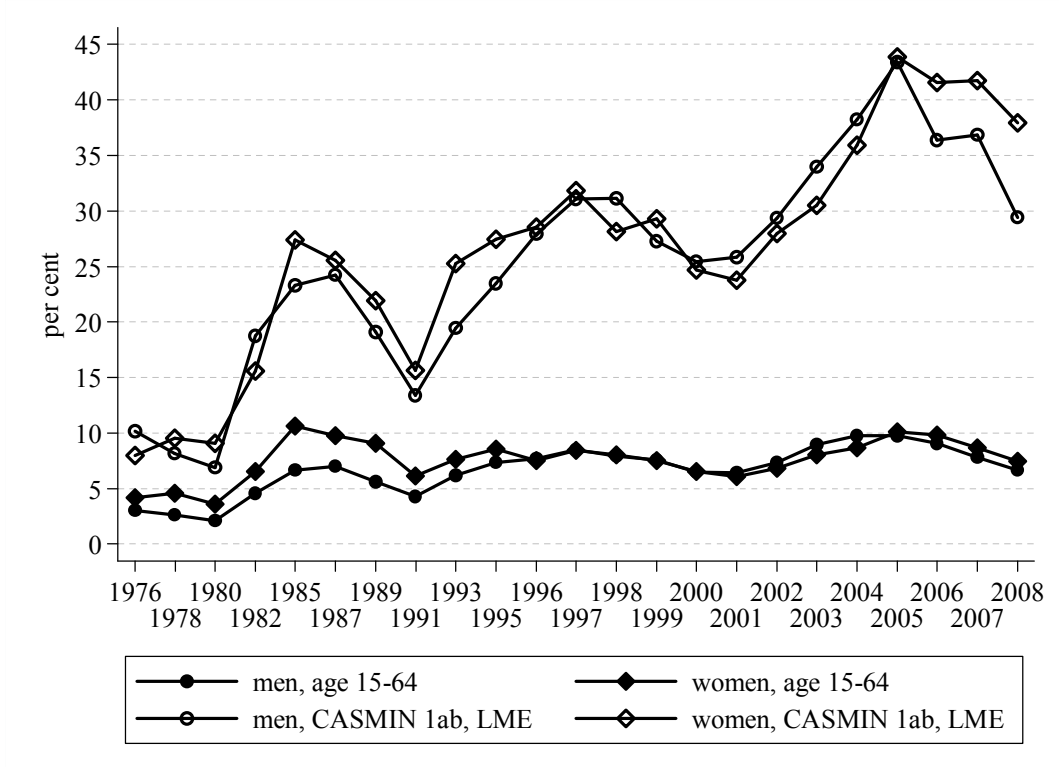
For women, the decrease in *absolute* service class returns was more substantial than for men. A substantial share of female university graduates had to work in inadequate positions across the 1980s. In this period, the other educational groups had lower access rates into the upper service class as well. Hence, displacement processes were more severe among women than among men. As with men, job competition for high-skilled positions has become less severe since the 1990s. Consequently, increasing proportions of tertiary graduates and *Abitur* holders had been able to attain service class positions. As to the upper service class, female university and *Fachhochschule* graduates were increasingly able to select into it, whereas access rates remained rather stable for lower educational groups.

Overall, *structural crowding-out* appears to be a rather unlikely mechanism for the increasing relative unemployment risks among the less-educated. This is due to the fact that occupational upgrading more or less paralleled educational expansion, i.e. the educational system did not produce a substantial oversupply of tertiary graduates that has been continuously increasing over time. *Structural crowding-out* was most likely across the 1980s for both sexes.

In order to evaluate the potential of *cyclical crowding-out* as a mechanism for increasing relative unemployment risks among the less-educated, Figure 7 confronts the trend in the absolute unemployment rate among the less-educated (*CASMIN* 1ab) with the *business cycle*, measured as the unemployment rate in the total labor force. For both sexes, the unemployment rate among the less-educated sharply increases in economic downturns and strongly decreases in economic upturns. Hence, the evolution of increasing joblessness for the

less-educated over time seems to be heavily dependent on macrostructural developments. Thus, *cyclical crowding-out* in West Germany is a likely scenario.

Figure 7 Business cycle and unemployment rate among the less-educated



Source: German *Microcensus*, Scientific-Use-Files 1976-2008. Notes: LME = Labor market entrants.

If an oversupply of tertiary graduates at the upper end of the *labor queue* or a worsening of macroeconomic conditions induces processes of crowding-out, high-skilled workers displace low-skilled workers and low-skilled positions are increasingly filled by overeducated workers. Therefore, Table 9 indicates the correlations between the respective macro-level factors, *business cycle* and *labor supply-demand ratio*, and the share of overeducated individuals in low-skilled jobs for both sexes. Workers in low-skilled jobs are counted as overeducated if they have *Abitur* certificates or more (*CASMIN* groups 2c, 3a and 3b). For both men and women, the two macro-level factors show a positive correlation with overeducation in low-skilled jobs. If there is an economic downturn or the supply of higher education exceeds the demand, the share of overeducated workers in low-skilled jobs increases. While for men the correlation with the *business cycle* is exceptionally strong but only moderate with the labor supply-demand ratio, it is exactly the reverse for women. This may indicate that *cyclical crowding-out* is more relevant among men, *structural crowding-out* more relevant among women. In the following, we will investigate with more profound

statistical analyses for each of the sexes whether *structural* or *cyclical crowding-out* or both can account for the increasing relative disadvantages among the less-educated in unemployment risks.

Table 9 Correlation between macro-level factors and proportion of overeducated workers in low-skilled jobs

	Men	Women
Business cycle	0.86	0.47
Labor supply-demand ratio	0.65	0.94

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

6.4.5 *The interplay between macro-level effects and educational attainment*

In order to see whether macrostructural or cyclical changes or both are able to explain dynamic changes in education-specific unemployment risks, I introduce these determinants as well as interaction terms with *CASMIN* groups in pooled logistic regression models for both sexes separately (see Tables C6 and C7). While higher values of the *labor supply-demand ratio* go along with a labor supply outpacing demand and vice versa, higher values of the *business cycle* involve worsening macro-economic conditions and vice versa. Surprisingly, for men the main effect of the labor supply-demand ratio is negative indicating that an oversupply of tertiary graduates – and thus increasing job competition for high-skilled positions – significantly reduces the risk of unemployment among labor market entrants (see Table C6). But does an oversupply of male tertiary graduates affect unemployment risks among educational groups differently?

Figure 8 illustrates education-specific *marginal effects (MEs)* of a changing labor supply-demand ratio on the probability of being unemployed (see Figure C3 for the respective predicted probabilities).¹²⁵ The dotted lines indicate 95% confidence intervals (CI). Against expectations, the marginal effect is significantly negative for all educational groups except tertiary graduates. Thus, a growing imbalance between tertiary graduates and high skilled positions decreases the risk of becoming unemployed for non-higher-education graduates, in particular the less-educated without vocational training (*CASMIN* 1a and 2b). Labor imbalances at the upper end of the *labor queue* seem to take pressure from job competition among graduates with lower educational degrees. For the less-educated, the negative marginal

¹²⁵ The tertiary degrees (*CASMIN* 3a and 3b) are merged together because they do not significantly differ in their risk of unemployment. *CASMIN* 2c_gen and 2c_voc are combined since graduates at the *Abitur*-level without vocational training are a small group.

effect becomes somewhat less strong the worse the LSD ratio is. By contrast, for tertiary graduates, the positive marginal effect indicates that a worsening supply-demand ratio increases their probability of being unemployed. When the supply of tertiary graduates is growing faster than demand, tertiary graduates are affected by unemployment only. Hence, for men, the increasing relative unemployment risk among the less-educated cannot be attributed to *structural crowding-out*. Therefore, *hypothesis 4a* has to be rejected. By contrast, the alternative *hypothesis 4b* cannot be rejected in the case of men. During structural imbalances, male tertiary graduates appear to be unable to displace employees in intermediate-skilled positions, thereby avoiding unemployment.

In contrast to men, the main labor supply-demand ratio effect for women is positive, i.e. a growing imbalance between tertiary graduates and high-skilled positions leads to increasing unemployment risks among labor market entrants (see Table C7). As indicated in Figure 8, the *marginal effect (ME)* is significantly different from zero for all educational groups except *CASMIN 2a*. However, education-specific effects go in different directions. While a worsening ratio decreases the unemployment probability for the higher educated groups (*CASMIN 2c* and *3ab*), this increases it for *CASMIN* groups *1ab*, *1c* and *2b*. Though significant, the effect for *Hauptschule* graduates with vocational training (*CASMIN 1c*) is weaker and remains constant across different levels of the ratio. That is, vocationally qualified school-leavers at all educational levels tend to be less affected by increasing joblessness when labor supply increasingly exceeds demand. Only for the less-educated (*CASMIN 1ab* and *2b*), the marginal effect of labor supply-demand ratio is strongly positive. The unemployment probability for the less-educated even becomes (exponentially) larger, the stronger the imbalance between labor supply and demand is. Hence, *structural crowding-out* seems to be apparent among women and thus *hypothesis 4a* cannot be rejected. By contrast, this analysis provides no evidence for *hypothesis 4b* in case of women.

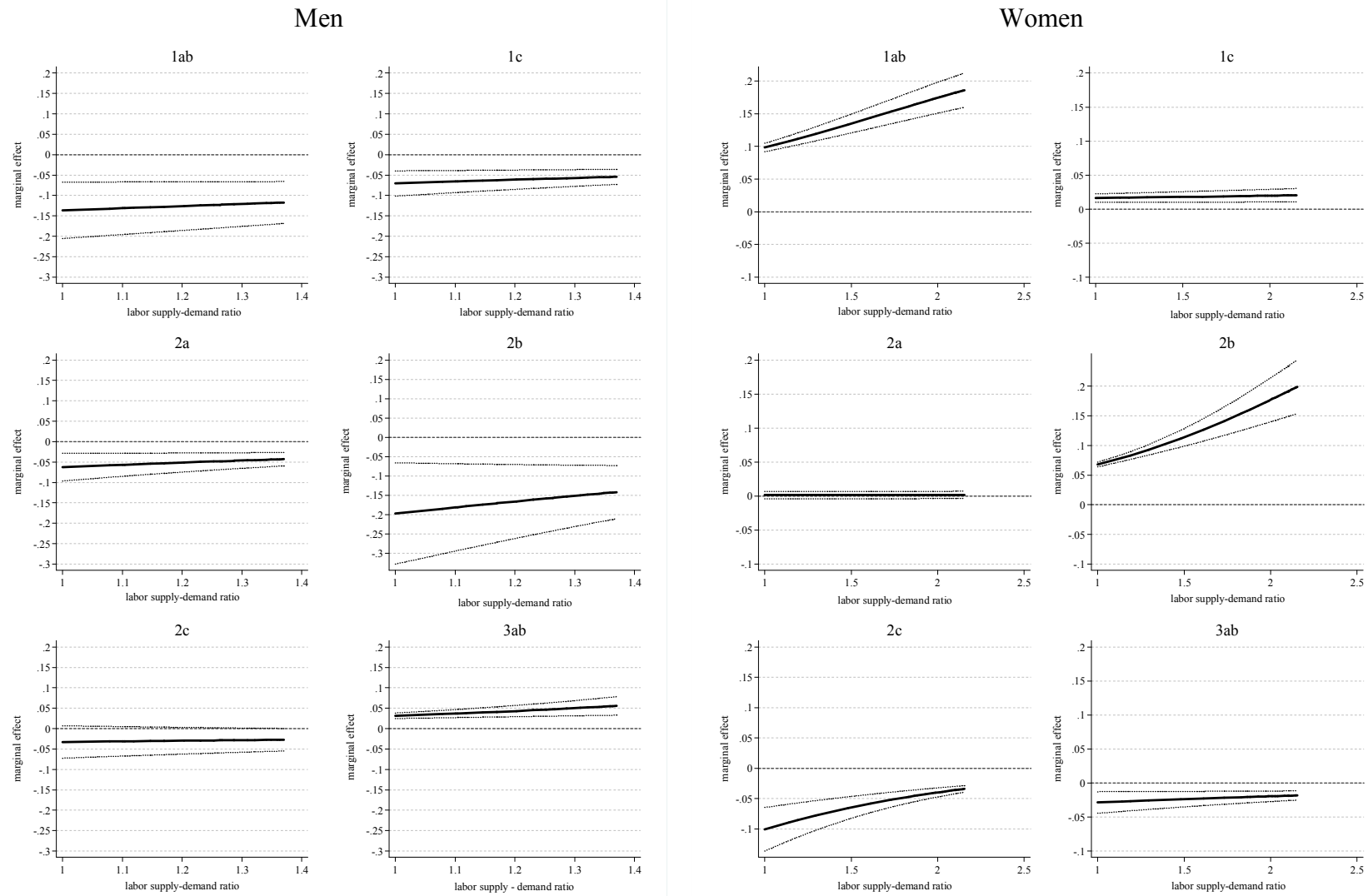
With regard to the *business cycle*, Tables C6 and C7 reveal positive main effects for both sexes. Thus, worsening macroeconomic conditions are accompanied by increasing unemployment risks among labor market entrants. However, the relevant question is whether different educational groups are disproportionately affected by these cyclical changes. For both sexes, Figure 9 shows education-specific *marginal effects (MEs)* of the business cycle on the probability of being unemployed (see Figure C4 for the respective predicted probabilities). Again, dotted lines indicate 95% confidence intervals (CI).

For men, the marginal effects of the business cycle are significantly different from zero, increasing the probability of being unemployed among all *CASMIN* groups. However,

tertiary graduates and *Abitur* holders are clearly less affected in their probability of being unemployed by changes in the business cycle than lower educated groups. For them, the marginal effect is rather weak and does not fundamentally change across different levels of the economic climate. Even under the most severe labor market conditions, tertiary graduates and *Abitur* holders are moderately affected in their unemployment risk. For tertiary graduates, the marginal effect is almost insignificantly different from zero. Worsening macroeconomic conditions also have a stronger impact on unemployment probabilities among educational groups without vocational training (*CASMIN* 1ab and 2b) than on those with vocational training (*CASMIN* 1c and 2a). As expected, the less-educated (*CASMIN* 1ab) are most susceptible to unemployment when the economic climate worsens. For them, the marginal effect on the unemployment probability is already strongest at the start of macroeconomic deteriorations and tremendously increases throughout the business cycle. Nevertheless, for *CASMIN* 1ab, the curve of the marginal effect increases at a slower rate in times of severe recessions than at the start of worsening economic conditions. By contrast, the marginal effects for graduates from *CASMIN* 1c, 2a and 2b exponentially rise when economic downturns are most pronounced. While, the less-educated men are strongly hit by unemployment when economic conditions start to worsen, the other *CASMIN* groups tend to be particularly hit by unemployment when recessions become most severe. Since *cyclical crowding-out* is evident, *hypothesis 5* cannot be rejected for men.

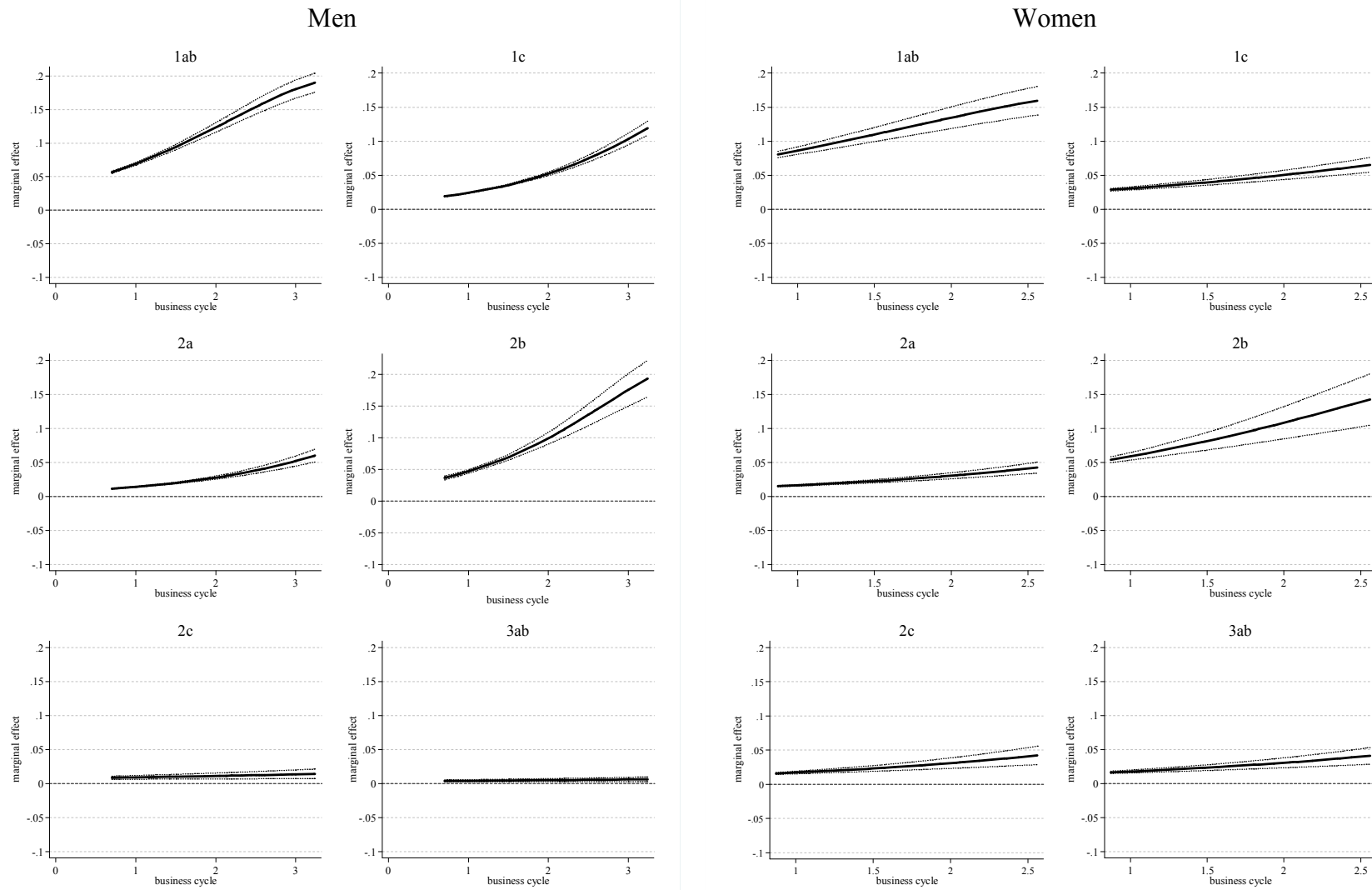
For women, the marginal effect of the *business cycle* is significantly positive among all educational groups, i.e. changes in the business cycle increase the probability of being jobless. Nevertheless, the *CASMIN* groups differ substantially in how their unemployment risk is dependent on macroeconomic conditions. The vocational divide is even stronger than for men: While the impact of the business cycle on vocational and tertiary tracks is rather moderate, the less-educated without vocational training (*CASMIN* 1ab and 2b) are most vulnerable to business cycle effects in terms of unemployment probabilities. As with men, less-educated women seem to suffer most from increasing unemployment already when the economic climate is starting to worsen. In severe recessions the slope of the marginal effect becomes less pronounced. By contrast, for *CASMIN* 2b graduates the slope is much steeper and rises exponentially. In case of vocational and tertiary degrees the slope rises as well but to a much lower extent. The impact of the business cycle on the propensity to be unemployed does not substantially differ between tertiary and vocational tracks. Overall, *cyclical crowding-out* is also evident for women. Hence, we cannot reject *hypothesis 5* for women either.

Figure 8 Marginal effect (ME) of labor supply-demand ratio



Notes: Estimates obtained from model 4 in Tables C6 (men) and C7 (women). Business cycle is held constant at the mean; citizenship set on German.

Figure 9 Marginal effect (ME) of business cycle



Notes: Estimates obtained from model 4 in Tables C6 (men) and C7 (women). Labor supply-demand ratio is held constant at the mean; citizenship set on German.

6.4.6 How much do macro-level effects explain?

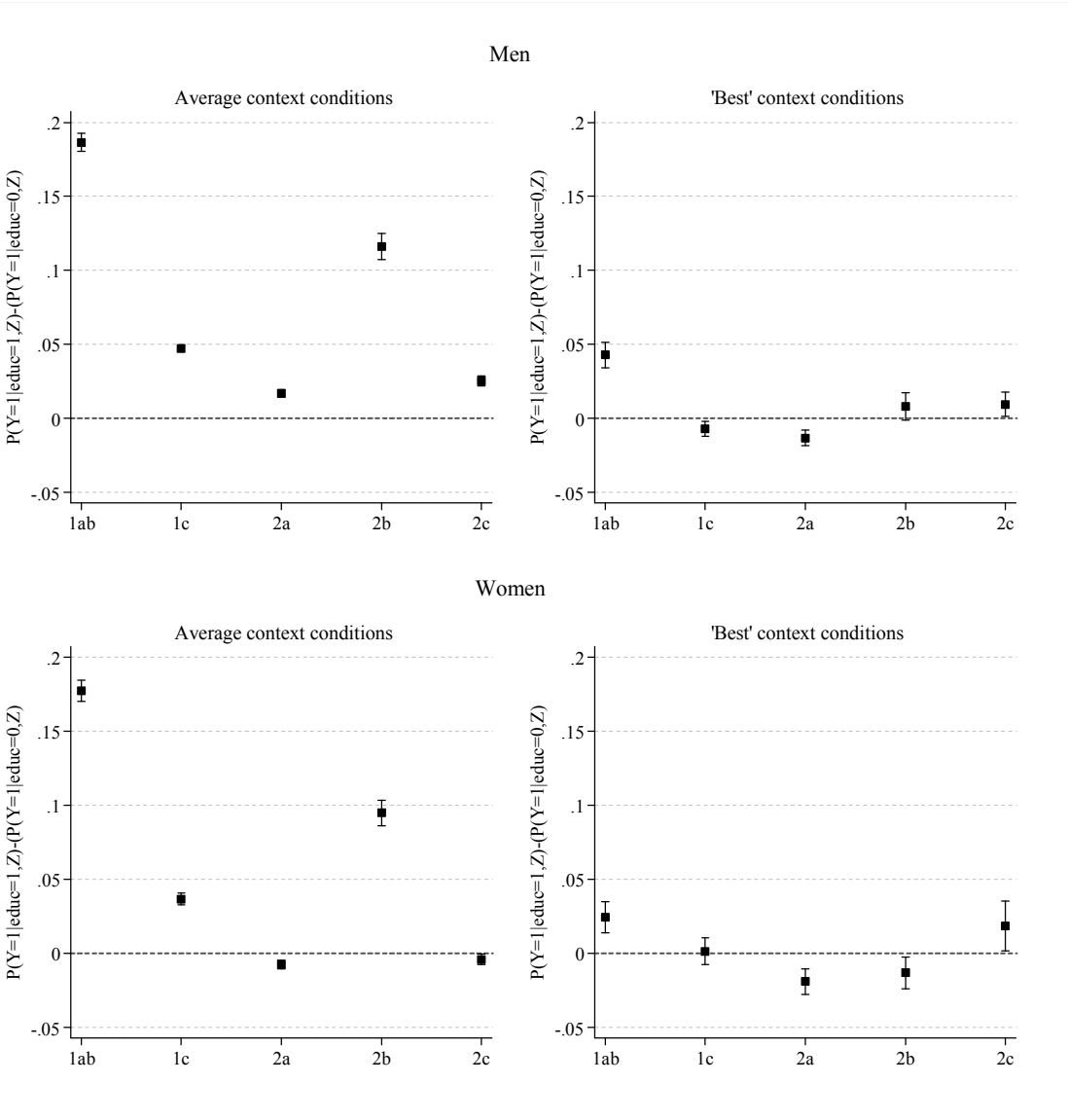
From the previous chapter we know that macrostructural changes and economic recessions differently affect educational groups in their risk of unemployment. But how much do these mechanisms contribute to the explanation of the increasing gap between the less-educated and the higher educated? For both sexes, Figure 10 indicates *discrete change effects (DCs)* in terms of probabilities between different *CASMIN* groups and tertiary graduates (*CASMIN* 3ab) under differing macro-level conditions. The respective first graph illustrates these effects when macro-level conditions are set at the mean: average economic climate and average balance between labor supply and demand. In comparison to this, the second graph indicates the combination of the ‘best’ macro-level conditions for the less-educated that have been empirically prevailing in the period between 1976 and 2008. For both sexes, this is the lowest unemployment rate among individuals aged at 15-64 in this period. Following the previous results, we assume different ‘best’ macrostructural conditions for female and male less-educated. While modeling the highest oversupply of tertiary graduates for men, we assume the least tightened job competition scenario among women.

Under average macro-level conditions, less-educated men have a substantial disadvantage: the probability of being unemployed is more than eighteen percentage points higher than for tertiary graduates. Also, graduates with *Realschule* degree without further vocational training (*CASMIN* 2b) are disproportionately affected by unemployment when macro-level conditions are set on average. Although effects are highly significant, differences between graduates with vocational degrees and tertiary degrees appear to be rather modest. When macro-level conditions are ‘best’ the probability differences between both *CASMIN* 1ab and 2b and tertiary graduates are largely reduced. The propensity for *CASMIN* 2b graduates is even significantly lower than for tertiary graduates under ‘best’ conditions. However, *CASMIN* 1ab graduates still have a five percentage point disadvantage in unemployment when macro-level conditions become ideal. Hence, even when assuming the most favorable environment regarding both macrostructural and macroeconomic conditions, a significant difference between the less-educated and tertiary graduates remains unexplained. Nevertheless, a considerable part of the unemployment gap can be accounted for when switching from average to ‘best’ conditions.

For women, educational differentials under average macro-level conditions look rather similar to men’s. Though, female *Abitur* holders do not significantly differ from female tertiary graduates under these conditions; *CASMIN* 2a graduates even have a significantly

lower probability when the economic climate is average and job competition on the high-skilled labor market is moderately high. Under the ‘best’ macro-level conditions, unemployment differentials between graduates without vocational training and tertiary graduates are considerably reduced. The effects are even larger reduced than for men: under ‘best’ scenario, *CASMIN* 2b graduates have a significantly lower probability of being unemployed than tertiary graduates, while the probability difference for the less-educated (*CASMIN* 1ab) is reduced to only two percentage points. The difference between *CASMIN* 1c graduates and tertiary graduates becomes insignificant as well. Even more than for men, the macro-level factors appear to account for educational differentials in unemployment risks.

Figure 10 Educational differentials under differing macro-level conditions



Source: German Microcensus, Scientific-Use-Files 1976-2008; Notes: Discrete change effects (DCs) in reference to *CASMIN* 3ab (university and *Fachhochschule*); Estimates obtained from the respective model 4 in Tables C6 (men) and C7 (women); citizenship set on German; Ranges within capped spikes indicate 95% confidence intervals.

6.4.7 Sensitivity analysis: fixed-effects approach

In order to check the robustness of these results for West Germany and to use greater variance at the *German Länder* level, I additionally estimate panel models with fixed effects on pooled time-series cross-section data. In fixed effects models (FE), coefficients are based on changes *within* countries or states instead of differences between countries or states (Allison, 2009). Hence, I look at the skill divide in unemployment rates and their development over time within each of the ten West German *Länder*¹²⁶ and attempt to explain this change with the time-varying business cycle and labor supply-demand ratio. As with the previous analysis, fixed effects models are also separately estimated for both sexes since the macro-level effects may have a different impact on both groups.

By introducing *Länder* fixed effects I eliminate all unmeasured, time-invariant differences across *Länder* that influence the skill divide in unemployment rates and may be correlated with the business cycle or labor supply-demand ratio. This pertains to all possible time-constant state-specific factors such as stable differences in policy, culture, work attitudes, costs of living, population composition or structure of the labor market. I also control for year fixed effects in order to account for time-varying unobserved factors affecting all *Länder* the same way in the same year. Thus, year fixed effects hold constant any period effects such as institutional changes, changes in the national economy or welfare policies that influence the entire country. Moreover, year fixed effects are necessary to address secular changes in the skill divide in unemployment rates between 1976 and 2008.¹²⁷ In order to eliminate any period effects that are idiosyncratic to specific German *Länder* I additionally control for *Länder*-specific linear trends.

The formula for the analysis is as follows:

$$Y_{it} = \alpha + \beta BC_{it} + \beta LSDR_{it} + \sum_{i=1}^{i-1} Land_i + \sum_{t=1}^{t-1} Year_t + \sum_{i=1}^{i-1} Land_i * LTP + \varepsilon_{it}$$

where Y_{it} is the difference in the unemployment rate between the lowest educational group and the highest or medium educational group in Land i and year t ; α is a constant; β is a regression coefficient; BC is the business cycle and LSDR the labor supply-demand ratio;

¹²⁶ Baden-Wuerttemberg, Bavaria, Hesse, Rhineland-Palatinate, Saarland, North Rhine-Westphalia, Lower Saxony, Hamburg, Bremen, Schleswig-Holstein.

¹²⁷ Technically, including *Länder* dummies is equivalent to setting the mean of the relevant variables within each German state to zero where changes in particular years represent deviations from the *Länder* mean. Year fixed effects are equivalent to setting the mean of the relevant variables for each year at zero where changes for each German state in a particular year represent deviations from the year mean.

Land_i refers to *Länder* fixed effects; Year_t refers to year fixed effects; LTP is the linear trend predictor that is *Länder*-specific (Land_i*LTP) and ε_{it} is the error term.

Since the analysis includes 23 observations for each West German federal state, these are not independent of each other.¹²⁸ In particular, when variables change only slowly over time, the residuals are auto correlated and strongly inflate t-statistics. To address this problem of serial correlation in time-series data I treat the West German *Länder* as cluster and calculate cluster-robust standard errors (Bertrand, Duflo, & Mullainathan, 2004).

The dependent variables are two measures for the skill divide in unemployment rates, each generated from the micro data for every *Microcensus* year and federal state separately: the percentage point difference in unemployment rates between the less-educated without vocational training (*CASMIN* 1a and 2b) and either a medium educated group of vocationally qualified job seekers (*CASMIN* 1c, 2a and 2c) or a high educated group of tertiary graduates (*CASMIN* 3ab). By using bivariate measures, I refrain from applying a two-step regression approach¹²⁹ since the number of cases having a citizenship other than German is particularly small at the *Länder*-level. To further prove the robustness of the previous results, I also consider the effects of the two macro-level indicators on the skill divide in non-employment (unemployment and inactivity according to ILO definition). When considering unemployment risks only the extent of crowding-out among the less-educated is probably underestimated, since some individuals do not actively search for a new job but become completely inactive.

As with the previous analysis, the *labor supply-demand ratio* is generated from the micro-data sample of labor market entrants and measured as the ratio between the proportion of tertiary graduates and the proportion of service class positions in every German state and observation year. As before, higher values indicate a more severe imbalance between labor supply and demand and vice versa. For the sensitivity analysis, I use different operationalizations of the *Länder*-specific *business cycle*. First, I take the prior measure and use the unemployment rate among individuals aged 15 to 64. Second, following Blanchflower and Freeman (2000), the business cycle is measured as the unemployment rate among prime-age workers, aged 35-54. Third, in order to have a separate measure that is not derived from micro-data, the business cycle is operationalized as *Länder*-specific unemployment-to-job

¹²⁸ In the 1976 *Microcensus* Scientific-Use-File the variables on educational attainment are wrongly coded for the city state Hamburg (see footnote 72). As I am not able to generate a reliable measure on the skill divide in unemployment rates in this year, the fixed effects analysis only includes 22 observations for Hamburg.

¹²⁹ In a first step, we would estimate the effect of educational attainment on unemployment risks under control of other variables at the individual level. In a second step, we would use the regression coefficient for the education effect as dependent variable in a macro-level analysis.

vacancy ratio - the ratio of unemployed workers to job openings - that is based on numbers from the labor statistics of the Federal Employment Agency. However, the last measure could not be estimated for men and women separately, as numbers for gender-specific job openings are unavailable.

Table 10 shows coefficients of the business cycle (BC) and labor supply-demand ratio (LSDR) from pooled OLS regressions, fixed effects and fixed effects with *Länder*-specific linear trends on the skill divide in unemployment risks. Model 1 measures the business cycle as the unemployment rate among individuals, aged 15 to 64; model 2 as the unemployment rate among prime-age workers. Model 3 considers the skill divide in non-employment as dependent variable. Lastly, model 4 includes the business cycle measure unemployment-to-job vacancy ratio.

For both sexes, most of the different model specifications indicate a significant positive impact of the *business cycle* on the skill divide in unemployment or non-employment rates: the worse the economic conditions, the larger the gap in unemployment or non-employment rates between the less-educated and individuals with medium and high levels of educational attainment. As expected, business cycle effects tend to be more robust in the case of low vs. high than low vs. medium educational attainment. Aside from the second model specification, the significant positive effect of the business cycle holds not only true for the pooled OLS regression but also for both variants of fixed effects models.¹³⁰ Since FE models usually involve relatively large standard errors, this is a remarkable result. Altogether, the robustness check provides strong evidence for *cyclical crowding-out* on the West German labor market confirming the previous analysis.¹³¹

As to the effects of *labor supply-demand ratio*, the sensitivity analysis confirms the results for men: When competition for service class positions is tightened, the skill divide in unemployment rates becomes smaller. In other words, it is graduates from higher education that are increasingly faced with unemployment in the light of structural imbalances in the labor market.¹³² While the pooled OLS regression indicates a *structural crowding-out* effect

¹³⁰ When operationalizing the business cycle as the unemployment rate among prime-age workers, both FE models do not produce significant effects. However, this may indicate that the measure does not adequately capture the business cycle, as prime-age groups tend to be rather protected from cyclical unemployment.

¹³¹ For both sexes, a sensitivity analysis without small city states Hamburg and Bremen also confirm the significant positive effects of the business cycle on the skill divide in unemployment rates.

¹³² For men, modeling educational expansion and occupational upgrading separately indicates that educational expansion has a significant negative impact on the skill divide in unemployment rates, while occupational upgrading has a significant positive effect. These effects even prevail in FE models. When the share of male tertiary graduates increases, the skill divide in unemployment becomes smaller. By contrast, occupational upgrading increases educational differentials in unemployment risks. This is in line with the results by Gangl (2003b: 273). For women, we do not see any significant effects of both macro-level variables.

for women, both standard FE model and trend-adjusted FE model yield no significant effect. Regarding the contrast low vs. high education, the LSDR coefficient becomes even negative under the FE conditions. Hence, the sensitivity analysis cannot confirm the evidence of *structural crowding-out* among women which was found in previous analysis. Thus, *hypothesis 4a* has to be also rejected among women. Apparently, *structural crowding-out* is an inadequate mechanism to explain the increasing disadvantages among the less-educated in West Germany.¹³³

¹³³ Since the skill-divide in unemployment rates is estimated from individual-level data with errors, the sampling uncertainty in the dependent variables may not be constant across observations. Thus, the residuals could be heteroscedastic and produce inconsistent standard error estimates (Lewis & Linzer, 2005). However, using weighted least squares (WLS) will usually lead to inefficient estimates and overconfidence in estimates. Therefore, the inconsistent OLS standard errors are corrected by using reliable heteroscedastic consistent standard error estimates. As Lewis & Linzer (2005) point out, the OLS estimator may still be inefficient when due to sampling errors the regression residual in the dependent variable is very high. They propose a feasible generalized least squares (FGLS) in order to achieve gains in efficiency. FGLS estimations need to be based on assumptions about the kind of heteroscedasticity and highly rely on the quality of those assumptions. The results of OLS and FE models in the first model specification have been checked with an estimated dependent variable (EDV) approach that corrects for the insecurity in the dependent variable (STATA ado *edvreg*). As both coefficients and standard errors only marginally differ between standard and corrected models, I present the conventional FE models.

Table 10 OLS regression estimates of macro-level determinants on relative unemployment rates of the less-educated

		Men						Women						Overall	
		Low vs. medium			Low vs. high			Low vs. medium			Low vs. high			Low vs. medium	Low vs. high
		M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3	M4	M4
<i>OLS</i>	BC	2.17*** (0.16)	2.14*** (0.22)	2.69*** (0.27)	2.77*** (0.36)	2.70*** (0.46)	2.70*** (0.24)	2.08*** (0.20)	1.90*** (0.27)	1.47** (0.40)	2.23*** (0.25)	1.88*** (0.32)	2.00** (0.51)	0.48*** (0.10)	0.57*** (0.12)
	LSDR	-0.76** (0.21)	-0.51* (0.18)	-0.39 (0.32)	-1.60*** (0.17)	-1.28*** (0.22)	-2.20*** (0.18)	2.86*** (0.36)	2.50*** (0.37)	3.72*** (0.58)	2.19** (0.60)	1.90* (0.62)	4.33*** (0.77)	3.76*** (0.69)	3.35** (0.95)
<i>FE</i>	BC	1.46** (0.34)	0.78* (0.34)	1.38** (0.31)	1.59* (0.61)	0.54 (0.56)	1.45* (0.58)	1.86*** (0.31)	0.47 (0.37)	0.73 (0.48)	2.87*** (0.43)	0.78 (0.43)	2.28*** (0.63)	0.20** (0.05)	0.23** (0.07)
	LSDR	-1.10 (0.68)	-1.27 (0.69)	-1.61** (0.48)	-1.81* (0.75)	-2.14* (0.82)	-2.52*** (0.56)	0.51 (0.86)	0.21 (0.84)	-0.29 (0.47)	-0.38 (1.14)	-0.84 (1.17)	-1.15 (0.79)	-0.03 (1.08)	-0.76 (0.94)
<i>FE, linear trend</i>	BC	1.69** (0.40)	0.78 (0.66)	1.41* (0.44)	2.62*** (0.56)	1.32 (0.82)	2.05*** (0.39)	2.07*** (0.41)	0.22 (0.42)	0.48 (0.57)	3.16*** (0.47)	0.70 (0.48)	1.99*** (0.36)	0.29** (0.07)	0.28** (0.08)
	LSDR	-1.47 (0.67)	-1.59* (0.63)	-1.72** (0.49)	-2.58** (0.79)	-2.75** (0.75)	-3.06*** (0.56)	0.61 (0.83)	0.30 (0.78)	0.02 (0.43)	-0.29 (1.26)	-0.70 (1.30)	-1.12 (0.80)	0.43 (0.93)	-0.53 (0.95)
R ² (FE, l. t.)		0.60	0.59	0.76	0.74	0.72	0.78	0.66	0.61	0.70	0.67	0.63	0.80	0.80	0.83

Sources: German *Microcensus*, Scientific-Use-Files 1976-2008, Labor statistics from Federal Employment Agency, N=229; *Notes:* * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. OLS: Ordinary least squares regression; FE: OLS with *Länder* fixed effects and year fixed effects; FE, linear trend: OLS with *Länder* fixed effects, year fixed effects and *Länder*-specific linear trends. BC = business cycle; LSDR = labor supply-demand ratio. M1 = business cycle measured as unemployment rate among age group 15-64; M2 = business cycle measured as unemployment rate among prime-age adults, aged 35-54; M3 = model M1 but using skill-divide in non-employment as dependent variable; M4 = business cycle measured as unemployment-to-job vacancy ratio; cluster-robust standard errors in parentheses.

6.5 Summary

This book chapter has had two objectives, one merely descriptive, the other more explanatory. The first part depicted trends in the educational stratification of unemployment in West Germany over a long period from 1976 to 2008. The second part aimed at testing whether temporal changes in macrostructural or macroeconomic conditions are able to account for the increasing relative unemployment risks among the less-educated over time.

Other than access to occupational outcomes, the analyses show that educational qualifications do not structure the risk of unemployment on a unidimensional rank order. As already stressed by the literature, vocational training in West Germany is crucial in the prevention of individual unemployment risks. In fact, the vocational component seems to be by far more important than the educational level when considering the outcome unemployment. For instance, graduates with *Abitur* and vocational training do not substantially differ in their unemployment risks from university graduates. Male *Fachhochschule* graduates are even significantly lower affected by unemployment than their peers from university; for women the degrees do not significantly differ. Graduates with vocational training also have a lower risk of being employed in low-skilled positions than their counterparts with general education. Vocational training appears to work as a ‘safety net’ (Arum & Shavit, 1995) that substantially lowers the risk of being jobless and increases the chances of being employed in skilled positions. Vocationally qualified school leavers’ comparatively beneficial labor market statuses upon labor market entry tend to be more or less preserved in later career stages (Kurz, Hillmert, & Grunow, 2006; Müller, 2009). Besides, vocational training is also clearly beneficial in terms of hindering individuals from receiving temporary contracts (Giesecke & Groß, 2003; Gebel & Giesecke, 2009). Given that graduates with vocational training attain considerably lower occupational returns than tertiary graduates in West Germany (e.g. Müller et al., 2002; Müller, 2001), however, this confirms the view that ‘diversion and safety net effects are not mutually exclusive but are the flip side of the same coin’ (Shavit & Müller, 2000: 29; Müller, 2005), in particular in *occupational labor markets*.

As to trends over time, the unemployment gap between the less-educated (*CASMIN* 1a and 2b) and the higher educated individuals widens significantly for both sexes. Hence, graduates below the *Abitur* level that did not participate in vocational training are increasingly pushed out of the labor market over time. Educational attainment – whether tertiary or vocational – tends to be increasingly the requirement to get ‘in the door’. University and

Fachhochschule graduates have an exceptional low risk of unemployment that persists across the long period. Only in the 1980s, tertiary graduates were somewhat more affected by unemployment, in absolute and relative terms. Beside this skill divide in unemployment risks, educational differentials, in general, have become most pronounced in the 2000s. Among vocationally qualified graduates, the educational level appears to have been increasingly relevant for the structuring of relative unemployment risks in this period. Overall, the descriptive analysis reveals an increasing relevance of educational attainment in the stratification of unemployment in West Germany. The most salient result is the sharply increasing skill divide between the less-educated without vocational training and vocational or tertiary graduates.

These results speak against Beck's (1997) assumption that all classes and educational groups alike are exposed to job loss in times of globalization and rising market uncertainties. Instead, they stress the claim that the link between social class and employment insecurity is persistent among advanced societies (Breen, 1997; Goldthorpe, 2007b). Nevertheless, unemployment risks in Germany tend to be less stratified by educational level or social class than in Britain (McGinnity & Hillmert, 2004). As the less-educated can be put on a level with non-skilled manual wage workers, the skill divide plays an increasingly important role in structuring labor market risks in West Germany. In West Germany, the vocational training system seems to make the boundary between unskilled and skilled work more important for individual life courses than in other countries.

But why do we see this skill divide over the course of time in West Germany? For both sexes, further analyses show that the increasing gap between the less-educated and the higher education groups can be significantly attributed to *cyclical crowding-out*. While tertiary graduates and *Abitur* holders are only marginally affected by tightened labor market conditions, the less-educated are highly vulnerable to changing macroeconomic conditions being increasingly pushed out of the labor market during economic downturns. Only when the economic climate is worst, vocationally qualified job seekers below the *Abitur* also experience increasing unemployment risks. Pooled cross-sectional time-series analyses exploiting the variation on the *Länder* level more or less confirm the strong effects of the business cycle on the skill divide in unemployment rates.

By contrast, *structural crowding-out* tends to be an inadequate explanation for rising educational differentials in unemployment risks. In times of structural imbalances, i.e. the supply of higher education graduates increases more strongly than the supply of high-skilled labor market positions, male tertiary graduates seem to be unable to displace lower educated

people from their traditional positions. Instead, an increasing number of male tertiary graduates experiences job losses themselves, when job competition surrounding high-skilled positions tightens. We confirmed this in fixed effects models at the federal state level. While less-educated females seem to be increasingly affected by unemployment in case of an oversupply of tertiary graduates in the main analysis, *structural crowding-out* could not be confirmed in sensitivity analysis among women.

Altogether, *cyclical crowding-out* rather than *structural crowding-out* appears to prevail in West Germany. Interestingly, Dutch findings suggest just the opposite transpires in that labor market (Gesthuizen & Wolbers, 2010). Why are there no severe processes of *structural crowding-out* in West Germany? It may be due to the fact that educational expansion and occupational upgrading did not diverge substantially over time (see respective sections in chapter 5). Only in the 1980s, the proportion of tertiary graduates increased more strongly than the proportion of service class positions. Hence, the conditions that prompt *structural crowding-out* may not have been given on the West German labor market. Moreover, in *occupational labor markets* such as West Germany, tertiary graduates that need to look for occupational positions below the service class may have difficulties in competing with graduates from the *dual system of apprenticeship* for these jobs thanks to apprentices' occupational specificity and firm-specific training.

Given the 'best' macrostructural and macroeconomic conditions, probability differences in unemployment between the less-educated and all other *CASMIN* groups would be largely reduced. Still, significant differences for both women and particularly men remain. These net differences could be attributed to another mechanism that should not be seen as an alternative but rather complementary explanation. According to *stigmatization by negative selection* perspective, educational expansion not only reduces the quantitative number of the less-educated but also changes the social composition in terms of 'quality' within this group (Solga, 2002; Gesthuizen, Solga, & Künster, 2011). Due to negative selection processes, the less-educated increasingly originate from lower social backgrounds, are less and less talented in terms cognitive skills and increasingly exhibit 'problems of a social, physical or mental character' (Åberg, 2003).¹³⁴ Throughout educational expansion the less-educated increasingly deviate from educational norms and are therefore stigmatized as a group of 'left overs' that cannot be considered for employment even in low-skilled jobs. While there may be some

¹³⁴ Comparing 14 industrialized countries, Abrassart (2012) shows that cross-country differences in the cognitive skill gap between the less-educated and graduates with intermediate education are able to explain cross-country differences in the relative risk of unemployment among the less-educated.

indication for negative selection processes, stigmatization by employers that eventually leads to exclusion from employment has so far not been convincingly shown.¹³⁵

What are the implications for labor market policy in West Germany? First of all, policy schemes that attempt to avoid a downsizing of low-skilled jobs or furthering the creation of low-skilled jobs seem to be unable to reduce unemployment among the less-educated. Even though there are enough low-skilled jobs, the less-educated are displaced from these jobs by the higher educated and become unemployed during economic downturns. Obviously, the best way for economic policy to lower unemployment among the less-educated is to stimulate economic upturns and minimize aggregate unemployment. For instance, Oesch (2010) shows that a monetary policy which enables the central bank to offer lower long-term interest rates and thus increases investments and consumption in a national economy significantly decreases the unemployment rate among the less-educated. Instead of creating low-skilled jobs, subsidies may be better directly aimed at labor market integration among the less-educated. Active labor market policy (ALMP) seems to be a valuable instrument for improving the match between workers and jobs e.g. through employment services, incentives for employers to create more training places or the supply of further education, thereby increasing the skills and competencies among less-educated workers (Bassanini & Duval, 2006). It is also worthwhile to invest in individuals' educational attainment as early as possible in order to reduce the share among the less-educated and put as many individuals as possible above a minimum level. Intensified financial investments in the early childhood development of disadvantaged children are profitable in the long run (Heckman, 2006). Of course, there will always be individuals at the bottom of the *labor queue* and those people will become unemployed if labor supply exceeds the demand. But if the group of less-educated becomes smaller, unemployment will be less concentrated among a selective group of 'educational losers'.

¹³⁵ Solga (2002) sees evidence for stigmatization by negative selection in the fact that controlling for changes in the marginal distributions over time - using *odds-ratios* - the less-educated are increasingly excluded from qualified jobs. However, such interpretations should be regarded with caution as the property of margin insensitivity does not automatically imply demand insensitivity (Logan, 1996b). Hence, it could just indicate that employers' hiring standards have been increasing. Moreover, exclusion from employment is not directly considered; the possibility of cyclical crowding-out is completely masked out. Recently, Kleinert and Jacob (2012) show that changes in their group composition are not able to explain decreasing relative chances among the less-educated in accessing vocational training places. Buch, Hell and Wydra-Somaggio (2011) consider the effects of the educational level on the transition from vocational training to subsequent employment. They find that apprentices with a *Hauptschule* degree or no general degree - a negatively selected group - have a significantly higher risk of unemployment than their peers with *Abitur* or *Mittlere Reife*. Controlling for final grade, they interpret this as stigmatization of apprentices with *Hauptschule*.

Chapter 7 Educational attainment and class destinations

7.1 Introduction

The *liberal theory of industrialism* (Treiman, 1970; Blau & Duncan, 1967) claims that modern societies are driven to make decisions according to universalistic, meritocratic principles. According to this framework, education plays a central role in the mediation of intergenerational class mobility. Empirically, however, it has been shown for several European countries that the association between educational attainment and social class destinations have been weakened in recent decades (for Britain see Breen & Goldthorpe, 2001; Goldthorpe & Mills, 2004; Van de Werfhorst, 2007; for Sweden see Jonsson, 1996; for Ireland see Whelan & Layte, 2002; for the Netherlands see Ganzeboom & Luijkx, 2004; for France see Vallet, 2004).¹³⁶ Thus, employers seem to attach greater importance to other non-educational traits that are possibly linked to social origin (Breen & Goldthorpe, 2001). In this regard, the *liberal theory of industrialism* fails to explain the decreasing returns to education neglecting the fact that merit is socially constructed and employers eventually determine what counts as merit (Goldthorpe & Jackson, 2008).¹³⁷ Jackson et al. (2005: 26) attribute this decreasing ED association in European countries to compositional changes: occupations or occupational sectors where educational requirements are less crucial in hiring decisions increase in quantitative importance relative to those where educational attainment is of most significance for employers. In access to the expanding kinds of jobs, e.g. in management, sales or personal services, employers would require less formal education and rather consider social skills or personality characteristics as economic values.

Stemming from European liberal tradition, the *market versus meritocracy (MVM)* argument goes even beyond by postulating that free-market economies are incompatible with the notion of an *education-based meritocracy* (Bukodi & Goldthorpe, 2010; Breen & Goldthorpe, 2001). For post-socialist Hungary, Bukodi and Goldthorpe (2010) illustrate that the relations between class origins, educational attainment, and class destinations are rather

¹³⁶ Though, one study for the Netherlands (Wolbers et al., 2001) concludes that employers increasingly take educational credentials into account. Changes in the ED association largely depend on business cycles with a stronger association observed in times of high unemployment. Moreover, the ED association tends to remain stable for French men (Pollak, 2009).

¹³⁷ A meritocracy is not necessarily education-based and can be constituted by selection on productive skills that are directly linked to social origin (for a discussion on meritocracy see Goldthorpe, 1996).

consistent with the *MVM* argument than the *meritocracy as a functional imperative (MFI)* argument.¹³⁸

However, Goldthorpe's *outline of a theory of social mobility* (2007c) fully neglects differences in the institutional setting between countries that shape the three partial relationships in the OED triangle (Pollak, 2009). In this regard, it is well-known that the strength of the association between education and occupational outcomes depends on the institutional framework of educational system and labor market (Müller & Shavit, 1998; Allmendinger, 1989b; Andersen & Van de Werfhorst, 2010). Since the West German labor market is defined as *qualificational space* (Maurice, et al., 1986), the ED association in West Germany is particularly strong compared by international comparisons (Müller & Shavit, 1998). The institutional setting, however, not only plays an important role in explaining cross-country variations, its change is also crucial for the understanding of national developments in the ED association. In this regard, Breen and Goldthorpe (2001: 84) emphasize that in free-market economies the significance of merit, defined as education or in any other way, depends on the current economic, social and political conditions under which employing organizations are constrained to operate. Given no major institutional shifts and a high degree of credentialism, the ED association in West Germany may continue to be exceptionally strong.

Previous studies for West Germany on the association between educational attainment and class destinations come to contradicting conclusions. While a part of the literature finds a declining association (Handl, 1986, 1996; Schiener, 2006; Kalter, et al., 2007), other scholars observe a more stable or even increasing relationship (Däumer, 1993; Brauns, et al., 1999; Müller, et al., 2002; Mayer, Schnettler, & Aisenbrey, 2009). In the context of research on social mobility, Müller and Pollak (2004a) conclude that there is little or no change in the ED association in West Germany.

Aside from a decline in the relative value of education, scientific debates on the effects of educational expansion on the labor market have been dominated by the notion of *credential inflation* (Collins, 1979; Boudon, 1979; Lutz, 1991), i.e. the educational system produces an oversupply of tertiary graduates that cannot be absorbed in adequate labor market positions. As ever more people invest in higher education in order to stay ahead of the *labor queue*,

¹³⁸ While research on three other countries - Czech Republic, Estonia and Russia - also shows that the occupational status of the first job has been highly stratified by educational attainment in the socialist era, it cannot confirm a declining ED association for post-socialist labor market entry cohorts (Kogan, Noelke & Gebel, 2011a; see also Gerber, 2003 for the Russian case). If at all, we see a slight decline in the Estonian case. Hence, it is far from clear, whether a transformation from socialism to marketization – at least with regard to the ED association – necessarily leads to a weakening of *education-based meritocracy*.

higher education becomes eventually devalued. Proponents of this scenario, however, neglect the possibility of an upgrading in the occupational structure. While the labor market may increasingly demand highly skilled individuals due to technological progress, it may also adapt its skill requirements and job structure in reaction to an increasing supply of higher education graduates. Consequently, changes in the value of higher education in *absolute* terms in the West German labor market depend on the relative strength of both educational expansion and occupational upgrading. While Blossfeld (1985) did not find any severe imbalance between educational expansion and occupational upgrading in the 1970s and the start of the 1980s, Müller et al. (2002) shows slightly decreasing *absolute* returns to education between the 1980s and 1990s.

This chapter empirically tests the *devaluation* hypothesis by looking at the access to service class positions in *absolute* terms. Using log-linear and log-multiplicative models I investigate long-term trends in the ED association in West Germany. Moreover, this chapter offers a more detailed look on *relative* returns to higher education in access to service class positions. In order to test whether compositional changes account for changes in the ED association the service class is further differentiated into three different segments: administrative and managerial positions, technical experts and social services positions.

7.2 Theoretical considerations and hypotheses

When considering returns to higher education in terms of occupational outcomes over time, it is important to differentiate between returns in *absolute* and *relative* terms (Müller et al. 2002: 51; Wolbers et al., 2001: 6). *Absolute* or total returns to certain educational certificates - in this case to higher education - are measured in absolute terms e.g. the unemployment rate among higher education graduates (see chapter 6.4.1) or the proportion of graduates that enter service class positions. In order to assess whether a tertiary degree pays off on the labor market, however, *absolute returns* alone may not show the complete picture. Decreasing *absolute* returns do not necessarily imply reduced benefits of higher education vis-à-vis lower educational degrees.¹³⁹ Therefore, *relative* returns indicate the relative advantages of higher education graduates in labor market returns over lower educational groups.

¹³⁹ *Absolute returns* already indicate that education is a positional good (Hirsch 1977), i.e. the chances of accessing better occupational positions do not only depend on how much education an individual has but on how much relative to others. As some individuals with identical credentials may not be selected to adequate occupational positions in the *job queue*, investments in further education are not a sufficient but a necessary requirement in order to stay ahead of the *labor queue* (Müller 1998a: 92) and become a defensive strategy in order to protect one's *market share* (Thurow 1979: 30; Sørensen & Kalleberg 1981: 69). While *absolute returns* to education may be crucial parameters in determining investment decisions in further education, *relative returns* in relation to other educational groups seem to be no less than important. Individuals may not necessarily strive

While trends in *absolute* returns to education are directly influenced by the balance between educational expansion and occupational upgrading, trends in *relative* returns to education indicate the association between educational attainment and labor market outcomes such as social class net of changes in educational and occupational distributions (Wolbers, et al., 2001). Hence, changes in *absolute* returns are determined by the relative strength of labor supply and labor demand over time (Gangl, 2003b).¹⁴⁰ By contrast, trends in *relative* returns result from micro-level changes in employers' attitudes towards educational attainment as selection criterion that may induce changes in the matching of differently educated individuals to occupational positions. Regarding *relative* returns, we ask whether educational credentials still structure access to occupational positions in the same way independently of opportunity structures in the labor market and supply of graduates with certain degrees.

Both measures should not be mixed up and considered separately as they involve different theoretical considerations and empirical expectations.¹⁴¹ *Absolute* returns to higher education may indicate a potential devaluation of higher education on the labor market; *relative* returns may indicate a potential decoupling of educational attainment and occupational outcomes. They do not necessarily need to develop in the same direction (Müller, 2000: 77).¹⁴² For instance, *absolute* returns may decrease due to an oversupply of higher education graduates, but the *relative* advantages in occupational returns over lower educational groups may even increase. This is the case when the returns for the lower educational groups decrease even stronger than the returns for tertiary graduates.

7.2.1 Trends in absolute returns to education

Trends in *absolute* returns to education are strongly shaped by the relative development of educational expansion and occupational upgrading. On the one hand, educational expansion results in a stronger competitive pressure for tertiary graduates on the labor market. On the

for the best occupational positions, but for relative positions that enable comparative advantages over other groups. If education increasingly becomes the central allocation mechanism for the rank ordering of relative positions in the *labor queue*, it could be even more significant to invest in higher education.

¹⁴⁰ 'Clearly, the expected effects of educational expansion and occupational upgrading are mutually offsetting, so that observable net changes in occupational attainment are a question of the relative development along both dimensions' (Gangl, 2003b: 254).

¹⁴¹ 'In short, both total [*absolute*] returns and additional [*relative*] returns provide interesting information but should not be confused since they might follow different patterns in reaction to proliferation' (Van der Ploeg, 1994: 65).

¹⁴² However, *absolute* and *relative* returns do not develop separately. Changes in *relative* returns are included in changes in *absolute* returns. Thus, *absolute* returns illustrate both structural and associational changes. For instance, increasing *relative* returns to higher education may prevent a decrease in *absolute* returns to higher education. This is the case when employers increasingly value higher education to such an extent that graduates are increasingly matched into adequate positions which fully compensates that occupational upgrading lags behind educational expansion.

other hand, occupational upgrading may create new high-skilled positions that are adequate for people with tertiary degrees and therefore mitigates job competition. Educational expansion and occupational upgrading do not necessarily show a parallel development but may mutually influence each other in the sense that both can act as a catalyst for the other dimension. Since *absolute* returns to education depend heavily on the strength of both factors in every period, theoretical predictions are notoriously difficult. Nevertheless, three scenarios are possible.

The first scenario strongly relies on Thurow's *job competition model* (see chapter 2.1.3). It assumes that educational expansion grows faster than occupational upgrading. Thus, the labor market is not able to produce sufficiently enough high-skilled positions for the increasing share of tertiary graduates. Consequently, this disequilibrium leads to a more tightened job competition and an over-supply of tertiary graduates that does not find adequate occupational positions. According to this model, employers are responsive to the increasing relative supply of highly educated people and raise their hiring standards. Hence, they prefer selecting job applicants from the *labor queue* that are overqualified for the jobs at hand. This results in downward competition where the oversupply of higher education graduates displace lower educated job applicants from their positions (e.g. Solga, 2002; Wolbers, et al., 2001; Blossfeld, 1983, 1985; Fürstenberg, 1978; Lutz, 1979; Boudon, 1979). As a consequence, *absolute* returns for tertiary graduates in terms of the proportion accessing the service class decrease. As crowding-out processes also push down the lower qualified into less favorable occupational positions, all educational groups except for the less-educated are affected by declining *absolute* returns. Given a labor surplus, the less-educated at the bottom of the *labor queue* are completely pushed out of the labor market (see previous chapter).

By contrast, *proletarianization hypothesis* predicts that the oversupply of higher education graduates cannot be absorbed by the labor market (Schlaffke, 1972). This theory doubts that employers raise their skill requirements and thus allocate overeducated workers into intermediate occupational positions. Rather, employers perceive overeducated workers as less productive for the given job, as they lack occupation-specific skills and possibly have a low level of job satisfaction or motivation. Since overeducated workers quit the under-qualified job as soon as they have a job offer that matches their qualification, investments in occupation-specific or firm-specific training tend to be rather risky. Therefore, employers may decide to keep hiring lower educated job applicants with an occupation-specific qualification instead of selecting overeducated job candidates. Particularly in *occupational labor markets* such as West Germany, employers may not value overqualified job seekers. Thanks to their

occupation-specific skills vocationally qualified job seekers could be able to defend their occupational positions against crowding-out processes from above (Brauns, Müller, & Steinmann, 1997: 3; Müller & Shavit, 1998). Moreover, higher education graduates who face severe job competition may - at least at the beginning of the job search - prefer to become temporarily unemployed and continue job search than accepting an inadequate occupational position. Overall, the *proletarianization hypothesis* expects the oversupply of tertiary graduates to become unemployed throughout structural imbalances. However, both theoretical accounts are not mutually exclusive: while an oversupply of tertiary graduates may induce processes of crowding-out and thus decreases *absolute* returns in terms of occupational outcomes, it may increase the unemployment rate among tertiary graduates at the same time.

In the *job competition model*, the occupational distribution is more or less fixed and changes in skill requirements are fully supply-side driven. However, demand-side factors such as *skill-biased technological change* may exogenously increase the availability of jobs with higher skill requirements. Hence, not only the *labor queue* experiences an upgrading but also the second queue of job opportunities. According to the *absorption hypothesis*, technological changes enable an upgrading of the occupational structure that is always fast enough to fully absorb the increasing share of higher education graduates in adequate high-skilled positions (Teichler, Hartung, & Nuthmann, 1976). Hence, educational expansion and occupational upgrading more or less balance each other. Accordingly, *absolute* returns to education do not decline but remain rather stable or even increase. From a supply-side perspective, educational expansion may induce a time-lagged upgrading of the job structure. Other than the displacement hypothesis, the labor market not only raises hiring standards in existing positions but creates new high-skilled positions in reaction to an increasing supply of higher education graduates. In this view, decreasing *absolute* returns to higher education can be seen as 'transitory phenomenon' (Gangl, 2003b: 276).

Hypothesis 1

Since occupational upgrading appears to have more or less followed educational expansion (see chapter 5.3 and 5.4), I do not expect a consistent and strong decrease in *absolute* class returns to education in West Germany over time. Only in the 1980s, higher education expansion tends to have slightly outpaced occupational upgrading for both sexes. Therefore, *absolute* class returns may have decreased in this decade only. Since the oversupply of tertiary graduates in the 1980s has been stronger among women than among men, *absolute* class returns to education may particularly decrease for women. Male tertiary graduates tend to become rather jobless during structural imbalances (see chapter 6.4.5).

7.2.2 Trends in relative returns to education

From a micro-level perspective, employers take in a central role in job matching processes since they are eventually responsible for the allocation of people into jobs (Breen, et al., 1995).¹⁴³ Depending on given contextual conditions, employers more or less rely on educational achievement in their hiring decisions and may adjust their recruitment patterns when macro-level changes take place. However, it is very difficult to assess or anticipate the mechanisms behind changes in employers' perceptions, beliefs and behavior. The question is whether employers exclusively recruit applicants only with higher educational credentials for the 'best' jobs or whether selection processes have become more permeable for job seekers with lower credentials? In this section, I discuss several theoretical approaches that make contracting predictions with regard to trends in the ED association. While the first two approaches rather stay on the macro-level, the following two arguments take employer decisions explicitly into account.

Liberal theory of industrialism

The macro-theoretical approach of *liberal theory of industrialism* (Erikson & Goldthorpe, 1992)¹⁴⁴ - also known as modernization or industrialization theory - proposes a long-term monotonic trend of decreasing intergenerational social reproduction and an increasing role of education in the mediation of intergenerational social mobility across all industrialized societies (Treiman, 1970; Blau & Duncan, 1967; Kerr, et al., 1973).¹⁴⁵ While amidst industrialization educational attainment is assumed to become less and less dependent on social background, i.e. an increase in equality of educational opportunity, the selection on universalistic values and meritocratic criteria in industrial labor markets may inevitably emerge due to macro-level developments such as technical progress, an increasing specialization of labor, growing pressures of rationalization and a higher work complexity (Treiman, 1970).¹⁴⁶ Furthermore, the bureaucratization of work and strong tendencies towards

¹⁴³ In this regard, Goldthorpe (2009: 29) stresses that employers are 'key actors in processes of social mobility but who have for too long been effectively disregarded.' Indeed, the allocation procedure is two-sided and job applicants act according to their preferences (e.g. Logan, 1996a; see also chapter 2.1.4). Nevertheless, one can assume that job candidates with given preferences always strive to obtain jobs that promise the best possible outcomes.

¹⁴⁴ It is frequently labeled as *functional theory of industrialism*. Bukodi and Goldthorpe (2010) call this line of reasoning *meritocracy as a functional imperative (MFI)*.

¹⁴⁵ In substance, the core statements of the *liberal theory of industrialism* are based on Parson's (1967, 1971) neo-evolutionary considerations. The proposed developments throughout industrialization would lie in the logic of an inherent process and automatically emerge as being functionally essential for the preservation of the system.

¹⁴⁶ Moreover, the direct effect of individuals' class origin on their class destinations should vanish over time. 'In sum, the social order becomes increasingly 'meritocratic' in character, at least in so far as educational attainment is taken as the leading indicator of merit' (Jackson et al, 2005: 6).

professionalization of work bolsters credentialism and the use of formal, universalistic hiring criteria (Weber, 1972 [1922]; Abbott, 1988). Accordingly, the *Increased Merit Selection (IMS)* hypothesis (Jonsson, 1992) claims that selection on the basis of achievement relative to ascriptive characteristics such as social class, gender, race or religion becomes the dominant strategy in modern societies.¹⁴⁷ Hence, the *liberal theory of industrialism* predicts an increasing association between educational attainment and occupational achievement throughout industrialization (Blau & Duncan, 1967: 430). Since all societies sooner or later follow a transformation process towards industrial economies¹⁴⁸, the framework assumes that countries become increasingly similar in the strength of the linkages between education and the labor market.

Using data from 35 countries, Ganzeboom, Luijkx and Treiman (1989) show that nearly all countries have experienced greater social mobility over time. Comparing 21 countries, Treiman and Yip (1989) indicate that among more industrialized societies educational attainment has a stronger impact on occupational outcomes than among less industrialized societies. By contrast, a more recent large-scale comparative study of social mobility in Europe concludes that models allowing for temporal change in social fluidity and cross-national variations do not yield a substantially different model fit compared to models assuming no change or commonality (Breen & Luijkx, 2004). This book also reveals declining ED associations across several European countries which clearly speak against the predictions of the *liberal theory of industrialism*.

This theory has frequently been criticized for being ideologically motivated, theoretically not convincing and empirically indefensible (Goldthorpe, 2007c). While proposing macro-level *functional exigencies* or *functional imperatives* and lacking a micro-theoretical foundation which takes individual actions of employers seriously into account (Coleman, 1990: chapter 1; see also chapter 2.1), the framework also neglects significant institutional differences between modern societies that determine the use of meritocratic criteria and shape the association between education and occupational attainment.

Skill-biased technological change (SBTC)

Economists stress *skill-biased technological change, SBTC* (e.g. Autor, et al., 1998; Acemoglu, 2002, 2003; Katz & Autor, 1999), a theory postulating that technical progress leads to significant shifts in labor demand favoring high-skilled workers relative to less-

¹⁴⁷ '[...] formal education probably becomes more important as a mechanism for the learning of occupationally relevant skills, and an increasingly important resource in job competition' (Treiman, 1970: 218).

¹⁴⁸ Societies do not necessarily follow a uniform trend towards industrialization. By contrast, it may also involve some discontinuities.

skilled. Autor et al. (2003) for the US and Spitz-Oener (2006) for Germany show that an upgrading of skill requirements has mostly occurred within occupations and is predominant in computer-intensive industries. Most importantly, computerization is accompanied by reduced labor input of routine manual and routine cognitive tasks and increased labor input of non-routine analytical and interactive tasks.¹⁴⁹ This clearly speaks in favor of demand-driven occupational upgrading. Nevertheless, *SBTC* may also be caused by the increasing supply of highly-skilled workers throughout educational expansion, thereby promoting occupational changes towards skill-complementary technologies (Acemoglu, 1998; Oesch & Rodríguez Menés, 2011). With regard to job matching processes, *SBTC* may not only induce an increasing demand for the highly skilled and widen the opportunity structures for higher education graduates but also have the effect that employers more strongly sort and select on educational attainment in their hiring decisions at the micro-level.

Educational expansion and the declining signaling capacity

A downward trend in the effect of education on social class is often attributed to *credential inflation* (e.g. Ganzeboom & Luijkx, 2004; Jackson, et al., 2005). An individual's returns to education not only depend on his or her own educational resources, but on the relative scarcity of the acquired certificate. While amidst educational expansion higher education becomes more widespread in the population, it provides a less reliable or more 'noisy' *signal* to employers than in former times. Employers are less sure whether higher education signals productivity as prior to expansion. Thanks to *credential inflation* employers may seriously doubt whether higher education graduates substantially differ from lower educational groups in terms of unobserved attributes such as general ability, motivation or diligence. Since employers have increasing difficulties to interpret the value of qualifications, they may less and less rely on higher education certificates as hiring criteria over time. Hence, it is the *signaling* capacity rather than the *certifying* capacity of educational credentials that is reduced when the supply of higher education students increases (Jackson et al., 2005). By contrast, employers may look for alternative, more distinct signals indicating potential productivity, e.g. ascriptive characteristics, that thus become increasingly relevant in the selection process again.

Thanks to educational expansion, teaching standards and the quality of examinations may decline as well, thereby making the educational system less selective. While the investment costs for the *signal* of higher education may decrease and therefore allure less able

¹⁴⁹ Non-routine analytical tasks are for instance researching, analyzing, evaluating or planning; non-routine interactive tasks are negotiating, lobbying, coordinating, organizing etc.

students, higher education provides students with less productive skills than before. Given that the proportion of under-performing students in higher education rises, the average productivity level of tertiary graduates declines (Walker & Zhu, 2005). As a consequence, employers devalue higher education degrees due to a lower signaling capacity in the long run.

In fact, Müller and Shavit (1998) find that the larger the proportion of tertiary graduates in a country, the weaker the effects of educational qualifications on occupational outcomes. Controlling for demand in terms of the proportion of professional positions, Gangl (2003b) shows that the strength of educational expansion captured as the share of tertiary degree-holders lowers the occupational returns upon labor market entry. While educational expansion tends to generally decrease occupational status scores or access chances to professional employment among labor market entrants, it does not have, however, particularly negative effects on higher education graduates.

Compositional changes in the service class

The second argument for a downward effect of educational attainment on social class refers to compositional changes in the occupational structure (Jackson, et al., 2005; Van de Werfhorst, 2007). According to this, the relative importance employers attach to qualifications varies across different types of employment (Bills, 1992, 2003). Over time, the *certifying* capacity of higher education is assumed to decline as employers in growing occupational areas decreasingly rely on specific skills that are provided through learning in the education and training system (Jackson et al, 2005). Not only did the service class expand in sheer numbers, but also the kinds of jobs changed dramatically as many new occupations emerged particularly in the expanding service sector. Jobs in management, sales or personal services that are supposed to gain in relative importance are assumed to be less dependent on educational attainment, expertise or cognitive skills. As they involve diverse forms of *people processing*, employers more strongly demand social skills, soft skills or manners (Breen & Goldthorpe, 2001; Duncan & Dunifon, 1998)¹⁵⁰ or put more emphasis on personality or other non-cognitive traits in their hiring decisions (Jackson, 2006; Osborne Groves, 2005; Heckman, Stixrud, & Urzua, 2006; Jencks, 1979; for a review see Farkas, 2003).¹⁵¹ As

¹⁵⁰ Elias and Purcell (2004a) show that interactive and managerial skills have become increasingly important in the UK graduate labor market and are used somewhat more in newer areas of graduate employment than in traditional graduate jobs. Dörfler and Van de Werfhorst (2009) also indicate that communication and teamwork skills are increasingly demanded in job advertisements. The authors conclude that the increasing demand for non-cognitive traits cannot only be attributed to compositional changes but also to temporal changes within occupations.

¹⁵¹ While *incentive-enhancing preference theory* (Bowles & Gintis, 1976) has most pronouncedly stressed the importance of behavioral traits that are learned through socialization in the educational system. More recently, Bowles and Gintis point out that personality characteristics are *incentive-enhancing* as well (Bowles, Gintis &

evidenced by the growing importance of human resource management, modern companies place greater emphasis on personal traits such as commitment or adaptability (Hendry & Pettigrew, 1990). Jackson et al. (2005: 13) refer to all these personal characteristics as *embodied capacities*. Consequently, in these new occupational areas, the *certifying* capacity of educational attainment is rather limited as job seekers' knowledge, expertise or specific skills are no major selection requirements. Aside from that, educational credentialing may not have yet evolved the way it has for the traditional occupations since it takes some time to establish institutionalized linkages between educational credentials and newly created service class occupations (Van de Werfhorst, 2007). Overall, the diversification in the occupational distribution dilutes the effects of educational credentials on class destinations.

Among the service class, managerial or administrative occupations may also differ from professional positions in the value that is attached to educational qualifications because of differences in the nature of the employment relations between employer and employee. While professional work needs to rely on specialized knowledge or expertise, managers or employees in administrative hierarchies are engaged to exercise the delegated authority of the employer (Goldthorpe, 2007d). While managers tend to follow the fordist logic of the division of labor, professionals reflect the post-fordist logic (Esping-Andersen, 1993). Likewise, Kriesi (1989: 1081) argues that 'a basic antagonism of interest exists between managers and professional rank and file because the former are essentially concerned with the preservation of the integrity of the organization (or organizational unit) as a whole, while the latter are concerned with the preservation of the integrity of their specialized pursuit of a discipline or a profession'. While individuals working in professional, social services are much more liberal in their attitudes than technical professionals or managers, differences in educational attainment are able to explain most of this variation (Brint, 1984; see also Lamont, 1987). In filling managerial or administrative positions, employers may value a high level of loyalty to the organization and their assets and see the primary aim of employees in performing supervisory or managerial duties. By contrast, professional positions more strongly require a high degree of knowledge or expertise and an individual pursuit for professional freedom and autonomy. Therefore, selection into service class managerial or administrative positions could be less dependent on educational achievement than selection into professional positions. That is, graduates with lower credentials may be more able to attain managerial positions than professional positions. Drawing on content analyses of job advertisements as well as

Osborne, 2001; Bowles & Gintis, 2002). Personality differences, however, are rather due to different social origins than to differences in schooling (Goldthorpe, 2009: 26).

household data, Jackson et al. (2005) find that employers more strongly select on educational qualifications for professional occupations than for managerial jobs in contemporary Britain (see also Jackson, 2007).¹⁵² Akin to this study, the analysis of job advertisements in Austria indicates that professional occupations more often require tertiary qualifications and cognitive skills than all other occupational groups, particularly service sector occupations (Dörfler & Van de Werfhorst, 2009).

Summing up, compositional changes in the service class throughout occupational upgrading may result in a declining overall ED association since access to expanding managerial and administrative occupations is less dependent on educational attainment. So far, the effects of these compositional changes on the ED association have not been conclusively proven.

Context dependency

All in all, there are both plausible reasons to suppose that the effect of educational attainment on class destinations increases as well as decreases over time. Empirically, a downward effect of education on social class is evident for several European countries. However, employers' decision-making freedom is dependent on how unregulated a given market economy is (Breen & Goldthorpe, 2001). The importance of education for selection procedures on the labor market varies between free-market economies depending on economic, political and social conditions under which employers are free to act.¹⁵³ In this regard, I already pointed out the high relevance of the institutional setting for job matching processes upon labor market entry (see chapter 3).

If the educational system sends out strong signals that minimize the uncertainty with regard to job applicants' productivity, then employers do not have the necessity to look for and evaluate other signals. If productivity signals provided by educational credentials are, however, rather unreliable, then employers more often take other individual traits such as gender, ethnicity, social background or personality into account. As a consequence, in societies with rather weak linkages between educational system and labor market non-educational factors should play a greater role in job allocation procedures than in societies with strong linkages.

¹⁵² Interestingly, Goldthorpe (1982: 173) has already emphasized this at the beginning of the 1980s: 'As might be expected, it is within the administrative and managerial situses rather than the professional one that the degree of evident 'under qualification' is most marked.'

¹⁵³ Besides, a growing relevance of non-educational factors may not automatically imply a reduction of the relevance of education in absolute terms. Certainly, it is possible that other characteristics play an increasing role in addition to a persistent impact of educational attainment on labor market rewards.

In a market economy with highly institutionalized regulatory structures and legal restraints, employers may have less leeway in defining which employee characteristics are regarded to be merit-based and which ones are not. For instance, in heavily unionized industries or in the public service formal education is above all the strongest determinant of career opportunities thanks to rigid agreements and institutional linkages (Jonsson, 1992).¹⁵⁴ By contrast, a less regulated labor market enables employers to have greater ability to disregard educational credentials and giving greater value to other characteristics.

Hence, it is clearly not the case that every free-market, capitalist economy has to experience a declining association between educational attainment and class destinations, as proposed by Bukodi and Goldthorpe (2010). Modern societies strongly differ in their institutional arrangements that shape education effects at the transition from school to work (Müller & Shavit, 1998; Kerckhoff, 2001; Gangl, 2003c). In the OED triangle, the ED association appears to vary most across countries (Müller, Lüttinger, König, & Karle, 1989; Erikson & Goldthorpe, 1992). Thus, country-specific changes in the ED association may not only depend on macrostructural developments, but also on changes in the institutional framework (Gerber, 2003) or political interventions (DiPrete & Grusky, 1990). The institutional setting also acts as mediator for structural changes, i.e. labor markets that are highly segmented along occupational lines have a lower capacity to adapt to technological changes as they rely on rigid linkages between specific qualifications and particular jobs (DiPrete, et al., 1997).

7.2.3 *Is West Germany a distinct case?*

Due to its distinctive institutional framework, the association between educational attainment and occupational outcomes has remained high in West Germany compared to other industrialized societies (Müller, et al., 1998; Müller & Shavit, 1998). But are there any changes in these institutional characteristics that may have provoked substantial changes in the ED association over time? As indicated in chapter 3.1, the three main characteristics of the West German educational system – high level of standardization, stratification and occupational specificity – ensure that educational qualifications emit strong signals. West Germany can still be regarded as a *coordinated market economy (CME)* or a *conservative welfare state* that provides security against market uncertainties and prevails the standing of

¹⁵⁴ Policy-makers, who are willing to intensify market principles in the labor market, are therefore able to achieve their goals by cutting down the power of trade unions or by reducing the share of public employment. For instance, the policy interventions of conservative governments in the direction of a freer market are seen as significant reasons for the decreasing ED association in the British context (Breen and Goldthorpe 2001: 96).

existing social classes by establishing relatively strong labor market regulations (see chapters 3.2 and 3.3). Employers in West Germany are clearly not as free in their hiring decisions as employers in *liberal market economies* such as Britain and have also good reason to strongly rely on educational attainment. Hence, from a mere institutional point of view, the strong link between educational credentials and occupational destinations in West Germany should have remained.

How do both structural arguments for a declining ED association in free-market economies apply to West Germany? Can the persistent institutional setting in West Germany mediate the impact of macrostructural developments on returns to education? In comparison to other European countries, West Germany experienced modest educational expansion (see chapter 5.3). This is particularly evident by the slowly increasing proportion of individuals with tertiary qualifications. Since the mid-1990s, the share of graduates with tertiary degrees has even remained constant in West Germany. The argument that higher education has become an increasingly unreliable productivity signal for employers tends to be less suitable in the West German case simply because the sheer number of tertiary graduates has not extensively grown. Hence, fears of *credential inflation* in West Germany are unjustified. Because employers rank workers according to their occupation-specific skills rather than by their absolute amount of education, individuals tend to feel less pressure to attain ever more education in an *occupational labor market* such as West Germany. That is, *occupational labor markets* may restrict the impact of educational expansion on the sorting of occupational positions by imposing market barriers that prevent downward substitution pressures (Gangl, 2003b: 256). The *certifying* role dominates the *signaling* role of educational attainment. Due to this, the value of credentials remains intact in West Germany relative to countries with *organizational spaces* amidst educational expansion (Müller & Shavit, 1998: 7).

As to *compositional changes*, the share of service sector positions has substantially increased in West Germany, particularly during the 1990s (Schubert & Engelage, 2006: 108). Thus, occupational positions that demand soft skills or personality characteristics and require less formal education may have indeed gained in importance in the labor market. As service class expansion has overwhelmingly taken place in the private sector (see chapter 5.4), this sector has become an increasingly important employer for higher education graduates. Amidst educational expansion, an increasing share of tertiary graduates has to compete for service class positions in the private industry. As selection of job applicants in private industry is less strictly based on educational certificates and employers are freer to decide which individual characteristics signal productivity, occupational sorting may be less dependent on educational

credentials. Other than the public service, the private industry more often enables promotions through successful probation rather than promotion by educational rules. Therefore, one could expect that the stop in service class growth among the public sector and the increasing importance of the private sector have had negative effects on returns to higher education (Blossfeld & Becker 1989: 244f.).

Given that educational expansion acts as a catalyst for occupational upgrading, it is plausible that new highly educated graduates are also selected into new existing high-skilled positions in the private sector (Gangl, 2003b). Accordingly, Lutz (1979) argues that the private industry increasingly makes use of the growing share of graduates from higher education. Over time, selection procedures or promotional decisions in the private industry may have become more and more based on educational certificates. Organizational studies have shown that hiring into managerial positions is more strongly based upon specific expertise or formal qualifications in West Germany than in France or United Kingdom (Lane, 1989; Stewart, Barsoux, Kieser, Ganter, & Walgenbach, 1994). In order to preserve a *qualificational space*, it is also plausible that the German higher education system more quickly adapts to changing needs of the labor market by establishing new courses of studies which match the requirements of service sector occupations. The strong tradition of educational credentialism in West Germany (Müller, 1994) may also create a structural environment in which all employers - even those in managerial or administrative segments - reward educational certificates as *cultural currency* (Weeden, 2002).¹⁵⁵ Despite compositional changes and an increasing importance of private industry position for higher education graduates, this argument would rather speak for few changes in the ED association over time.

Hypothesis 2

I do not expect that the overall association between educational attainment and class destinations in West Germany has been substantially declining. Nevertheless, due to compositional changes in the occupational structure, the *relative* value of educational attainment may have somewhat decreased in access to the service class.

7.3 Current state of research

In the first empirical work on the effects of educational expansion on *absolute* returns to education in West Germany, Blossfeld (1985) concluded that educational expansion outpaced occupational upgrading among labor market entrants between the 1970s and early 1980s.

¹⁵⁵ 'In this view, credentialing restricts the labor supply because employers, occupational gatekeepers and consumers value the cultural currency and believe that the credential certifies a unique capacity to perform a set of skills' (Weeden, 2002: 62).

Despite this, tertiary graduates were more or less able to maintain their advantageous occupational positions during the observed time span (Blossfeld 1985: 85). Conversely, Blossfeld found that predominantly *Realschule* and *Hauptschule* graduates were displaced over time. Akin to Blossfeld (1985), Müller et al. (2002) find that occupational upgrading lagged behind educational expansion between the beginning of the 1980s and mid-1990s. Consequently, tertiary graduates' *absolute* access to the service class slightly decreased for both sexes. In general, men have higher *absolute* chances to access the service class, in particular the upper service class, than women.

Using log-linear models, Handl (1986) observed a decreasing association between educational attainment and occupational positions between the 1970s and the beginning of the 1980s among workers, aged 28-30. In an updated analysis extended through 1989, Handl (1996) confirms his older results of declining association by applying more elaborated log-multiplicative models. He also found that women's *relative* returns to education are larger than men's, even though they have less access chances to privileged positions in *absolute* terms. However, Handl (1996: 255) admits that this result has to be considered with caution as the 1980s trend could be attributed to measurement changes in the occupational outcome. Moreover, he draws conclusions from logistic models only contrasting hierarchical levels between white-collar employees and blue-collar workers, while not testing the significance of cohort changes in log-linear models.¹⁵⁶

Using data from the *German Socio-economic Panel (GSOEP)*, Däumer (1993) considered trends in the ED association for different labor market entry cohorts between 1947 and 1986. Using log-multiplicative models, he doubts Handl's (1986) previous results and concludes that the ED association remained more or less constant across cohorts. In the last entry cohort 1977-1986, both male and female tertiary graduates were able to improve their *relative* access chances into the service class (Däumer 1993: 68). In contrast to Handl's results, *relative* returns to education are larger for men than for women. However, the results are based on a small sample size; some contingency tables categories are only marginally filled.

While focusing on a cross-national comparison between West Germany and France, Brauns et al. (1999) also consider changes in the ED association among labor market entrants over time. Using multinomial logit models, they compare the effects of educational attainment

¹⁵⁶ Thus, he considers only a fraction of the occupational structure. The exclusion of public servants may bias the result, as the association between educational credentials and careers in the public service is particularly strong. Furthermore, Handl models a linear trend in the logit-models that fits less well in his log-multiplicative models (Handl 1996: 268).

on class destinations between census data from 1970 and data from the 1991 *Microcensus*. For both sexes, tertiary graduates have increasing relative advantages over lower educational groups in access to all class positions compared to unskilled workers (*EGP VIIab*). In particular, the upper service class has become more education-exclusive over time. While general education is a critical factor for accessing the upper service class, the lower service class also tends to be more open to graduates with vocational qualifications. Vocational training is also crucial for gaining access to self-employed positions (*EGP IV*), including mostly craft trades that require a master craftsman's certificate, skilled worker positions (*EGP V/VI*) as well as routine non-manual jobs (*EGP III*). Moreover, for both sexes, university and *Fachhochschule* graduates do not differ much in their *relative* class returns.

Aside from considering *absolute* returns, Müller et al. (2002) focused on changes in *relative* service class returns to higher education between the beginning of the 1980s and mid-1990s in West Germany. They find that, in 1995, tertiary graduates had the same *relative* advantages in access to service class positions in comparison to *Abitur*-holders than in 1982. Over time, *Fachhochschule* graduates converged onto university graduates' service class returns. Still, *Fachhochschule* graduates were disadvantaged in accessing service class positions compared to university graduates in the 1990s. In line with Däumer (1993), *relative* returns to education are larger for men than for women.

Schiener (2006) considers the GSOEP, using waves 1984 to 2000. Due to small sample sizes, the author is unable to focus on school-to-work transitions. As occupational upgrading was strong enough to absorb the increasing share of tertiary graduates, *absolute* returns to higher education did not decrease over time (Schiener 2006: 60). Log-linear and log-multiplicative models indicate that the relative returns to education have decreased among men. The reduction follows a convex pattern: a strong decrease in the 1980s which became somewhat weaker during the 1990s and came to a standstill at the end of the observation period. Schiener (2006: 70) argues that *absolute* returns to tertiary education remained stable because strong occupational upgrading was able to cancel out the decline in *relative* returns to tertiary education. For women, *relative* returns remained constant over time while being generally higher than for men. In contrast to all other approaches, Schiener (2006) operationalizes returns to education with a subjective measure of job skill requirements.¹⁵⁷ Hence, this subjective scale does not take individuals' occupation and employment relations into account and thus remains rather vague.

¹⁵⁷ The categories differentiate between 'no special training or a short briefing on the job', 'a longer firm-specific training', 'visits of special training courses', 'completed vocational training' and 'having a tertiary degree'.

While Kalter et al. (2007) mainly concentrate on trends in structural assimilation of second generation migrants, they also analyze changes in the ED association among individuals, aged 18 to 65. Using 1989-2004 *Microcensus*, they measure occupational attainment with a simple indicator distinguishing between white-collar employees and blue-collar workers and also do not differentiate between men and women. Based on logistic regressions, they find that access to white-collar positions has become significantly less dependent on educational attainment over time.

Mayer et al. (2008) operationalize class destinations with the *German Employment Class Schema (GEC)* (Mayer & Aisenbrey, 2007: 135) and rely on small-sample data from the *German Life History Study (GHLS)*. They compare the ED association across several birth cohorts at ages 26-28 and 33-36. Log-linear and log-multiplicative models reveal a rather stable ED association in West Germany. This association tends to have been stronger in postwar conditions that affected birth cohorts 1930 and 1940. Individuals with higher educational credentials had more privileged access to advantageous positions in this period.

Using *Mannheim mobility data*¹⁵⁸, Müller and Pollak (2004a) find increasing social fluidity across birth cohorts in West Germany. In general, they discover that a large part of the effect of class origin on class destination is mediated by education. The increasing social fluidity can be mostly attributed to a decreasing association between class origin and educational attainment.¹⁵⁹ By contrast, the ED association remained constant across birth cohorts in West Germany. Based on an extended data series, Breen and Luijkx (2007) find that period effects of increasing social fluidity are the product of cohort replacement, i.e. earlier born cohorts drop out of the working-age population and later born cohorts replace them. However, this is not surprising since increasing social fluidity in West Germany is driven by decreasing inequality of educational opportunity and class inequality in education is a cohort phenomenon (Müller & Pollak, 2004a: 110). Moreover, they show that trends in social fluidity across cohorts disappear when controlling for differences in social fluidity at different levels of education. As the association between class origin and class destination is weaker at higher educational levels in West Germany, educational expansion leads to a compositional effect by placing increasing shares of each cohort in those higher levels that enable increasing fluidity (Hout, 1988). In Britain, however, we do not find this three-way interaction between class origin, education and class destination. This effect could be

¹⁵⁸ The *Mannheim mobility data* contain a variety of datasets: several replications of the *ZUMABUS*, the survey on well-being (*Wohlfahrtssurvey*), biannual *General Social Survey (Allbus)* data and GSOEP waves (1986, 1999).

¹⁵⁹ Some historical peculiarities that are manifested through class inheritance effects or rigid barriers between manual and non-manual occupations persist even after controlling for education.

attributed to a persistently strong ED association in West Germany that may not necessitate the use of non-educational factors in hiring decisions.

7.4 Research design

7.4.1 *Dependent variable: social class*

Social class at the time of the interview is measured according to *EGP* or Goldthorpe class schema (Erikson & Goldthorpe, 1992: 35-47; Erikson, Goldthorpe, & Portocarero, 1979), one which adheres closely a Weberian class concept (Breen, 2005b).¹⁶⁰ That is, social classes are strictly formed by market situations and social relations in economic life, more precisely by labor market relations or relations to the means of production and thus determine individuals' life chances by stratifying access to material resources.¹⁶¹

As indicated in Table 11, the applied version of the *EGP* class schema comprises eight categories.¹⁶² Basic distinctions are made among employers who own the means of production and buy the labor of others (large proprietors in *EGP* I; small proprietors in *EGP* IVa or IVc), self-employed who do not sell their work but do not have employees (*EGP* IVb or IVc) and employees that sell their work to employers.¹⁶³ Employees are further differentiated according to their type of *employment relation*. Manual workers (*EGP* VI-VIIab) and lower-grade non-manual workers (*EGP* IIIb) typically possess a *labor contract* that offers precise exchange of wage for effort. That is to say, workers offer discrete amounts of labor on a piece or time basis and receive a wage that more or less exactly reflects the actual work output. This form of contract does not entail a long-term relationship between employer and employee. By contrast, professionals or managers (*EGP* I and II) in organizational bureaucracies are typically involved in a long-term *service relationship* where

¹⁶⁰ For an overview of different class approaches see Wright (2005).

¹⁶¹ A class position implies 'experiences of affluence or hardship, of economic security or insecurity, of prospects of continuing material advance, or of unyielding material constraints' (Erikson & Goldthorpe, 1992: 236).

¹⁶² The most disaggregated form identifies eleven categories (Erikson & Goldthorpe, 1992: 38-39). The applied form, however, follows the four-class version suggested by Breen (2005b: 41), differentiating between service class (*EGP* I + II), intermediate classes (*EGP* IIIa + V), manual classes (*EGP* IIIb + VI + VII) and the petty bourgeoisie (*EGP* IV). The applied version comes up with eight categories as the within-group classes are treated as separate units. I refrain from using the widely applied seven-class version (Breen, 2005b) because it combines employees (*EGP* IIIa and IIIb as well as V and VI) that have different forms of employment regulations, pure labor contract and mixed forms of employment regulations. Given Goldthorpe's (2007d) theoretical foundations, these categories should not be collapsed.

¹⁶³ The placement of large proprietors in class I rather than class IV is justified as follows: 'large proprietors tend to be quite extensively involved in managerial as well as entrepreneurial activities, they may be regarded as having a yet greater affinity with those salaried managers to be found in class I who have a substantial share in the ownership of the enterprises in which they work' (Erikson & Goldthorpe, 1992: 40). Breen (2005b: 42f.) argues that this classification is rather inconsistent with the theoretical rationale as large proprietors do not have a service relationship with an employer and thus cannot be seen as an economic elite.

they render service for *compensation* due to an exchange of a more diffuse kind. Employees' rewards in service class positions not only include a salary and various perquisites but also prospective elements such as promotion opportunities and security both in employment and after retirement in terms of pension rights. Routine non-manual employees in higher grade (*EGP* IIIa) and lower-grade technicians (*EGP* V) represent *mixed forms* that combine elements of both *labor contract* and *service relationship*.

Table 11 Categories of the *EGP* class schema

Class	
I	Higher-grade professionals, administrators, and officials; managers in large industrial establishments; large proprietors
II	Lower-grade professionals, administrators, and officials; higher-grade technicians; managers in small industrial establishments; supervisors of non-manual employees
IIIa	Routine non-manual employees, higher grade (administration and commerce)
IIIb	Routine non-manual employees; lower grade (sales and services)
IVabc	Petty bourgeoisie: small proprietors, artisans, etc., with employees (a) and without employees (b) Farmers and smallholders; other self-employed workers in primary production (c)
V	Lower-grade technicians; supervisors of manual workers
VI	Skilled manual workers
VIIab	Semi- and unskilled manual workers (not in agriculture, etc.) (a) Agricultural and other workers in primary production (b)

Source: Erikson and Goldthorpe, 1992: 38-39.

The theoretical rationale behind the *EGP* class schema draws both on rational action theory, organizational and personnel economics, and transaction-cost economics (Goldthorpe, 2007d).¹⁶⁴ In general, the primary aim of employers and employer's agents is not only to enforce employee compliance but also to induce them to produce maximum effort and performance in their job. However, employment contracts involve the problem that they are often implicit and unspecific regarding what employers can demand of employees in terms of effort and their degree of responsibility or adaptability.¹⁶⁵ Organizational and transaction-cost economics identifies two sources of *contractual hazard* for employers. First, employers have severe difficulties in monitoring the work performance among employees. Second, employers highly rely on employees' specific skills, expertise or knowledge in the performance of the

¹⁶⁴ The theoretical rationale is akin to sociological matching models (Sørensen & Kalleberg, 1981; see chapter 6.2.3).

¹⁶⁵ The problem is similar to a *principal-agent*-relationship in which the employer as the principal hires an agent, the employee, to advocate the principal's interests while not being able to directly observe the agent's actions.

job, i.e. if specific human assets are transferred to another job, the productive value would be completely lost. As occupations differ in complexity of *monitoring* and *human asset specificity*, employers offer different employment contracts for different occupations according to the degree of potential *contractual hazards*.

Workers employed with a *labor contract* typically work in jobs where performance can easily be based on actual output whether by piece or time.¹⁶⁶ In these jobs, employees are easy to monitor regarding quantity and quality of work and do not need to have specific human assets to execute the work tasks. In such occupational positions ‘workers undertake physical (rather than mental) operations that lead in a fairly transparent way to discrete (rather than symbolic) results’ (Goldthorpe, 2007d: 110). Therefore, employers are able to establish a direct linkage between work and pay that is reasonable for both sides. As the costs of labor turnover are low, employers also have less interest to establish a long-term relationship with their employees. Consequently, employers face fewer hazards and are able to hire workers on the basis of a *labor contract*.

By contrast, professional or managerial capacities create a substantial amount of asymmetry of information between employer and employee given the specialized knowledge and autonomy associated with these positions. As employees in such labor market positions necessarily have a significant degree of legitimate autonomy and discretion and use highly specific skills and expertise to perform on the job, employers have severe difficulties monitoring professional and managerial personnel. In order to gain the employee commitment and ensure that they adhere to organizational goals, employers need to construct appropriate incentive structures. Therefore, the *service relationship* relies on performance appraisal, i.e. the better employees perform on a career entry job, which pays them below their actual productivity, the quicker they are promoted into higher levels of the organizational hierarchy. Hence, this form of a contract offers the chance of steadily rising salaries throughout working life and long-term career success in exchange for employees’ commitment to the organization and high job performances. This arrangement ‘envisages, even if implicitly as much as explicitly, a quite diffuse exchange of service to the organization in return for compensation in which the prospective element is crucial and the contract is understood as having a long-term rather short-term basis.’ (Goldthorpe, 2007d: 115).¹⁶⁷ Hence, service class positions

¹⁶⁶ This requires a very specific and well-defined output as well as a production process that is relatively simple.

¹⁶⁷ The classes of higher-grade routine non-manual occupations (*EGP IIIa*) and lower technical and manual supervisory occupations (*EGP V*) have employment regulations of a *mixed form* because of different reasons. While occupations in *EGP IIIa* imply difficulties of monitoring but require no human asset specificity, occupations in *EGP V* are relatively easy to monitor but rely on highly specific skills. Regarding the benefits of a *service relationship*, employees in *EGP IIIa* enjoy a salary, but do not have a long-term relationship. By

offer ‘well-defined career opportunities’ (Erikson & Goldthorpe, 1992: 42) and life course benefits, which can therefore be unequivocally regarded as hierarchically above all other classes (Erikson & Goldthorpe, 1992: 46). In this regard, changes in access to the service class seem to be of major relevance for comparing returns to education, particularly to higher education, over time.

The *EGP* class schema involves both high *criterion validity* and high *construct validity*.¹⁶⁸ On the one hand, this class schema empirically captures the cleavages in job characteristics that it is supposed to capture (e.g. Goldthorpe & McKnight, 2006; Evans, 1992; Evans & Mills, 1998, 2000). On the other hand, measured social classes show theoretically plausible variations in terms of voting behavior, differentials in educational attainment, health issues or other life outcomes. Not surprisingly, the Goldthorpe class schema has been extensively used in empirical class analyses.¹⁶⁹

In West Germany, the *EGP* class schema is common in research (for a description see Brauns, Haun, & Steinmann, 1997), based on detailed information on the employment status (*Stellung im Beruf* and *Stellung im Betrieb*) and occupational titles (German classification KldB (*Klassifizierung der Berufe*) version 1975; since 1993 *Microcensus* KldB version 1992; 3-digits) in *Microcensus* data. Unfortunately, in 12 out of 23 *Microcensus* years, detailed information on respondents’ employment status (*Stellung im Betrieb*) was not collected. In order to use the full range of data, I approximated the *EGP* class schema by combining Blossfeld’s occupational classification (Blossfeld, 1985; see also Schimpl-Neimanns, 2003) with information on the rough measure of employment status (*Stellung im Beruf*).¹⁷⁰ This approach was already applied to measure class origin (Klein, et al., 2010).¹⁷¹

contrast, employees in *EGP* V enjoy long-term career opportunities but pay is based on actual output (Goldthorpe, 2007d: 116ff.).

¹⁶⁸ According to Tahlin (2007a), the theoretical rationale behind this class schema – employment relations and reciprocal dependence as suggested by Goldthorpe (2007d) – cannot be empirically validated, at least with Swedish data. Instead, the main source of class differentials tends to be skill requirements among jobs. He does not generally criticize the usefulness of *EGP* class schema, but rather doubts the theoretical assumptions behind it. However, he admits that testing of these theoretical claims is based on his own reading of the theory and may deviate from the views of theory’s proponents (Tahlin, 2007a: 566). For sure, it does not invalidate the operationalization of the *EGP* class schema (Tahlin, 2007a: 567).

¹⁶⁹ More recently, a new classification for cross-national comparisons, the *European socio-economic classification (ESeC)*, has been developed which is explicitly based on the *EGP* class schema (Rose & Harrison, 2007). The German *ESeC* shows high criterion validity regarding the theoretical rationale behind the *EGP* class schema (for details see Wirth, Gresch, Müller, Pollak & Weiss, 2009).

¹⁷⁰ The variable *Stellung im Beruf* only covers the insurance-legal differentiation between employees in self-employed, civil servants (*Beamte*), white-collar employees (*Angestellte*), blue-collar employees (*Arbeiter*), apprentices and family workers.

¹⁷¹ While the approximated upper service class (*EGP* I) and the small proprietors or farmers (*EGP* VIabc) only marginally differ from the standard routine (Brauns et al., 1997), the lower service class (*EGP* II) is more exclusively defined in the approximated version. A substantial share of lower service class positions is assigned to higher-grade routine non-manual jobs (*EGP* IIIa). Conversely, higher-grade routine non-manual jobs also

In their seminal work, Erikson and Goldthorpe (1992: 46) emphasize that the *EGP* class schema is an *instrument du travail* that can be further extended when there are good reasons to do so. Among others, Goldthorpe (2009: 29f.) recognizes the need for disaggregating the class schema in order to compare the effects of educational attainment between different types of employment.¹⁷² Educational attainment plays different roles within different labor market contexts (Bridges, 1996: 173). In order to test whether the importance of educational qualifications systematically varies between different types of employment, I further distinguish the *service class* into different segments. A disaggregated analysis is crucial in assessing whether *compositional changes* in the occupational structure on the West German labor market account for changes in the ED association over time. The three service class segments are *administrative or managerial occupations (1)* such as managers, accountants or governmental and non-governmental administrators, *technical expert positions (2)* such as engineers or scientists and *social and cultural services (3)* such as medical services, education, social work, services related to cultural activities in the arts, media etc. (for a detailed listing of occupations in upper and lower service class and the service class segments see Tables A4-A5).¹⁷³

This differentiation was used to explain class-specific electoral behavior in the German context (Müller, 1998b; Müller, 1999a) and is similar to Oesch's (2003) conceptual reassessment of the Goldthorpe class schema.¹⁷⁴ Güveli (2006) also differentiates between *social and cultural specialists* as new and *technocrats* as old service class segment in the Netherlands and can externally validate her concept with several outcomes e.g. political

include a substantial fraction of skilled manual workers (*EGP VI*). This is due to the fact that *Stellung im Beruf* identifies these individuals as white-collar employees (*Angestellte*), while detailed information on *Stellung im Betrieb* indicates them as specific blue-collar groups. By contrast, lower technicians and skilled manual workers (*EGP V/VI*) contain a fraction of unskilled workers (*EGP VII*). In order to test whether approximated and standard *EGP* version have impact trends in the ED association, I also run analyses with this standard routine (see footnote 187). However, applying this involves another problem: The measurement of detailed employment status (*Stellung im Betrieb*) has strongly changed between 1995 and 1996 *Microcensus*. Therefore, changes in the ED association between 1982 and 1995 are hardly comparable to period 1996-2008 and have to be interpreted with caution.

¹⁷² Brauns et al. (1997: 13) also stress the necessity to disaggregate classes: 'A detailed study of the relationship between tertiary education and service class employment and in particular of changes in this relationship would therefore imply to account for the composition of service class jobs and for compositional changes.'

¹⁷³ Service class positions in social and cultural segments that predominantly perform supervisory or managerial duties are coded into the category *administrative and management (1)*.

¹⁷⁴ Goldthorpe (2009: 29) himself suggests the differentiation between professional and technical jobs on the one hand and managerial, administrative or sales jobs on the other hand. I refrain from using a new classification of graduate occupations, known as *Standard Occupational Classification (Higher Education) (SOC [HE])* (Elias & Purcell, 2004b) since it was developed and tested only for the British labor market and cannot be easily transferred to German occupational classification.

preferences (Güveli, Need, & De Graaf, 2007).¹⁷⁵ While *technocrats* combine administrative and managerial positions with technical experts, the *social and cultural capitalists* are more or less identical with the social and cultural services used in the classification for this analysis. In my opinion, it is worthwhile to sustain the differentiation between administrative and managerial positions and technical experts since they significantly differ in their function within the division of labor (Goldthorpe, 1982: 169). While technical expert jobs are more knowledge-intensive and rely more strongly on specific skills, employees in managerial and administrative jobs primarily delegate employer authority (Goldthorpe, 2007d: 113). In this disaggregated analysis, I do not further differentiate between upper and lower service as this upper-lower distinction appears to be less important than the segmental distinction with regard to social mobility patterns (Güveli, Luijkx, & Ganzeboom, 2012).

7.4.2 *Statistical methodology*

In order to illustrate changes in *absolute* returns to education that are directly influenced by the interplay between educational expansion and occupational upgrading, I concentrate on access to the service class positions, which are traditionally assumed adequate for higher education graduates (Müller et al., 2002). Macrostructural supply and demand changes for highly skilled individuals should be mainly reflected in allocation to these positions. In order to detect potential processes of crowding-out, *absolute* returns are not only considered among tertiary graduates but also among intermediate and lower educational groups. For higher education graduates (differentiating *CASMIN* 3a and 3b), graduates at the secondary level (differentiating *CASMIN* 2ab and 2c) and graduates at the elementary level (*CASMIN* 1abc) *absolute* returns are indicated as the predicted probabilities of attaining the service class.

To test changes in the ED association over time, the literature suggests the *uniform difference model (UNIDIFF)* (Erikson & Goldthorpe, 1992) or the identical *log-multiplicative layer effect model* (Xie, 1992), which have become standard tools in social mobility research. Log-linear and log-multiplicative models are characterized by measures of *odds-ratios*, which are invariant to changes in the marginal distributions (Powers & Xie, 2000: chapter 4) and thus partial out differences among the educational and occupational distribution over time. Due to margin insensitivity, I am able to look at class returns in *relative* terms independently

¹⁷⁵ Almost all these approaches on new class conceptions go back to Kriesi's work (1989). He differentiates *technocrats* further into four subgroups, among them *administrative and commercial personnel* and *technical specialists*.

of the degree of educational expansion and occupational upgrading.¹⁷⁶ Moreover, log-linear and log-multiplicative models are advantageous as they allow me to study relationships between nominal variables. This is a desirable trait for studying the ED association, as the *EGP* class schema cannot be hierarchically ordered (Erikson & Goldthorpe, 1992): While members of the service class are clearly advantaged and manual workers disadvantaged in terms of labor market rewards, difficulties of one-dimensional ordering particularly arise for intermediate classes such as farmers or the petty bourgeoisie (Chan & Goldthorpe, 2007: 154).

Using one multiplicative scaling factor (Φ), the *UNIDIFF* model estimates the change in all local *log-odds ratios* of the two-way table between educational attainment (E) and class destinations (D) over a specified layer (in this case period P). Overall, the three-way contingency table (8 *CASMIN* groups x 8 *EGP* class destinations x 23 periods) comprises 1472 cells. The model can be written as follows:

$$\log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \Phi_k \Psi_{ij}$$

where $\log F_{ijk}$ is the natural logarithm of the expected frequency in cell ijk , μ is the intercept, μ_i^E , μ_j^D , μ_k^P are the main effects of the distribution of individuals over educational credentials, class destinations and periods respectively and μ_{ik}^{EP} , μ_{jk}^{DP} indicate variation in the margins across periods and thus control for changes in educational and occupational distribution. The last term, Ψ_{ij} , indicates the general pattern of educational association and Φ_k , the relative strength of the association specific to that period. Thus, the ED association follows the same qualitative pattern but with different strengths in each *Microcensus* year. Technically, the phi parameter (Φ) indicates by which factor *log-odds ratios* of the ED table have to be multiplied in comparison to a reference period. Hence, the expected *log-odds ratios* for different periods will move uniformly either towards or away from statistical independence. The phi parameter is conventionally fixed at 1 for the first period. If the ED association increases in relation to the reference period, then the phi parameter will surpass 1; if the association weakens, the phi parameter will be lower than 1. This model is parsimonious as it only expends 22 degrees of freedom to test this three-way interaction.¹⁷⁷

¹⁷⁶ However, Logan (1996b) shows that the mathematical property does not guarantee that the association is unaffected by demand shifts. Margin insensitivity does not imply demand insensitivity. Nevertheless, log-linear models take macrostructural changes as exogenous and thus can be useful for the analysis at hand.

¹⁷⁷ If we assume that the ED association varies freely from period to period, we come up with the saturated model. However, this model lacks parsimony because it specifies $(I-1)*(J-1)*(K-1)$ parameters and provides a poor test of the existence of cross-period variation in the ED association. Parsimony in the *UNIDIFF* model,

Since theoretical arguments on changes in the ED association refer to the expansion of higher education and compositional changes in the service class, the second part of the analysis concentrates on *relative* returns to higher education in access to service class positions. A more detailed look at the service class is justified because changes in the occupational distribution have taken place particularly at the top of the occupational hierarchy, given service class expansion (see chapter 5.4). While occupational upgrading first and foremost came at the expense of (skilled) worker positions (*EGP* VI/VII), there seem to be little indication of job polarization in West Germany in terms of an increasing number of low-skilled personal service jobs (*EGP* IIIb). Hence we do not need to focus so greatly on the changing returns among intermediate classes (for access patterns into low-skilled jobs see chapter 6.4.3).¹⁷⁸

Among university (*CASMIN* 3b) or *Fachhochschule* (*CASMIN* 3a) graduates, I compare the *relative* chances - indicated as *log-odds ratios* - of attaining a service class position in comparison to *Abitur* holders (*CASMIN* 2c). In contrast to the sixth chapter, I consider *log-odds ratios* in order to be consistent with previous log-linear models on the overall ED association. *Log-odds ratios* or *odds-ratios* are still the standard measurement for relative mobility rates or relative returns to education net of changes in marginal distributions. However, I am aware that trends in *log-odds ratios* across survey years may be biased since they capture variations in residual variance across points in time (see chapter 6.3.2). Therefore, I also calculate *average marginal effects* (*AMEs*) as robustness check.

Abitur holders are chosen as the reference group because they are most likely capable of competing with tertiary graduates for service class positions and have also grown throughout educational expansion. Moreover, they represent a cogent comparison group because *Abitur* holders with vocational training do not show a considerably different selectivity pattern from higher education graduates with regard to employment over time (see chapter 6.4.2). Educational groups below *Abitur* have generally low chances of attaining service class positions and thus should not threaten tertiary graduates. Nevertheless, I also consider lower educated groups with *Realschule* (*CASMIN* 2ab) and *Hauptschule* (*CASMIN* 1abc) degrees in order to see whether access to service class positions has become more or less exclusive among the highly educated.¹⁷⁹ Here, we have to be aware that particularly

however, is only achieved at the cost of a strong simplification: We assume stability in the qualitative pattern of the ED association across periods.

¹⁷⁸ Moreover, I concentrate on service class because this measurement deviates least from the standard routine to operationalize the *EGP* class schema compared to other classes (see footnote 171).

¹⁷⁹ Such as in the analysis on *absolute* returns, the eight-category version of the *CASMIN* scale is condensed to five categories. Aside from differentiating between lower and upper tertiary institutions, I only take the vertical

CASMIN group 1abc has become a more selective group in terms of employment over the course of time. Hence, when interpreting the results we have to keep in mind that the effects of educational attainment in access to the service class are probably underestimated.

As to the disaggregated class analysis, I run several multinomial logit models for different periods. The dependent variable consists of four categories: administrative and managerial positions, technical expert positions, social services and non-service class positions (*EGP* III-VII). First, I present changes in *log-odds ratios* of being in one of the three specific service class segments instead of being in a non-service class position among different *CASMIN* groups over time. Irrespective of changes in marginal distributions, this indicates differences between these service class segments in terms of the value that is attached to educational credentials in job allocation and likewise whether there are any changes in these different relationships across time. Second, I show trends in predicted probabilities of attaining one of the specific service class segments for every *CASMIN* group in order to illustrate how changes in service class composition actually affect education-specific access patterns into the service class over time. An additional reason based on methodological grounds is that in multinomial logit models, the algebraic signs of the *log-odds ratios* do not necessarily correspond with the algebraic signs of the respective probabilities (Brüderl, 2000). A *CASMIN* group may have a positive (negative) *log-odds ratio* compared to another group regarding for instance the contrast administrative/management vs. classes III-VII, but has a lower (higher) probability of attaining this service class segment than the comparison group. In order to interpret the effects of educational credentials in multinomial logit models in a profound way, we must consider predicted probabilities as well. In a last step, I compare the *relative* value of educational credentials in access to the service class between public service and private industry over time.

7.5 Empirical results

7.5.1 Relevant macro-level developments

Gangl (2003b) has shown that the *business cycle* yields no significant effects on occupational returns to education among labor market entrants. In the theoretical section, I also did not propose any business cycle effects on returns to education in terms of occupational rewards.

dimension of *CASMIN* into account. This is because vocational training appears to be less beneficial when considering high-skilled occupational positions (Shavit & Müller, 2000). Moreover, *CASMIN 1ab* and *1c* are merged together because these groups have exceptionally low chances of being employed in service class positions (see Table C8). *CASMIN 2a* and *2b* as well *2c_gen* and *2c_voc* are also merged together due to a low number of cases in general tracks *2a* and *2c_gen*.

Hence, I concentrate on two macro-level factors, *educational expansion* and *occupational upgrading*, assuming that these developments are most relevant for trends in *absolute* and *relative* returns to education.

The interplay between educational expansion and occupational upgrading

In order to measure the balance between educational expansion and occupational upgrading over time, I look at the ratio between the demand for high-skilled individuals in the labor market, according to the proportion of service class positions (*EGP* I and II), and the supply of high-skilled people, based on the proportion of tertiary graduates (*CASMIN* 3a and 3b) at each time point. Hence, ratios above one indicate an oversupply of service class positions while ratios below one imply an undersupply of adequate occupational positions among tertiary graduates.

For both sexes, Table 12 clearly shows that the proportion of service class positions is higher than the proportion of tertiary graduates at all points in time. Particularly, female tertiary graduates from higher education appear to have more than sufficient job opportunities in the service class. However, a large fraction of these positions among women are semi-professional jobs in the lower service class. Due to low supply of female higher education graduates in the 1970s, most semi-professional positions were filled with women without a higher education degree in this period. From the end of the 1970s through the 1980s, the supply/demand ratio decreased for both sexes, meaning that educational expansion grew faster than the occupational upgrading, especially among women. Consequently, an increasing number of tertiary graduates had to compete for relatively fewer service class positions. Nevertheless, tertiary graduates may have increased their *relative* returns and displaced lower educational groups from preexisting service class positions. But this may not fully counterbalance the disequilibrium between educational expansion and occupational upgrading during these times. Across the 1990s, the ratio remained more or less constant for men, while job competition slightly increased among female tertiary graduates. In the 2000s, the balance between educational expansion and occupational upgrading stayed stable for women. For male graduates, occupational upgrading increased slightly more than educational growth in most recent periods. Still, for female graduates from higher education, relatively more service class positions have been available in most recent periods than for men.

Summing up, both male and female tertiary graduates were confronted with increasing job competition at the end of the 1970s as well as across the 1980s. This should be reflected in decreasing *absolute* returns to higher education in terms of accessing the service class, particularly for women. From then on, job competition became less pronounced for women

and improved for men. For this reason, *absolute* returns to higher education may have – if at all – only marginally decreased for women, while they may have even slightly increased for men.

Table 12 Ratio between share of service class positions and share tertiary graduates

	Men	Women
1976	1.57	3.35
1978	1.46	2.94
1980	1.43	2.81
1982	1.41	2.59
1985	1.28	2.26
1987	1.26	2.08
1989	1.25	1.93
1991	1.19	1.83
1993	1.17	1.78
1995	1.15	1.80
1996	1.17	1.70
1997	1.16	1.59
1998	1.16	1.56
1999	1.20	1.67
2000	1.23	1.61
2001	1.24	1.55
2002	1.22	1.59
2003	1.28	1.58
2004	1.31	1.59
2005	1.35	1.66
2006	1.37	1.65
2007	1.35	1.64
2008	1.32	1.52

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Compositional changes

One of the major reasons why previous researchers have found that the ED association has decreased in some European countries may be due to compositional changes in the occupational structure. Therefore, it is necessary to descriptively consider the structure of the service class and its changes over time. Table 13 indicates the proportions of these three segments, *administrative and management*, *technical experts* and *social services*, among the population and among the service class (for detailed distributions over time see Tables C9-C10).

For men, these three occupational areas were nearly equally important in the first period. Of all three segments, the administrative and management segment expanded the most over time and is thus predominantly responsible for occupational upgrading in West

Germany. While the share of expert positions moderately increased, social services contribute less to the expansion of the service class. As indicated by the service class distribution, the compositional changes already started before the greater expansion of the service class in the second half of the 1990s, where all three segments but with different strengths contributed to the expansion. While administrative and managerial positions continued to expand at the beginning of the 2000s, upgrading has completely stopped among the other segments. Compositional changes had completely come to a standstill in the last period. In fact, compositional shifts have led to a decrease in expert positions rather than social services in the 2000s. At present, administrative and managerial positions represent almost half of the service class positions while the proportion of professional positions in the social services has shrunk to a quarter. This is not because positions in social services have disappeared but because the administrative and management segment has expanded much more relative to rather stable social services. Hence, between the 1980s and mid-1990s, we see a remarkable occupational shift in favor of administrative and managerial positions for men that came mainly at the expense of professional social services.¹⁸⁰ For technical experts, their numerical importance somewhat increased through the end of the 1990s, but decreased again afterwards.

Table 13 Compositional changes within the service class (in per cent)

	Total				Service class			N
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	
Men								
1976-1980	6	7	7	80	31	32	37	30956
1982-1987	7	7	7	79	33	32	35	36958
1989-1993	9	8	6	76	39	34	27	31624
1995-1999	14	12	8	66	41	36	23	41523
2000-2004	17	12	8	63	46	33	21	37578
2005-2008	17	11	8	64	48	30	23	25120
Women								
1976-1980	5	2	13	80	24	10	66	25774
1982-1987	5	2	15	77	24	9	67	31071
1989-1993	7	3	15	75	30	11	60	27753
1995-1999	13	4	17	66	37	12	51	35374
2000-2004	13	4	20	62	36	11	53	31907
2005-2008	14	4	21	61	36	10	54	23236

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* ^a = administrative and management; ^b = experts; ^c = social services.

¹⁸⁰ Although Güveli et al. (2012) label *social and cultural specialists* as new and *technocrats* as old service class segment, an increasing proportion of *technocrats* over time can also be seen in the Netherlands.

Among women, the most predominant employment segment in the service class were (semi-)professional social service positions at the end of the 1970s. At this time, two third of female labor market entrants were employed in this occupational segment. Not surprisingly, the proportion of female technical experts has continued to be low. The segment of technical experts only marginally contributes to female service class expansion. As in the case of men, service class jobs shift towards administrative and managerial positions at the cost of professional social services positions. While both segments expanded, social services expanded at a lower rate relative to administrative and managerial occupations. This compositional change started at the end of the 1980s and solidified in the 1990s. For women, compositional changes came to a standstill at the beginning of the 2000s. Still, more than half of women that enter the service class are employed in social services in recent periods.

Table C11 additionally indicates the service class composition among public and private sector separately as well as the overall percentages in the total sample. Again, the figures in parentheses stress that occupational upgrading in the public service has been non-existent for men and limited for women (see chapter 5.4). As one would expect, social services are the dominant service class segment in public service, particularly among women. While the share of social services among service class positions somewhat increases in public service for men, for women the share somewhat decreased over time. Hence, for men, it is the expansion of social services that keeps the total share of public sector service class positions constant amidst a shrinking public sector (see Table 6). For women, both segments of social services and administrative/management contributed to the moderate service expansion in the public service.

As already pointed out, occupational upgrading has overwhelmingly taken place in private industry. For men, the proportion of private industry social service positions remained constantly small over time. While the proportion of expert positions increased across the 1990s, it decreased further in the 2000s. Above all, the growth in administrative and managerial positions in private industry contributes to the overall service class expansion for men. For women, both segments of social services and administrative or managerial positions expanded in the private sector over time. Hence, the expansion of a female-dominated social service sector in the private industry inhibits a stronger compositional change towards administrative and managerial positions among women.

Overall, compositional changes in the service class are evident for men and women.¹⁸¹ Nevertheless, this does not necessarily imply that these compositional changes have negative consequences on returns to education over time. This requires that access to the administrative/management segment is less dependent on educational attainment than in the other segments.

7.5.2 Trends in absolute returns to education

How do *absolute* returns to education in terms of access to the service class develop amidst educational expansion and occupational upgrading in West Germany? Figure 11 indicates predicted probabilities of attaining service class positions for both sexes and five *CASMIN* groups. The ranges within capped spikes illustrate 95% confidence intervals (CI).

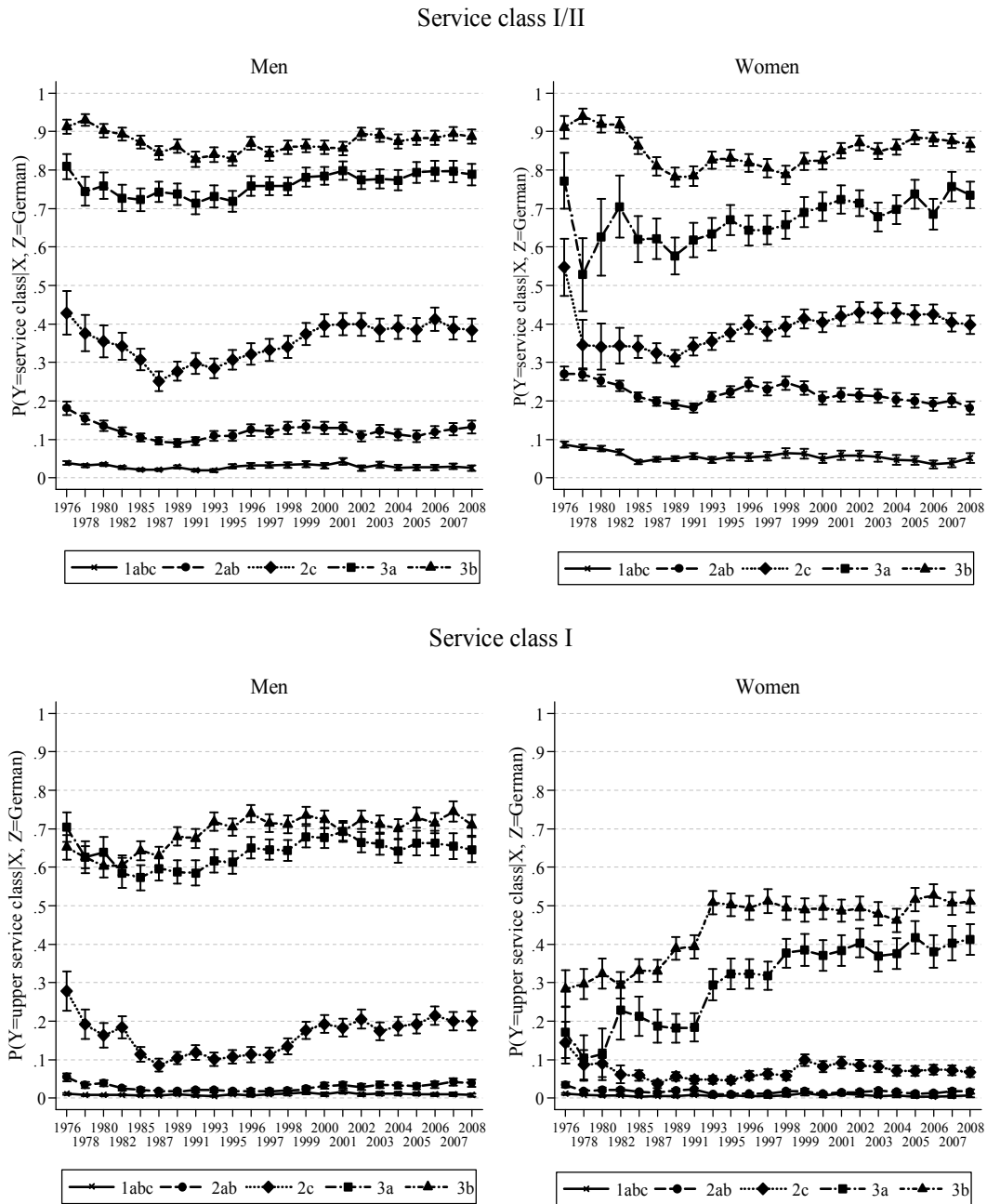
Among men, university graduates had an exceptionally high probability of attaining a service class position at the end of the 1970s. More than 90 per cent of male university graduates were able to find employment in a service class occupation. Across the 1980s, *absolute* returns to higher education became clearly worse: the probability of accessing the service class decreased around 10 percentage points. Since the mid-1990s university graduates' probability of attaining the service class had been increasing again. Although it does not reach full base level parity, male university graduates still have high *absolute* returns: Across the whole period, male university graduates' access probabilities did not dip below 80 per cent. As expected, *absolute* returns to university education decreased in the 1980s, when occupational upgrading lagged behind educational expansion. It likewise increased again in the following decades when job competition became less severe. *Absolute* returns for male *Fachhochschule* graduates sharply declined between the first *Microcensus* years. Apparently, they were strongly hit by crowding-out due to structural imbalances at the end of the 1970s. However, *absolute* returns for *CASMIN* 3a graduates only marginally decreased during the 1980s. Hence, they remained relatively isolated from structural imbalances in this decade. In the 1990s, the probability of attaining service class positions strongly increased for male *Fachhochschule* graduates again. Leaving 1976 out, *absolute* returns to *Fachhochschule* have been increasing in the long run. Still, these graduates significantly differ in their probabilities of attaining the service class from university

¹⁸¹ To ensure that this result is robust, we consider compositional changes when applying the standard routine for the operationalization of the *EGP* class schema (see Table B3). In general, the share of administrative and managerial positions is somewhat larger than in the approximated scheme. Accordingly, the importance of this segment has already been more pronounced in the mid-1970s. Distributional changes in this *EGP* routine, however, confirm the evidence on compositional changes towards administrative and managerial positions over time.

graduates. Thanks to an oversupply of tertiary graduates, all educational groups below tertiary level tended to be affected by crowding-out throughout the 1980s. This is particularly evident among *CASMIN 2c* graduates, whose probability strongly declined from more than 40 per cent to 25 per cent from the mid-1970s to mid-1980s. In these decades, increasingly more individuals had higher degrees than *CASMIN 2c* and displaced graduates with lower qualifications from high-skilled positions in the service class. Although having typically a low probability of attaining the service class, even male graduates from *CASMIN 1abc* experienced a decrease in *absolute* returns. For male *Abitur* holders, *absolute* returns strongly increased again from the mid-1980s onwards. Particularly during the 1990s, male graduates from *CASMIN 2c* were able to gradually increase their probability. The strongest increase for them is evident in period 1998-2000. Hence, *Abitur* holders appear to have profited most from occupational upgrading and less job competition in the 1990s, while university graduates seem to be less able to increase their attainment rates into the service class. Graduates below the *Abitur* experience no tremendous changes in their *absolute* returns over the last two decades.

As to access into the upper service class (*EGP I*), male university graduates experienced a slight decrease in their probability at the end of the 1970s. However, from the 1980s onwards, their access probability sharply increased. Since mid-1990s *absolute* returns to university education stayed constant around a probability of 70 per cent. Hence, for male university graduates, *absolute* returns in terms of attaining the most advantageous occupational positions have been increasing over time. For *Fachhochschule* graduates, the probability of attaining the upper service class substantially decreased until the start of the 1980s, but remained constant during this decade. While their probability strongly increased during the 1990s, it slightly decreased again at the beginning of the 2000s. Aside from significant probability differences in the 1990s, tertiary graduates did not substantially differ in their probabilities of attaining the upper service class. Surprisingly, access to the upper service class is rather unstratified by first-tier and second-tier higher education degrees. For men with *Abitur* certificates, changes in *absolute* returns are akin to that on overall service class positions: The probability sharply decreased until the mid-1980s and increased again from then onwards. Access to the upper service class is more selective than access to the service class as a whole: educational groups below *Abitur* have very low probabilities of attaining the upper service class. Likewise, *Realschule* and *Hauptschule* graduates do not differ much in their probabilities of attaining the upper service class.

Figure 11 Predicted probabilities of attaining the service class



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; Ranges within capped spikes indicate 95% confidence intervals (CI). *Citizenship* set on German.

Although the ratio between service class positions and tertiary graduates had already decreased at the end of the 1970s (see Table 12), female university graduates were at first able to keep their high probability of attaining the service class. During the 1980s, however, the access probability for university graduates declined sharply. As expected, *absolute* returns to university education decreased more strongly for women than for men. This can be attributed

to greater structural imbalance between occupational upgrading educational expansion among women and the fact that male tertiary graduates increasingly became jobless when labor supply exceeds demand (see chapter 6). Aside from a slight decrease in the 1990s, the probability of attaining the service class increased substantially for female university graduates from then onwards. While there was no continuous trend, *absolute* returns to university education have declined in the long run. While heavily fluctuating in the earliest periods, *absolute* returns to *Fachhochschule* have continuously increased since the beginning of the 1990s.¹⁸² Still, female *Fachhochschule* graduates have a substantially lower probability to access service class I than female university graduates in most recent times. Moreover, *absolute* returns are clearly lower for female graduates than for male graduates in *CASMIN* 3a. Female *Abitur holders* tended to be slightly affected by crowding-out across the 1980s.¹⁸³ Hence, female university graduates appear to have been less able to displace them during the 1980s. In addition to tertiary graduates, female *Abitur* holders were able to improve their *absolute* returns during the expansion of the service class across the 1990s and the start of the 2000s. For female graduates from *CASMIN* 2ab, the probability of attaining the service class continuously decreased from the mid-1970s to the beginning of the 1990s. While probabilities to access the service class have been decreasing for female graduates in *CASMIN* 1abc, female *Realschule* graduates tended to have been most affected by downward processes of crowding-out. As their *absolute* returns did not consistently increase, they benefited less from an increasing availability of service class positions and less pronounced job competition in more recent decades.

The probability of attaining the upper service class substantially increased for female university graduates during the observation period, particularly throughout the 1980s and the beginning of the 1990s. It rose from a probability under 30 per cent in the mid-1970s to a probability around 50 per cent at the end of the 2000s. Thus, *absolute* returns to university education in terms of accessing the most beneficial labor market positions have tremendously increased for women. For female *Fachhochschule* graduates, the probability of accessing the upper service class follows more or less the same trend as for the service class as a whole. Their probability to attain the upper the service class considerably increased, particularly in

¹⁸² The strong fluctuations may be due to a low number of female graduates in *CASMIN* 3a in mid-1970s and 1980s (see Table 4 in chapter 5.3), which is also reflected in large confidence intervals. Hence, we should be cautious in over-interpreting any meaningful trends for *CASMIN* 3a in this period.

¹⁸³ As with female *Fachhochschule* graduates, female *Abitur* holders experienced a sharp decrease in service class attainment between the first two observation points at the end of the 1970s. Again, this could be due to a low number of females in *CASMIN* 2c at this time.

the 1990s. Probability differences between graduates in *CASMIN* 3a and 3b decreased but were still significant. For female *Abitur* holders, the probability of attaining the upper service class strongly decreased from the mid-1970s to the end of the 1980s. Hence, female *Abitur* holders appear to be crowded-out by higher education graduates from upper service class positions. Furthermore, they do not seem to profit from the expansion of the upper service class as female tertiary graduates throughout the following decades. Female graduates below *Abitur* have a low probability of attaining the upper service class. A comparison of the lower figures illustrates that women still have distinctly lower *absolute* returns in terms of accessing the upper service class than men.

To sum up, this analysis provides evidence for first *hypothesis* concerning *absolute* returns to higher education. For both men and women, we do not see a consistent and substantially strong decrease in *absolute* returns to higher education since the mid-1970s up to now in West Germany. *Absolute* returns to university education declined only in the 1980s and increased again in the following decades. As expected, the decrease in *absolute* returns to university education has been stronger for women than for men. Overall, we do not see a consistent *devaluation* of higher education credentials over the course of time in West Germany.

7.5.3 Trends in the ED association

Table 14 shows fit statistics for different specifications of log-linear and log-multiplicative models. The total number of observations consists of $N = 175,438$ for women and $N = 203,906$ for men. The *conditional independence* model acts as a baseline model and allows marginal distributions to vary across periods while assuming that educational attainment and class destinations are independent. The *constant association model* allows for a relationship between these variables but specifies that the association is constant across all periods (see the model specifications in Table 14). The relevant fit statistics are G^2 as the likelihood ratio chi-square or *model deviance*, rG^2 indicates the log-likelihood reduction of the baseline model, and the *dissimilarity index* Δ (%) identifies the percentage of individuals that are wrongly classified by the specific model. The *Bayesian Information Criterion (BIC)* (Raftery, 1995) is highly relevant as a tool of model selection since it assigns a penalty for the estimation of extra parameters and thus rewards the parsimony of a model.¹⁸⁴

¹⁸⁴ *BIC* considers the likelihood ratio chi-square (G^2), the log sample size and the numbers of parameters and can be used to compare non-nested models. A negative value means that a constrained model should be preferred to the saturated model. Following this, the model with the most negative *BIC* value will be selected.

Table 14 Results of modeling change in ED association

Model ^a	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
Men (N=203,559)							
Cond. ind.	162989.3	1127	0.00	-	35.6	149213.2	-
Const. assoc.	3376.6	1078	0.00	97.9	4.0	-9800.6	-
<i>UNIDIFF</i>	3170.9	1056	0.00	98.1	3.8	-9737.3	0.000
Women (N=175,115)							
Cond. ind.	99164.0	1127	0.00	-	28.7	85557.5	-
Const. assoc.	3384.2	1078	0.00	96.6	4.1	-9630.7	-
<i>UNIDIFF</i>	3242.1	1056	0.00	96.7	4.0	-9507.2	0.000

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; Notes: 23 periods (P) by 8 educational levels (E) by 8 class destinations (D).

^a Model specifications:

$$\text{Conditional independence: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP}$$

$$\text{Constant association: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \mu_{ij}^{ED}$$

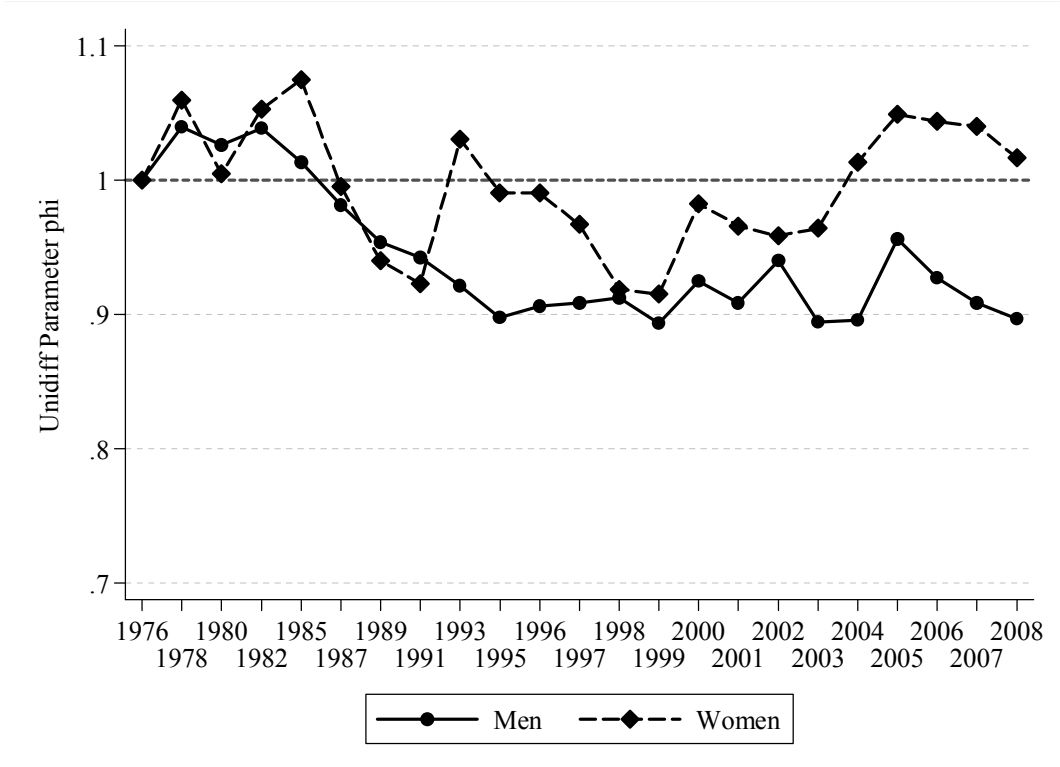
$$\text{UNIDIFF: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \Phi_k \Psi_{ij}$$

Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with difference in G² between *constant association* and *UNIDIFF*.

For both sexes, the *conditional independence* model fits poorly according to all fit statistics. Unsurprisingly, there is an association between educational attainment and class destinations. In comparison to *constant association* model the *UNIDIFF* shows a slightly larger reduction of *deviance* and misclassifies 0.2 per cent fewer cases. Although the *UNIDIFF* model yields a significant improvement in model fit, the more negative *BIC* value of *constant association* model compared to *UNIDIFF* indicates that the *UNIDIFF* model is not worth the loss of 22 degrees of freedom. Hence, the *constant association* model is the preferred model among men. In the case of women, the *UNIDIFF* is also a significant improvement in comparison to the *constant association* model and explains at least 96.7 per cent of the ED association. Thanks to its more negative *BIC* value, the parsimonious *constant association* model is preferred over *UNIDIFF* among women.¹⁸⁵ Overall, we must assume constant relationship between educational attainment and class destinations in West Germany over the course of time for both sexes.

¹⁸⁵ Both *constant association* models for men and women fail to give a satisfactory fit to the data (indicated by the p values). The poor fit can be attributed to the large sample size and thus should not be a major issue. With large sample sizes one can expect that all estimated models predict cell frequencies that significantly deviate from the observed ones. Thus, the rejection of the models may result from quite trivial differences between observed and estimated frequencies and does not change the overall results.

Figure 12 Change in the strength of the ED association (*UNIDIFF* parameter phi)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Nevertheless, some - not substantially large - variations in the ED association across points in time seem to be evident. In order to identify in which direction change goes or whether there are periodical up- and downturns, Figure 12 indicates the phi parameter under the *UNIDIFF* model for both men and women. The phi parameter illustrates changes in the strength of the ED association in comparison to 1976, which is fixed at value 1. Compared to the reference year the phi parameter increased in the following years for both sexes, particularly women.¹⁸⁶ From 1982 through mid-1990s, the ED association had been continuously decreasing among men. Nevertheless, a phi parameter of 0.9 does not indicate a dramatic decline in the ED association compared to 1976. Since then, the phi parameter remained rather constant for men, indicating a stable ED association until the end of the observation period. In this period, the phi parameter increases in some years though generally returns to the lower level of 0.9. Hence, the ED association is clearly not as strong at present as it was in the 1970s. At the same time, the decreasing ED association has not been exceptionally strong given a time span of over 30 years. For men, the most salient change was the continuous decrease across the 1980s and the first half of the 1990s. Apparently, this

¹⁸⁶ Since I do not have information before 1976, the specific reference point may represent a downward outlier in the 1970s.

decline in the ED association was not strong and consistent enough to prompt a significant uniform change as specified in the *UNIDIFF* model.

For women, the phi parameter does not show a consistent trend over the last thirty years. We only see up- and downturns where the phi parameter periodically returns to the base level. Only at the end of the 1980s and 1990s decade the ED association slightly decreased. At present, the ED association among women is even slightly stronger than in the reference year. But this may be a temporary fluctuation. Overall, given the long period of time, the ED association has remained more or less constant for women.

Summing up, the *UNIDIFF* model did not reveal any indication of a consistent and strong decline in the association between education and occupational destination upon labor market entry for either sexes.¹⁸⁷ So far, the results do not give hints at a steady decoupling of the relationship between educational attainment and class destinations in West Germany. Only for men, the phi parameter indicates a moderate decrease in the ED association across the 1980s and the first half of the 1990s. Nevertheless, this analysis provides evidence for the *second hypothesis* on a rather persistent ED association in West Germany.

7.5.4 Trends in relative returns in access to the service class

Figure 13 shows education-specific *log-odds ratios* of attaining positions in the service class (upper graphs) and the upper service class (lower graphs) for men and women. In this case, the reference category is *Abitur* holders (*CASMIN* 2c), indicated by the zero lines.¹⁸⁸ Hence, Figure 13 illustrates the upper part of the ED association in more detail. As with the overall association, the *log-odds ratios* illustrates *relative* changes between educational groups in

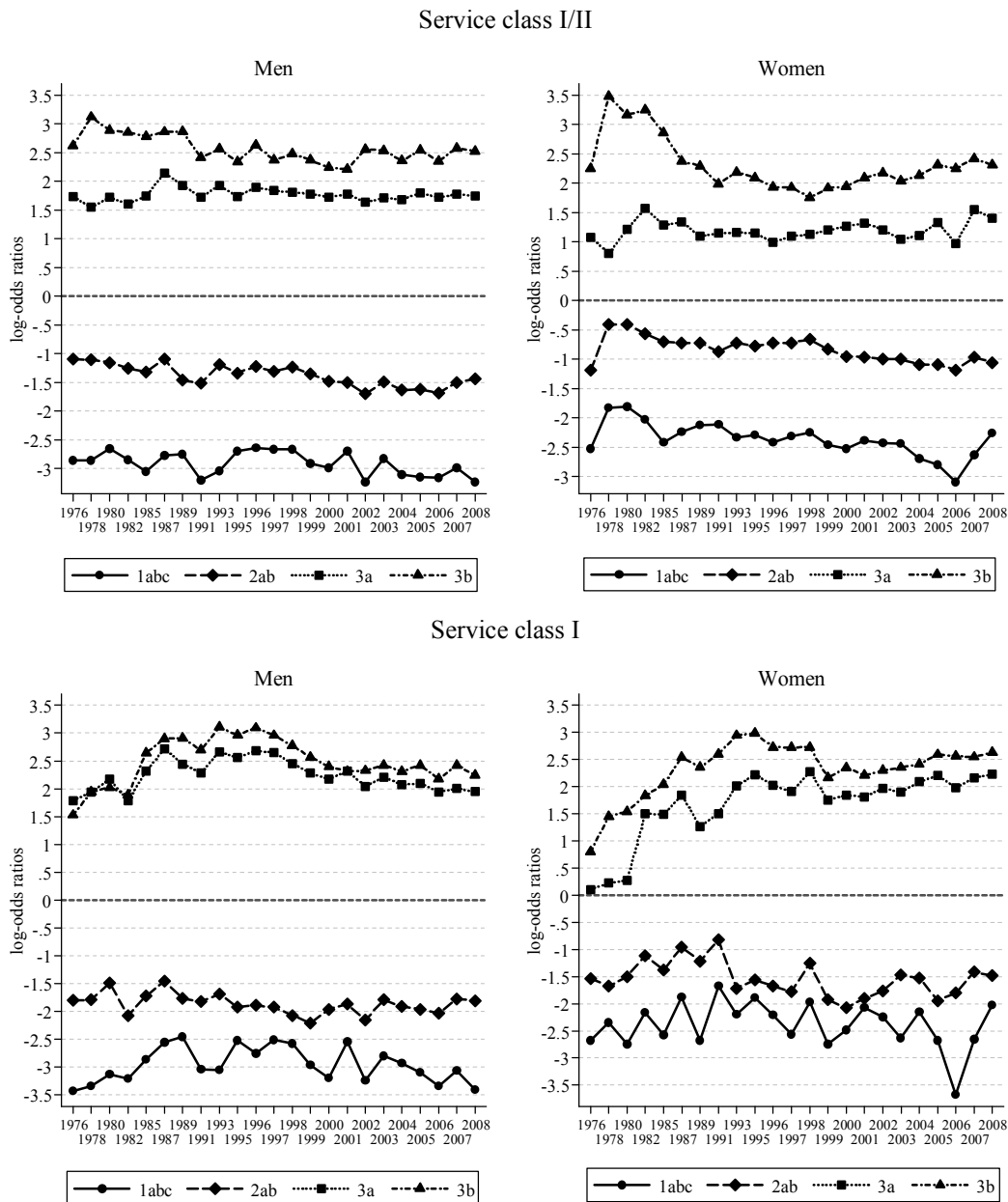
¹⁸⁷ The contingency tables do not further differentiate between German and foreign citizens that may have received their educational certificate in their home country. As foreign credentials are in most cases not comparable with German ones, changes in the ED association could be biased, particularly in the early periods. However, sensitivity analyses with log-linear and log-multiplicative models on West German citizens only do not reveal any different trend in the ED association for both sexes (see Table B4 and Figure B1).

Another sensitivity analysis shows changes in the ED association when using the standard routine to operationalize the *EGP* class schema. Hence the layer variable only consists of 11 periods: 1982, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 2000, 2004 and 2007 (see Table B5). Please note that the reference period is 1982 instead of 1976. The robustness check reveals that *constant association* is the preferred model for both sexes according to *BIC* values. Nevertheless, there are some differences in comparison to Table 14 regarding the fit statistics of the *UNIDIFF* model. While the *UNIDIFF* even fits the data less well for men, the fit statistics for women's *UNIDIFF* indicate a somewhat greater variation in the ED association over time. Figure B2 illustrates these changes in *UNIDIFF* parameter Φ . For men, the phi parameter remains constant between 1982 and 2007. Only in the first half of the 1990s the ED association had been slightly decreasing. While Figure 11 shows up- and downturns around the base level for women, Figure B2 reveals a more substantial decrease in the ED association across the 1980s. However, from mid-1990s onwards the phi parameter converges onto the base level again. Overall, this sensitivity analysis confirms the results on a persistent ED association in West Germany.

¹⁸⁸ It seems reasonable to further distinguish the upper service class (I) from all other classes (including service class II) since upper-level positions clearly guarantee the most beneficial rewards associated with a service relationship (Erikson & Goldthorpe, 1992: 43).

reaching the service class, independent of quantitative shifts in the educational and occupational distribution.

Figure 13 Relative access chances into the service class (*log-odds ratios*)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008. Notes: *log-odds ratios*; reference category: *CASMIN 2c*; controlling for *citizenship*.

For male university graduates (*CASMIN 3b*), relative chances of attaining service class positions have not tremendously changed over the last thirty years. Between the late 1970s and the late 1990s, these chances slightly decreased compared to *Abitur*-holders, particularly

between the 1980s and 1990s. In the 2000s, the *relative* advantages over *Abitur* holders somewhat increased again. Across the 1990s and 2000s, *relative* chances of entering the service class for male university graduates remained largely stable. While these *relative* advantages among male university graduates decreased in the long run, this cannot be interpreted as a substantial downward trend in the relative value of education in the labor market. As *relative* returns for university graduates only marginally changed throughout the 1980s, they did not significantly contribute to a decline in *absolute* returns to university education during this time (see Figure 11).

The *relative* chances of reaching the service class for male *CASMIN* 3a graduates remained even more stable over time. While there were fluctuations in the 1980s, access chances for male *Fachhochschule* graduates did not considerably change in the 1990s and 2000s relative to male *CASMIN* 2c graduates. Comparing graduates from *CASMIN* 3a and 3b, *relative* returns have slightly converged during the 1980s. In the following decades, however, the *relative* distances stayed constant. At present, male university graduates still have substantial *relative* advantages in terms of attaining the service class over male graduates from *CASMIN* 3a. Hence, we do not see a trend towards a decreasing gap in labor market outcomes for male graduates from these institutions as Müller et al. (2002). Male graduates from *CASMIN* 2ab and 1abc clearly have lower *relative* chances of attaining service class positions than *Abitur* holders. Both educational groups below *Abitur* experienced declining *relative* returns in access to the service class in the long run. *Relative* disadvantages tended to become particularly strong in the 1980s and at the end of the 1990s. Thus, decreasing *absolute* returns for the lower educated groups may not only be attributed to *structural crowding-out* but also to a *devaluation* of credentials below *Abitur*. Comparing lower educated groups, male *CASMIN* 2ab graduates clearly have higher chances of attaining service class positions than male graduates from *CASMIN* 1abc. We probably underestimate the negative trend for *CASMIN* 1abc graduates, as they have become a more selective group in terms of participation in employment. Hence, access to the service class has even become more exclusive for men above *Abitur*. Considering the long time period, changes in the *relative* value of educational credentials have been modest for male labor market entrants in West Germany.

Analyzing the upper service class separately, *relative* chances for male tertiary graduates from *CASMIN* 3a and 3b strongly increased over time until the mid-1990s. From then on, the *relative* chances over male *Abitur* holders decreased again, particularly at the end of the 1990s. Most recently, *relative* returns in access to the upper service class are higher

than the base level in the mid-1970s for male graduates with both tertiary degrees, particularly for university graduates. Hence, the *relative* value of tertiary education in access to top-level positions has been somewhat increasing over time. As already indicated for *absolute* returns, male *Fachhochschule* graduates do not substantially differ from male university graduates in their *relative* chances of attaining the upper service class. Considering results from the upper graph, university graduates have stronger *relative* advantages over *Fachhochschule* graduates in access to the lower service class.¹⁸⁹ While there are up- and downturns in the *log-odds ratios* for male *CASMIN* groups below *Abitur*, a consistent trend across the observation period in access to the upper service class is not identifiable.¹⁹⁰

Aside from a strong increase in *log-odds ratios* between the two first *Microcensus* years, *relative* returns to university education in access to the service class decreased more strongly for women than for their male counterparts. Particularly between 1982 and 1987, *relative* returns in comparison to female *Abitur* holders sharply declined and continued to do so into the 1990s. Hence, a decline in the *relative* value of university degrees contributes to the strong decrease in *absolute* returns to university education among women in the 1980s. At the end of the 1990s, *relative* returns for female university graduates started to increase again but clearly did not regain the exceptionally high base level at the end of the 1970s. Nevertheless, other than with men, relative service class returns have been somewhat increasing among female university graduates in recent times. Among female *Fachhochschule* graduates, *log-odds ratios* tended to fluctuate in the 1970s and 1980s, but slightly increased from the 1990s onwards. In the long run, Figure 13 illustrates a slight increasing trend in *relative* returns for female *Fachhochschule* graduates compared to female *Abitur* holders. Since *relative* returns for female university graduates decreased, female *Fachhochschule* graduates were able to reduce their *relative* disadvantages in service class attainment. As with men, a substantial gap between graduates from both tertiary institutions remains among women. Both female graduates from *CASMIN* 2ab and particularly from *CASMIN* 1ab have lower *relative* chances of attaining the service class than female *Abitur* holders. Leaving outliers at both ends of the observation period aside, *relative* returns for

¹⁸⁹ This circumstance may be due to different segmental distributions in upper and lower service class (see Table C12). While for men the share of positions in social services is much higher in the lower than upper part, technical expert positions are more frequently found in the upper than lower service class. Since *Fachhochschule* graduates are concentrated in technical fields of study as well as business and economics, they have considerably less access to positions in social services and particularly access the two other segments. This may explain the less marked disadvantages in attaining the upper than lower service class for male *Fachhochschule* graduates.

¹⁹⁰ The large fluctuations in *log-odds ratios* for *CASMIN* 1abc are due to their low probability of attaining the upper service class. The probability is always under or around one per cent for both sexes across the entire time span (see Figure 11 and Table C8).

Realschule graduates and *Hauptschule* graduates steadily decreased. Hence, access into the service class has become more dependent on educational qualifications above *Abitur* also among women.

Regarding women's access to the upper service class, university qualifications have clearly become more important. The strong increase in *relative* chances became more or less continuous from the mid-1970s to the beginning of the 1990s. Among female university graduates, *relative* access chances into the upper service class were exceptionally high in the early 1990s, but decreased throughout that decade. In the 2000s, the *relative* advantages over *Abitur* holders increased again. Hence, female university graduates substantially improved their *relative* advantages in attaining the most beneficial labor market positions. For female *CASMIN* 3a graduates, *relative* returns in access to the upper service class strongly increased, too. This improvement in service class returns meant that female *Fachhochschule* graduates were able to reduce their attainment disadvantages compared to female university graduates. Nevertheless, they are not able to outperform *CASMIN* 3b graduates in recent years. For both female *CASMIN* groups below *Abitur*, changes in relative returns do not indicate any consistent trend with regard to access to the upper service class. As with men, there are large fluctuations in *log-odds ratios*, particularly for *CASMIN* 1abc graduates over time (see footnote 190). Overall, access to the upper service class has become increasingly dependent on higher education among women.

Summing up, the preceding analysis on men's and women's service class access suggests there has been little change in *relative* returns to higher education for either sex.¹⁹¹ Nevertheless, *relative* returns to university graduates slightly decreased in comparison to *Abitur* holders between the 1980s and mid-1990s, particularly among women. Whether the slight decline in university graduates' *relative* returns is due to compositional changes in the service class will be discussed in the next chapter. As to the upper service class, the *relative* value of tertiary degrees has even increased, particularly again among women. Moreover,

¹⁹¹ The comparison of *log-odds ratios* or *odds ratios* across groups or samples – in this case survey years – may lead to wrong conclusions with regard to trends, as changes in logit coefficients of educational attainment could also indicate differences in unobserved heterogeneity across samples (see chapter 6.3.2). Therefore, the analysis has been replicated by calculating *average marginal effects (AMEs)* that are assumed to be unaffected by the *rescaling problem* in comparing coefficients from non-linear probability models across samples. Controlling for formal citizenship, Figure B3 shows that education-specific *AMEs* in reference to *Abitur* holders more or less follow the same trend as the *log-odds ratios* for both sexes. The only substantial difference can be seen in the upper graph for men: While *log-odds ratios* for *CASMIN* 2ab and *CASMIN* 1abc indicate rather decreasing *relative* returns from the mid-1970s to mid-1980s, *AMEs* clearly illustrate increasing *relative* returns in access to the service class. In general, the lower graphs show that - in contrast to *log-odds ratios* - *CASMIN* 2ab graduates are quite similar to *CASMIN* 1abc graduates in terms of accessing the upper service class when considering *AMEs*. Nevertheless, these slight differences do not alter the conclusion with regard to long-term trends: both measures reveal no substantial decrease in the effect of educational attainment on access to service class positions in West Germany.

graduates below *Abitur* gained less access to service class positions over the course of time.¹⁹² Overall, this provides further evidence for *second hypothesis* assuming no substantial changes in the ED association.

Figure 14 additionally illustrates whether educational credentials structure access to the service class in the same way for men and women net of different educational and occupational distributions. As this figure depicts, female university graduates had about the same *relative* chances in accessing the service class compared to male university graduates. Men tended to have larger *relative* returns to university education than women only in the 1990s. Regarding *CASMIN* 3a degrees, the *relative* chances of attaining the service class for women clearly lag behind those of men across all periods. Hence, the *relative* value of *Fachhochschule* degrees appears to be higher among males relative to females.¹⁹³ By contrast, women in *CASMIN* groups below *Abitur* have clearly better *relative* returns in access to the service class than their male counterparts. In general, educational attainment tends to play a slightly less pronounced role in structuring service class positions among women than among men.

Among the upper service class, the structuring of access chances by educational attainment is even more equal between the sexes. While the *relative* value of university education does not tremendously differ between sexes, more recently, university graduation provided even slightly better relative returns for women than for men. In the earliest periods, *relative* returns to *Fachhochschule* degrees were clearly better for men than for women. Over time, the relative *Fachhochschule* value among women increasingly converges onto men's

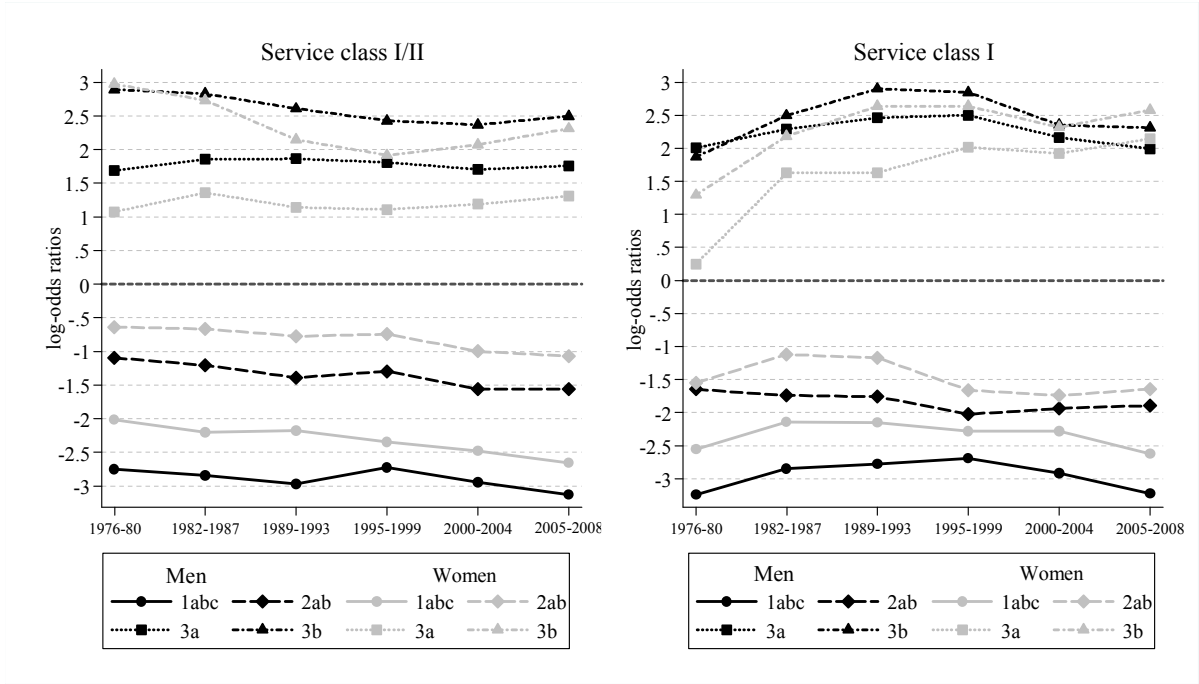
¹⁹² Figure C5 additionally differentiates between *relative* returns among general and vocational degrees below tertiary level. For men, general and vocational groups, particularly at elementary level, are rather similar in terms of accessing the service class and show more or less the same trends. Male *CASMIN* 2b graduates had significant relative advantages over vocationally qualified job seekers (*CASMIN* 2a) only in some years. By comparison, female *CASMIN* 1c graduates had significantly higher access chances into the service class relative to *CASMIN* 1ab graduates in most periods. However, female *Realschule* graduates with vocational training have *relative* disadvantages in comparison to their counterparts with general education (*CASMIN* 2b), which became even more severe over time.

Both female and male *Abitur* holders without vocational training (*CASMIN* 2c_gen) are able to reduce their relative disadvantages in access to the service class in the long run towards their peers with vocational training (*CASMIN* 2c_voc). The upgrading of *Abitur* holders is possibly related to two mechanisms: On the one hand, this group may consist of university dropouts that worked during studies and have been retained constantly or become self-employed e.g. in the IT sector. On the other hand, they may originate from higher social classes and thus have personality characteristics, soft skills or manners that enable them to gain access to high-skilled positions without further educational certificates.

¹⁹³ Female *Fachhochschule* graduates also have lower probabilities of attaining the service class than male *Fachhochschule* graduates particularly in the earlier period (see the upper graphs in Figure 10). This disadvantage, however, cannot be attributed to gender differences in the field of study choice at *Fachhochschule*. While women tend to opt more often for social services/education and men more often for engineering, field of study analyses with *Microcensus* data indicate that these fields do not substantially differ in terms of service class attainment among *Fachhochschule* graduates. Controlling for the field of study gender disadvantages in terms of attaining the service class prevail.

value.¹⁹⁴ While women had better *relative* returns to *CASMIN* 1abc than men across the observation period, the sexes did not substantially differ in upper service class returns to *CASMIN* 2ab most recently. Overall, access to service class positions on both gendered partial labor markets appears to be quite similarly dependent on educational attainment.

Figure 14 Comparing *relative* returns to education (*log-odds ratios*) between sexes



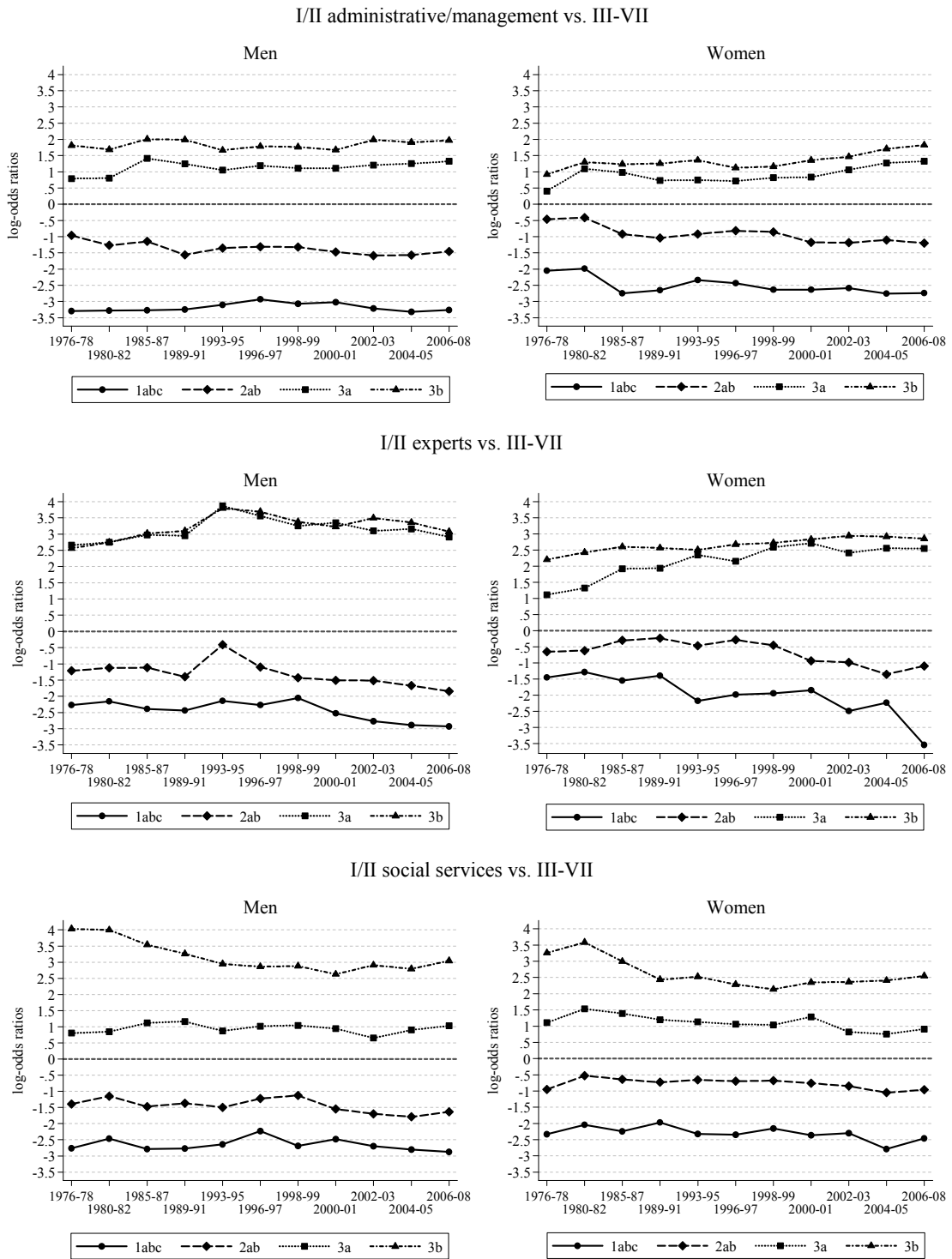
Source: German *Microcensus*, Scientific-Use-Files 1976-2008. Notes: *log-odds ratios*; reference category: *CASMIN* 2c; controlling for citizenship.

7.5.5 *Disaggregating the service class*

This disaggregated analysis explores whether selection on educational attainment varies between different service class segments and illustrates whether the *relative* value of education in these segments changes over time. Given general differences in the value of educational credentials among service class segments, changes in *relative* chances to access the service class – as found in the previous section - are either related to changes in this segment-specific value of educational attainment, to compositional changes in the service class or to both.

¹⁹⁴ At first sight, this may be surprising because male tertiary graduates clearly have higher access chances to access the service class than their female counterparts. The *relative* returns to tertiary education over the *Abitur* are similar for both sexes because *absolute* returns to *CASMIN* 2c are substantially lower for women than for men, too.

Figure 15 Educational attainment and access to different service class segments (*log-odds ratios*)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; Notes: *log-odds ratios* from multinomial logit models contrasting the different segments to classes III-VII; reference category: *CASMIN* 2c; controlling for citizenship.

Using multinomial logistic regressions for several periods, Figure 15 indicates *relative chances (log-odds ratios)* of attaining one of the three service class segments (administrative/management, technical experts or social services) vs. non-service class positions (*EGP III-VII*).¹⁹⁵ As expected in the literature review, for both sexes, particularly women, access to administrative or managerial service class positions is less dependent on higher education degrees compared to occupational positions in the segment of technical experts or social services. Particularly university graduates tend to have lower *relative advantages* over *Abitur* holders in attaining the administrative and management segment than in the other service class segments. Over time, *relative chances* of attaining administrative or managerial positions appear to depend similarly on the acquisition of higher education credentials for men, and even more so for women from mid-1990s onwards. Hence, skill requirements in terms of university education did not become as important in these positions as in traditional academic segments. For both male and female *CASMIN 2ab* graduates, *relative chances* of accessing administrative or managerial positions became worse in the 1970s and 1980s and remained constant from then onwards. *CASMIN 1abc* graduates, especially men, have exceptionally low chances of attaining this segment. Hence, access to administrative and managerial positions tended to become more exclusive for graduates above *Abitur*.

With regard to technical expert positions, access increasingly depended on higher education credentials among men, while having become slightly less stratified again from mid-1990s onwards. For female tertiary graduates, *relative access chances* of attaining a technical expert position vs. a non-service class position increased over time. In particular, female *Fachhochschule* graduates were able to increase their relative advantages over *Abitur* holders. In the long run, both educational groups below *Abitur* have decreasing *relative returns* in attaining the technical expert segment.

University graduates had exceptionally high *relative advantages* in access to the social services vs. non-service class positions over *Abitur* holders in the 1970s. This is not really surprising given that most of the professions and semi-professions that represent the traditional graduate occupations are included in social services. However, male and female university graduates had substantially declining *relative chances* of attaining service class positions in social services particularly in the 1980s and 1990s. In the 2000s, the *relative*

¹⁹⁵ In order to keep a meaningful sample size in all relevant educational categories I do not further distinguish between lower and upper service class in this disaggregated approach. Furthermore, I combine *Microcensus* years into 11 periods: 1976-78, 1980-82, 1985-87, 1989-91, 1993-95, 1996-97, 1998-99, 2000-01, 2002-03, 2004-05 and 2006-08.

advantages over *Abitur* holders slightly increased again for both sexes. Occupational positions in the social services differ from the other service class segments in being less accessible to *Fachhochschule* graduates. While there is no consistent trend in *relative* social services returns to *CASMIN* 3a among men, *relative Fachhochschule* returns even decreased among women. As for the other service class segments, the *relative* disadvantages in attaining social services vs. positions below the service class have become more pronounced for both *CASMIN* groups below *Abitur* over the course of time.

Overall, we can identify two mechanisms for university graduates' slightly decreasing *relative* chances of attaining positions in the service class between 1980s and mid-1990s. Firstly, *relative* access chances into social services decreased particularly in the 1980s. The decreasing *relative* returns in social services access was partly compensated by university graduates' increasing *relative* chances of attaining technical expert positions though. *Relative* returns for female university graduates appear to have more strongly decreased compared to male university graduates because the relevance of social service positions is substantially higher among women than among men (see Table 13). Besides, while the technical expert segment is less important for women, the increase in university graduates' *relative* chances of attaining these positions has been less pronounced among women than among men.

Secondly, the decline in *relative* returns for male and female university graduates can be attributed to compositional changes in the service class as evidenced by Table 13. For both sexes, the share of jobs in administrative and managerial service class jobs strongly increased over time, while the share of social services jobs strongly decreased. Thanks to the increasing availability of administrative and managerial service class positions, the *relative* returns for university graduates decreased upon labor market entry because access to these expanding positions is less dependent on higher education than in technical expert or social services positions. However, *relative* returns to university education did not decline any further as this compositional effect phased out at the end of the 1990s.

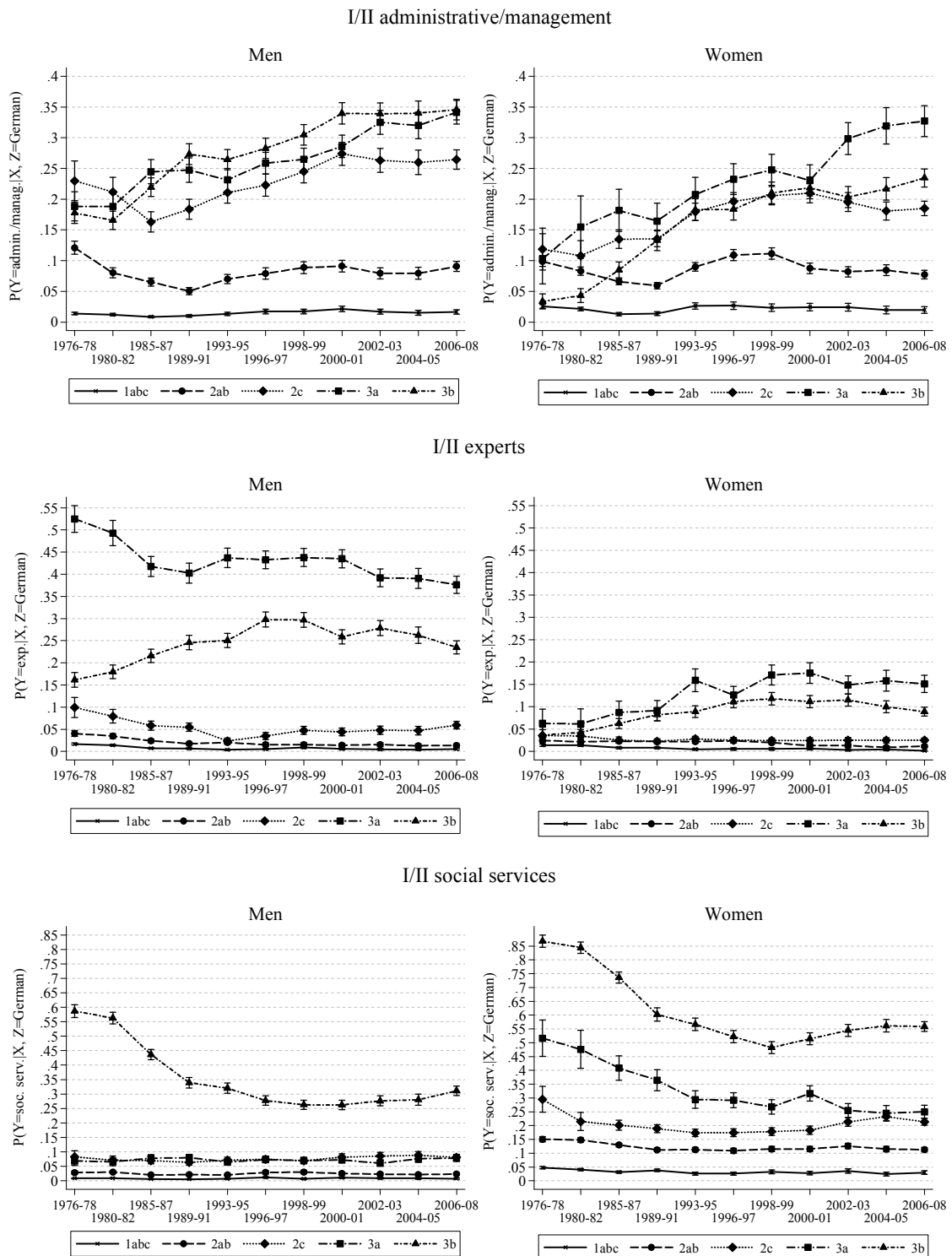
How are these compositional changes and changes in the segment-specific *relative* value of education reflected in *absolute* returns to education across these three different service class segments? Figure 16 indicates the probabilities of attaining service class segments among different *CASMIN* groups over time. To answer this, qualification-specific probabilities prove that administrative and managerial positions are less stratified by educational attainment and more or less remain this way throughout expansion of this segment. In the earliest periods, differences between graduates from both tertiary institutions and *Abitur* holders were insignificant for men; female university graduates even had a

significantly lower probability than graduates from *CASMIN* 2ab, 2c and 3a, while graduates from these degrees did not significantly differ in their probabilities.¹⁹⁶ From the 1980s onwards, administrative and managerial jobs became more stratified by *Abitur*: While graduates from *CASMIN* 2ab and 1abc did not profit from the expansion of administrative and managerial positions, *Abitur* holders were able to increase their probabilities, reaching near parity with tertiary graduates. Since administrative and managerial positions grew in size and access to this subsection is only weakly dependent on higher education, *Abitur* holders profited from the growing availability of these jobs. In the 2000s, probability differences between *Abitur* holders and tertiary graduates in access to the administrative/management segment became somewhat larger for both sexes. The administrative and management segment in the service class is clearly the occupational area where *Abitur* holders are generally able to attain high-skilled positions and increasingly find service class employment over time. Although their attainment probability decreased, *Realschule* graduates also gain access to the service class through administrative and managerial positions compared to positions in the technical expert area or social services.

University graduates were most likely to work in social services in the 1970s and early 1980s. Thanks to changes in the service class composition and the declining *relative* value of higher education in access to social services – university graduates' probability of attaining these social service positions substantially decreased from then onwards. In the most recent period, male university graduates were allocated in almost equal shares into the three subsections of the service class. Among women, however, around half of university graduates still worked in social services most recently. For men, all other educational groups had a very low probability of attaining a social services position, a trend which remained constant over time. Female *Fachhochschule* graduates also had a high probability of entering social services at the end of the 1970s, but this probability substantially decreased as well. Over the last three years, this probability did not significantly differ from female *Abitur* holders' probability. Other than their male counterparts, female graduates from *CASMIN* 2c and 2ab had relatively high and stable probabilities of entering social services. Hence, the social services among women are less tertiary-exclusive than among men.

¹⁹⁶ At the end of the 1970s, female university graduates' probability of attaining the administrative and management segment was even insignificant from the probability among *CASMIN* 1abc graduates.

Figure 16 Predicted probabilities of attaining service class segments among different *CASMIN* groups



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* Predicted probabilities calculated after estimating multinomial logit models; citizenship set on German; Ranges within capped spikes indicate 95% confidence intervals (CI).

The middle graphs below illustrate that women, in general, have a very low probability of attaining technical expert positions. As indicated by *relative* returns, the sharply decreasing probability for university graduates in social services can be partly compensated by increasing probability differences between university graduates and *Abitur* holders in obtaining expert positions for both sexes, particularly men. *Fachhochschule* graduates have a significantly higher probability than university graduates to enter technical expert positions, especially among men.¹⁹⁷ This can be possibly attributed to the limited choice of fields of study at *Fachhochschule*, which mainly concentrate on technical subjects. Over time, the probability among male *Fachhochschule* graduates, however, has been decreasing. This is because relative returns for male *Fachhochschule* graduates in access to expert positions decreased and administrative and managerial positions tended to become equally important as employer for *Fachhochschule* graduates amidst occupational upgrading. All *CASMIN* groups below tertiary level had low probabilities of attaining technical expert positions for both sexes.

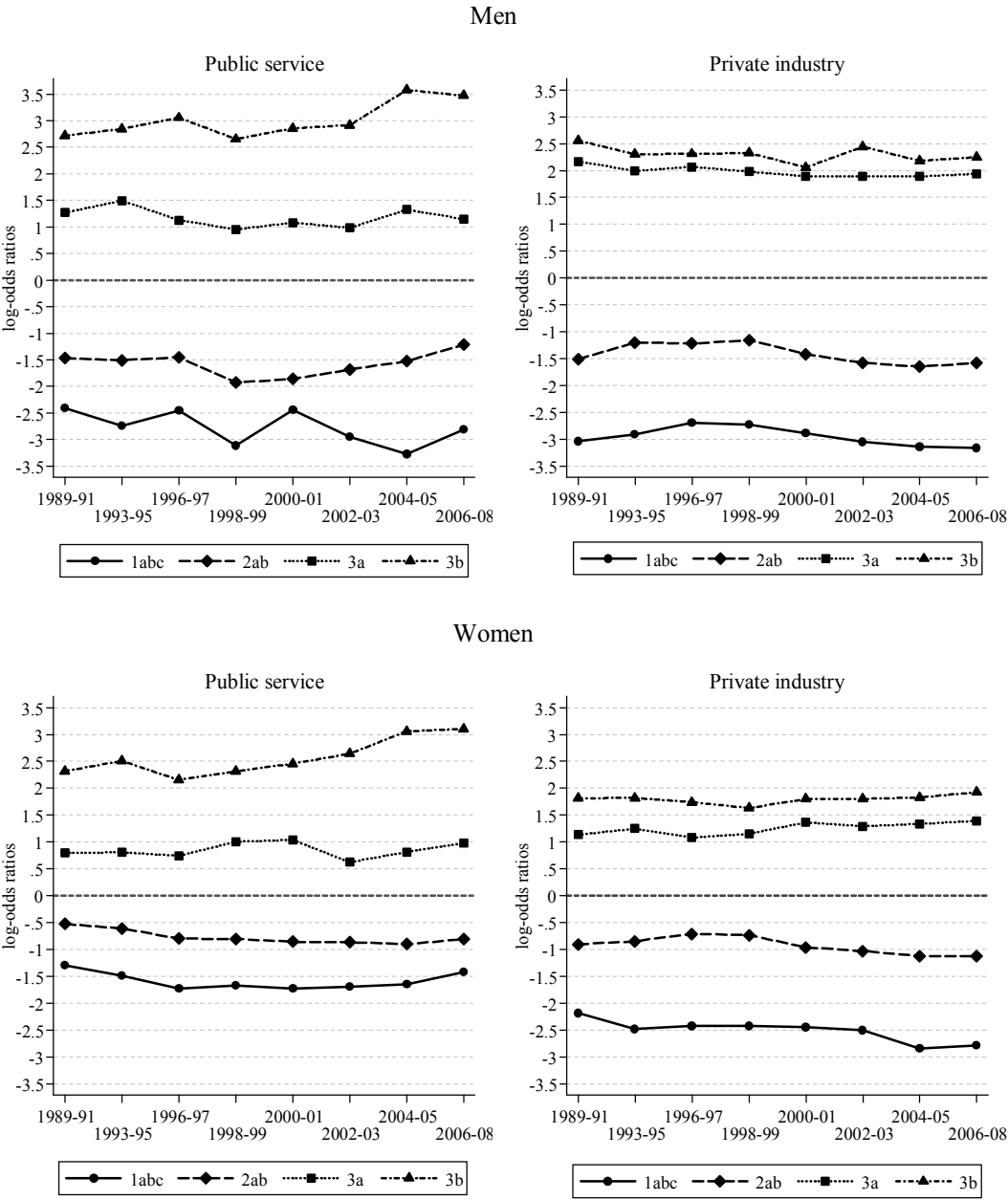
Overall, this analysis provides evidence for a compositional effect for either sexes that can overly account for decreasing relative returns among university graduates compared to *Abitur* holders between 1980s and mid-1990s.

7.5.6 *Public service vs. private industry*

Figure 17 illustrates trends in *relative* chances of accessing the service class (*log-odds ratios*), broken down into public and private sector employment. As already indicated in chapter 5.4, employment sector information is only available from 1989 *Microcensus* wave forward. Hence, some significant changes in access to the service class had already taken place by this time. Nevertheless, this analysis aims to reveal differences between two important partial labor markets that may differ in the *relative* value that is attached to educational attainment. While due to employment regulations access to high-skilled positions in the public service is more strictly based on higher education certificates, employers in the private industry are freer to decide which individual traits among job applicants are considered as relevant for their hiring decisions and which are not.

¹⁹⁷ The similar *log-odds ratios* in Figure 14 might let us believe that university and *Fachhochschule* graduates have about the same probability of attaining technical expert positions. However, this *log-odds ratio* contrasts technical expert from non-service class positions. As *Fachhochschule* graduates have a higher probability of attaining non-service class positions than university graduates, they need to have a higher probability of attaining technical expert positions in order to have about the same *log-odds ratio* as university graduates.

Figure 17 Education and membership in service class: public service vs. private industry (log-odds ratios)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; Notes: Reference category: *CASMIN 2c*; controlling for citizenship.

As one would expect, university graduates have stronger relative advantages of entering service class positions over *Abitur* holders in public service compared to private industry. However, this difference in *relative* value of university education is not as

substantial as the institutional framework in both partial labor markets might suggest.¹⁹⁸ Clearly, employers in private industry also use educational attainment as selection criterion to a considerably degree. Hence, even if employers are freer to consider which individual characteristics are important for hiring decisions, they strongly take educational attainment into account. While men have higher relative returns to university education than women in both sectors, female disadvantages in the value of higher education are somewhat more pronounced in the public service (see also Figure B4). As to *Fachhochschule* graduates, larger differences between these sectors are evident: they have distinctly better *relative* access chances to attain the service class in private industry than in public sector. While returns to tertiary degrees strongly differ in public service, they are nearly the same in private industry. This is particularly evident among men. For the lower *CASMIN* groups, differences between these two sectors tend to be rather small. Figure 16 suggests a salient variation for female *CASMIN* 1abc graduates, indicating lower relative chances in private industry compared to public service. However, this is not confirmed by sensitivity analysis (see Figure B4).

Regarding trends over time, *relative* chances of accessing the service class even increased among university graduates in public service, while slightly decreasing for men and remaining rather constant for women in private industry. Hence, the slight increase in *relative* returns for female university graduates in the overall labor market that started at the end of the 1990s (see upper left graph in Figure 13) can be attributed to this increase in the public service.¹⁹⁹ For female and male graduates from *CASMIN* 3a employed in the public sector, the above figures do not indicate any consistent trend in the *relative* value over time. What about trends among lower educated groups? For male graduates below *Abitur*, there is no consistent trend in public service; for female graduates from *CASMIN* 2ab *relative* access chances to attain the service class have slightly decreased in public service. In private industry, all educational groups below *Abitur* experienced decreasing relative chances of attaining the service class (particularly evident in *AMEs* in Figure B4). Hence, it is the private industry that appears to increasingly consider the *Abitur* as threshold for accessing high-skilled positions.

Overall, changes in *relative* returns in access to the service class - as already shown in Figure 13 - were not pronounced from the beginning of the 1990s up to now. This is particularly evident for private industry, where one could have expected more tremendous

¹⁹⁸ A sensitivity analysis using *average marginal effects* (see Figure B4) reveals that differences between these sectors in the *relative* value of university education are even less pronounced than in *log-odds ratios*, particularly among women.

¹⁹⁹ Since the share of positions in public service has decreased for men (see Table 6) and, at the same time, *relative* chances in the expanding private industry have slightly declined, the *relative* returns in the overall labor market have kept rather stable for men.

variations in employers' freedom to allocate workers. This differentiated analysis emphasizes that educational credentials maintain their major role in the allocation of individuals to advantageous positions in different institutional labor market contexts.

When distinguishing further by service class segments (see Figure C6), the increasing *relative* returns among university graduates in the public service in most recent times are due to an increasing importance of university degrees in social services. In general, university education is clearly more beneficial in terms of its relative value in public service social services positions than in private industry social services positions. The reverse is true for the other segments: University education appears to be somewhat more effective in attaining technical expert positions or the administrative/management segment in private industry than public service. The dependence on education is particularly weak among administrative and managerial positions in public service.²⁰⁰ But administrative and managerial service class positions do not represent a large group in the public sector (see Table C11). In the private sector, administrative and managerial positions have become somewhat more stratified by education over time.

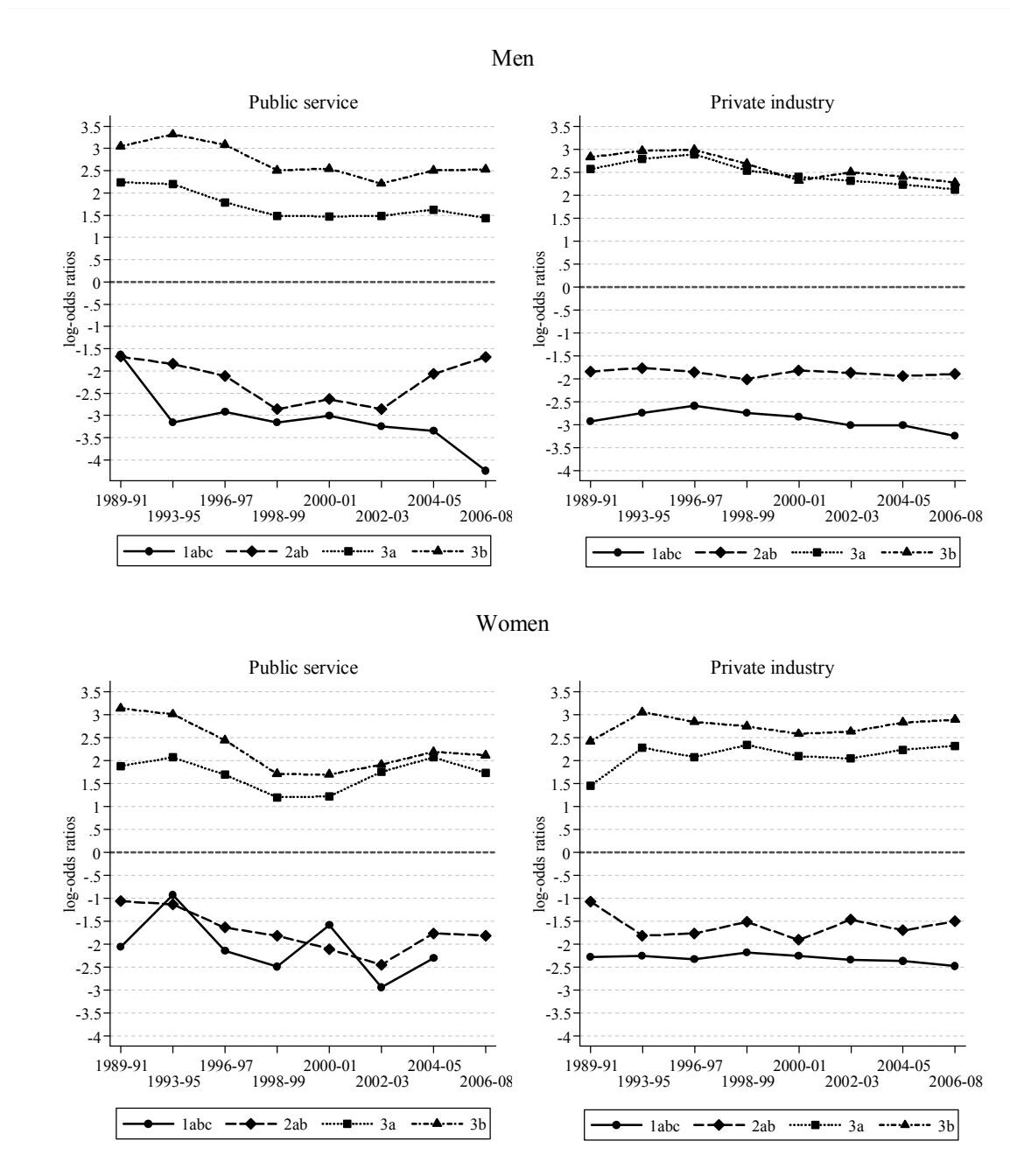
Figure 18 differentiates between public service and private industry in terms of access chances to the upper service class (for *AMEs* see Figure B5). As already indicated in the analysis on the overall labor market, *relative* chances for male tertiary graduates somewhat decreased in both sectors from the mid-1990s onwards. Access to the most prestigious positions in the labor market appears to be almost equally dependent on university education in both sectors, particularly in the most recent periods. As with accessing the service class as a whole, male *Fachhochschule* graduates have higher *relative* chances of attaining the upper service class in private sector than in public sector. While upper service class returns for female tertiary graduates in the public service somewhat decreased in the long run²⁰¹, *relative* returns have been increasing in the private industry. Thanks to these different developments among women, *relative* returns to university education are even higher in the private industry than in the public service in terms of attaining upper service class positions from the mid-1990s onwards. Overall, access to the upper service class tends to be more equally dependent on university education in both sectors than access to the service class as a whole. Differences in *relative* returns between university and *Fachhochschule* graduates in public service are not

²⁰⁰ Administrative positions in public service also include workers in political offices where access may depend less on education than in other bureaucratic departments.

²⁰¹ The sensitivity analysis with *average marginal effects* (see Figure B5), however, illustrates that female *Fachhochschule* graduates in public service have increasing relative chances to attain the upper service class over time.

as strong in access to the upper service class as in access to both parts of the service class together.

Figure 18 Education and membership in upper service class: public service vs. private industry (*log-odds ratios*)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* Reference category: *CASMIN* 2c; controlling for citizenship.

7.6 Summary

The aim of this chapter has been twofold. On the one hand, I assessed long-term trends in *absolute* returns to education according to access changes into service class positions. On the other hand, I examined long-term changes in the ED association over time net of macrostructural developments. Thereby, I concentrated on the *relative* chances of attaining service class positions in more detail.

For both sexes, there has been no consistent trend in *absolute* returns to higher education between 1976 and 2008. While *absolute* returns for university graduates decreased across the 1980s, particularly among women, they slightly increased in the following decades. Excluding 1976, we identify somewhat increasing *absolute* returns for male and female *Fachhochschule* graduates in the long run. Although *absolute* returns to university education are not as strong at present as they were in the 1970s, we see no *devaluation* of higher education credentials throughout educational expansion. The West German labor market appears to have been able to absorb the increasing proportion of tertiary graduates into adequate occupational positions thanks to a more or less paralleling occupational upgrading. Hence, university education still pays off in the West German labor market where most of these graduates are able to attain service class positions.

By assessing trends in the ED association, log-linear and log-multiplicative models show that across the board, there are no substantial changes in the strength of this association over the last thirty years in West Germany. While we see small periodical up- and downs for women, the association decreased from an exceptionally high level between 1980s and mid-1990s for men. From then on, however, the *UNIDIFF* parameter indicates that the ED association remained constant among men and continued to be only slightly lower (0.9) than in 1976. Thus, the analysis does not reveal a consistently declining effect of education on social class as for instance in Britain, where van de Werfhorst (2007) indicates a *UNIDIFF* parameter that monotonically declines to a value of 0.6 between 1972 and 2003 for men and women.²⁰²

As to changes in service class access, the *relative* chances for university graduates have slightly decreased in comparison to *Abitur* holders between the 1980s and mid-1990s, while having remained constant for men and increased for women from then onwards. Hence, we do not see a consistent and strong decline in the *relative* value of university education in

²⁰² A direct comparison between these analyses, however, has to be considered with caution as the analysis by van de Werfhorst (2007) did not concentrate on labor market entrants but refers to period effects among individuals aged 25 to 64.

terms of attaining the service class either. In contrast to previous analyses (e.g. Müller et al. 2002), I did not find a convergence of service class returns between university and *Fachhochschule* graduates over time. Still, university graduates have substantial advantages in accessing service class positions over *Fachhochschule* graduates.²⁰³ Educational groups below *Abitur* have decreasing *relative* returns in access to the service class over time. Hence, access to these advantageous occupational positions has become more dependent on *Abitur* and higher education. Regarding access to the upper service class, *relative* advantages for tertiary graduates over *Abitur* holders have increased over time, especially for women. Altogether, *relative* returns to higher education in access to the service class stayed relatively similar. As with the overall ED association, there is no decoupling of educational credentials and service class attainment in West Germany.

Jackson and colleagues (2005) attempt to explain the declining ED association in several European countries according to compositional changes in the occupational structure. They argue that the kinds of occupations in which educational credentials are highly relevant may have declined in size relative to occupations where hiring decisions are less dependent on formal education. Can this mechanism account for university graduates' slightly decreasing *relative* chances in comparison to *Abitur* holders? Disaggregating the service class shows that the importance employers attach to qualifications indeed varies across different types of employment. That is, access to administrative or managerial positions is generally less stratified by educational degrees than expert positions or social services jobs for both sexes. This has also been shown for Britain (Jackson, et al., 2005). Moreover, in administrative and managerial positions, the *relative* value of education in job allocation decisions did not become as strong as in other service class segments over the course of time. While social services positions became less dependent on higher education across periods, the reverse is true for access into expert positions. Hence, the qualitative pattern in access to service class positions has changed. In terms of *relative* effects of education though, these developments tend to more or less cancel each other out, particularly for men. The most consequential change appears to be compositional: Amidst growth in administrative or managerial positions that are less credentialist-focused, credentialist-oriented social services decline. As a consequence of this compositional change, *Abitur* holders were increasingly able to access the

²⁰³ For East Germany, Gebel (2011) indicates that graduates from both tertiary institutions have about the same chances of gaining access to managerial, professional or semi-professional occupations in their first significant jobs. Apparently, employers in East Germany do not make a difference in evaluating graduates from university and *Fachhochschule* in job allocation processes. Though, differences between East and West Germany regarding the labor market value of the *Fachhochschule* may be due to differences in the distributions of fields of study in Eastern and Western institutions.

service class via the expanding administrative and management segment. Hence, their slightly improved *relative* returns in accessing the service class compared to university graduates between the 1980s and mid-1990s tend to be largely due to this mechanism.

But why are these changes in access to the service class not strong enough to prompt a more substantial decline in the overall association between educational attainment and class destinations in West Germany? *Firstly*, qualitative changes were not in the same direction: social services became less dependent on higher education, while expert positions became more dependent. Aside from this, these changes only arose in the 1980s. In the 1990s and 2000s, *relative* access patterns were exceptionally stable in all three segments of the service class. *Secondly*, occupational shift towards less stratified administrative and managerial occupations came to a standstill in the 2000s. This compositional change mechanism has simply phased-out. Possibly, compositional changes in the service class may have also been weaker in West Germany than in other European countries. Besides, the educational stratification of administrative and managerial positions has remained robust over time. Although substantially lower than in other service class segments, educational attainment pays off in the administrative/management segment, too. Access into these positions could be more stratified by educational credentials in West Germany than in other European countries (Lane, 1989). *Thirdly*, the gap between those with high and low education in access to the service class has increased. Over time, service class positions are more exclusively assigned to graduates with at least the *Abitur*. This credential seems to have become increasingly required for gaining access to high-skilled service class positions. *Fourthly*, the association between educational credentials and the service class is particularly strong in the public sector. Access to social services positions has become increasingly dependent on university education in this sector in recent periods. As long as the public sector enables hierarchical career opportunities that are restricted to individuals having the required educational credentials and does not tremendously shed labor, the overall ED association may not dramatically decrease thanks to this credentialist sector.

The rather constant ED association for both sexes can also be attributed to the fact that there are no major institutional changes in the setup of the transition from school to work. Taking social background into account, Müller and Pollak (2004a: 106) arrive at the same conclusion of no significant variation in the credentialist link between education and class destinations across cohorts in West Germany. That is, not every free-market economy moves in the direction of a non-meritocratic society. While this may not reject the *market versus meritocracy* argument for some European countries, the high credentialism in West Germany

has - so far - not led to a decline in the ED association.²⁰⁴ Certainly, employers decide what counts as merit, but they are simultaneously constrained by the institutional arrangements under which they can act. Comparing West Germany and Britain, Breen and Luijkx (2007: 121) argue: ‘As far as non-educational factors are concerned, it seems at least plausible that these operate more strongly in Britain than in West Germany, given the much tighter relationship between educational qualifications and occupations in the latter. It may be that the weaker link between education and jobs in Britain gives more freedom to employers to base their decisions about hiring and promotion on other factors – or indeed such a weaker link may necessitate the use of additional criteria.’

Institutional differences, however, may not account for deviating trends in the ED association between West Germany and other European countries alone. Since higher education expansion in West Germany is modest by international comparisons, higher education degrees may have remained a distinct and reliable signal for employers in the West German labor market, while being perceived as less trustworthy by employers amidst a stronger educational expansion in other societies. While this book chapter clearly illustrates that the ED association in West Germany remained rather stable compared to other countries, it cannot, however, specify the exact mechanisms for these different trends. This would necessitate a direct comparison of a large set of countries with different strengths of educational expansion and changes in service class composition as well as different institutional arrangements.

²⁰⁴ As Gerber (2003: 269) puts it: ‘Perhaps, for complex historical reasons, some societies are more culturally predisposed than others to credentialism’ and thus do not experience a change in the ED association over time. ‘In addition, when the individual practices and behaviors that, in aggregate, serve as mechanisms of stratification become established within a particular institutional context, they may become ‘locked in’ and survive even when the conditions that originally gave rise to them disappear’ (Gerber, 2003: 270).

Chapter 8 Educational attainment and occupational prestige

8.1 Introduction

The previous chapter showed that the association between educational attainment and social class upon labor market entry has not significantly changed between 1976 and 2008. Only the *relative* chances of accessing the service class have slightly decreased among university graduates in comparison to *Abitur* holders between the 1980s and mid-1990s. This rather stable relationship is attributable to West Germany's institutional stability, providing strong linkages between educational credentials and entry positions the labor market over time. While ED association results appear to challenge Beck's far-reaching assumption regarding a *decoupling* of educational and occupational systems, returns to education may develop differently depending on the specific outcome under analysis (Müller, et al., 1998: 198; Müller, 1998a: 106). Based on the same data and time frame, the present empirical chapter considers a different occupational outcome, namely individuals' occupational prestige.²⁰⁵ Does this result remain robust when using occupational prestige as the dependent variable? Or do we find substantial differences depending on the specific outcome? The following additional analysis on occupational prestige is useful for several reasons.

According to Max Weber's work (1972 [1922]), social class and prestige (or status) are distinct concepts which represent different forms of stratification (see also Chan & Goldthorpe, 2007). While classes reflect the social relations in economic life, prestige is a symbolic variable indicating the degree of *social honor* that is attached to certain positions. The ordering of occupational prestige reveals rather institutionalized barriers around occupations such as self-selection or differential recruitment (Weeden & Grusky, 2005). This conceptual distinction has different theoretical implications for trends in the returns to education. Since occupational prestige is associated with occupational closure processes, educational expansion may not guarantee high prestige for every university graduate, even if service class positions sufficiently expand and access remains equally dependent on educational credentials as before expansion. Moreover, measuring occupations on a scale has methodological advantages: It allows us to use the coefficient of determination (R^2) as an

²⁰⁵ I do not use socioeconomic status scales such as *ISEI* (*International Socio-economic Index of Occupational Status*) (Ganzeboom & Treiman, 1996) because *ISEI* scores are generated by an optimal scaling procedure that uses occupation as intervening variable between education and income and thus obliterates the theoretically and empirically important distinction between class and prestige or status. Moreover, the construction of *ISEI* relies on *ISCO 68/88 (COM) occupational classification* that is not implemented in *Microcensus* data before 1996. Therefore, I am not able to look at long-term relationships between education and *ISEI*.

indicator of changes in the predictability of occupational prestige by educational attainment. Further, hierarchically ordering occupations according to prestige enables us to take within-class heterogeneity in terms of occupational rewards into account. While university graduates still have high chances of attaining the service class in recent times, prestige differences among these positions may have increased over time. That is, variation in occupational prestige among university graduates grows thereby contributing to a decreasing predictability of occupational prestige by educational credentials.

While the previous analyses of this book have concentrated on the effects of macrostructural and macroeconomic changes, Mills and Blossfeld (2005) stress the importance of globalization for developments on national labor markets.²⁰⁶ They argue that increasing market dynamics and economic volatility lead to substantial levels of structural uncertainty and growing unpredictability of social and economic developments in modern societies. As a reaction to this, the West German labor market has been partly deregulated by allowing employers to provide employees with fixed-term contracts (see chapter 3.3). Nevertheless, recent literature has generally concluded that labor market mobility, occupational or job mobility and career stability have not tremendously changed across birth cohorts (Erlinghagen & Knuth, 2004; Erlinghagen, 2004; Kurz, et al., 2006; Mayer, Grunow, & Nitsche, 2010; Biemann, Fasang, & Grunow, 2011).²⁰⁷ As global uncertainties are filtered by national institutions and passed on overwhelmingly to individuals occupying weak labor market positions (Mills & Blossfeld, 2005; Breen, 1997), labor market entrants as *outsiders* may predominantly be affected by increasing market uncertainties. In fact, several studies find that young people are particularly affected by instability, more flexibility and less standardized entry patterns into the labor market across cohorts in Germany (Blossfeld, et al., 2007; Kurz, Steinhage, & Golsch, 2005; Erlinghagen, 2004, 2006; Giesecke & Heisig, 2010; Gebel & Giesecke, 2009).²⁰⁸

While nearly all institutional characteristics determining the linkages between education and occupational attainment upon labor market entry have remained constant, flexibilization and destandardization may have some consequences for matching processes in

²⁰⁶ According to Mills and Blossfeld (2005: 3ff.), the term globalization refers to the internationalization of markets, the intensification of competition, the spread of global networks of people and firms and the rise in the importance of markets. A critical point, however, is that these developments represent different changes in the economy and possibly should not be mixed up in one concept.

²⁰⁷ There seems to be no erosion of the standard employment relationship (*Normalarbeitsverhältnis*) (Mückenberger, 1985: 422f.) as frequently suggested, particularly in the 1980s.

²⁰⁸ Nearly all of these approaches, particularly those by Blossfeld and colleagues, do not use a direct measure of globalization but model cohort changes in different dependent variables such as temporary employment or job stability as proxy measures.

external labor markets (Gangl, 2004a). As fixed-term contracts have an automatic termination date and thus avoid employment protection legislation for permanent employees, employers may be more inclined to take risks in their hiring decisions and lower their hiring standards with regard to job applicants' educational attainment upon labor market entry. In general, employers may use fixed-term employment as screening periods in order to test labor market entrants' productivity. Consequently, highly educated individuals may have increasing difficulties to quickly find *entry jobs* into *internal labor markets* upon labor market entry. Since occupations are more strongly differentiated by measures of prestige than the nominal social classes, using prestige as an outcome variable may identify such processes more clearly.

Overall, considering occupational prestige may shed further light on changes in the relationship between education and the labor market. In contrast to studies on the ED association, analyses of occupational prestige upon labor market entry in West Germany are rare. Based on combined data of 1984 and 1994 *Allbus* and the 1986 *GSOEP*, Müller et al. (1998) and Müller (2001) show that the predictability of occupational prestige in first job by educational attainment has increased for both sexes, particularly men, across labor market entry cohorts (see also Mayer & Blossfeld, 1990). The most pronounced increase in explained variance was between cohorts entering the labor market in the 1940s and 1960s.²⁰⁹ Nevertheless, it remains important to note that these analyses rely on rather small samples and compare very crude entry cohorts. Additionally, these studies do not consider time periods after the early 1990s.²¹⁰

The following section considers the different concepts of social class and prestige. I then present theoretical considerations arguing why returns to education in terms of occupational prestige could develop other than class returns. After that, I provide information on the occupational prestige measurement used in this study, followed by a discussion of the results. Finally, the chapter ends with concluding remarks.

²⁰⁹ This can be attributed to three different developments. Tertiary graduates, in particular from *Fachhochschule*, had, on average, increasing advantages in terms of prestige scores compared to lower educational groups. Both tertiary groups, particularly university graduates, showed an increasing homogeneity in terms of occupational prestige. Thanks to compositional changes in the educational distribution, higher education groups that deviate most from the average prestige have grown over time and thus contribute to an increase in variance explained.

²¹⁰ Müller (2001: 55) also points out that these results are uncertain for the most recent developments, since the proportion of tertiary graduates are underestimated in this data.

8.2 The conceptual distinction between class and prestige

Max Weber (1972 [1922]: 531-540) treats *class* and *prestige* as distinct forms of social stratification, which influence individuals' life chances through different mechanisms. According to Weber, *classes* are not *communities* (*Klassen sind keine Gemeinschaften*), but simply exist when 'a number of people have in common a specific causal component of their life chances' (Weber 1972 [1922]: 532). This causal component merely reflects economic interests that are expressed under market principles (*Klassenlage*). Thus, *class* structure is dictated by social relations in economic life. Hence, one's *class* position ultimately describes one's (labor) market position.²¹¹ *Class* position has a strong impact on its members, independently of members' *class* awareness: A particular economic situation offers members of different *classes* different opportunities and constraints that determine members' goals and interests, eventually leading to different life choices. Hence, *classes* do not need to represent real collectivities formed by processes of socialization or social closure. Moreover, as emphasized by Chan and Goldthorpe (2007), *classes* do not always fall into a simple hierarchical ordering: While the service class can be seen as clearly advantaged and the working class as predominantly disadvantaged, a classification of the intermediated classes is far more difficult.

In contrast to one's economically determined *class* position, *prestige* is an attribute of *status groups* (*Stände*). Unlike *class* positions, *status groups* represent communities and describe the degree of *social honor* attached to members' common attributes. Thus, *prestige* is a symbolic sign indicating the perceived value of a given position. This distribution of *social honor* determines the *social order* of a society. Hence, Weber's term is explicitly subjective in nature. *Social honor* is not necessarily related to one's *class* situation; in fact, in some cases these two are even contradictory. Hence, *prestige* is not based on achievement, wealth, productive assets or authority. Rather, *prestige* manifests itself in differing lifestyles. Consequently, everyone desiring to be part of a certain *status group* has to have the same lifestyle as all other group members. The *status order* is based on the monopolization of ideal and physical goods or chances and relies on distance and exclusiveness. Therefore, high *status groups* block free market developments and establish *closed positions* (Weber 1972 [1922]: 23-25; 201-207) to preserve the existing social order.

Generally, these monopoly tendencies appear because social collectivities seek to restrict access to resources and opportunities to a limited number of eligible personnel and

²¹¹ The well-known *EGP* class schema (see chapter 7.4.1; Goldthorpe, 2007d) supposes that individuals have a similar class position when subject to similar forms of employment regulations.

thus close economic opportunities for individuals who do not belong to the group, thereby maximizing their rewards (Parkin, 1979: 44). Monopoly tendencies become very specific in the case of *communities* whose members have the same specific *qualities* (e.g. certificates, same or similar official positions) that are acquired via education, teaching or practice. Primarily, these groups have a strong interest in restricting the supply of job seekers and monopolizing the consumption of ideal, social and economic goods, duties and lifestyles as a certain *occupation*.²¹² In modern societies, *social closure* is less based on ascribed attributes but on individual traits such as property ownership or educational credentials (Parkin, 1979; Collins, 1979). In this regard, prestige is attached most commonly to *occupations* given the salience of this position (Chan & Goldthorpe 2007). Typically, the smaller and more exclusive the occupational group is, the larger the *prestige* attached to membership to this group (Weber 1972 [1922]: 206). The structural theory of inequality proposes that *occupational prestige* - as income or any other reward - can be seen as *monopoly rent* that increases ‘the returns on the asset over what it would have generated in the absence of a monopoly’ (Sørensen, 2000a: 23). According to that, the creation of social and legal barriers and thus the degree of *occupational closure* shapes the prestige order in modern societies.

Class and status, or prestige, are not only distinct concepts but also have different empirical implications: While class stratifies economic security and economic prospects more than status, cultural consumption is more dependent on status than on class (Chan & Goldthorpe 2007).²¹³ The conceptual distinction also has implications for theoretical approaches on trends in the association between educational attainment and occupational prestige vs. trends in the ED association.

8.3 Theoretical considerations and hypotheses

Since the ED association upon labor market entry remained rather stable in West Germany over time, one might expect similar results for the association between education and occupational prestige. Although there have been compositional changes in the service class that accompanied decreasing service class returns among university graduates in the 1980s, the persistent institutional setting has – so far – not prompted substantial changes in West Germany. Nevertheless, two different theoretical ideas take the specific outcome of

²¹² Here, Weber (1972 [1922]: 203) explicitly refers to the guilds (*Zünfte*) and the educational requirements among modern civil servants (*Beamte*) and white-collar employees (*Angestellte*).

²¹³ However, Chan and Goldthorpe (2007) do not stress the relevance of occupational closure for the status order. They argue that status groups rather operate via informal and very implicit social networks in modern societies. They rather use the method of *interaction scaling* and order occupational groupings according to the degree of similarity in friendship patterns.

occupational prestige into account and suppose a more substantial decrease in the association between education and occupational prestige than in the ED association. As in the seventh chapter on class destinations, the first theoretical notion strongly relies on educational expansion and occupational shifts in the labor market but from a different point of view.

8.3.1 *Educational expansion and occupational closure*

Given that the *prestige order* tends to be unequivocally attached to *occupational closure* processes, we must ask how this phenomenon relates to educational attainment and occupational prestige. Accordingly, *occupational closure* is established by legal, technical or social barriers that artificially restrict the number of individuals that are able to perform the tasks being provided by an occupation (Freidson, 1994: 80-91; see also Parkin, 1979: 44-71). The restriction of supply is at the core of Weber's definition of *social closure*. In this regard, the *professions* have a unique institutional position that shields their workers from all kinds of market forces (Timmermans, 2008).²¹⁴ Weeden (2002) presents two strategies of exclusion that are based on educational attainment: *educational credentialing* and *licensing*.²¹⁵

Educational credentialing refers to *markers of knowledge* such as educational certificates used to ease employers' selection procedures. 'Credentialism is a form of closure designed to control or monitor entry to key positions in the division of labour' (Parkin 1979: 48). Consequently, 'educational closure produces occupational closure' (Bol & Weeden, 2012: 7). Educational signals do not necessarily have to indicate the acquisition of 'real' skills; whether this closure strategy is promising mainly relies on organizational rules, norms and hiring practices among gatekeepers. In turn, these hiring practices depend on the institutional setting of the national educational and occupational system. The West German institutional framework enforces *educational credentialing*, thus producing a strong relationship between educational attainment and labor market positions (see the previous chapter; Müller, et al., 1998).

In contrast to *educational credentialing*, *licensing* is a state certification, which grants actors permission to enter an occupation only once individuals have obtained this required occupational title (Kleiner, 2006; Kleiner & Krueger, 2010). *Licensing* involves imposing legal controls, establishing *state-sanctioned quasi-monopolies* (Freidson 1994: 83). This form

²¹⁴ When I refer to the term *professions* in this chapter I only mean the traditional professions: medicine, pharmacology, law, teaching, the clergy and science and academics. Contemporary research on professionals attempts to expand the focus and includes a broader range of expert or knowledge-based occupations (Gorman & Sandefur, 2011).

²¹⁵ Overall, Weeden (2002) presents four closure mechanisms: restricting the supply, increasing diffuse demand, channeling demand and signaling quality of service.

of occupational closure has been particularly emphasized in the literature on *professions*. The crucial difference between *professions* and other forms of occupational exclusion is that the former seek to establish a legal monopoly over the provision of their services (Parkin 1979: 57). *Professions* as ‘traditional graduate jobs were those for which a degree was essentially a prerequisite’ (Elias & Purcell, 2004a: 61). This *licensing* for *professions* is based on the argument that these occupations provide important public goods such as health, where misbehavior is difficult to monitor and practice requires a minimum level of competence, which can be guaranteed only by state-approved training (Law & Sukkoo, 2005). Hence, *professions* are better able to create and justify legal barriers because they can more easily claim that due to the necessity of formal, abstract knowledge ‘only members of the occupation possess the skill or qualification, by virtue of their occupational training, to perform it [occupational task] properly or reliably’ (Freidson, 1994: 87; Abbott, 1988). Empirically, Weeden (2002) shows for the US that *professions* strongly rely on *licensing* strategies and are particularly able to convert this *licensing* into higher economic rewards compared to non-professional groups.

West Germany, much more than the US, can be seen as a prototypical case for *licensing* practices as ‘state certification, rather than association membership, thus identified professionals in Germany, a situation that persisted long after the appearance of the associations’ (Abbott, 1988: 197; see also Neal & Morgan, 2000).²¹⁶ Thanks to this tradition for *licensing*, universities teach theoretical skills and undertake state-controlled examinations in *professional* programs, while the state is responsible for practical training and examination in a second educational stage. Eventually, the state, in cooperation with the university, certifies *Staatsexamen* degrees that enable graduates to work in *professions* such as medicine or law. Thus, the paternalistic German state considers it its duty to uphold access and performance standards via strict examination procedures. Moreover, other free-lance *professions* (e.g. architects, psychotherapists) that do not rely on a *Staatsexamen* degree are strongly regulated by professional associations. Professional associations as public bodies obtain permission from the state to organize and administrate themselves and to undertake legislative actions. Thanks to this autonomy, they also have the ability to stipulate educational requirements and award occupational titles. Thus, professional employment is characterized by two dominant features: *self-recruitment* and *self-regulation* (Brown, 2001). For some (free-lancing) professions, mostly in medicine and law, the unauthorized using of the official

²¹⁶ Another prominent example of occupational *licensing* is the German *dual system of apprenticeship* - the teaching of occupation-specific skills coordinated between vocational schools and the workplace – where certificates are a legal prerequisite for practicing a trade (for an excellent description see Hansen, 2011).

title is punishable under criminal law (Article § 132a *Strafgesetzbuch*).²¹⁷ Likewise, early 18th century Prussia's state bureaucracy established a recruitment and promotion system where a university degree is required for access to the higher ranks of the public service (Fischer & Lundgreen, 1975). Other than in private industry, university graduates that pursue these occupational positions do not have to compete with job seekers having lower educational degrees.

Thanks to occupational closure via *licensing* and elitist training rites, *professions* and higher rank positions in the public service are not only able to monopolize their work but also to generate distinct cultures and reputations via *homogeneity-inducing mechanisms* (Weeden & Grusky, 2005; Collins, 2004). In addition, Zhou (2005) argues that formal knowledge and science are commonly recognized attributes in a society that transcend group boundaries and thus represent the institutional realm of shared values and beliefs. As the *professions* can base its legitimate claims on these commonly recognized attributes, they are able to place themselves at the top of the occupational prestige ranking.

Since the magnitude of occupational prestige is determined by occupational closure, including *licensing*, occupational prestige is intrinsically related to university education in West Germany. Given a small elite group of university graduates at the beginning of educational expansion, most of them easily gained access to fields of study which enabled access to *professions* and thus have an exceptionally high average occupational prestige compared to other educational groups. University degrees more or less guaranteed access to *professions* in former times because the primary goal for university education was to prepare individuals for *professional* work. Consequently, the relationship between educational attainment and occupational prestige in West Germany was traditionally high (Müller, 2001).

But how does this relationship develop when the supply of individuals with higher education credentials increases? Throughout educational expansion, substantially more individuals gain access to higher education but not all of them are able to acquire a university degree that enables access to prestigious (free-lance) *professions*. As modern societies only need a certain number of traditional *professions* delivering public goods, demand for these positions is limited. Amidst higher education growth, not every new university graduate needs to become, for instance, a doctor, lawyer or teacher. As the expansion of mass higher education involves a stronger demand for labor in the higher education system, the public

²¹⁷ For the complete article see http://www.gesetze-im-internet.de/stgb/_132a.html (last access July 30, 2012). The official titles are: *Arzt, Zahnarzt, Psychologischer Psychotherapeut, Kinder- und Jugendpsychotherapeut, Psychotherapeut, Tierarzt, Apotheker, Rechtsanwalt, Patentanwalt, Wirtschaftsprüfer, vereidigter Buchprüfer, Steuerberater* and *Steuerbevollmächtigter*. Moreover, it comprises all official titles or dignities assigned by the church or other religious bodies.

service may have been initially able to absorb the self-generated production of qualifications in high-rank positions in the public service (Becker, 1993; Blossfeld, 1985). But since public service has shed labor and service class expansion within this segment has not been pronounced, the private sector has become an increasingly important employer among university graduates (Schubert & Engelage, 2006). Occupational upgrading took mainly place in administrative, managerial or service sector occupations in private industry that are unrestricted by the mechanism of *licensing* (see chapter 5.4). Since potential students factor in structural shifts in the labor market in deciding which specific field to study, *Abitur* holders have increasingly opted for fields in greater demand. A student expansion in popular fields of study may also act as a catalyst for an upgrading in matching occupational segments (Gangl, 2003b: 275). Aside from this, professional associations attempt to minimize the number of potential *license* holders in order to sustain their rewards.²¹⁸ If demand exceeds the supply of university slots, universities and *Länder* are allowed to request a *Numerus clausus* in order to restrict access to popular fields, including *professions*.²¹⁹

As a consequence, an increasing share of university graduates has to compete with potentially lower educated graduates for open (service class) positions in the private sector amidst educational expansion. As these expanding service class positions do not require any *licensing*, that is, they are, in principle, open to all job seekers regardless of their educational attainment, they are not as prestigious as the *professions*. This does not mean that occupational upgrading is unable to absorb the increasing number of university graduates into adequate occupational positions; rather this means that new service class positions are free-market positions attached to inherently lower occupational prestige (Collins, 2004: 79). Closure mechanisms mainly operate at the occupational level and thus the generalized reputations that attach to ‘big’ social classes are comparatively weak (Weeden & Grusky 2005). Therefore, the *first hypothesis* in this chapter assumes that due to these compositional changes in university graduates’ occupational destinations throughout educational expansion, the average occupational prestige among university graduates declined while prestige scores increasingly varied. Thanks to this development, the overall association between educational attainment and occupational prestige decreased over the course of time.

²¹⁸ According to *conflict theory* (Collins 1979), *professions* increase educational requirements when educational supply is increasing. However, this largely depends on the power of professional groups to establish their exclusionary criteria (Jonsson, 1996). Therefore, conflict theorists do not dare to postulate any long-term trend in the association between education and occupational positions (Müller, 1999b)

²¹⁹ Currently, medicine, veterinary medicine, dentistry and pharmacology require a *Numerus clausus*. Admission criteria are average *Abitur* grades, waiting terms and universities’ own selection procedures.

8.3.2 Flexibilization and elongation of labor market integration

Labor market flexibilization or deregulation more strongly affects labor market entrants relative to prime-age workers for two reasons (Bukodi, Ebralidze, Schmelzer, & Blossfeld, 2008). First, young people at the beginning of their career are *outsiders* who are more at risk of needing to accept various forms of flexible labor contracts. Second, given that laying off permanent contract holders is costly, employers attempt to avoid ‘bad’ choices and thus screen new job applicants with temporary or flexible positions. In fact, labor market integration in West Germany became more flexible, less standardized and frequently does not represent one single transition from the educational system to stable permanent employment (Kurz, et al., 2005; Erlinghagen, 2006; Giesecke & Heisig, 2010; Gebel & Giesecke, 2009; Buchholz & Kurz, 2008).²²⁰

Due to high employment protection legislation among regular employees in West Germany, employers are generally more risk-averse in their hiring behavior. In order to prevent a ‘bad’ choice and consequently high dismissal costs, they strongly rely on educational qualifications as signaling traits. Therefore, high employment protection legislation is considered as one important factor for a strong relationship between educational attainment and labor market rewards in external labor markets (Gangl, 2004a; see also chapter 3.3). Amidst labor market deregulation, employers in Germany gain the possibility to screen new employees during probationary periods before hiring them with permanent contracts. This may imply that employers can practice otherwise more risky hiring behavior and possibly rely less on observable traits among job applicants because fixed-term contracts have an automatic end. Thanks to these new screening possibilities, employers may attach less value to educational attainment in their hiring decisions upon labor market entry. That is, individuals with lower qualifications have the chance to show their productivity in screening periods, while some highly educated people lack productive behavior. As a consequence, an increasing share of lower educated individuals may gain access to *entry jobs* in *internal labor markets*.

At the same time, job matching upon labor market entry in West Germany is facilitated by *occupational labor market* characteristics. This classification has mainly been based on the strong linkages between the German *dual apprenticeship system* and the labor

²²⁰ The literature consistently indicates that the less-educated - at every career stage - are predominantly hit by increasing precarious work and employment instabilities (e.g. Blossfeld, et al., 2007). This aligns with Breen (1997) and Goldthorpe (2007b) who argue that existing inequality structures become even stronger when labor markets demand more flexibility. But a *recommodification* of risks seems to have only few consequences for the association between educational attainment and occupational outcomes, as the less-educated are already at the bottom of the *labor queue* and thus have a low level and dispersion of prestige.

market (see chapter 3.2). In such systems, graduates with vocational training do not require additional screening because they were already screened during their apprenticeship. Hence, graduates with vocational training should be less affected by flexibilization pressures and have a lower risk of holding fixed-term contracts in West Germany.

Commonly, university graduates rather compete for *entry jobs* in *firm internal labor markets*, which are usually found in large firms or the public sector providing *closed positions* that ensure job security and promotion ladders (see chapter 3.2). *Closed positions* in *internal labor markets* involve *composite rents* that are both beneficial for employees and employers, i.e. employees obtain higher rewards than they could obtain in *external labor markets* due to their investment in firm-specific investments; employers increase their profits as the internal recruit is more productive than an external recruit could be (Sørensen & Kalleberg, 1981). Due to increasing market uncertainties and flexibilization pressures, however, employers are increasingly forced to redesign jobs, thereby reducing internal career paths (Cappelli, 1999; Sørensen, 2000b).²²¹ At the same time, *insiders* attempt to protect their labor market rewards against *outsiders* such as labor market entrants or the unemployed. Since employees in *internal labor markets* are strongly protected from dismissals, and in addition, corrections of potential mismatches are costly, employers attempt to avoid the selection of inadequate applicants into *closed positions*, particularly in times of growing labor market uncertainties. While strong linkages between university education and the *professions* prevail (see chapter 3.1), for a substantial part of university graduates, transition patterns into the labor market are less determined and productivity may be rather difficult to assess. Thus, employers may increasingly use fixed-term contracts, probationary periods or internships in order to screen university graduates' abilities before letting them enter *closed positions* in *internal labor markets*. A downsizing and delaying of *internal labor markets* would imply a stronger competition among university graduates for the reduced number of advantageous *entry jobs* providing access to these internal career paths. Consequently, a growing share of university graduates needs a much longer time to establish adequate initial positions upon labor market entry amidst labor market flexibilization and destandardization.²²²

²²¹ The reduction of *firm internal labor markets* is regarded as one of the key elements of flexibilization pressures on labor market structures. For a brief summary of macro- and meso-developments that are supposed to impede long-term relationships between employers and employees see Giesecke & Heisig (2010: 405f.)

²²² Another potential reason for decreasing prestige returns among university graduates could be that younger cohorts, on average, finish their studies in an older age and therefore have less time for labor market integration than older cohorts. Since I am only able to approximate labor market entry and compare the same age groups over time, university graduates in older cohorts may be observed at a later point in their early career than younger cohorts and thus may have, on average, a higher prestige than university graduates in younger cohorts.

Empirical evidence for West Germany gives supports this notion. Firstly, labor market integration has become more complex and diverse across all educational groups (Konietzka, 1998).²²³ The transition from school to work can be increasingly understood as a searching phase associated with several job changes before finding a stable position in the labor market. While labor market integration has elongated across birth cohorts, particularly higher education graduates need a longer time before gaining access to prestigious labor market positions (Hillmert, 2002). We also see a non-linear relationship between educational attainment and the risk of holding a fixed-term contract: Not only the less-educated face a high risk of being employed on a temporary basis but also university graduates (Giesecke & Groß, 2003; McGinnity, et al., 2005). The proportion of university graduates with fixed-term contracts is twice as high as the proportion among comparably more occupation-specific *Fachhochschule* graduates (Gebel & Giesecke, 2009). Köhler, Luodovici and Struck (2007) provide evidence for a reduction of *internal labor markets* in the German labor market structure. Diewald and Sill (2004) show a decline in internal job changes as well as internal promotions over time, particularly at the end of the 1990s. While a reduction of these mobility patterns is especially evident among labor market entrants, Giesecke and Heisig (2010) also find that university graduates, particularly men, are disproportionately affected by a decline in internal job changes and promotions within firms. This is attributable to the fact that tertiary graduates are more often found in large firms, where the reduction of *internal labor market* positions has been most pronounced. They also find evidence that tertiary graduates are increasingly faced with inter-firm downward mobility. Likewise, the share of individuals employed in large firms with more than 500 employees has consistently decreased in West Germany over time (Leicht, 1995). Also, the proportion of public sector employees has been declining, particularly among men (Schubert & Engelage, 2006; see also chapter 5.4). Lastly, Scherer (2004) shows that initial disadvantages in terms of status-inadequate jobs have some long-lasting consequences across workers' subsequent careers in tightly regulated and segmented labor markets such as West Germany.

Overall, the *second hypothesis* in this chapter is as follows: Amidst growing flexibilization and elongating of labor market integration, university graduates' occupational prestige, on average, declined and became increasingly varied. Since graduates with vocational training are supposed to be less affected by labor market deregulation, the association between educational attainment and occupational prestige upon labor market entry decreased over the course of time.

²²³ For a general overview on destandardization of life courses see Shanahan (2000).

8.4 Research design

8.4.1 Dependent variable: occupational prestige

Occupational prestige is measured according to Wegener's (1985, 1988) *Magnitude Prestige Scale (MPS)*. This measurement has several advantages over other prestige scales such as Treiman's (1977) *standard international occupational prestige scale (SIOPS)* which is frequently used to operationalize occupational attainment (e.g. Sandefur & Park, 2007).²²⁴ *First*, this is a national scale that appears to more adequately represent the prestige hierarchy in Germany. *Second*, this is based on Weber's notion of *social honor* and thus closely links theory to empirical analysis. *Third*, this clearly has better measurement qualities.

As Weber's notion of prestige explicitly deals with a subjective order, Wegener uses a direct reputation scaling that does not leave the quantification of prestige to the researcher but to respondents themselves. That is, respondents were asked in two representative cross-sectional surveys (*ZUMABUS* 1979, 1980) about the prestige of 50 *ISCO-68 (COM)* occupations compared to electricians, which has been the standard stimulus. In contrast to categorical scales that predetermine answer possibilities for linking prestige to occupations (e.g. Treiman, 1977; Nakao & Treas, 1994), Wegener uses a direct scaling, the psychophysical *magnitude estimation technique*, where respondents give implicit ratio judgments about a series of stimuli. In order to ensure measurement validity, Wegener uses two different magnitude estimations: on the one hand, numerical size estimations in comparison to a reference number; on the other hand, line drawings in comparison to a reference line. The prestige scores for these 50 occupations (*MAG-50*) are then calculated by averaging respondents' evaluations.

In a next step, we need to assign prestige values to the remaining *ISCO-68 (COM)* occupations, deriving them – in any logical sense – from these estimated prestige scores. A further issue is to validate these subjective measures: does this provide any meaningful information concerning the objective structure of a society? Again, the solution is based on Weber's notion. If *occupational prestige* is identified by *occupational closure* and prestige attributions are closure mechanisms themselves, then the subjective prestige order should parallel objective processes of occupational closure. In order to validate this subjective prestige order with a structural component that takes the hierarchical ordering of occupations

²²⁴ Treiman's work, however, indicates a very useful phenomenon labeled as the *Treiman constant* (Hout & DiPrete, 2006), meaning that prestige hierarchies are generally invariant through space and time. This is an important prerequisite for studying trends in the association between educational attainment and occupational prestige over the course of time (for a critique see the discussion).

by degree of closure into account, Wegener uses Sørensen's (1977, 1979) *status attainment scale (SAS)*.²²⁵ Since the subjective average prestige scores (MAG-50) are highly correlated with this *status attainment scale*, the subjective prestige order appears to represent, indeed, a structural order of occupational closure. Therefore, prestige scores for the remaining *ISCO-68* occupations are estimated by regressing SAS on MAG-50.²²⁶ While dentists obtain the highest prestige score (216.0), family workers, basket makers and fish-processors have the lowest prestige score (30.0).

Compared to other prestige measures, Wegener's version, as being linked to the structural component of *occupational closure*, offers more than a crude continuous variable or merely the reflection of judgments on job rewards and requirements (Goldthorpe & Hope, 1974). Hence, it defies criticism arguing that both 'big' class approaches and scaling techniques are not able to capture closure processes and institutional boundaries at the detailed occupational level (Weeden & Grusky, 2005).²²⁷ Occupational prestige – measured in a Weberian sense as distinct from social class – both takes occupational closure processes and the hierarchical order of social inequality into account. Treating social stratification in a multidimensional way, the *Magnitude Prestige Scale (MPS)* complements the 'big' *EGP* class scheme.²²⁸

8.4.2 Statistical methodology

Since occupational prestige is measured on a scale, I use standard OLS regressions in order to analyze the impact of educational attainment on occupational prestige over time. That is, I regress occupational prestige on respondents' educational attainment and citizenship separately for every survey year and compare what proportion of variance these variables explain across survey years, i.e. the coefficient of determination (R^2). Explained variance is used as an indicator for the association between educational attainment and occupational

²²⁵ In a first step, a socio-economic status scale (STAT) is built according to income, educational attainment and the subjective assessment of one's class. In a second step, we accumulate the frequencies of occupations from above and calculate the accumulated percentiles by division through the total number of observations. In a last step, SAS is estimated as the negative logarithm of these values according to formula $-\log(1-F(y))$. Due to this logarithmic function, an occupation's value is larger, the lower the share of individuals in this occupational position or in higher-level positions is. Hence, the ordinal scale of STAT is transferred into an interval scale of SAS.

²²⁶ The operationalization of the *Magnitude Prestige Scale (MPS)* is based on *ISCO-68 (COM)* occupational classification. However, in *Microcensus* surveys occupations are captured with *Kldb (Klassifizierung der Berufe)* classification. Nevertheless, following Wegener's approach, *MPS* has been implemented for *Kldb-75* and *Kldb-92* classification. The detailed procedure is described by Frietsch and Wirth (2001). I follow their data routines that are available as microdata tool at <http://www.gesis.org>.

²²⁷ Aside from that, Grusky and his colleagues have not convincingly shown how their classification of detailed occupations can be translated into a hierarchy and to what extent it involves systematic social inequalities (Goldthorpe 2007a).

²²⁸ For an extensive critique of *Magnitude Prestige Scale* see Müller (1990).

prestige. Hence, I look at the predictive value of respondents' educational attainment and citizenship on changes in occupational prestige over time.

While changes in the proportion of explained variance can be analyzed in a straightforward manner, the mechanisms underlying these trends are less clear. Three different developments may contribute to a changing association over time. *First*, changes in R^2 may be attributed to changes in *intergroup* differences: over time, i.e. educational groups differ more or less from each other in their average occupational prestige. *Second*, they could be due to changing *intragroup* variations, i.e. the prestige scores of a given educational level become more homogeneous or heterogeneous across periods. *Third*, changes in R^2 may result from *group composition shifts*. On the one hand, the share of educational groups that more strongly or less strongly deviate from the grand mean may increase, thereby changing the share of between-groups variance explained. On the other hand, educational groups that are more or less homogenous may gain in size, thereby affecting within-group (residual) variance.

Due to these different determinants, empirical predictions regarding changes in the proportion of explained variance are notoriously difficult. According to theoretical assumptions in this chapter, the explained variance should shrink due to a decreasing gap in prestige scores between university graduates and other educational groups as well as thanks to increasing prestige score heterogeneity among university graduates. Educational expansion leads to compositional shifts towards university graduates. As university graduates are expected to have exceptionally high prestige but simultaneously comparatively heterogeneous prestige scores, group composition shifts may have countervailing effects on the predictability of educational attainment. More detailed investigations will show which of these alternative developments may account for changes in the association.

However, by doing so, we are still not able to disentangle the proposed mechanisms mentioned in the theoretical section as both imply the same expectations regarding changes among university graduates. For this reason, I do some simple simulations by excluding university graduates with specific labor market statuses from the analysis. In order to test the *first hypothesis* that compositional changes in the occupational destinations among university graduates account for changes in R^2 , I exclude *professions* from the analysis. Hence, I ask how would trends in the predictive value of educational attainment look without *professions* or individuals that occupy them at a given time. In order to test the *second hypothesis* whether flexibilization and the elongating of labor market integration decrease the proportion of variance explained by educational attainment, university graduates with inadequate occupational positions are excluded from the analysis. Inadequate positions are

operationalized as class positions below the service class. From a theoretical point of view, service class positions can be seen as equivalent to positions in *internal labor markets* (Goldthorpe, 2007d; Goldthorpe, 2007a; see also chapter 6.2.3). Here, I ask how trends in the predictive value of educational attainment would look if university graduates were always matched to adequate positions in *internal labor markets* upon labor market entry. After each of these manipulations, we recalculate the variance explained by educational attainment for every survey year and compare the results to those obtained from the observed data in reality.

8.5 Empirical results

8.5.1 Relevant macro-level developments

Although higher education expansion has been rather modest in West Germany and came almost to a standstill for both sexes from the mid-1990s (see chapter 5.3), the traditional employer for higher education graduates, the public service, has been cut (men) or stopped to expand (women) at the same time (see chapter 5.4). More importantly, the upgrading of skill requirements within the (shrinking) public service has not been large enough to adequately absorb the increasing number of higher education graduates. Thus, the overall upgrading of the occupational structure, i.e. expansion of the service class, took predominantly place in private industry. Amidst educational expansion, the growing number of higher education graduates has found employment in private industry rather than public service (see Table C13). While the overall proportion of university graduates in public service has somewhat increased for women, it has completely stagnated for men. As assumed, job vacancies in private industry have become increasingly important for growing shares of higher education graduates.

What do these structural developments imply for university graduates' chances of attaining highly prestigious occupational positions in the labor market? Theoretically, I argued that either compositional changes in university graduates' occupational positions or a reduction of adequate positions in *internal labor markets* have a crucial impact on the association between educational attainment and occupational prestige. As prestigious *professions* are overwhelmingly found in the public service, an increasing share of university graduates has to compete for *open positions* in the private industry. While the decreasing relevance of the public sector and its limited service class expansion clearly reduces the availability of jobs with well-defined career opportunities, the private sector has experienced substantial occupational upgrading. Aside from the 1980s, the private sector seems to have been able to adapt to the increasing supply of university graduates by establishing new *entry*

jobs into internal labor markets. While there was also a creation of (largely) adequate positions for university graduates, these new positions may still be less prestigious than traditional graduate occupations, as they are, in principle, accessible to every individual.

In order to offer a more detailed analysis, Table 15 presents distributions of university graduates' occupational destinations over time. The occupational groups are based on Blossfeld's occupational classification (Blossfeld, 1985; Schimpl-Neimanns, 2003). Service class positions, as considered as equivalent to *internal labor market* positions, are indicated in italic numbers and comprise five occupational groups: engineers, semi-professions, traditional *professions*, highly qualified administrative positions and managers/directors. As indicated in the seventh chapter, both male and female university graduates overwhelmingly attained service class positions in the past and the present (at least 85 per cent for men and 80 per cent for women in every period). However, a growing share of university graduates, in particular women, had to work in inadequate positions upon labor market entry across the 1980s and the beginning of the 1990s. Hence, these university graduates were not able to find entry jobs into *internal labor markets* upon labor market entry. While occupational and skill upgrading may have continued across the 1980s due to technological changes, pressures of labor market flexibilization may have shifted increasing market uncertainties particularly onto labor market entrants. This affects particularly the growing share of university graduates that attain non-service class positions in qualified administration or lower management such as clerks, sales representatives or accountants. From the mid-1990s onwards, the situation for university graduates improved rather than worsening. Overall, the increase in number of overeducated graduates was modest and restricted to the 1980s.

Table 15 also indicates compositional changes in university graduates' occupational attainment that follows the general pattern of compositional changes in the service class (see chapter 7.5.1). For university graduates, *professions* are the dominant occupational positions and represent the traditional jobs that university graduates strive to attain.²²⁹ In particular, female university graduates have entered *professional* positions: the proportion of female graduates was more than 80 per cent in the first period. This confirms that university education in Germany has historically been strongly linked to *professional* activities. As suggested in the theoretical section, educational expansion and technological upgrading caused the share of university graduates in *professional* jobs to strongly decrease between the mid-1970s and the mid-1990s: The share of graduates nearly halved during this time, both for

²²⁹ The *professions* are a very exclusive group of occupations including teachers for upper and lower secondary school, judges and prosecutors, lawyers, doctors, veterinaries, dentists, professors, scientists, psychologists and the clergy.

men and women.²³⁰ From then on, the share of *professionals* somewhat increased again for both sexes. While *professions* are still the most important occupational area among university graduates, particularly women, in recent times, occupational upgrading has induced much more variation in their occupational positions. Although numerical importance of technical expert positions within the service class has not substantially increased (see chapter 7.5.1), female and particularly male university graduates increasingly have attained technical positions. This increase among university graduates reflects the fact that access to technical expert positions has been increasingly dependent on educational attainment over the course of time (see chapter 7.5.5). Despite the growing share of administrative and managerial positions within the service class, university graduate certificates are only moderately associated with segments of highly qualified people in the administrative and management segment. Again, this reveals that administrative and managerial positions are less dependent on educational attainment and do so across the whole time period. Overall, an increasing share of university graduates had to find employment in less prestigious non-professional positions over time.

²³⁰ Particularly for women, the decreasing share of professions is predominantly attributable to strongly decreasing shares of teaching students.

Table 15 University graduates' occupational destinations across time (in per cent)

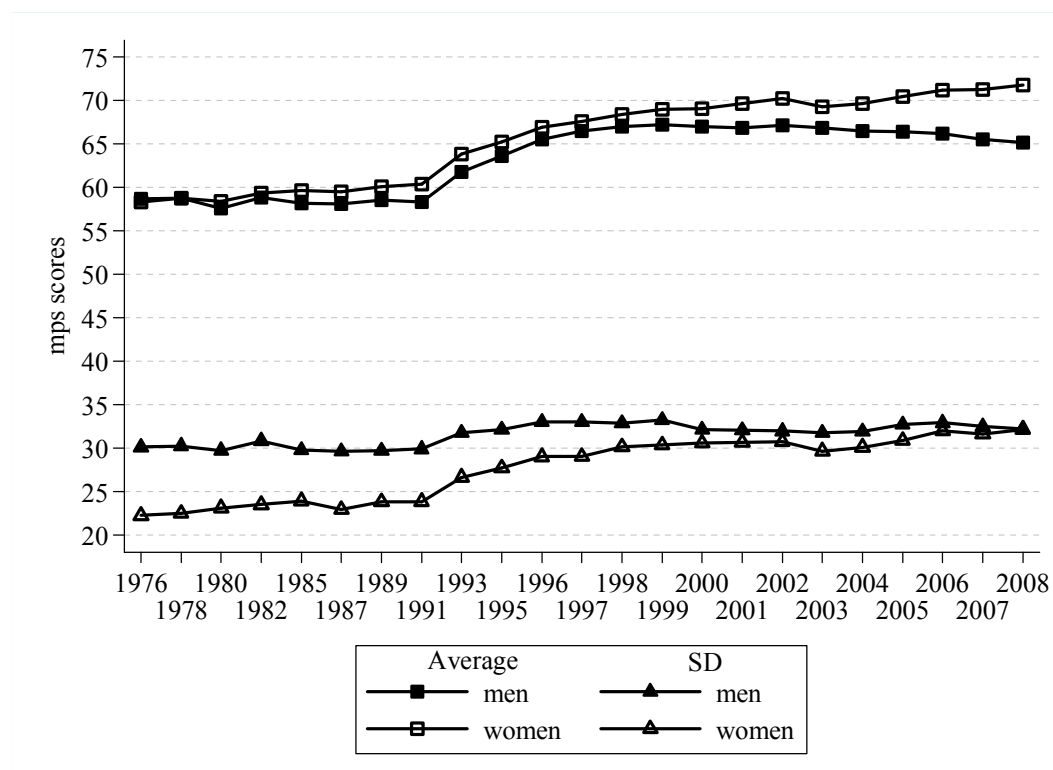
Men	M1	M2	M3	M4	M5	<i>M6</i>	S1	S2	<i>S3</i>	<i>S4</i>	A1	A2	<i>A3</i>	<i>A4</i>
1976-1980	0	0	0	1	1	<i>13</i>	0	1	6	<i>65</i>	0	5	<i>1</i>	<i>8</i>
1982-1987	0	0	1	1	1	<i>18</i>	1	2	7	<i>53</i>	0	7	<i>1</i>	<i>8</i>
1989-1993	0	0	1	2	1	<i>27</i>	1	3	8	<i>37</i>	0	7	<i>3</i>	<i>11</i>
1995-1999	0	0	1	1	2	<i>30</i>	1	2	7	<i>33</i>	0	7	<i>3</i>	<i>13</i>
2000-2004	0	0	1	1	2	<i>29</i>	1	2	7	<i>32</i>	0	7	<i>4</i>	<i>15</i>
2005-2008	0	1	1	1	1	<i>26</i>	1	2	7	<i>36</i>	0	5	<i>5</i>	<i>14</i>
Women	M1	M2	M3	M4	M5	<i>M6</i>	S1	S2	<i>S3</i>	<i>S4</i>	A1	A2	<i>A3</i>	<i>A4</i>
1976-1980	0	0	0	1	0	<i>1</i>	0	1	6	<i>83</i>	1	3	<i>0</i>	<i>2</i>
1982-1987	0	0	0	1	0	<i>4</i>	1	1	<i>11</i>	<i>71</i>	2	6	<i>0</i>	<i>3</i>
1989-1993	0	0	1	2	0	<i>8</i>	1	2	<i>13</i>	<i>53</i>	2	10	<i>2</i>	<i>6</i>
1995-1999	0	0	1	0	1	<i>9</i>	2	3	<i>15</i>	<i>45</i>	1	11	<i>3</i>	<i>8</i>
2000-2004	0	0	1	0	1	<i>10</i>	2	2	<i>13</i>	<i>48</i>	1	9	<i>4</i>	<i>10</i>
2005-2008	0	0	0	0	0	<i>8</i>	2	2	<i>12</i>	<i>53</i>	0	8	<i>4</i>	<i>11</i>

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* Blossfeld's occupational classification: M1=agricultural; M2=manual (low level); M3=manual (medium level); M4=manual (high level); M5=technicians; M6=engineers; S1=basic service; S2=qualified service; S3=semi-professions; S4=professions; A1= basic administrative; A2=qualified administrative/lower management; A3=highly qualified administrative/upper management; A4=managers, directors; service class positions are indicated in italic.

8.5.2 General trends in occupational prestige

Figure 19 indicates how average occupational prestige among labor market entrants - independently of their educational degree - changed across periods for both sexes separately. While the average prestige level remained stable until the end of the 1980s, it increased across the 1990s for both men and women. In this period, educational expansion and occupational upgrading were most pronounced (see chapters 5.3 and 5.4). From then on, the increase in average occupational prestige declined for men, while slightly further increasing for women. Educational expansion and occupational upgrading continued to transpire among women into the 2000s, while they have totally stopped for men. Interestingly, despite high levels of occupational gender segregation, men and women had about the same average occupational prestige in the 1980s and 1990s. This is due to the fact that women predominantly work in routine non-manual jobs that have, on average, higher prestige scores than manual jobs that are mostly held by men. In the 2000s, women even outperform men in terms of average occupational prestige.

Figure 19 Occupational prestige among labor market entrants over time



Source: German Microcensus, Scientific-Use-Files 1976-2008; Notes: SD = standard deviation.

With regard to social inequality in terms of occupational prestige, the changes in standard deviation indicate that inequality became stronger across the 1990s, particularly for

women, while remaining constant in the 1980s and 2000s. It is not astonishing that increasing inequality in terms of occupational prestige is especially evident in the 1990s, since increasing average prestige scores increase the propensity of having stronger variations around the mean. In the 1980s and 1990s, variance in occupational prestige has been more pronounced for men than for women. In most recent periods, inequality among women completely adapts to men's. While inequality in terms of occupational prestige has only slightly increased in the long run among men, present women differ more substantially in terms of occupational prestige upon labor market entry than in former times.

8.5.3 Trends in the predictive value of occupational prestige by educational attainment

In this section, I address the main research question: How well are individuals' educational attainment and citizenship able to predict occupational prestige upon labor market entry and, more importantly, has this relationship changed over time? Compared to the analysis on service class attainment (see chapter 7.5.4), I use a six-category version of the *CASMIN* scale, further differentiating between *CASMIN* 1ab and *CASMIN* 1c at the bottom of the *labor queue*, as the metric variable of occupational prestige may indicate stronger differences between these groups.²³¹

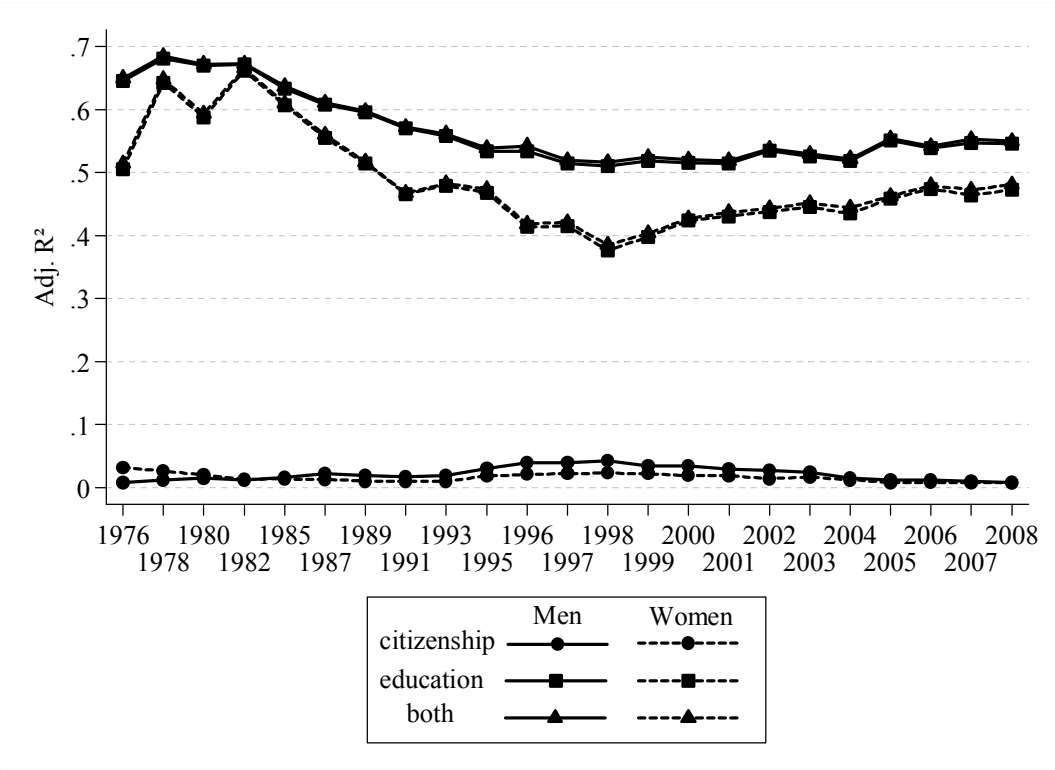
Figure 20 shows changes in the proportion of variance explained (R^2) for three different model specifications: including only citizenship, including only educational attainment and including both variables. Without controlling for educational attainment, citizenship (circle) is only able to slightly explain variance in occupational prestige for both sexes and shows somewhat less predictability in the long run, particularly among women. Comparing a model including educational attainment only (square) with another model including both variables (triangle) indicates that citizenship does not add much predictive power once taking educational attainment into account.²³² Hence, the total effect of nationality on occupational prestige is partially mediated by educational attainment, that is, labor market disadvantages of individuals with foreign citizenship are partly due to their lower educational attainment. Still, foreigners have disadvantages in occupational prestige net of education upon labor market entry.

²³¹ The proportion of variance explained does only marginally change and follows the same trend when including the full range of *CASMIN* groups for both sexes. The average prestige scores for graduates from *CASMIN* 2c_gen are volatile and tend to slightly improve over time compared to graduates from *CASMIN* 2c_voc for both sexes. While male graduates from *CASMIN* 2a and 2b do not significantly differ in their prestige scores in almost all of the *Microcensus* years, female graduates from *CASMIN* 2a have a significantly higher occupational prestige than their *CASMIN* 2b counterparts.

²³² Nevertheless, incremental F-tests in all survey years indicate that the inclusion of citizenship into the regression model significantly improves the model fit for both men and women.

In the 1970s and 1980s, around 40 per cent of the total effect of foreign citizenship is attributable to an indirect effect via educational attainment for both sexes (see Table C14).²³³ While due to an increasing indirect effect the total effect of foreign citizenship became larger in the 1990s for men, it remained rather constant for women. In the 2000s, this same indirect mechanism decreased for both sexes. However, only for women, the effect of citizenship is less mediated via educational attainment in the long run.²³⁴ Overall, the total negative effect of foreign citizenship on occupational prestige was persistent over the course of time for both sexes.

Figure 20 Proportion of variance explained by educational attainment



Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Figure 20 clearly illustrates that controlling for citizenship does not change the association trend between educational attainment and occupational prestige. As expected, educational attainment and occupational prestige are strongly related in West Germany. While the explained variance remained at a constant level for men between 1976 and 1982, it

²³³ In order to have a more parsimonious model, the decomposition differentiates between German and foreign citizenship only.

²³⁴ Differentiating single years in the 2000s reveals that educational attainment is a non-significant confounder for foreign citizenship on occupational prestige for women between 2004 and 2006 and for men since 2005. While in former periods, migrants’ occupational prestige disadvantages were mostly due to lower educational attainment, at present they are more substantially due to direct labor market effects of citizenship.

increased for women towards the men's value. In these earliest years, the association was exceptionally strong with educational attainment being able to explain between 60 per cent and 70 per cent of the variance in occupational prestige upon labor market entry for both men and women (exception 1976 with only 50 per cent). From 1982 onwards, the coefficient of determination (R^2) primarily decreased until the mid-1990s for men and particularly for women. The most substantial decline in the predictive value of educational attainment took place in the 1980s. For instance, the explained variance for female labor market entrants decreased around 20 percentage points between 1982 and 1991. At the end of the 1990s, the predictive value of educational attainment slightly increased for men and rose considerably for women. Nevertheless, educational attainment explains less of the variance in occupational prestige for both sexes in the long run. Still, the explained variance is considerably high at present: for men it can explain around 55 per cent, whereas it explains nearly 50 per cent among women. Due to a stronger decrease in R^2 among women across the 1980s and 1990s, educational attainment explains less of the variance in occupational prestige for women than for men from then onwards.

Overall, this evidence reveals that the association between educational attainment and occupational prestige has been largely stable over time. We do not find a steady decrease across the whole observation period. While a sharp decline in the predictive value of educational attainment is evident in the 1980s and somewhat less until the mid-1990s, it increased again in the 2000, particularly among women. However, we find no evidence that the bond has intensified across periods, nor do these results imply that this relationship has completely dissolved either. Given this long observation period and changes in the macrostructural environment during this time, the association stayed astonishingly stable in West Germany. As for the ED association, this may be attributed to West Germany's persistent institutional framework.

The most salient change is the consistent decline in the association between the 1980s and mid-1990s. This reduction in R^2 may result from decreasing intergroup differences, increasing intragroup differences or group composition shifts. Therefore, the next sections consider these different developments in order to get to know the mechanism behind this declining association. Since association trends have been unaffected by the inclusion of citizenship, I do not control for citizenship in the following analyses for reasons of parsimony.

8.5.4 Trends in intergroup differences

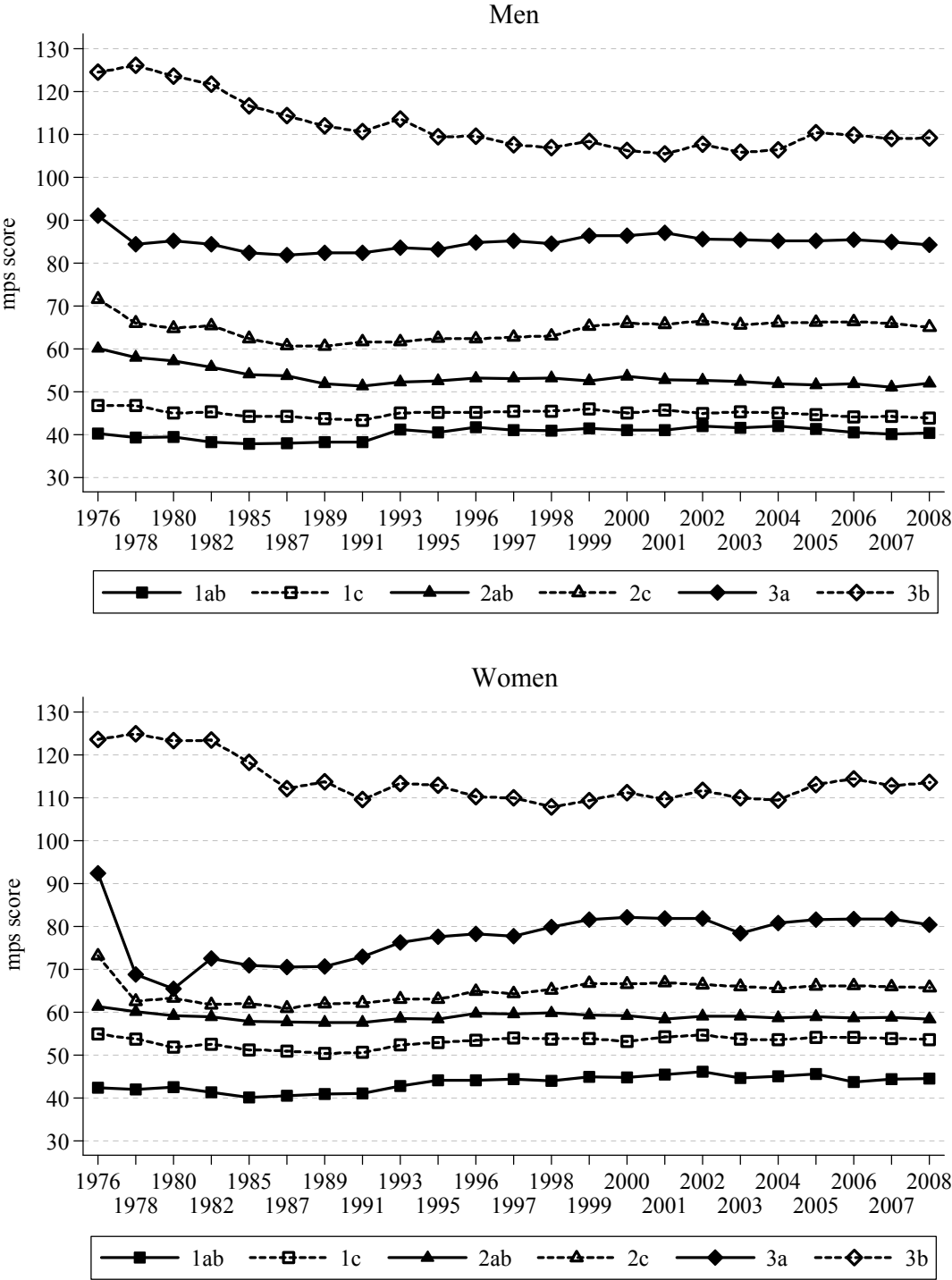
In the following I start with an analysis of changes in intergroup differences over time, i.e. how occupational prestige differs, on average, among graduates with different educational qualifications between 1976 and 2008. Can this sharp decline in the predictive value of educational attainment in the 1980s among men and women be partially attributed to decreasing intergroup differences? Figure 21 shows differences between educational groups in average occupational prestige for both men and women over time.

As expected, the most salient changes in the level of occupational prestige can be seen for male and female university graduates: on average, their occupational prestige decreased, above all in the 1980s. Changes in mean prestige scores among other educational groups remained remarkably stable for both sexes over time. Hence, the gap between university graduates and all other groups slightly closed across the 1980s, particularly among women. In fact, decreasing intergroup differences partially contribute to the decreasing predictability of educational attainment in this period. Nevertheless, university graduates' decreasing mean prestige is not dramatic and thus may not be the only reason for the decreasing explanatory power of educational attainment. Particularly among women, the decline in R^2 is much sharper and went on in the 1990s when changes in university graduates' prestige level were only marginal. Interestingly, even though women access the upper service class to a substantially lower extent than men, male and female university graduates do not differ much in their prestige returns across the entire period.

Two other developments stand out. First, except for male *Hauptschule* graduates, all male graduates, particularly *Realschule* graduates, had somewhat decreasing average prestige scores across the 1980s. This was also evident among the service class. Again, this hints at crowding-out processes from above. Prestige scores among *Hauptschule* graduates, however, did not further decrease over time. This is likely because they are already found at the bottom of the *labor queue*. Since the 1990s, male *Abitur* holders differ somewhat more from lower educational groups in terms of occupational prestige. This may indicate that educational requirements in more demanding vocational training places - leading to more prestigious jobs - have been increasing. The growing supply of *Abitur* holders opting for vocational training increases competition for advantageous training places between graduates with differing educational levels. In turn, women with educational degrees below *Abitur* attained higher prestige returns than their male peers with the same degree. That is, the prestige gap between *Abitur* holders and lower educated graduates is much greater for men than for women. This

may be due to the fact that women with degrees below *Abitur* more frequently enter routine non-manual positions than men.

Figure 21 Estimated occupational prestige by *CASMIN* groups



Source: German Microcensus, Scientific-Use-Files 1976-2008.

Second, female *Fachhochschule* graduates were able to slightly increase their average occupational prestige, particularly in the 1990s, and thus reduced the gap between themselves and female university graduates in the long run (neglecting outlier in 1976). Since they also increased their distance to lower educational groups, this trend cannot be responsible for the continued decrease in the proportion of explained variance for women across the 1990s. Although women with a *Fachhochschule* degree improved their prestige returns, they still have lower prestige returns than their male counterparts most recently.

To sum up, the decreasing association between educational attainment and occupational prestige can be partially related to declining intergroup differences between university graduates and all other educational groups. However, these changes tend to be not strong enough to fully account for the decreasing association, particularly among women.

8.5.5 Trends in intragroup variation

The second determinant of the association trend could be changes in residual variation or changes in intragroup differences, i.e. whether graduates in a given *CASMIN* group become more or less similar in regards to occupational prestige over time. Hence, we consider changes in the dispersion around group averages for each *CASMIN* group. Therefore, Figure 22 indicates the standard deviations of residuals around the predicted average scores for every *CASMIN* group among men and women.

Unsurprisingly, we see that the dispersion around group means increases with a groups' average prestige score.²³⁵ Hence, university graduates show the highest within-group occupational prestige variability, particularly among men. The standard deviation considerably increased for male university graduates throughout the period 1982 to 1993. This was also the phase where the decrease in the proportion of explained variance was most pronounced. Over the following ten years university graduates' dispersion around the group mean decreased, though it slightly increased again towards the end of the observation period. At this point, this dispersion around the mean is as high as it was in the beginning. Among *Fachhochschule* graduates and *Abitur* holders, there are standard deviation fluctuations but no continuous trend across the observation period. At best, we can see a slight increase in dispersion around the mean among these groups across the 1990s. This may account for the continued decline in predictive value until the mid-1990s. The educational groups below

²³⁵ If we consider the *coefficient of variation* that corrects the measure of dispersion for differences between educational groups in average scores, male *Fachhochschule* graduates have a relatively low dispersion given their higher average prestige level. Thus, male *Fachhochschule* graduates tend to have a very narrow occupational profile in terms of occupational prestige.

Abitur do not substantially differ from each other in terms of variability of prestige scores. In general, graduates at the bottom of the *labor queue* are markedly homogeneous regarding occupational prestige. Over time, the lower educated groups, particularly *Realschule* graduates (*CASMIN* 2ab), maintain a stable dispersion around the mean.

Among women, substantial changes in intragroup differences are evident for three educational groups: university graduates (*CASMIN* 3b), *Fachhochschule* graduates (*CASMIN* 3a) and *Abitur* holders (*CASMIN* 2c). For female university graduates, dispersion around the mean sharply increased across the 1980s and continued to increase, but on a more moderate level in the 1990s. Hence, increasing dispersion is much more pronounced among female university graduates than among their male counterparts. This may explain why the proportion of explained variance decreased more sharply in the 1980s for women than for men. At the end of the 1990s, the standard deviation started to slightly decline again. Still, occupational prestige scores were much more heterogeneous for female university graduates in recent times than at the beginning of the observation period. The continuing decline in predictive value of educational attainment in the 1990s may be attributed to two additional developments: among both female *Fachhochschule* graduates and *Abitur* holders the variability in occupational prestige increased during this time period, more so for graduates in *CASMIN* 3a.²³⁶ While the standard deviation remained rather constant for female *Abitur* holders from then on, prestige returns for *Fachhochschule* graduates became slightly more homogeneous at the end of the observation period. In general, prestige returns for female *Fachhochschule* graduates are more heterogeneous than for their male counterparts. Even more than among men, standard deviations for educational groups below *Abitur* tend to be very similar among women. Likewise, the dispersion around the mean remained consistently low among the lower educated.²³⁷

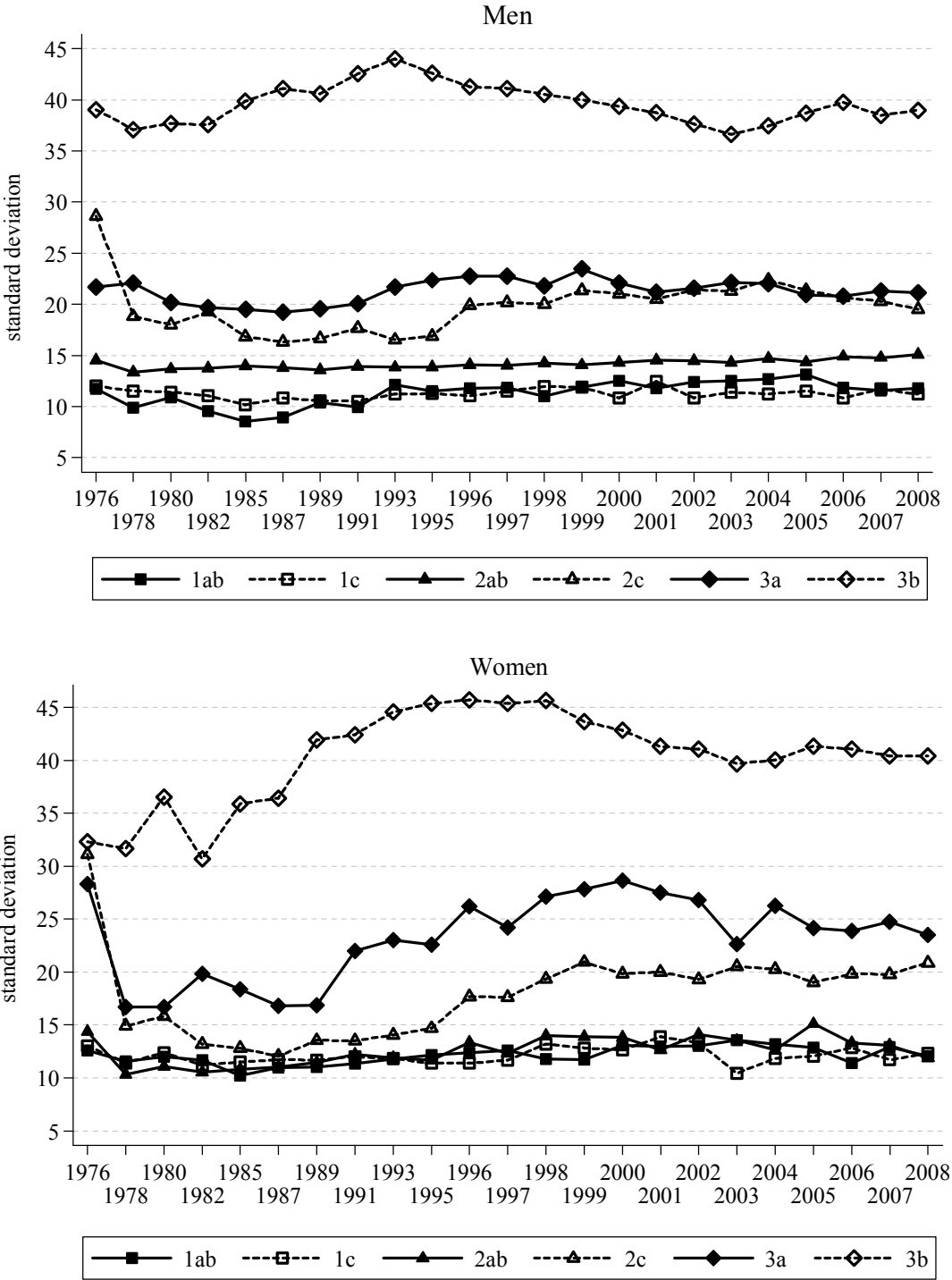
To sum up, male and female university graduates showed increasing prestige heterogeneity in the 1980s and the beginning of the 1990s. Changes in intragroup differences were stronger among women. While prestige heterogeneity sharply increased for female university graduates, female *Fachhochschule* graduates and *Abitur* holders were also affected by higher dispersion around the mean in the 1990s. This growing within-group residual variance decreased the predictive value of educational attainment during this time. The stronger decline in the association between educational attainment and occupational prestige

²³⁶ The sharp increase in R^2 from 1976 to 1978 for women tends to be due to the sharp decrease in residual variation among *Fachhochschule* graduates and particularly *Abitur* holders between these years.

²³⁷ Considering the *coefficient of variation*, less-educated women (*CASMIN* 1ab) show a relatively high dispersion around the mean given the lowest average occupational prestige among all groups.

among women is attributable to more strongly increasing intragroup differences among women than among men.

Figure 22 Residuals' standard deviation by *CASMIN* groups



Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

8.5.6 *Group composition shifts*

The third component that affects changes in the predictive power of educational attainment on occupational prestige refers to compositional changes in the educational distribution over time. Since educational expansion in West Germany was rather modest by international comparisons (particularly tertiary education), the impact of group compositional shifts on changes in the coefficient of determination appears to be limited. Particularly in the 1980s and the beginning of the 1990s, growth in the proportion of tertiary graduates was weak, especially among men (see Table 4 in chapter 5.3). Nevertheless, the share of university graduates has become somewhat larger for both sexes. As argued above, compositional shifts may have opposing effects: while the variance explained may increase (or decrease), the residual variance may increase (or decrease) as well. This is actually the case: While the expansion of university graduates increased the share of individuals whose prestige scores more strongly deviate from the grand mean (see Figure 20), at the same time, this increases the share of individuals that are most heterogeneous within their groups (see Figure 21). Hence, the compositional shift towards university graduates should have increased the explained variance as well as the residual variance simultaneously. Due to these opposing effects, it seems rather unlikely that group composition shifts are the dominant mechanism for this decreasing predictability of occupational prestige by educational attainment.²³⁸

8.5.7 *A simulation approach*

From the former sections we know that the decrease in the predictive value of educational attainment on occupational prestige across the 1980s is predominantly attributable to changes among university graduates for both sexes. While in this period university graduates' average prestige decreased, thereby reducing the gap between university graduates and the other educational groups, their heterogeneity in prestige scores increased at the same time. Nevertheless, we still do not know whether these changes among university graduates are prompted by the proposed mechanisms in the theoretical section, as both hypotheses assume a declining association between educational attainment and occupational prestige. According to the *first hypothesis*, this development is due to compositional changes in university graduates' occupational destinations towards less prestigious non-professional positions amidst

²³⁸ The share of male and female *Abitur* holders, whose prestige scores deviate less from the grand average compared to the lower educated, has also been increasing. This might rather imply a reduction in the explained variance. Besides, *Abitur* holders are more heterogeneous in terms of prestige than the lower educational groups. At best, this compositional change may have contributed to a decreasing association.

educational expansion According to the *second hypothesis*, it is prompted by a reduction of *internal labor market* careers upon labor market entry strongly affecting university graduates' occupational attainment.

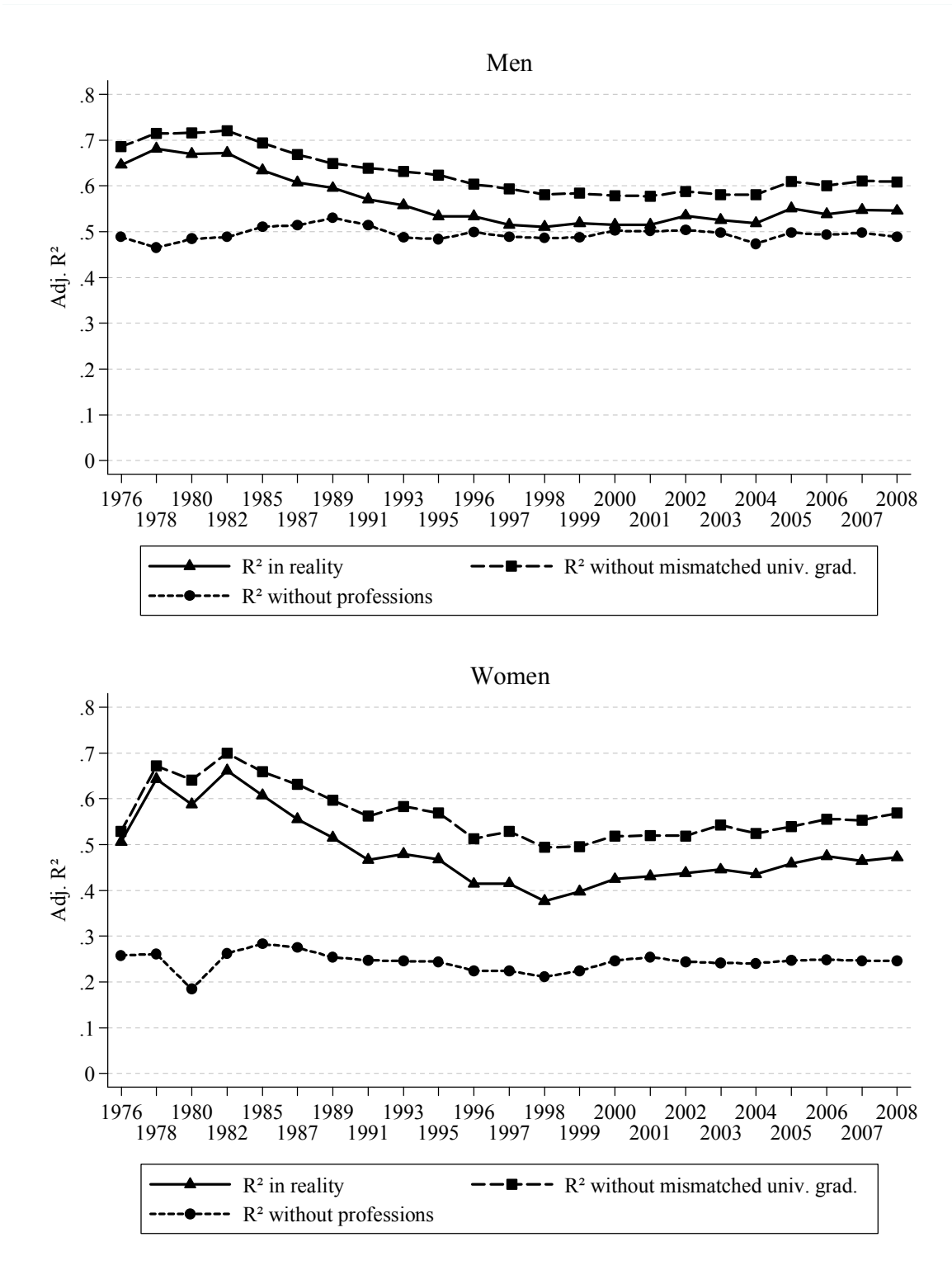
In order to test these hypotheses, I simulate some counterfactual scenarios for both sexes by excluding university graduates either in non-service class positions or *professions* in all *Microcensus* years from the sample. The *first* scenario is the reality observed with the data. By excluding non-service class positions, the *second* scenario asks how trends in the association between educational attainment and occupational prestige would look if university graduates found adequate positions in *internal labor markets* at all times. By excluding the *professions*, the *third* scenario shows how the explained variance would have developed over time if *professions*, featuring high occupational closure, had never been career options.

Figure 23 compares trends in the predictive value of educational attainment among these different counterfactuals for men and women. In each instance, R^2 *full model* indicates the observed variance explained in the full sample. These are identical to R^2 for education in Figure 20. Unsurprisingly, excluding mismatched university graduates generally increases the predictability of educational attainment in comparison to the full model. Although the decrease in explained variance is somewhat flatter, particularly at the beginning of the 1990s, we still see a generally parallel trend over time for men. Hence, even if assuming a counterfactual in which all male university graduates had entered adequate positions in the labor market, the variance explained would have shown a decreasing trend. If we look at university graduates' average occupational prestige and variance around the mean with this same counterfactual, we also see that these trends do not substantially differ from the full model (see Figures C7 and C8). For women, variance explained in this scenario would have decreased as well, but the decline would not have been as steep as in reality, particularly across the 1980s. Thanks to the exclusion of mismatched university graduates, the average prestige score among female university graduates would have decreased at a lower rate than in reality, but this manipulation had no effect on their dispersion around the mean (lower graphs of Figures C7 and C8). More than for men, the increase in mismatched university graduates across the 1980s partially accounts for the declining predictability of educational attainment on occupational prestige. Nevertheless, growing difficulties for male and female university graduates to find *entry jobs* into *internal labor markets* upon labor market entry appear to be not the dominant mechanism for the decreasing predictive value of educational attainment on occupational prestige.

Simulating a scenario without male *professionals*, the explained variance would have been much lower at the beginning of the observation period. Over time, this counterfactual shows that the predictive value of educational attainment on occupational prestige would have remained rather stable over time. Compared to the full model, the association between educational attainment and occupational prestige among men did not decrease across the 1980s, but somewhat increased in this counterfactual scenario. Hence, the decreasing share of *professional* positions among male university graduates appears to be responsible for the decreasing variance explained in the 1980s. The upper graphs in Figures C7 and C8 additionally indicate that in this scenario, male university graduates would have had stable average occupational prestige as well as stable variance in this period. For women, a world without *professions* implies a considerably lower association between educational attainment and occupational prestige. This illustrates that the *professions* - being accompanied by exceptionally high prestige scores - are dominant occupational destinations among female university graduates. In this scenario, the variance explained would not have experienced such a sharp decrease between the 1980s and mid-1990s. While the average occupational prestige among female university graduates would have remained stable without female professionals (see lower graph in Figure C7), variability among them would have even decreased in the 1980s (see lower graph in Figure C8). Nevertheless, we see a slightly decreasing predictive value of educational attainment also in this scenario. This is possibly due to the fact that heterogeneity in terms of occupational prestige also increased among female *Fachhochschule* graduates and female *Abitur* holders.

Overall, these counterfactuals demonstrate that the decrease in explained variance among men and women across the 1980s can be attributed to the *first hypothesis* rather than the *second hypothesis*. In this thought experiment without *professionals*, the association between educational attainment and occupational prestige would have remained rather stable. This implies that a merely compositional change among university graduates' occupational attainment in which the highly prestigious professions were reduced in numerical importance relative to less prestigious open private sector positions prompted a decrease in average occupational prestige and increase in variability among university graduates, thereby decreasing the overall association. Interestingly, had prestigious professional positions never existed university graduates would have had about the same average occupational prestige as *Fachhochschule* graduates. This stresses the importance of occupationally closed *professional* positions for university graduates' strong advance in occupational prestige over other educational groups.

Figure 23 Simulations and changes in proportion of explained variance



Source: German Microcensus, Scientific-Use-Files 1976-2008.

8.6 Summary

This chapter considered changes in the association between educational attainment and occupational prestige upon labor market entry in West Germany. Addressing another occupational measure besides class destinations was necessary in order to determine whether returns to education have developed differently depending on the specific labor market outcome. Hence, the chapter attempted to shed further light on the potential mechanisms behind a changing relationship between educational credentials and occupational positions.

Akin to service class returns, the relationship between educational attainment and occupational prestige decreased particularly across the 1980s and somewhat less in the 1990s, and slightly more for women than for men. In the 2000s, however, this association slightly increased, particularly among women. Hence, we do not find any significantly different trends in the returns to education when considering occupational prestige instead of service class attainment. Overall, we see little change in the association between education and occupational prestige over time. Similar to the analysis on class destinations, these results emphasize that the link between educational credentials and occupational positions upon labor market entry has been remarkably stable in West Germany. Hence, the claim of some authors, most prominently Beck (1985, 1986), that the relationship between educational qualifications and labor market positions would become increasingly dissolved amidst a general destandardization and discontinuity of life courses over time can – at least for West Germany – clearly be rejected.

But do the mechanisms behind these consistent trends for service class attainment and occupational prestige differ? Since social class and prestige are distinct concepts, one can derive somewhat different theoretical expectations regarding changes in relation to educational attainment. On the one hand, occupational prestige is historically linked to processes of occupational closure such as *licensing*. Thus, *professions* that require specific occupational *licences* via university education are traditionally rewarded with high levels of occupational prestige, thereby generating strong advantages in terms of average occupational prestige among university graduates over lower educational groups. Throughout educational expansion, however, an increasing share of university graduates is unable to gain access to highly prestigious occupations, being allocated to less prestigious (service class) positions in the private sector. Therefore, compositional changes in their occupational destinations imply a more heterogeneous and lower average prestige level among university graduates, eventually leading to a decreasing overall relationship between educational attainment and occupational

prestige. On the other hand, university graduates may be affected by increasing flexibilization and elongation of labor market integration upon labor market entry. Amidst globalization and growing market uncertainties, employers may reduce internal career possibilities and increasingly screen job candidates in probationary periods before letting them enter promotion ladders. This may result in more heterogeneous and lower medium prestige scores among university graduates across labor market entry cohorts.

In fact, the analyses show that the decreasing association between educational attainment and occupational prestige across the 1980s is attributable to changes among university graduates. In this period, university graduates had, on average, a decreasing occupational prestige. As the reduction in average prestige was not as strong among other educational groups, differences between educational groups in terms of occupational prestige were reduced. Most importantly, university graduates had more diversified prestige scores across the 1980s. In order to differentiate between the two proposed explanations for this development, we used a simulation approach. While an increasing share of university graduates working in inadequate occupational positions below the service class cannot significantly account for the decreasing association, the dominant mechanism appears to be compositional, as university graduates increasingly work in less prestigious non-professional positions over time.

Flexibilization and labor market deregulation seem to have had little impact on returns to education in terms of occupational outcomes upon labor market entry. While labor market entrants may be particularly affected by increasing market uncertainties compared to prime-age workers and may have increasingly flexible and destandardized job-entry patterns, this does not change the ordering of occupational prestige by educational attainment at the start of workers' career. University graduates have more or less extraordinarily good career prospects in terms of occupational rewards across time. This is in line with the general consensus that labor market deregulation in West Germany has had rather weak effects on career patterns.

Both trends in education-specific service class returns and the association between educational attainment and occupational prestige can be attributed to compositional changes in the occupational structure. Nevertheless, the mechanisms behind these effects tend to be somewhat different. Among service class workers, administrative and managerial positions, where access is less dependent on education compared to social services or expert positions, have increased in relative size over time. Due to this compositional change, *Abitur* holders have been increasingly able to enter the service class. Hence, the *relative* value of university education has slightly decreased because access to the expanding service class segment of

administrative and management is less exclusively restricted to university graduates. Regarding occupational prestige, however, university graduates' advance in average prestige is less pronounced than in the 1970s and has become more heterogeneous due to compositional changes in their occupational destinations. This is because Wegener's prestige scale takes *occupational closure* explicitly into account, as *professions* are rewarded with extraordinary high prestige levels due to educational *licensing*. Over the course of educational expansion, an increasing share of university graduates did not gain access to traditional university graduate occupations and therefore had to settle on less prestigious (service class) employment. Returns to university education in terms of occupational prestige tend to be rather independent from access patterns into the service class. Simulating a world without university graduates in non-service class positions only marginally accounts for trends in the relationship between educational attainment and occupational prestige. Assuming that university graduates' relative advantages in access to the service class would have been stable, i.e. access to administrative and managerial positions is equally dependent on education as in other segments of the service class, they would still have seen a decrease in average prestige level and a more heterogeneous distribution. By contrast, *Abitur* holders did not profit from stronger service class attainment in terms of increasing average prestige scores. These differences tend to be a logical consequence of educational expansion and the fact that *professions* and other service class positions in the private sector substantially differ in their occupational prestige.

Although revealing a fairly consistent trend, the chapter stresses that the returns to education are clearly dependent on the chosen outcome variable and its operationalization (see also Van de Werfhorst, 2007). In this regard, social classes alone do not reveal the whole picture since they neglect structural or institutional barriers such as *occupational closure*. In the class framework, the *professions* are equated with other (new emerging) high-skilled occupations in the service class. However, labor market positions in the service class are quite heterogeneous in terms of prestige (and other aspects such as wages) and have become more so over time. While a growing share of university graduates was absorbed by the expanding service class, service class positions today may not guarantee the same economic and social rewards as in former times. Due to growing heterogeneity, it might be worthwhile to break down the service class into occupations or occupational segments in order to detect potential inequalities in labor market rewards, employment relations or career prospects that are created in a systematic way at the occupational level. For instance, Bol and Weeden (2012) show a strong positive relationship between occupational closure and wages in Germany. Also,

studies that deal with returns to education over time are urged to use a multidimensional outcome concept, while using the same data, in order to account for different aspects of labor market inequality.

Critically, Wegener's measure of occupational prestige was constructed at the beginning of the 1980s and not been updated over time. Hence, analyses on the relationship between educational attainment and occupational prestige heavily rely on the *Treiman Constant*, i.e. the assumption that the prestige hierarchy does not change over the course of time. In this regard, Nakao and Treas (1994) showed that individuals in the US did not strongly differ in their prestige evaluations for occupations between 1964 and 1989. Although some occupations reveal statistically significant changes in their prestige scores, the authors discovered a remarkable temporal stability in the prestige order (correlation of 0.97), which stresses the significance of the *Treiman Constant* (see also Hodge, Siegel, & Rossi, 1964). Also, with regard to economic rewards we see a considerable stability in the occupational wage structure in terms of ranking occupations by median earnings over time in several European countries including Germany (Oesch & Rodríguez Menés, 2011: 9; Goos & Manning, 2007: 122).

Nevertheless, I am only able to take compositional changes in the prestige order into account and cannot consider changes in the prestige level within occupations. If occupational closure determines occupational prestige and the extent of occupations' closure changes over time, prestige scores among occupations may change as well. Some high-skilled occupations in private industry may rely more strongly on *educational credentialing* over time, while others may increasingly use non-educational factors. However, regardless of any prestige changes within occupations, the *professions* remain clearly at the top of the hierarchy so long as they rely on *licensing*, since occupational positions that do not explicitly rely on *licensing* will never be as strongly connected to educational credentials as in the *professions*.

Chapter 9 **Differentiations in higher education and labor market outcomes**

9.1 Introduction

In spite of large cross-country variations, education remains the most important determinant of individuals' labor market outcomes in modern societies. Beside the vertical dimension of educational attainment, scholars have increasingly paid attention to the impact of horizontal differentiations in postsecondary education such as the field of study or college major, the quality of the institution and college performance on earnings or occupational returns (for an overview see Gerber & Cheung, 2008). The increasing focus on qualitative differences in education is probably due to the frequently cited assumption of *effectively maintained equality* (Lucas, 2001) which basically claims that horizontal differences increase when vertical differences decrease. Given that lower class students increasingly opt for higher education throughout educational expansion, the impact of students' social origin on qualitative characteristics such as the field of study should increase, as students from higher classes aim to differentiate themselves from lower class students in their educational attainment (Ayalon & Yogevev, 2005; Reimer & Pollak, 2010).²³⁹ The argument can easily be adapted to stratification processes in the labor market. When tertiary education becomes more widespread in the population, employers may have difficulties to regard higher education credentials as clear signals for potential productivity and thus increasingly rely on qualitative aspects of schooling to differentiate between job applicants in the job matching process. In this regard, some scholars argue that students' field of study in particular may have become a more significant and reliable selection criterion for employers (Jackson, et al., 2005; Hansen, 2001; Van de Werfhorst, 2002).

Research on the effects of college major has largely concentrated on earnings differentials as a mechanism for the gender wage gap in the US (among others Daymont & Andrisani, 1984; Gerhart, 1990; Brown & Corcoran, 1997; Loury, 1997; Joy, 2003; Bobbitt-Zeher, 2007). Since women typically enter fields such as education and humanities, which offer reduced economic returns, while men overwhelmingly select into advantageous fields such as math, science, engineering and business, gender segregation in higher education is partially able to

²³⁹ While the findings of the Israeli study are consistent with EMI hypothesis (Ayalon & Yogevev, 2005), the study on Germany does not reveal any change towards increasing social inequalities in selection of fields of study (Reimer & Pollak, 2010).

explain earnings differentials between men and women.²⁴⁰ Some studies also focus on the question why fields of study differ in labor market returns and associate these differences with specialization effects (Van de Werfhorst & Kraaykamp, 2001; Paglin & Rufolo, 1990; Shauman, 2006; Klein, 2011). Other researchers (Roksa, 2005; Wolbers, 2003; Klein, 2011) stress the mediating role of job characteristics for field of study effects on earnings or job adequacy. More recent work in the context of social stratification literature concentrates on cross-national comparisons and how the institutional context shapes the effect of fields of study on labor market returns (e.g. Kim & Kim, 2003; Van de Werfhorst, 2004; Reimer & Steinmetz, 2009; Giesecke & Schindler, 2008). As suggested by Gerber and Cheung (2008: 309), these studies also widen the analysis on labor market outcomes other than earnings such as occupational prestige, access to service class positions, employment status or temporary employment. Jackson et al. (2008) investigate the role of the field of study in intergenerational social mobility among four European countries (UK, France, Germany and the Netherlands), finding that taking the field of study into account does not contribute much to the understanding of standard mobility processes.²⁴¹

Despite the vast literature on a range of topics related to the field of study, the idea that field of study differences in stratification outcomes become stronger throughout educational expansion has - to my knowledge - so far not been empirically tested.²⁴² By contrast, studies often assume stability in the labor market effects of fields of study over time (e.g. Reimer & Pollak 2010). One exception deals with horizontal stratifications in Russia and considers trends in the effect of field of study over time, but rather emphasizes changes between Soviet Russia and the post-Soviet period (Gerber & Schaefer, 2004). Roksa and Levey (2010) also focus on trends but look at career trajectories of graduates from different college majors in the US. While college graduates with occupationally specific majors have advantages in terms of occupational status upon labor market entry, status growth is lowest across their career. By

²⁴⁰ Research on the gender wage gap among tertiary graduates in the German context is sparse. Using 1996 *Microcensus* data, Machin and Puhani (1996) show that the field of study explains a significant part of the gender wage gap among tertiary graduates in Germany. Moreover, Leuze and Strauß (2009) indicate that the wage discrimination of female-dominated fields and female-dominated occupations on the German labor market partially accounts for the gender wage gap among tertiary graduates. Focusing on university graduates from the same field of study (social sciences) at the same university (Mannheim) and considering a larger set of explanatory variables, Reimer and Schröder (2006) still identify a wage gap for labor market entrants of nearly seven per cent. Therefore, the authors see some hints for wage discrimination of female university graduates on the German labor market.

²⁴¹ The inclusion of field of study into the standard model of class mobility does not decrease the direct effect of class origin on class destinations. That is because children of higher social origin do not appear to choose those fields of study that offer better chances of attaining higher class destinations.

²⁴² A plausible reason might be that large-scale data including information on the horizontal field of study and job characteristics for different labor market entry cohorts are sparse.

contrast, graduates with more general majors are disadvantaged at the start of their career, but have the highest relative status growth across their occupational career. Reimer, Noelke and Kucel (2008) examine the relation between educational expansion and field of study differences by looking at a cross-country comparison. They propose that the higher the level of educational expansion in a country, the larger the differences between fields of study in terms of labor market outcomes. That is because amidst educational expansion increasingly untalented students gain access to higher education and opt for the less challenging *soft fields* (Biglan, 1973), such as humanities or social sciences, thereby decreasing the signaling value of these fields in the labor market. Using multilevel analyses of twenty-two European countries, Reimer and colleagues find that the higher the share of tertiary graduates in a country, the lower the returns in terms employment chances for graduates from humanities.²⁴³ Several economics studies show that increasing wage inequality for British university graduates can be attributed to growing wage differences among fields of study and higher education institutions (e.g. Bratti, Naylor, & Smith, 2007; Green & Zhu, 2010).

The question is then whether these findings also hold true for West Germany in terms of occupational returns. Therefore, the ninth chapter of this book aims to address this research gap by comparing field of study differences in service class attainment, occupational prestige and unemployment risks across time. In the previous chapters I focused on temporal changes in the association between level of schooling and labor market returns. While returns to tertiary education have not substantially decreased during the last thirty years, this does not automatically imply that inequalities in labor market returns among different fields of study remained stable. Although tertiary graduates in West Germany typically maintain their relative advantages over lower educational groups, some field of study groups may increase their relative advantages while others fall behind in terms of labor market success. Besides mere descriptive statistics, I want to shed light on the mechanisms behind changing field of study differences in labor market rewards. Can increasing differences be attributed to changes in the signaling capacity of fields of study? Or do compositional changes in the occupational structure affect the demand for different fields of study? Again, I make use of the German *Microcensus*, which includes information on the field of study of tertiary graduates since 1980.²⁴⁴ Apart from a few prior studies (Kim & Kim, 2003; Reimer & Steinmetz, 2009) that

²⁴³ While the effect on unemployment remains statistically significant when controlling for other macro factors such as business cycle, EPL or occupational specificity, the effect on occupational status becomes insignificant.

²⁴⁴ Certainly, it would be preferable to have data prior to 1980 since educational expansion has already been started earlier. Nevertheless, I am able to look at field of study differences in labor market outcomes for a time span of almost thirty years.

use information on the field of study in one particular year, *Microcensus* data have not been extensively used to analyze horizontal stratifications.

Given the same educational level, the seventh chapter revealed a decreasing but still substantial gender gap in *absolute* chances of attaining the upper service class (see also Gundert & Mayer 2012). Particularly female tertiary graduates are disadvantaged in terms of *absolute* attainment chances compared to male tertiary graduates. Although women have become equal or even outperform men in terms of university attendance across the last decade (see chapter 5.3), the global trend towards a declining gender segregation in higher education is only moderate (most recent Charles & Bradley, 2009; Barone, 2011). As the gender-specific choice of fields of study is strongly linked to occupational gender segregation, the field of study may partially account for gender differences in access to the service class (Smyth & Steinmetz, 2008). This could be particularly evident for the West German labor market thanks to strong linkages between specific educational credentials and occupational positions. Using *German Life History Study (GLHS)*, Gundert and Mayer (2012) find that gender differences in access to the upper service class are largely driven by gender-specific choices of the field of study. Aside from two further studies on social class (Kim & Kim 2003) and employment status (Reimer & Steinmetz 2009), the mediating role of one's field of study in non-pecuniary labor market outcomes has been rather neglected. Therefore, the book chapter intends to identify the extent to which one's field of study contributes to gender differences in occupational outcomes and how this role changes over time.

The previous chapters also indicated that *Fachhochschule* graduates are still disadvantaged in terms of service class attainment and occupational prestige compared to university graduates. This gap could be largely attributed to the fact that first-tier and second-tier institutions differ in the supply of fields of study (Shwed & Shavit, 2006; Gebel & Noelke, 2011). Hence, the current chapter aims to assess whether *Fachhochschule* graduates are still disadvantaged after accounting for differences in fields of study.

Lastly, in order to top off all relevant horizontal and vertical differentiations in higher education, I aim to assess whether PhD degrees involve additional advantages with regard to labor market outcomes in comparison to university degrees. In previous empirical chapters both degrees were merged together in one *CASMIN* group (3b) as information on PhD graduation is only available since 1999. So far, studies that concentrate on further vertical

differentiations in higher education and the labor market benefits of having a PhD are sparse.²⁴⁵

In the following, I present theoretical considerations on the relationship between field of study and labor market rewards as well as on potential changes in this association over the course of time. Besides, the section covers the mediating role for gender differences and tertiary institution differences in labor market rewards. It also deals with the theoretical background on the additional value of a PhD over university degree. Thereafter, I introduce the research design before considering the variety of empirical results. Finally, the chapter concludes with a summary of all these results discussing them with reference to the theoretical expectations.

9.2 Theoretical background and hypotheses

In the first subsection I present theoretical considerations that deal with why various fields of study are rewarded differently on the labor market. Against this background, I consider theoretical arguments concerning the relationship between fields of study and labor market returns over time. The third and the fourth sections elaborate on the mediating role of one's field of study in differences in labor market outcomes between men and women and between tertiary institutions (university vs. *Fachhochschule*). The last section considers the labor market value of a PhD compared to university graduates.

9.2.1 *Field of study and labor market returns*

From a *human capital* perspective (see chapter 2.1.1), graduates from different fields of study acquire different competencies and skills during their studies (e.g. Van de Werfhorst and Kraaykamp 2001). Fields of study may differ in the provision of general academic skills, learning environments or the complexity of curricula. Thus, some fields may provide students with more challenging and productive general skills and knowledge than others. Moreover,

²⁴⁵ In Switzerland, doctoral degrees are significantly beneficial in terms of monetary returns and avoiding unemployment compared to university degrees (Engelage & Hadjar, 2008). While a PhD has the same advantages for men and women with regard to unemployment risks, male graduates benefit substantially stronger from a doctoral degree than women in terms of wages. Over time (1983-2001), wage differences between doctoral graduates and university graduates remain relatively stable for both sexes. PhD graduates in Switzerland also have high chances of being adequately employed, somewhat less so female graduates (Engelage & Schubert, 2009). For Germany, Spangenberg, Mühleck, Schramm and Schneider (2010) indicate that recent doctoral graduates have a monthly net income that is, on average, almost 1000 Euro higher than university graduates' net income. Nevertheless, income advantages among PhD graduates over university graduates in Germany tend to depend on the field of study (Enders & Bornemann, 2001). Across the board, Enders and Bornemann (2001) conclude that doctoral graduates have better promotion opportunities than university graduates over their working career. Occupational careers among PhD graduates also appear to be stable over different labor market entry cohorts, mostly indicating continuous employment after graduating (Kottmann & Enders, 2009).

some fields of study socialize students in a way that is particularly valuable in the labor market, while others lack this distinct socialization (Bourdieu, 1977). Whether the acquisition of human capital during studies is rewarded in the labor market may depend on the demand for specific skills (Heijke, Meng, & Ramaekers, 2003). That is, fields of study may differ in the provision of mathematical skills that are assumed to be scarcer than other skills in the graduate population (Paglin & Rufolo, 1990). Further, some fields of study may produce more job-related skills and prepare students for specific occupations or occupational segments, whereas others mostly convey general skills and lack an occupational specific orientation (Noelke, Gebel, & Kogan, 2012). Job applicants that match the skill requirements of the job are more productive as they are already familiar with the workflow and require less training. Therefore, graduates from fields of study that provide occupation-specific skills may have clear advantages in labor market returns over graduates from fields of study that rather convey general skills (Glebbeek, Wim, & Schakelaar, 1989).²⁴⁶

According to *signaling* approaches (see chapter 2.1.2), employers have to rely on imperfect information and hire job applicants in uncertainty about their true productivity. Thus, employers use recognizable characteristics such as the field of study as signal for potential productivity. According to *job competition theory* (see chapter 2.1.3), higher education graduates do not compete for wages, rather for high-skilled jobs that determine productivity and wages. Employers rank graduates from different fields of study into a *labor queue* according to their potential training costs and match it to a second queue of vacant jobs sorted by skill requirements. Which attributes of one's field of study might employers regard as relevant signals for potential training costs?

Employers may take differences in academic requirements between fields of study into account. Some fields are more academically demanding and more difficult to complete than others. If students are able to complete the most challenging fields, they indicate lower training costs in the future and have a higher probability of fulfilling the requirements of a demanding job. Some fields of study may indicate a higher degree of occupational specificity while others lack an occupational specific profile. Employers may assume that a stronger match between the content of the curriculum and job requirements reduces a job applicant's future training costs as he or she acquired - at least in theoretical terms - occupation-specific knowledge or transferable skills. In general, employers may believe that graduates from applied fields of study are more capable of acquiring occupation-specific or firm-specific

²⁴⁶ Though, some general skills may be universally useful in many job situations and thus may even widen the job opportunities.

skills than graduates from more academic fields of study regardless of job requirements. Due to lower training costs, graduates from occupation-specific fields of study could have a higher rank in the *labor queue* than graduates from more general fields of study. In this regard, employers appreciate the *certifying* capacity of the field of study (Jackson et al., 2005).

From a strict *signaling* perspective, one's field of study may not indicate a different acquisition of skills but rather signal differences in the graduate population in terms of preexisting cognitive abilities, motivation or commitment (Ishida, Spilerman, & Su, 1997; Davies & Guppy, 1997).²⁴⁷ The most capable students may select into and succeed in the most challenging fields, leading into occupational positions that involve the highest labor market returns. By contrast, less capable students may attempt to avoid failure by choosing less demanding fields of study with fewer labor market rewards. Employers may use one's field of study as an estimation of applicants' cognitive and non-cognitive skills, ranking them in the *labor queue* according to these perceived abilities. Selection effects may be further strengthened by supply restrictions of university graduates such as specific requirements to gain access to a certain field of study (e.g. Weeden, 2002).²⁴⁸ As supply restrictions increase labor market rewards, competition for access to restricted fields may tighten. Hence, restricted access to a field of study may additionally increase the average level of ability associated with a given field of study, thereby influencing the signaling value of this field in the labor market.

Alternatively, the *feminization* of a field of study may be the most salient signal indicating lower training costs (Bobbit-Zeher, 2007). According to this perspective, a higher share of women in a given field of study is correlated with lower labor market returns. The argument is similar to the so-called *devaluation thesis* or *thesis of valuative discrimination*, which claims that female-dominated occupations pay less because women hold them (Levanon, England, & Allison, 2009; Cohen & Huffman, 2003).²⁴⁹ Employers devalue work

²⁴⁷ Studies (e.g. Berger 1988; Grogger & Eide 1995) for the US that attempt to account for unobservable traits jointly affecting the choice of fields of study and wages find only limited evidence for *selection* bias. The remaining significant effect of the field of study after controlling for selection is frequently seen as evidence for the *human capital* perspective.

²⁴⁸ In Germany, the *Numerus clausus* restriction controls access to certain popular subjects by selection procedures that are predominantly based on the *Abitur* grade and waiting terms. However, the *Numerus clausus* that is assigned to a field of study (often the professions such as pharmacology, medicine, and law but also economics, engineering or science) depends on the demand for specific subjects in a given year. Thus, *Numerus clausus* restrictions substantially vary across the observation period. Hence, I do not expect that they have a systematic impact on changing field of study differences in terms of labor market rewards over time. For instance, in 2011, only the fields of study medicine, veterinary medicine, dentistry and pharmacology have been assigned a *Numerus clausus*.

²⁴⁹ Using fixed effects models, Levanon et al. (2009) find evidence for a negative causal impact of changes in the proportion of females on occupational earnings but only weak evidence for the other way round. For empirical evidence on the *valuative discrimination thesis* in Germany see e.g. Achatz, Gartner and Glück (2005), Brückner (2004) or Liebeskind (2004).

mostly done by women because of gendered cultural beliefs about women having a lower social status than men. In this scenario, the sex composition of a field of study is used as a signal and affects the allocation into high-skilled jobs. Employers ascribe higher training costs for future work to graduates from fields of study with a high share of females and thus give them a lower rank in the *labor queue*.

According to *labor market segmentation* theories (see chapter 3.3), the labor market is composed of a series of partial labor markets, which are not open to all job applicants to the same extent. Hence, it does not assume a national *job queue*, but several more or less isolated queues in specific segments of the labor market. As already pointed out, the West German labor market is known as prototypical case of a *qualificational space* where job applicants are matched to jobs according to their occupation-specific credentials (see chapter 3.2). While predominantly referring to strong linkages between the *dual system of apprenticeship* and skilled occupational positions, it can also be adapted to the German higher education system (Leuze, 2007). Many fields of study in tertiary education e.g. engineering or science involve a high *certifying* capacity thanks to their occupational specificity, thereby preparing students for certain partial labor markets. In these partial labor markets, recruitment is made almost exclusively among job applicants who graduated from the corresponding field of study. From a strict demand perspective, successful labor market integration among graduates from a given field of study depends on the pool of job openings in the corresponding occupational segment as well as the number of competitive candidates from the same field of study.²⁵⁰ If supply exceeds the demand in a partial labor market, some graduates have to compete either with lower educated applicants for under-skilled jobs or with graduates from other fields for high-skilled positions, which they are not specifically trained for. While they will probably out-compete individuals for the former positions, they lose in the latter positions since employers favor graduates from a corresponding field of study. Even if there is an undersupply of graduates from a matching field of study employers might prefer lower educated job applicants from the same field of specialization relative to tertiary graduates from other fields who do not match the occupational requirements. In this regard, field of

²⁵⁰ Based on annual occupation-level job-advertisements data, Kriesi, Buchmann and Sacchi (2010) show for the Swiss labor market - as akin to Germany's - that job opportunities, measured as the accessible pool of job openings, substantially differ between graduates from different fields of study. As a consequence, the authors argue that 'job opportunities vary depending on the size and the flexibility of the occupational sub-segment to which a worker has access due to his or her credential' (Kriesi et al., 2010: 317). A content analysis of newspaper job advertisements for the Austrian labor market indicates that employers increasingly require specific fields of study in their job advertisements (Dörfler & Van de Werfhorst, 2009). Moreover, there are substantial differences in demand for fields of study: While employers tend to particularly value a degree in economics, business or law, they clearly less often search for graduates from humanities and social sciences.

study differences in occupational returns or unemployment are mainly a matter of field-specific supply-demand balances.

Another theoretical branch deals with mechanisms of *social closure* where institutional barriers are responsible for differences between fields of study in labor market outcomes (Weeden, 2002). As already indicated in the previous chapter, access to prestigious professions such as law, medicine, pharmacology and teaching is only granted when individuals have completed the respective field of study and are adequately *licensed* (*Staatsexamen*). Thus, graduates from these fields have a state-enforced monopoly to work in these professions and do not have to compete with graduates from other fields of study. Thus, strong organizational linkages between professional programs and specific occupations are enforced by the state. Due to occupational closure mechanisms, the professions are associated with high labor market returns and thus graduates from the respective fields should have institutional labor market advantages over graduates from other fields.

9.2.2 Changes in the effect of the field of study over time

How have field of study differences in labor market returns developed over time? As described in the third chapter, the institutional setting of education-labor market linkages in West Germany remained largely constant over time. Substantial changes in the higher education system have only transpired in more recent times and are not included in the period of analysis. Hence, changes in the relationship between fields of study and labor market returns are not attributable to institutional changes. Due to persistent organizational linkages with specific occupations, graduates from *Staatsexamen* fields maintain their clear advantages in labor market outcomes compared to their peers from other fields of study. Graduates from law, medicine, pharmacology and teaching may have difficulties finding a matched position only when the supply of graduates exceeds the number of vacancies for these positions.²⁵¹ Nevertheless, we should see a consistent trend of high labor market rewards for professional study programs.

Although changes in average level of graduates' *human capital* endowment from different fields of study could be responsible for changes in labor market returns, I only derive arguments on trends in field of study differences from the perspective of *signaling* theory and

²⁵¹ If there is an oversupply of potential students in these subjects, they are imposed with a *Numerus clausus*. As professional organizations are highly involved in training coordination and have a strong interest to align educational supply with labor demand, dramatic mismatches may emerge to a rather limited extent.

labor market segmentation theories.²⁵² Several authors (Jackson et al. 2005: 12; Van de Werfhorst 2002: 287; Hansen 2001: 210) claim that educational level becomes a less reliable productivity signal over the course of educational expansion. As a consequence, employers increasingly take other characteristics of job applicants such as the field of study in their hiring decisions into account. Particularly Jackson et al. (2005) argue that an increase in the supply of degree holders, e.g. on the tertiary level, minimizes the *signaling* value of these qualifications as employers feel less certain whether a tertiary degree indicates job applicants' future productivity. By contrast, educational attainment would offer a *noisier* signal regarding applicants' unobservable attributes such as ability or motivation compared to former times. Amidst higher education expansion, employers may assume that the signaling costs for attaining higher education are less negatively correlated with individuals' productivity, as more and more individuals are able to acquire this signal. This does not imply that the association between tertiary degrees and unobservables has, in fact, weakened; rather, it stresses the increasing difficulty for employers to interpret the value of a tertiary degree. Therefore, employers may increasingly rely on other signals such as one's field of study to differentiate between tertiary graduates and choose the best available candidates among the increasing pool of higher education graduates. However, these previous authors did not specify how and in what way fields of study could have changed in terms of their signaling value throughout educational expansion.

Why may employers increasingly rely on one's field of study in job matching processes? Applicants' field of study is easily observable and gives further hints about graduates' potential training costs. As argued in the previous section, fields of study could signal differences in *selectivity*, *occupational specificity* or *sex composition* that may have become more pronounced or just be perceived as more salient attributes by employers amidst higher education expansion.

The growing share of tertiary graduates may have widened the differences between fields of study in the *selectivity* of the graduate population. That is, fields of study increasingly differ in average ability level of their students or other preexisting (unobserved) attributes that are demanded by employers. This relies on the assumption that increasingly more untalented students gain access to higher education over the course of educational

²⁵² Moreover, it is not possible to empirically test this mechanism since we do not have measures for field-specific human capital endowment. Likewise, employers do not have direct information on changes in productivity.

expansion (Walker & Zhu, 2005).²⁵³ This growing share of weaker students possibly selects into less academically challenging fields in order to minimize the risk of drop out. While mass higher education should then clearly lower the average skill level of students these fields, the ability distribution in more demanding fields should be rather unaffected. In this regard, I expect *hard fields* such as science, mathematics, computer science or engineering to more strongly rely on preexisting abilities or knowledge compared to other fields. By contrast, I assume that succeeding in *soft fields* like humanities and social sciences is less dependent on prior ability. Moreover, *soft fields* are easier to access among weaker students as they are overwhelmingly not affected by closure mechanisms such as student entry requirements (*Numerus clausus*). This decrease in students' mean ability in less demanding *soft fields* may have the additional effect that teaching standards in curricula decline as well. That is, enrollment in soft fields is increasingly dominated by untalented students, and at the same time, curricula in these fields offer decreasing skills training to compensate for this shift. Overall, higher education expansion should increase differences in the mean ability between *soft fields* and *hard fields*, thereby increasing differences in the *signaling* value in terms of *selectivity* among fields of study over time.

Empirically, Arcidiacono (2004) indicates for the US that freshmen in science had significantly higher test scores (SAT) in mathematics and verbal tests than freshmen in humanities, social sciences or business. Using several *HIS (Hochschul-Informationen-System)* school leaver surveys, Reimer and Pollak (2010) show for Germany that the better students' *Abitur* grades are, the less often students opt for studying humanities and social sciences in almost all school exit cohorts. However, except for comparing to business and economics, differences in selectivity between humanities and social sciences and all other fields (medical sciences and law, natural and life sciences and engineering) remained stable over time.

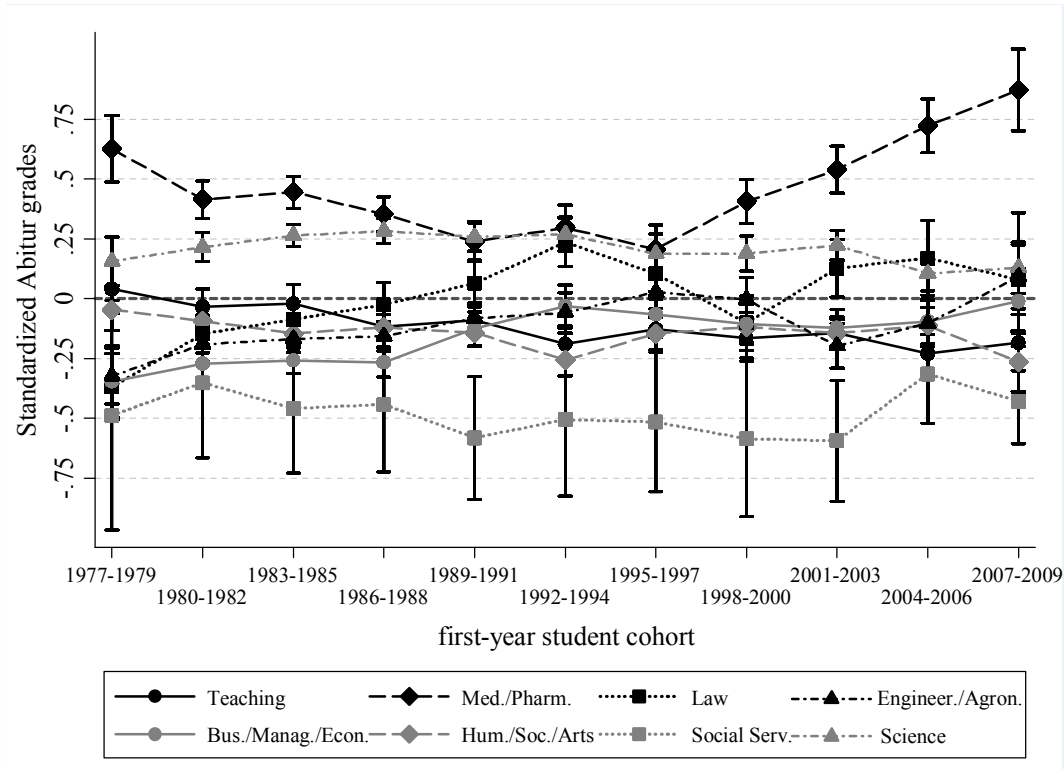
Based on my own calculations using the *Konstanz Student Survey (11 waves, 1982/1983-2009-2010)*, a survey on tertiary students' study and orientation in Germany, Figure 24 shows field-specific changes in student quality among first-year student cohorts, measured by mean *Abitur* grades²⁵⁴, over time. This figure indicates that students from science and mathematics fields clearly have better average *Abitur* grades than students from humanities and social sciences. While the gap somewhat increased through mid-1990s, it

²⁵³ Cohort comparisons of *Gymnasium* pupils' average competencies for Germany are rare and rather mixed. While 7th graders in *North-Rhine Westphalia* have a slightly higher average IQ in school year 1991/1992 than in 1968/1969, they show significantly lower average skills in mathematics (Becker, Trautwein, Lüdtke, Cortina & Baumert, 2006).

²⁵⁴ In order to address the issue of substantial grade inflation over time, *Abitur* grades have been z-standardized. Moreover, they have been reversed, i.e. higher values indicate higher student quality.

remained rather unchanged in the following periods. In comparison to humanities and social sciences students, engineering students had worse *Abitur* grades at the beginning of the 1980s. Over time, engineering students have become somewhat more selective and outperformed students from humanities in terms of selectivity in recent times. Students in social services and education have always been the worst students in terms of abilities.²⁵⁵ Hence, we see only moderate indications of increasing ability differentials between graduates from *soft fields* and *hard fields*. Business and economics students became more selective until the beginning of the 1990s and showed the average ability level of higher education students from then onwards. As to professional studies, law students became more able on average, while teaching students became slightly less capable. Medicine and pharmacology is clearly the most selective field of study in terms of student quality. As this figure shows, selectivity for these fields decreased from the late 1970s through the mid-1990s, after which time it grew substantially.

Figure 24 Field-specific changes in student quality over time



Source: Konstanz Student Survey (11 waves winter term 1982/1983 until winter term 2009/2010).
 Notes: Ranges within capped spikes indicate 95% confidence intervals (CI).

²⁵⁵ Due to large standard errors, changes in the mean ability of students from social services should be considered with caution.

As tertiary education becomes more widespread in the population, the signal of *occupational specificity* among fields of study may receive more attention by employers, indicating further information about graduates' potential productivity than solely information on the vertical level. Before expansion, a tertiary degree was a clear signal for outstanding competencies and a keen perception to quickly learn specific skills regardless of the type of education. When a tertiary degree becomes *noisier*, employers may increasingly take the *occupational specificity* of fields of study into account in order to lower the potential training costs and avoid the selection of inadequate applicants. While some curricula prepare students for a rather narrow occupational profile (e.g. science, mathematics), others (humanities, social sciences) convey rather general skills or knowledge that is unrelated to specific occupations (Klein, 2011).

Aside from that, *occupational specificity* may have become more relevant over time as labor market positions are increasingly characterized by knowledge-intensive high-skilled work tasks that emphasize the use of (computer) technology (see the literature on *SBTC*). Technological change leads to more complex non-routine jobs, requiring greater skills to complete a given job. Hence, high-skilled labor market positions increasingly demand graduates with specific academic abilities and knowledge that signal a high *occupational specificity*. The more specific expertise the labor market demands, the higher the potential training costs for guaranteeing a productive performance in high skilled jobs. The higher the amount of training costs in these jobs, the more important it is for employers to select job applicants that have occupation-specific knowledge in order to keep training costs as low as possible. While some fields of study more closely adapt to changing needs of the labor market or become more diversified and increasingly offer specialized curricula (e.g. engineering, science, business studies), others (humanities, social sciences) have not become as differentiated and increasingly lack *employability* in private sector high-skilled occupations. Accordingly, field of study differences in signaling *occupational specificity* may have increased over time.

Given that employers factor in the *sex composition* of a given field of study in their hiring decisions, field-specific changes in the *signaling* value are related to changes the gender distribution among fields of study. Since women have been mostly responsible for educational expansion in West Germany, it is likely that all fields of study are affected by an increase in the proportion of female graduates, though to a different extent. Given that *sex composition* is a relevant signaling value, changes in returns to fields of study depend on the relative growth of female graduates in these fields.

Changes in returns to fields of study may not only be due to supply-side changes in the *signaling* value of different fields, but also to changing opportunity structures in the labor market. As previously argued, field of study differences could be mainly a matter of field-specific supply-demand balances. From a *demand perspective*, the composition of the expanding service class has changed tremendously over the last thirty years: While the share of service class positions in social services has relatively decreased, concurrently, administrative and managerial positions have relatively increased (see chapter 7.5.1.). These compositional changes among service class positions may imply that some fields of study grow in demand thanks to occupational growth (e.g. business and economics, science and mathematics), while other fields (humanities, social sciences and arts, social services and education) will become less demanded throughout this compositional shift. In other words, the occupation-specific labor market for graduates from *hard fields* and particularly business and economics has been growing, while it has been declining for graduates from *soft fields*. However, this compositional change may not have an impact on field of study differences so long as the supply of tertiary graduates adapts to changing demand in the high-skilled labor market. Only if the relative share of graduates from *soft fields* not decreases in the same manner as the share of social services positions, we will see a growing oversupply of graduates from *soft fields* in the high-skilled labor market. As a consequence of competitive disadvantages in access to high-skilled positions in non-matching occupational segments, more and more graduates from *soft fields* would have to accept inadequate jobs below the service class. Aside from that, math and economic skills tend to become universally important for all kinds of jobs (Mitra, 2002). Due to this, graduates from business, economics or science and mathematics may be increasingly demanded regardless of the specific job.²⁵⁶ By contrast, graduates from *soft fields* may have increasing difficulties to find employment in the service class as they largely lack mathematical skills.

Given these theoretical considerations, *hypothesis 1* assumes that differences between fields of study in labor market rewards have become increasingly pronounced over the course of time. Particularly graduates from *soft fields* (humanities, social sciences, arts; social services and education) should be increasingly disadvantaged compared to graduates from *hard fields* (science and mathematics; engineering). With regard to potential mechanisms behind this trend, *hypothesis 1a* posits that the increasing differences among fields of study are due to changes in their *signaling* value according to *selectivity, occupational specificity or*

²⁵⁶ Literature for the US shows that math and science abilities predict salaries to a higher extent than in former times (Murnane, Willett & Levy, 1995). In general, Paglin and Rafalo (1990) assume that human capital based on mathematical ability is scarcer than human capital that is formed by verbal ability.

sex composition. By contrast, *hypothesis 1b* proposes that changes in the effect of field of study on labor market rewards are driven by demand-side changes in the occupational structure. Graduates from *hard fields* and business/economics have increasing advantages over graduates from *soft fields* because occupation-specific labor markets that match their fields of study gain in numerical size while occupational segments with skill requirements that match the abilities of graduates from *soft fields* relatively decrease.

Finally, differences between fields of study in labor market rewards may not consistently increase over time but vary with the business cycle or structural conditions, i.e. the balance between educational expansion and occupational upgrading (Reimer et al. 2008). During economic downturns or an undersupply of high-skilled positions, competition among tertiary graduates for high-skilled vacancies should tighten (see chapter 6). In particular graduates from *soft fields* could be affected by crowding-out when job competition tightens. Therefore, *hypothesis 1c* suggests that field of study differences in labor market returns depend on macrostructural and macroeconomic conditions and increase under growing competitive circumstances.

9.2.3 *Gender and field of study*

Male and female tertiary graduates strongly differ in their distributions across fields of study: while men are overrepresented in majors like engineering, science or math, women are typically concentrated in fields like humanities, education and arts (Jacobs, 1996). In recent decades, female tertiary graduates have increasingly entered male-dominated fields of study, which is assumed to be positively influenced by a spillover effect of women's increasing enrollment in all other fields (Ramirez & Wotipka, 2001). Although there is a global trend towards declining gender segregation in higher education, differences between the sexes in the choice of fields of study are still substantial (Jacobs, 1995; Bradley, 2000; Charles & Bradley, 2002, 2009; Barone, 2011). Which mechanisms account for persistent sex segregation in the choice of fields of study? The vast literature on gender relations identifies different explanations such as gender differences in returns to field of study (e.g. Kalmijn & Van der Lippe, 1997), career expectations (e.g. Polachek, 1981), job values (e.g. Marini, Fan, Finley, & Beutel, 1996) or math abilities and associated perceptions of comparative disadvantages (e.g. Jonsson, 1999; Ayalon, 2003). Taking all these conflicting explanations into account, Xie and Shauman (2003) show that none of these have much explanatory power

and thus the authors arrive at the conclusion that we still do not know why women and men opt for different majors.²⁵⁷

As fields of study that are mainly chosen by men involve higher earnings relative to those chosen by women, gender differences in the choice of the field of study substantially contribute to the gender wage gap (e.g. Daymont & Andrisani, 1984; Brown & Corcoran, 1997; Bobbitt-Zeher, 2007; Machin & Puhani, 2003). The gender inequality among higher education graduates is not only evident in earnings but in occupational returns as well. The seventh chapter of this book clearly showed that there is a substantial gender gap among higher education graduates in attaining upper service class positions (see Figure 11 in chapter 7.5.2). Akin to the gender wage gap, male graduates may have higher chances of being allocated to the upper service class than women because they select fields of study that involve a higher propensity of ending up in top-level positions.²⁵⁸ The mediating role of one's field of study may also be evident for differences in unemployment risks between female and male tertiary graduates. Therefore, *hypothesis 2a* suggests that female disadvantages in accessing the upper service class or unemployment risks among higher education graduates are at least partly mediated by one's field of study.

The seventh chapter also revealed that female graduates were able to reduce their disadvantages in accessing the upper service class compared to male graduates over time (see Table 11). Therefore, we ask whether this decreasing gender gap in upper service class attainment can be attributed to changes in men's and women's field of study distribution. A reduction that is related to one's field of study may be due to decreasing gender differences in field of study distributions and/or converging labor market rewards to gendered fields of study (Gerber & Cheung, 2008: 306). Since I expect the gender segregation in higher education to remain largely stable and decreasing relative occupational returns for female-dominated *soft fields*, *hypothesis 2b* suggests that the decline in this gender class gap can largely be not attributed to a reduced mediating role of one's field of study over time.

Gender differences in labor market returns are not only due to differences in fields of study but also to a variety of other processes, such as *allocative discrimination*, i.e.

²⁵⁷ Beside a differentiation between scientific and humanistic fields, Barone (2011) proposes a second divide, a care-technical divide. This differentiation is able to considerably account for gender segregation in higher education. With this modeling, gender segregation remains highly stable over time and across countries. He attributes this persistence in gender segregation to highly resilient cultural mechanisms.

²⁵⁸ The strength of this mediating effect depends on the interplay between gender segregation in higher education and occupational gender segregation. The declining sex segregation in higher education has not resulted in a similar decline of occupational sex segregation (e.g. Jacobs, 1995; Reskin, 1993). If men and women with the same field of study still end up in different occupations, gender differences in the labor market can be less attributed to the choice of fields of study.

discrimination in the hiring process, subsequent promotions and dismissals. Petersen and Saporta (2004) argue that *allocative discrimination* is most feasible at the point of hiring because discriminatory behaviors cannot be easily documented, making it difficult to raise a legal complaint. In this regard, employers' prejudices or stereotypes regarding women's potential productivity may particularly arise in the recruitment of labor market entrants since it offers an 'optimal' opportunity structure for discrimination. Due to high levels of gender segregation in higher education and occupational gender segregation, employers may regard female graduates from male-dominated fields as inadequate applicants for vacancies in typically male occupational segments (Hultin, 2003; Whittock, 2002). Since hiring for jobs in male-dominated occupations rather takes place through informal job networks among men, women's discrimination tends to be difficult to document (Reskin & McBrier, 2000). Accordingly, *labor queues* are often characterized as *gender queues* where women are placed at the bottom of the *labor queue* in male-dominated labor market segments (Reskin, 1991). In this regard, it has been shown that occupational areas with a high demand for female labor end up with more gender egalitarian labor markets and vice versa (Cotter, DeFiore, Hermsen, Kowalewski, & Vannemann, 1998). Thus, female graduates in male-dominated fields of study may be particularly affected by *allocative discrimination* upon labor market entry. *Hypothesis 2c* expects that gender differences in accessing the upper service class or unemployment risks are dependent on the field of study. Female disadvantages should be stronger in male-dominated fields than in integrated or female-dominated fields.

9.2.4 *Tertiary institution and field of study*

Labor market effects of the quality of higher education institutions have received much attention in the literature on horizontal stratifications in postsecondary education. In this regard, Gerber and Cheung (2008: 301) differentiate between four theoretical strands, which closely resemble effects related to one's field of study. From a *human capital* perspective, graduates from different institutions have a different productivity level and are therefore differently rewarded on the labor market. According to the *signaling* approach, employers use higher education institutions as indicators of potential productivity among graduates regardless of whether graduates from higher-rank institutions are indeed more skilled than those from lower-rank institutions. Graduates from higher-rank institutions may also be embedded in more valuable *social networks* than graduates from lower-rank institutions. Lastly, the effect of an institution's reputation on labor market rewards could also be due to selection, i.e. exogenous factors such as cognitive ability or motivation increase the

propensity of certain individuals attending higher-ranked institutions and increase labor market rewards concurrently, thereby causing the observed difference between institutions.

In the German context, we differentiate between traditional universities and *Fachhochschulen* (see chapter 3.1). Because teaching standards at *Fachhochschulen* are often assumed to be lower than at university, *Fachhochschule* graduates may have a lower productivity than university graduates. While the curricula at universities strongly emphasize academic skills, training at *Fachhochschule* is much more practically oriented and teaches occupation-specific skills. Thus, employers could be confronted with a trade-off at the point of hiring: while *Fachhochschule* job applicants might have clear advantages in occupation-specific or job-specific skills, their general skills and learning capacities may be less pronounced compared to university graduates. In Germany, occupational closure processes likely also play a role. While access to universities is limited to individuals that possess the university entrance qualification (*allgemeine Hochschulreife*), access to *Fachhochschulen* requires an advanced technical certificate (*Fachhochschulreife*) only. This may involve selection effects since rising entry hurdles may increase the institutional sorting of school-leavers by exogenous factors.²⁵⁹ As to the public service, *Fachhochschule* graduates are restricted to become upper-middle-level civil servants (*gehobener Dienst*) while university graduates are allowed to attain positions as upper-level civil servants (*höherer Dienst*).

Empirically, the mechanisms for this gap between university and *Fachhochschule* graduates in labor market rewards in West Germany have not been explored.²⁶⁰ Müller and colleagues find that differences between these institutions in attaining the service class decreased between the 1980s and 1990s (Müller, et al., 1998; Müller, et al., 2002). They attribute this development to an institutional and programmatic upgrading and thus an increased *signaling* value of *Fachhochschulen*.²⁶¹ The previous chapters in this book on social class and occupational prestige, however, did not indicate a substantial convergence in labor occupational returns between universities and *Fachhochschulen*. Contrary to expectations, graduates from these institutions differ less in access to the upper service class than in access

²⁵⁹ With regard to social origin, Reimer and Pollak (2010: 422) show that high-origin students are more likely to choose the traditional university than low-origin students, while the difference is rather small in terms of attaining *Fachhochschule*. Nevertheless, students from lower social origin are not increasingly ‘diverted’ into *Fachhochschule* over the course of educational expansion. Based on longitudinal data for *Baden-Wuerttemberg*, Kramer, Nagy, Trautwein, Lüdtke, Jonkmann, Maaz and Treptow (2011) find that freshmen at university substantially differ from freshmen at *Fachhochschule* in terms of cognitive abilities.

²⁶⁰ Research on higher education in the US predominantly comes to the conclusion that the effects of ‘college quality’ largely stem from selection bias (Gerber & Cheung 2008).

²⁶¹ More specifically, they argue that the *Fachhochschule* replaced schools of advanced vocational training that primarily had the aim to upgrade apprenticeship-based qualifications. By doing so, formal entry requirements have been raised and curricula became much more school-based than in the earlier schools.

to both sections of the service class and did so from the beginning of the observation period. Hence, in the German context, differences between first-tier and second-tier institution remained rather persistent over time.

Aside from an Israeli study (Shwed & Shavit 2005), research on differences between post-secondary education institutions in terms of labor market rewards neglects the mediating role of the field of study.²⁶² The gross gap in service class returns between university and *Fachhochschule* graduates (see chapter 7) may be partially reduced when considering differences among these institutions in the supply of fields of study (Gebel & Noelke, 2011: 44). While universities offer all kinds of fields of study, the supply of fields of study at *Fachhochschule* is limited and concentrates on fields like engineering, business and management or social services. Most importantly, the *Fachhochschule* offers no fields of study that lead into prestigious professions such as law or medicine and thus may be institutionally disadvantaged in terms of labor market rewards. Only when taking these structural differences into account, net effects of the ‘quality’ of the institution can be examined in terms of substantive mechanisms such as human capital vs. signaling. Thus, *hypothesis 3* assumes that differences between university graduates and *Fachhochschule* graduates are partially mediated by the field of study.

9.2.5 *The additional value of a PhD*

A doctoral degree is the highest educational degree students can achieve and represents a further vertical differentiation within higher education. Applying general theories on the returns to education described earlier, we compare the value of a PhD to a university degree. One central mechanism by which PhDs garner additional rewards is through occupational closure such as *licensing* (Weeden, 2002). In this regard, only graduates that are certified with a doctoral degree have the legal rights to pursue an academic career. Thus, a substantial share of PhD graduates do not need to compete with other university graduates for high-skilled positions in public service but have exclusive access to prestigious, well-paid professional positions in academia once they achieve this credential.

But why may graduates with doctoral degrees have advantages in terms of labor market rewards over university graduates outside academia? From a *human capital* perspective, graduates with doctoral degrees accumulate additional human capital by investing time in learning additional skills and knowledge that may increase their

²⁶² In the Israeli case, the field of study accounts for a large proportion of differences in occupational attainment and income between first-tier universities and second-tier colleges.

productivity. From a *signaling* perspective, employers may use doctoral certificates as productivity signal in order to further differentiate among university graduates in terms of potential training costs. Hence, PhD graduates do not need to be more productive than university graduates in order to have higher labor market rewards; it is sufficient that employers perceive them as more valuable at the point of hiring. Having a PhD could indicate that graduates have acquired certain non-cognitive skills throughout their doctoral studies that are particularly valuable for employers in the assignment of elite positions (e.g. Bowles & Gintis, 2002). Furthermore, employers may regard a PhD as productive value because graduates were able to work independently on a demanding topic for a long time, thereby signaling great perseverance. From a strict signaling view, a positive effect of PhD on labor market rewards is due to selection effects, i.e. doctoral studies do not produce more productive graduates but rather indicate extraordinary preexisting competencies, motivation or diligence since only the most able students select into PhD studies.²⁶³ Against this background, *hypothesis 4a* expects that PhD graduates have *relative* advantages over university graduates in terms of labor market rewards.

The additional value of having a PhD may depend on the field of study. A PhD could be particularly beneficial for university graduates in fields of study that are generally disadvantaged compared to other fields by increasing their signaling capacity and helping to compensate their disadvantages. By contrast, pursuing a PhD may be less beneficial for graduates from fields of study that already have a high signaling capacity in the labor market since these university graduates do not have any difficulties in finding advantageous occupational positions upon labor market entry. For instance, Enders and Bornemann (2001) show that particularly PhD graduates in social sciences have relative advantages in terms of income and employment chances over their peers with a university degree only. Therefore, *hypothesis 4b* suggests that the *relative* returns to a PhD compared to a university degree are larger among graduates from *soft fields* than among graduates from *hard fields*.

9.3 Research design

I do not have information on respondents' field of study prior to 1980. Further, this information is not included in all available *Microcensus* Scientific-Use-Files from then

²⁶³ Studies on selective enrollment in PhD programs are rather sparse. Regarding social origin, earlier studies (e.g. Mare 1980) for the US do not reveal any background effects on graduate enrollment. More recently, Mullen, Goyette and Soares (2003) indicate that parents' education has a strong effect on enrollment in doctoral programs. This effect largely operates indirectly via academic performance and educational expectations.

onwards. Despite this, I can use *Microcensus* years 1980, 1985, 1987, 1989, 1991, 1993, 1995, 1996, 2000, 2004, 2005, 2006, 2007 and 2008.²⁶⁴

Since I concentrate the analysis on horizontal differentiations in higher education, the sample is further restricted to graduates from university and *Fachhochschule* (*CASMIN* 3a and 3b). In order to maintain consistency in the empirical analyses on labor market returns among different *CASMIN* groups, labor market entrance for tertiary graduates is approximated with the age group 30 to 34 (see chapter 4.2).

9.3.1 Variables

Respondents' *field of study* is measured with eight main field groups as some degree of aggregation cannot be avoided due to small sample sizes in single categories. Moreover, the distribution of fields of study and their naming are different in every survey year. In order to make the variable comparable across survey years the aggregation in main groups has to be done.²⁶⁵ This classification attempts to scale respondents' majors according to similarities in labor market integration (see Table A6 for a detailed classification). As the field groups *teaching* (1), *law* (2) and *medicine/pharmacology* (3) offer *Staatsexamen* degrees and have strong organizational linkages they should not be pooled with other degrees and therefore represent separate groups. According to prior research, graduates from *soft fields* have relative disadvantages in labor market outcomes compared to all other fields of study. *Soft fields* comprise two groups: on the one hand, academic subjects such as *humanities, social sciences and arts* (4), on the other hand, *social services and education* (5). Because *social services* (*social work, medical care*) and *education* graduates may increasingly be in demand in a service economy, it would be worthwhile to separate them from the academic subjects. *Hard fields* are categorized as *science and mathematics* (6) as well as *engineering and agronomics* (7). *Business, management and economics* (8) indicate fields that may particularly profit from occupational upgrading and the accompanying distributional shifts towards administrative and managerial positions.²⁶⁶

²⁶⁴ In 2003, the *Microcensus* also asks about respondents' field of education in both tertiary education and vocational training. However, among tertiary graduates 54 per cent lack this information (are coded as missing) in this 2003 Scientific-Use-File. Apparently, the filter guidance for this question did not work. For this reason, I refrain from using the 2003 *Microcensus* for the analyses on fields of study.

²⁶⁵ Certainly, there is heterogeneity in terms of labor market returns within these broader aggregates. For instance, taking within-field group differences into account would possibly increase the mediating role of the field of study for the gender wage gap. Nevertheless, this chapter is mainly interested in changes over the course of time and thus relies on average returns of aggregated field groups.

²⁶⁶ In order to improve the reading flow in the result section all combined field groups are only labeled by the first listed subject, e.g. *business* instead of *business, management and economics*. If I refer to *hard fields* I always mean both *science/mathematics* and *engineering/agronomics*; referring to *soft fields* always includes *humanities/social sciences/arts* and *social services/education*.

Control variables include *gender* and *tertiary institution*, differentiating between *Fachhochschule* (3a) and university (3b). I further control for *citizenship* in all analyses. Since students with a citizenship other than German are rather rare at tertiary level, I do not differentiate between different foreign nationalities. Hence, *citizenship* is a binary variable indicating whether students are Germans or possess another citizenship.

For the additional analysis contrasting PhD graduates vs. university graduates, labor market entry for these groups is considered at the age of 35-39 in order to avoid an underestimation of the share of graduates with doctoral degrees.²⁶⁷ Separate information on doctoral degrees is only available in *Microcensus* data beginning in 1999. Nevertheless, in order to conduct a trend analysis over the last decade, I differentiate between the periods 1999-2003 and 2004-2008. Graduates from *medicine* and *pharmacology* are excluded from this analysis since doctoral degrees are common in these fields (see also Engelage & Hadjar 2008).

The dependent variables are binary labor market outcomes including unemployment vs. employment, service class vs. non-service class and a metric variable for occupational prestige. The variables are operationalized in the same way as earlier (for details see the respective chapters 6.3.1, 7.4.1 and 8.4.1).

9.3.2 *Statistical methodology*

In a first step, I look at the effect of one's field of study on labor market returns across periods in a descriptive manner. Given the sparse literature on field of study differences over time, these descriptive changes across *Microcensus* years reveal whether - as theoretically predicted - field of study differences in labor market rewards have become more substantial over the course of time. With each binary dependent variable, I run separate logistic regression models for every survey year, including one's field of study, gender, tertiary institution and citizenship as predictors. As already outlined in this book, a comparison of regression coefficients from non-linear probability models across groups or samples is highly problematic as we do not know whether differences in the effect of the predictor variable can be attributed to real differences or to differences in the residual variation across models (see chapter 6.3.2). Likewise, I calculate *average marginal effects (AMEs)* that are assumed to be unaffected by the *rescaling problem* in order to adequately capture changes in the effect of

²⁶⁷ Of course, university graduates without a PhD tend to have accumulated more work experience than PhD graduates. However, doctoral studies can be regarded as work experience, too. Moreover, it is reasonable to compare both educational groups in the same age as PhD graduates should be more than compensated for accumulating additional human capital upon labor market entry compared to university graduates.

field of study across periods.²⁶⁸ Since linear regression coefficients are not identified up to scale, the effects of field of study groups on occupational prestige can be compared across survey years in a straightforward manner. In contrast to previous chapters, I refrain from calculating gender-specific effects of one's field of study on each of these different labor market outcomes since gender differences in fields of study are explicitly dealt with in the next section.²⁶⁹ In all analyses, *science* is used as reference category because it is the prototypical *hard field* and this empirical analysis aims particularly at assessing differences in returns between *hard fields* and *soft fields* over time.

In a second step, I attempt to shed light on the different mechanisms behind field of study differences over time: *changes in the signaling value*, *demand-side changes in the occupational structure*, *macroeconomic changes* or *structural imbalances*. Since these mechanisms are difficult to operationalize and test simultaneously, the second part has to be considered rather explorative. First, I aim to test whether differences in the *signaling value* of fields of study in terms of *selectivity*, *occupational specificity* or *sex composition* can account for field of study differences in labor market returns. The assumption is that a supply-side change in one of these signaling determinants will lead to changes in employers' perceptions and evaluations of a field of study, thereby altering relative returns. In this regard, time series analyses which look at the effect of *changes* in the signaling characteristics on *changes* in labor market returns *within* a field of study tend to be most appropriate for testing supply-side effects. Hence, I use fixed effects models with field of study-years (see chapter 6.4.7 on FE models). In order to control for stable characteristics of fields of study and purge time-constant unobserved heterogeneity between fields, I control for field of study fixed effects. I also hold year fixed effects constant in order to account for unobserved time effects that affect all fields of study equally. The signaling assumption is tested with the outcomes unemployment and access to the service class. Hence, the dependent variables are year- and field-specific unemployment rates as well as year- and field-specific proportions of graduates employed in the service class.

But how do we operationalize changes in *selectivity*, *occupational specificity* and *sex composition*? Regarding *selectivity*, I use standardized *Abitur* grades, calculated with the *Konstanz student surveys*, across student entry cohorts. For every field of study, cohort-specific standardized *Abitur* grades for freshmen are matched to the respective *Microcensus*

²⁶⁸ Average marginal effects (AMEs) are calculated with STATA command *margins, dydx (*)*.

²⁶⁹ Testing the effect of the field of study over time separately for men and women does reveal field-specific gender disadvantages in labor market returns but no gender-specific trends in field of study differences that would urge to alter the conclusion on trends in field of study differences over time (see also chapter 9.4.5).

years in which a particular cohort entered the labor market. For instance, the field-specific *selectivity* of tertiary graduates (age 30-34) upon labor market entry in 1989 is measured as the field-specific standardized *Abitur* grades from the student entry cohort 1976-1979; the values of cohort specification 1978-1981 are matched to 1991 *Microcensus*, etc. Since I do not have information on the selectivity of student entry cohorts in the mid-1970s or earlier (*Konstanz student surveys* first started in winter term 1982/1983), all years before 1989 cannot be included in fixed effects models. *Occupational specificity* of a field of study is operationalized according to the *Herfindahl-index* of dispersion (Dekker, de Grip, & Heijke, 2002), which creates an index ranging from zero to one, quantifying whether graduates are allocated into a smaller or larger set of different occupational groups (*KldB* 2-digit codes). Higher values indicate a condensed allocation of graduates into fewer occupations and therefore high occupational specificity, lower values indicate the reverse.²⁷⁰ Field-specific indices are calculated by considering the occupational attainment of higher education graduates in the yearly *Microcensus* sample of labor market entrants. *Sex composition* is measured as the proportion of females in a field of study group. Again, this measure was derived from the *Microcensus* sample of tertiary graduates for every survey year separately. Since the impact of a proportion change can be somewhat different near the natural limits (0 and 1), the variable is specified as the logit of the proportion of females (Levanon et al. 2009).²⁷¹

In order to test whether demand shifts that are due to compositional changes in the high-skilled labor market account for changes in the effect of field of study, I follow the approach in chapter 7 and disentangle the service class into three different segments: administrative and management, technical experts and social services (for operationalization details see chapter 7.4.1). In this case, I show simple bivariate contingency tables between field of study and service class segments for both sexes separately, because it easily identifies potential changes in this relationship. A multinomial logit model keeps relevant occupational shifts constant, as *log-odds ratios* are invariant to changes in the marginal distributions. Hence, we would not see the direct impact of compositional changes on field of study changes in access to the service class. Moreover, in multinomial logit models, the interpretation of

²⁷⁰ In the original formula (see Figure A1) higher values indicate lower occupational specificity. In order to ease interpretation in terms of occupational specificity, this pattern was reversed.

²⁷¹ If the proportion of females of a field of study is P, the logit of P is $\log(p/1-p)$.

effects is rather complex as effect comparisons not only refer to a specific field of study but also to a specific contrast in the dependent variable.²⁷²

Changes in the effect of one's field of study may also vary with the business cycle or structural imbalances between supply and demand, i.e. some fields of study are more affected by macro-level developments than others. Here, I run a logistic regression including field of study, two time-varying measures of the *business cycle* and *labor supply-demand ratio* as well as interaction terms between field of study and both macro-level variables. As in chapter 6, the *business cycle* is operationalized as aggregate unemployment rate among the total labor force (aged 15-64); the *labor supply-demand ratio* is measured as the ratio between proportion of tertiary graduates and service class positions. Since the interpretation of interaction terms in logit models involves serious problems (see chapter 6.3.2), I calculate field-specific *marginal effects* of these two macro-level determinants on both outcomes.

Given that gender may mediate field of study effects, I first analyze gender segregation in higher education in West Germany and its development over time. Do field of study distributions among men and women become more similar over time, thereby reducing gender differences in labor market rewards? To test changes in gender segregation in higher education, I use log-linear and log-multiplicative models, identical to those used in chapter 7. The *UNIDIFF* model has increasingly been used to detect variations across countries or periods in the overall strength of gender segregation (Barone, 2011; Gerber & Schaefer, 2004; Xie, 1992).²⁷³ The *conditional independence* model acts as the baseline model, assuming no association between gender and field of study. This model is tested against the *constant association* model postulating constant gender segregation among fields of study across periods. By contrast, using one multiplicative scaling factor the *UNIDIFF* model estimates changes in the strength of this association between gender and field of study over time. Hence, this modeling strategy offers a simple test whether gender segregation in the choice of field of study has been changed significantly over the last decades in West Germany.

Against this background, I aim to assess how much one's field of study contributes to gender differences in labor market outcomes. Is there still a direct effect of gender on labor market returns after accounting for field of study differences among men and women? To what extent can a decline in gender segregation in higher education contribute to a reduction

²⁷² Such as in binary logistic models, the effects of multinomial logit models are affected by *rescaling* and involve the problem of adequately comparing effects across survey years.

²⁷³ Again, parsimony is given at the cost of assuming cross-period stability in the qualitative pattern of gender segregation in higher education. However, it serves my purpose quite well, as I am interested in a global assessment of the overall level of gender segregation over time. For a topological modeling that considers the qualitative pattern on theoretical grounds see Barone (2011).

in gender disadvantages in labor market returns over time? In order to see how the effect of x (gender) on y (occupational prestige) is mediated by z (field of study), we first estimate the effect of x on y in a *reduced* linear regression model and thereupon add the mediator variable z in a *full* model. Then, we compare the coefficients to see to what extent the effect of x on y is reduced by introduction of z .²⁷⁴ Akin to comparisons across groups or samples, however, comparing coefficients across nested non-linear probability models within the same sample involves the *rescaling problem*, i.e. *log-odds ratios* or *odds ratios* in these nested models not only reflect changes in the magnitude of the independent variables but also differences in unobserved heterogeneity across models (see chapter 6.3.2). As the residual variance is fixed, any change in the explained variance will change the scale of y^* and the logit coefficients. Hence, the coefficient of interest (x) in nested logit models will be affected by a confounder (z) that explains variation in the outcome variable (y^*) by both confounding and rescaling. As model fit in the *full* model is higher than or equal to the *reduced* model, rescaling and confounding work in opposite directions. Consequently, the role of this confounding variable (z) is generally underestimated.

In order to properly assess the mediating role of the field of study for gender effects on unemployment and access to the upper service class, I therefore use a new method that solves the *rescaling problem* in an analytical way (Karlson, et al., 2012).²⁷⁵ Basically, the so-called *KHB method* achieves comparable regression coefficients across nested non-linear probability models by equalizing the explained variance of the models. In order to do so, they calculate an OLS regression of x on the confounder z and include model's residuals as explanatory variable in the *reduced* model without the confounding variable z . As x and the residuals are uncorrelated, it does not change the partial effect of x but makes the model fit of *reduced* and *full* model identical. Consequently, both models have the same scaling parameter and the confounding effect of Z can be identified in the *full* model net of rescaling. Hence, the method is able to decompose the total effect in non-linear probability models into a direct and indirect effect via confounder Z .

²⁷⁴ As I intend to model a direct effect of gender that remains unexplained by taking account of the field of study, I refrain from applying decomposition methods that additionally consider gender differences in the effect of the field of study. The problem is that unexplained group differences cannot be disentangled from the explanatory contribution of differences in effect parameter β (Jann, 2008). Nevertheless, we always misspecify the decomposition when there are substantial differences in the effect of the field of study between sexes (see the subsection on interaction between gender and field of study). While the method by Yun (2004) is able to decompose group differences in a binary variable into the three components *distribution*, *effect* and *interaction*, it decomposes logit or probit functions that are still affected by *rescaling* when comparing partial effects over time. Therefore, I stick to the *KHB* method.

²⁷⁵ Kohler, Karlson and Holm (2011) implemented the method in STATA (ado *KHB*).

Several authors suggest the use of *average marginal effects (AMEs)* for comparing coefficients across nested non-linear probability models (e.g. Mood, 2010; Best & Wolf, 2012). Nevertheless, Karlson et al. (2012) argue that *AMEs* are, while solving the *rescaling problem*, sensitive to changes in the error distributions across models. Monte Carlo simulations indicate that *AMEs* provide, unlike the *KHB* method, biased inferences if nested models strongly differ in their error distribution. Since I aim to assess changes in the mediating role of one's field of study across time, I apply the *KHB* method to *average marginal effects*. The use of *AMEs* within the *KHB* method ensures to get rid of the second *rescaling problem* that arises when comparing coefficients across different samples. The *KHB* method can also be applied to linear models and provides the same results as the standard technique of comparing coefficients between *reduced* and *full* models. Thus, this method is also used for the outcome occupational prestige.²⁷⁶ The decomposition of the total effect of gender on these outcomes into a direct and indirect effect via the field of study is made for the 1980s, 1990s and 2000s separately.

In order to test an interaction between field of study and gender in case of binary outcomes (service class attainment, unemployment), I calculate probability differences between men and women (*discrete change effects*) for every field group, which are derived from logit models including these interaction terms between gender and fields of study (as well as gender and tertiary institution). By contrast, performing linear regression on occupational prestige offers a straightforward interpretation of interaction effects as normal.

As with gender, I apply the *KHB* method to study the mediating role of one's field of study for differences in labor market returns between university and *Fachhochschule* graduates. Do we see a direct effect of tertiary institution on labor market rewards when taking different field of study distributions across institutions into account? How do direct and indirect effects of fields of study develop over time? The *KHB* method is applied on all outcomes – unemployment, access to the service class and occupational prestige – and for three decades separately. Once again, I test interaction terms between tertiary institution and field of study and calculate field-specific probability differences (*discrete change effects*) in case of binary outcomes. Is the returns gap between *Fachhochschule* graduates and university graduates dependent on the field of study?

Comparing the effect of having a PhD vs. university degree on labor market returns between 1999-2003 and 2004-2008, I show *average marginal effects*, suitable for cross-

²⁷⁶ Unsurprisingly, decomposition results in regards to occupational prestige can be replicated with the Blinder-Oaxaca decomposition (*two-fold*) using STATA ado *oaxaca* (Jann, 2008).

sample comparisons. When looking at the interaction between one's field of study and graduating with doctoral degree, I calculate probability differences (*discrete change effects*) between PhD holders and university graduates in terms of unemployment or accessing the service class for every field group.

9.4 Empirical results

9.4.1 *The distribution of fields of study*

Table 16 shows the distribution of fields of study across seven periods for men and women separately. *Engineering* was the most popular field group among men, followed by *business* and *science*. Those three field groups encompassed almost 60 per cent of the male tertiary graduates in 1980. While male tertiary graduates chose *hard fields* even more often through the mid-1990s (*science*) and 2000s (*engineering*), the proportion of *hard fields* decreased in recent times to its base level. Meanwhile, the share of *humanities* graduates remained rather constant or decreased from a low base level in case of *social services*. By contrast, professional programs such as *law*, *medicine* and particularly *teaching* have decreased in relative share throughout educational expansion (28 to 17 per cent). Among men, *business* was the only field group that constantly increased its share over time, from 16 to 27 per cent. The increasing popularity of this field is possibly intertwined with an increasing demand for business and management skills during occupational restructurings towards administrative and managerial positions.

Among female tertiary graduates, *teaching* and *social services* were by far the most dominant fields of study at the beginning of the 1980s: almost two third of female graduates enrolled in these programs. Over time, this share, however, decreased to one third.²⁷⁷ However, this decline did not prompt a substantial increase among female tertiary graduates in *hard fields*. While female tertiary graduates in these fields are generally rare, they only marginally expanded over time. By contrast, the share of female tertiary graduates from *humanities* slightly increased. Thus, women tend to have preferences for humanistic, social or artistic fields of study that are quite persistent. Similarly, studies in *medicine* stayed quite popular as well. Female tertiary graduates were underrepresented in *law*, but became somewhat more demanded over time. As for men, the most salient change is the expansion of *business* studies throughout the last three decades among women (from 6 to 23 per cent).

²⁷⁷ Due to a substantial lack of teachers in the 1970s, particularly at *Gymnasium*, many young individuals became teachers in this period. The sharp decrease in the share of graduates from *teaching* studies in the mid-1980s is possibly due to the fact that the lack of teachers in the 1970s was more than fully compensated for by the growing supply of new teachers. Therefore, fewer *Abitur* holders opted to for *teaching* studies in the 1980s.

Table 16 Field of study distribution over time (in per cent)

Men	1980	1985-87	1989-93	1995-96	2000	2004-05	2006-08	N
<i>Field of Study</i>								
Teaching	12	7	5	2	4	6	6	1728
Med./Pharm.	9	8	8	7	6	5	5	2227
Law	7	6	5	4	5	6	5	1731
Science/Math.	14	15	17	20	15	12	14	4914
Engineer./Agron.	27	29	31	32	37	33	28	9867
Bus./Manag./Econ.	16	18	20	23	21	26	28	7198
Hum./Soc./Arts	8	10	8	9	9	9	10	2888
Soc. Serv./Educ.	8	7	5	3	3	4	4	1499
N	1755	4899	6959	5446	2594	4103	6296	32052
Women	1980	1985-87	1989-93	1995-96	2000	2004-05	2006-08	N
<i>Field of Study</i>								
Teaching	30	20	18	10	14	19	19	3938
Med./Pharm.	10	8	10	10	10	7	8	1978
Law	2	4	5	5	5	6	7	1211
Science/Math.	4	8	9	11	9	6	5	1758
Engineer./Agron.	4	5	8	9	10	10	9	1931
Bus./Manag./Econ.	6	10	13	18	19	23	23	4046
Hum./Soc./Arts	16	19	19	22	21	18	19	4439
Soc. Serv./Educ.	27	26	19	15	12	12	12	3692
N	828	2899	4535	3631	1713	3463	5924	22993

Source: German *Microcensus*, Scientific-Use-Files 1980-2008.

Analyzing gender composition, the female distribution of fields of study differed strongly from the male distribution at the beginning of the 1980s: women overwhelmingly choose *soft fields* and *teaching* while men opted for *hard fields* and *business* studies. Although gender segregation has become somewhat less pronounced across periods – in particular because *business* became a dominant field for both sexes – this preexisting patterns of gender-specific subjects remains. For instance, women still lag substantially behind men in *hard fields*. In order to have a more profound test of changes in gender segregation over time we now turn to the specification of log-linear and log-multiplicative models.

9.4.2 Trends in gender segregation in higher education

Table 17 indicates the results of different log-linear and log-multiplicative model specifications, including three-way interactions between gender, field of study (8 main groups) and periods (14 survey years). Unsurprisingly, the *conditional independence* model does not fit the data well according to fit statistics. Hence, there is clearly an association between gender and one's choice of field of study. Compared to the *constant association* model, the *UNIDIFF* model is able to slightly more reduce *model deviance* (97.9 per cent reduction in G^2 to 97.0 per cent) and only misclassifies 2 per cent of cases (instead of 2.4).

However, in light of parsimony the *UNIDIFF* model is not worth losing 13 degrees of freedom since the *constant association* model has a more negative *BIC* value than the *UNIDIFF* model. Hence, we opt for the *constant association* model and reject the assumption of significant changes in gender segregation in higher education over time.²⁷⁸

Table 17 Results of modeling change in gender segregation in higher education

Model ^a	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
N=55045							
Cond. ind.	9635.1	98	0.00	-	17.5	8565.4	-
Const. assoc.	275.6	91	0.00	97.1	2.4	-717.7	-
<i>UNIDIFF</i>	202.1	78	0.00	97.9	2.0	-649.3	0.000

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* 14 periods by gender by 8 fields of study groups.

^a Model specifications:

$$\text{Conditional independence: } \log(F_{ijk}) = \mu + \mu_i^G + \mu_j^F + \mu_k^P + \mu_{ik}^{GP} + \mu_{jk}^{FP}$$

$$\text{Constant association: } \log(F_{ijk}) = \mu + \mu_i^G + \mu_j^F + \mu_k^P + \mu_{ik}^{GP} + \mu_{jk}^{FP} + \mu_{ij}^{GF}$$

$$\text{UNIDIFF: } \log(F_{ijk}) = \mu + \mu_i^G + \mu_j^F + \mu_k^P + \mu_{ik}^{GP} + \mu_{jk}^{FP} + \Phi_k \Psi_{ij}$$

Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with difference in G² between constant association and *UNIDIFF*.

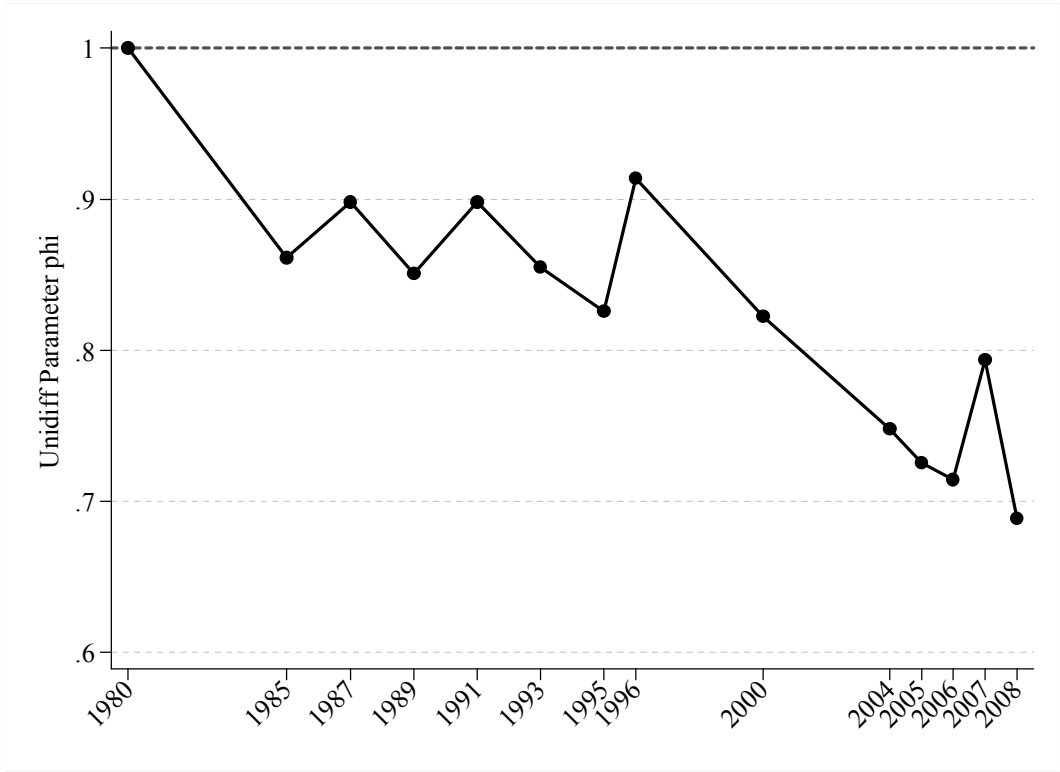
Nevertheless, in order to assess whether there is at least some degree of consistency in the association over time, I consider the phi parameter (Φ) under the *UNIDIFF* model (Figure 25). The phi parameter is fixed at a value of 1 for 1980 and indicates changes in reference to this year regarding the strength of association between gender and one's choice of field of study across 14 survey years. Overall, we see a long-term reduction of the *UNIDIFF* parameter and thus a trend towards decreasing gender segregation in higher education throughout the last three decades. While this relationship stayed rather stable across the 1980s, it declined afterwards, particularly between 1996 and 2005. Nevertheless, this trend does not decrease constantly enough to render a significantly better model fit in *UNIDIFF* compared to *constant association*.

Using more elaborated log-linear models, Barone (2011) finds that gender segregation in higher education in Germany remained constant over time. What does this imply for gender differences in labor market rewards? These rather persistent field of study differences might

²⁷⁸ Though, one has to keep in mind that the *UNIDIFF* model indicates no changes in the qualitative pattern of gender segregation, but rather identifies a global trend.

suggest that causes unrelated to one's field of study may play a greater role in reducing gender inequality in the labor market.

Figure 25 Change in the strength of gender segregation in higher education (UNIDIFF parameter phi)



Source: German Microcensus, Scientific-Use-Files 1980-2008.

9.4.3 Field of study and labor market returns over time

In this section I turn to the main research question of this chapter, namely whether field of study differences have become more pronounced over time. In particular, I assume that *soft fields* have increasing disadvantages in terms of labor market returns compared to *hard fields*. In the following, I present descriptive trends in field of study differences in risk of unemployment, access to the service class and occupational prestige.

Risk of unemployment

Figure 26 shows *average marginal effects (AMEs)* in terms of probabilities of being unemployed among different field groups between 1980 and 2008, while controlling for gender, tertiary institution and citizenship. *Science* acts as the reference category. The black shaded symbols indicate significant differences in *AME* points towards the reference category in each respective year. By contrast, gray shaded symbols indicate non-significant changes. Across the whole period, significant differences in the risk of unemployment are rare. The

small differences in *AME* points indicate that graduates from different fields of study do not substantially differ in their probability of being unemployed. Given that tertiary graduates have low general unemployment rates, no specific graduate population is particularly affected by joblessness. This figure indicates no consistent trend over time; rather trends are unsystematic and volatile. Field of study differences are only somewhat pronounced between the mid-1980s to the mid-1990s.

Graduates from *teaching* are somewhat better off in finding employment during the 1990s and 2000s than before. Nevertheless, only in 2006, they have a significant advantage over graduates from *science* in terms of avoiding unemployment. For the two other professional fields of *medicine* and *law*, there seem to be a non-consistent trend. If anything, one could say that their relative advantages - as indicated by a negative *AME* - are somewhat better in comparison to *science* graduates in the 1990s, though less so in the 2000s. For graduates from *medicine*, *AMEs* were significant in 1991 and 1996; similarly, the difference between graduates from *law* and *science* fields was significant in 1993.

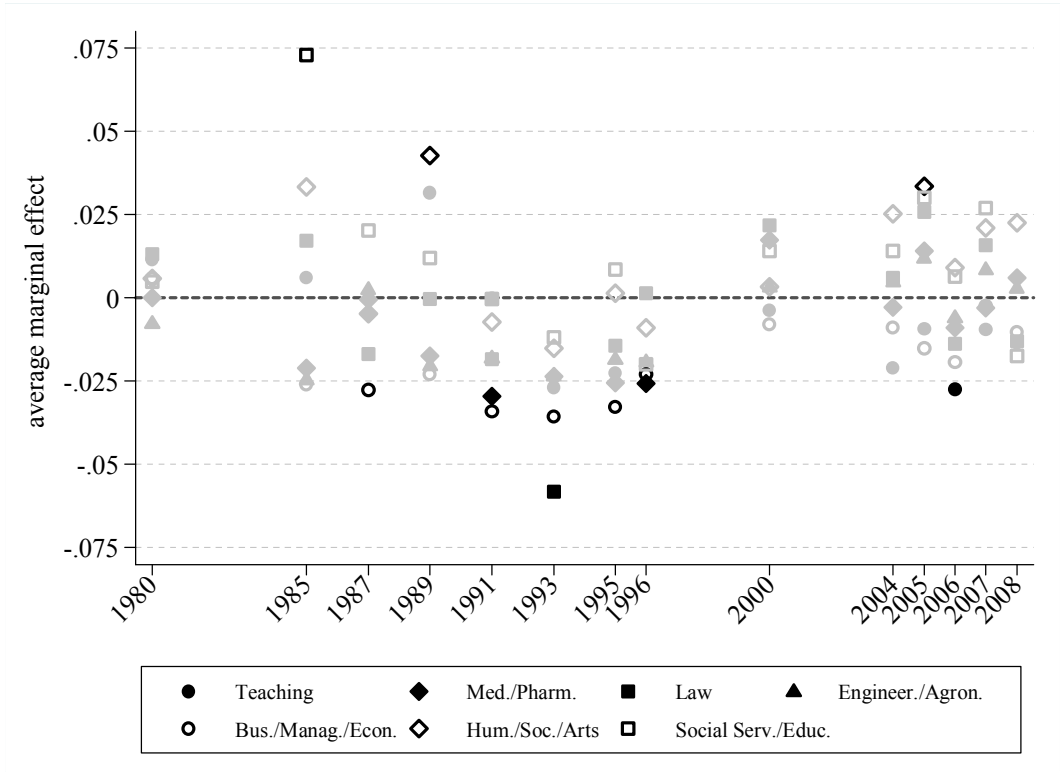
The *AME* is always negative for *engineering* graduates in the 1980s and 1990s, indicating a lower probability of becoming jobless compared to *science* graduates. In the 2000s, however, this reversed. Among *science* graduates, this field of study has become generally disadvantaged in terms of joblessness in the 1990s as *AMEs* became negative for almost all field groups. *Business* graduates are those with the lowest probability of being unemployed in all periods. This is particularly evident between mid-1980s and mid-1990s, where the *AME* was largely significant. In the 2000s, however, their *AME* became less negative, meaning their relative advantage compared to *science* graduates has become less pronounced.

Aside from 1985 and 1989, *AME* results do not indicate any substantial differences in the probability of being unemployed between graduates from *humanities* and *science* over the 1980s and 1990s. In the 2000s, however, this *AME* has become consistently positive, indicating relative disadvantages for *humanities* graduates in unemployment risks. Nevertheless, this difference was only significant in 2005. While graduates from *social services* were relatively disadvantaged in terms of unemployment in the 1980s, this situation has improved in the 1990s, though became worse again in the 2000s.

Overall, there is slight indication that graduates from *soft fields* have become somewhat disadvantaged compared to graduates from *hard fields*. However, effects are not large nor are they consistent across this observation period. Moreover, the relative position for *engineering* graduates has been decreasing in the 2000s. In general, differences between fields

of study in the risk of unemployment did not become considerably larger and did not follow a systematic pattern.

Figure 26 Trends in *AMEs* on the probability of being unemployed among fields of study



Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: Zero line indicates the reference category, *science*; average marginal effects (*AMEs*) derived from separate logit models for every survey year controlling for gender, tertiary institution and citizenship; Black coloured markers indicate significant differences at the 5% level compared to *science* (gray coloured markers indicate non-significant changes).

Access to the service class

Figure 27 shows average marginal effects (*AMEs*) on the probability of attaining the service class (upper graph) and the upper service class (lower graph) for different field groups compared to *science*, while controlling for the same variables as earlier. Not surprisingly, we see that graduates from *medicine* are clearly advantaged in accessing the service class over graduates from other fields. Their *AME* is significantly positive across all *Microcensus* years. Other professional fields, including *teaching* and particularly *law*, do not differ as much from *science* in terms of attaining the service class as expected. While there is no trend among graduates from *law*, *teaching* graduates were able to slightly improve their relative returns in accessing the service class in the 2000s. Throughout the 2000s, *AME* differences are significant between graduates from *teaching* and from *science*.

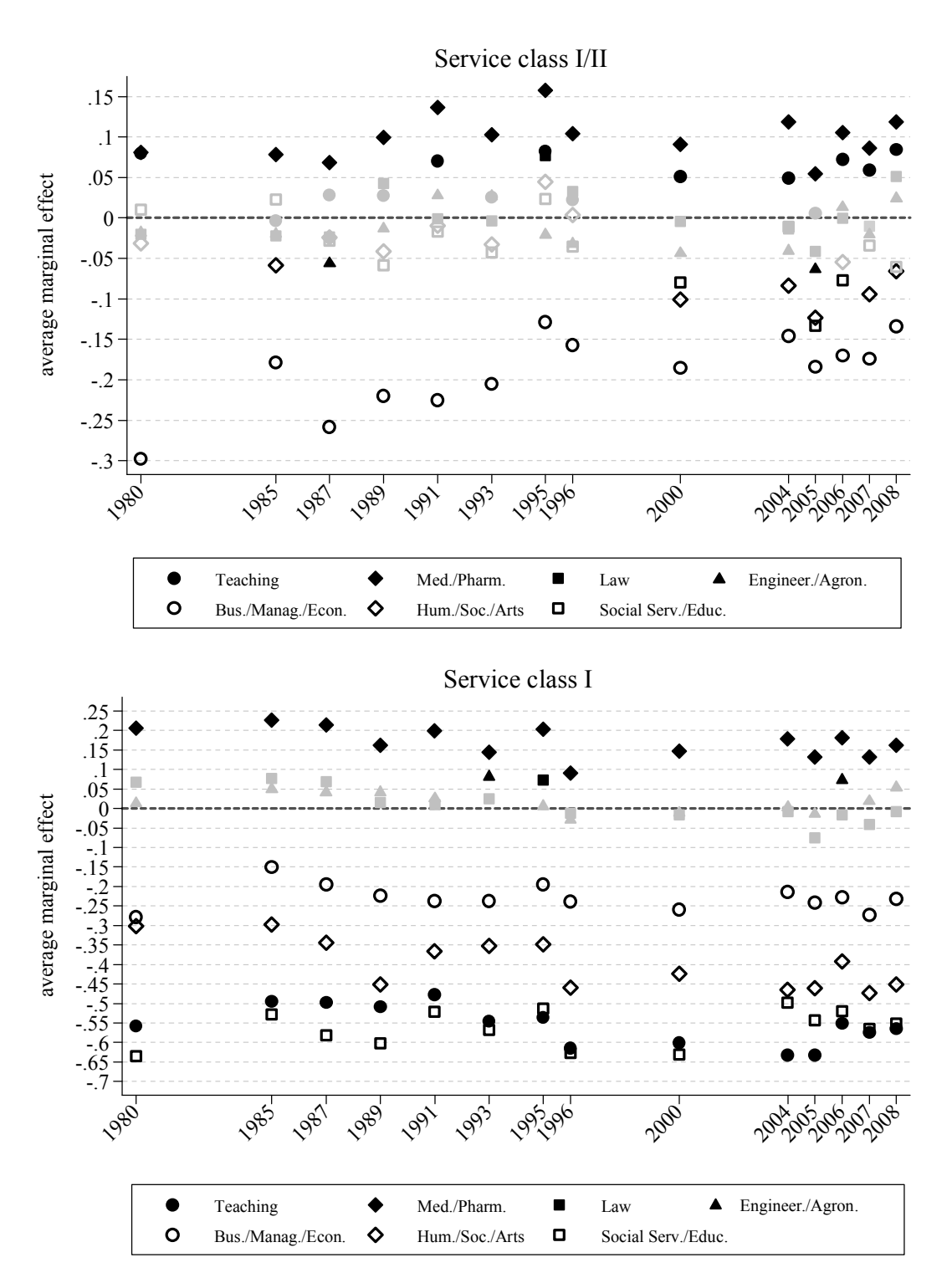
Graduates from *engineering* do not show any substantial differences in terms of *AMEs* on the probability of accessing the service class compared to graduates from the *sciences*. Among these *hard fields*, we are not able to detect any consistent trend across periods. Graduates from *business* clearly had the worse chances of attaining the service class at the beginning of the 1980s. Across the 1980s through mid-1990s however, these graduates considerably reduced their disadvantage relative to other groups. This coincided with occupational changes in the service class towards administrative and managerial positions. In the 2000s, however, we do not see any trend towards further *AME* reductions among *business* graduates. Still, these graduates remain substantially disadvantaged in terms of accessing the service class in recent times as evidenced by their significantly negative *AME* across all periods.

Graduates from *humanities* and *social services* do not have substantially lower relative returns in access to the service class compared to graduates from the *sciences*. Contrary to expectations, the probability of attaining the service class for *humanities* and *social services* has not worsened across the 1980s and 1990s compared to both *hard fields*. The relative returns in accessing the service class decreased for both *soft fields* only in the 2000s. During some of the 2000s, the *AMEs* for *humanities* and *social services* are even significantly negative. Nevertheless, one cannot speak of consistently increasing field of study differences between *soft fields* and *hard fields* in access to the service class.

The lower graph in Figure 27 indicates more general differences between fields of study in attaining the upper service class than in attaining both service class fractions. Nevertheless, over time, changes in *AMEs* on the probability of attaining the upper fraction are even less pronounced than indicated in the upper graph. Hence, field-specific access patterns into the upper service class appear to be quite persistent.

Across all decades, graduates from *medicine* have a significantly higher probability of attaining the upper service class compared to *science* graduates. Nevertheless, their *AME* became slightly less positive in the 2000s. While *law* graduates did not significantly differ from *science* graduates at nearly all points in time, the *AME* was significantly negative throughout the observation period for *teaching* graduates. This is due to the fact that most *teaching* students are prepared for teaching at *Realschule* or *Grund-* and *Hauptschule* and are thus classified as belonging to the lower service class. Over time, relative returns in access to the service class have been slightly declining for the population of *teaching* graduates.

Figure 27 Trends in *AMEs* on the probability of attaining the service class among fields of study



Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* Zero line indicates the reference category *science*; *average marginal effects (AMEs)* derived from separate logit models for every survey year controlling for gender, tertiary institution and citizenship; Black coloured markers indicate significant differences at the 5% level compared to *science* (gray coloured markers indicate non-significant changes).

Among the *hard fields*, graduates from *science* and *engineering* do not significantly differ in their relative returns in access to the upper service class. *Business* graduates are clearly less disadvantaged compared to all other groups in access to the upper service class than in access to the service class as a whole. Nevertheless, these graduates were not able to further improve their relative position compared to graduates from the *sciences* over time.

Graduates from *soft fields*, in particular from *social services*, are, in general, strongly disadvantaged in accessing the upper service class compared to *hard fields*. Over time, the *soft fields* experience reverse developments: while the *AME* became increasingly negative for graduates from *humanities*, it became slightly less negative for graduates from *social services*. The somewhat increasing relative value of graduates from *social services* could be related to an increasing demand in the service economy. In the 2000s, both *soft fields* had similar probabilities of attaining the service class compared to *hard fields*.

Akin to analyses with educational level, changes in the effect of the field of study on service class attainment in West Germany were not pronounced throughout the last decades. Field of study differences in attaining the service class did not consistently increase over time.²⁷⁹ At best, graduates from *soft fields* became somewhat more disadvantaged compared to *hard fields* in the 2000s. Conversely, *business* graduates have been slightly able to reduce their relative disadvantages in access to the service class over time.

Occupational prestige

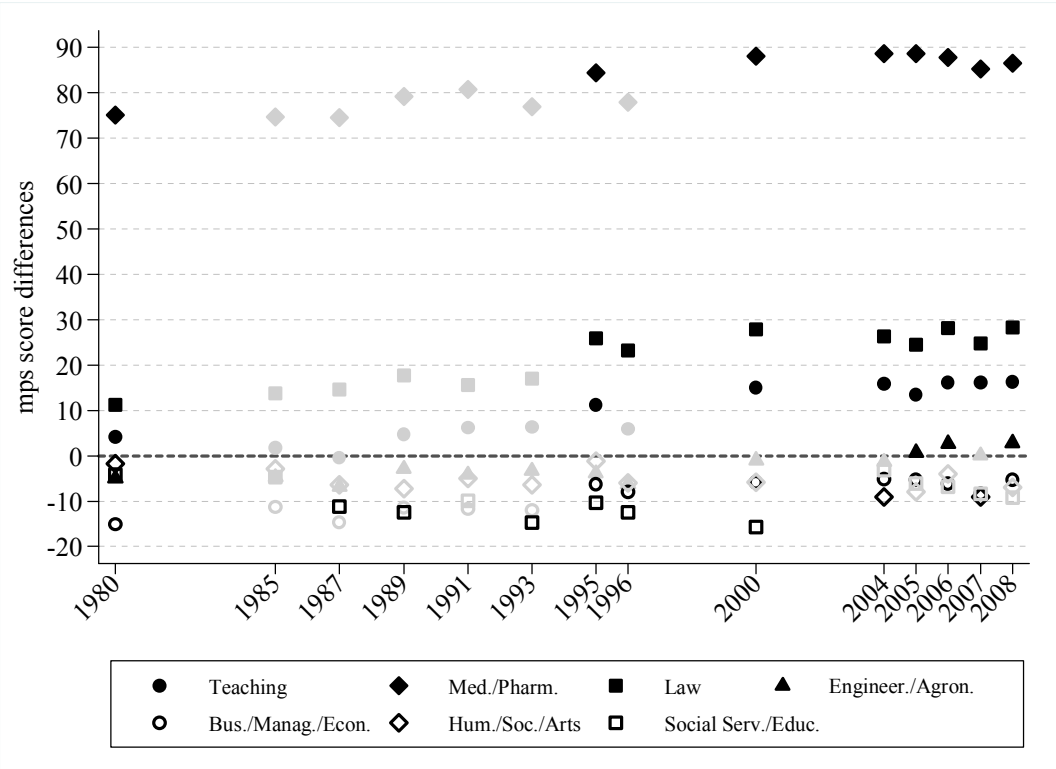
Figure 28 shows unstandardized coefficients from linear regressions on occupational prestige for different fields of study compared to *science*, holding the same variables as earlier constant. Aside from outstanding prestige among graduates from *medicine*, both other professional fields do not tremendously differ in average occupational prestige from other field groups. While *law* and *teaching* had above average prestige scores and *business* below average scores, all other groups had almost the same average prestige at the start of the 1980s.

Over time, professional programs such as *medicine*, *teaching* and *law* tended to increase their average occupational prestige compared to other fields, particularly in the 2000s. In general, it is not surprising that these fields have the highest occupational prestige since professions have the most occupational closure (see chapter 8). As with service class

²⁷⁹ In order to have a formal test of this claim, I applied – for both sexes separately – log-linear and log-multiplicative models on the three-way interaction between one’s field of study, social class (*EGP* I, II and III-VII) and periods (see Table B6). According to *BIC* values, the *constant association* model is the preferred model for men and women. Figure B6 indicates changes in the association between one’s field of study and service class attainment compared to 1980. While for women we see only up- and downturns, the association always remained slightly under 1 for men. Hence, this confirms the view that field of study differences in service class attainment did not become consistently stronger over time for both sexes.

attainment, graduates from *business* have been able to increase their average occupational prestige across periods. The comparison between *hard fields* and *soft fields* reveals a slight decrease in occupational prestige for *humanities* and *social services* in the long run, but this trend appears to be not strong and consistent. Again, trends are not far-reaching enough to conclude that differences between fields of study have magnified over time.²⁸⁰

Figure 28 Field of study differences in occupational prestige



Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: Zero line indicates the reference category *science*; linear regression coefficients; controlling for gender, tertiary institution and citizenship; Black coloured markers indicate significant changes at the 5% level compared to reference year 1980 (gray coloured markers indicate non-significant changes).

Summary

To parsimoniously summarize the results, Table 18 shows linear change coefficients estimated from pooled OLS models for every field of study and every labor market outcome. Among graduates from *teaching*, *medicine* and *law*, this table indicates significantly negative linear changes regarding access to the upper service class. Thus, graduates from professional

²⁸⁰ The explained variance (R^2) of this model, including field of study, gender, tertiary institution and citizenship, somewhat decreased across periods (see Figure C9). The decline cannot be attributed to non-field variables, since R^2 in the model including only field of study follows the same trend as in the full model. Field of study is a mediating component for gender effects, effects of the tertiary institution and citizenship effects, not the other way round, and contributes much more to the explanation of variance in occupational prestige than those variables. Hence, the field of study is slightly less able to predict occupational prestige over time, but this decline is far from being substantial. Aside from exceptions (*medicine* graduates in the 1990s; *social services* graduates in the 2000s), intra-group variations did not become considerably more heterogeneous over time (see Figure C10).

studies tend to have decreasing relative chances of attaining the most valuable labor market positions. At the same time, graduates from these fields were able to significantly improve their average occupational prestige compared to graduates from *science*. Hence, changes in terms of occupational rewards are rather inconsistent for the professions: decreasing advantages in access to the upper service class and increasing advantages in occupational prestige. In terms of unemployment, graduates from *medicine* tended to have a slightly increasing risk of joblessness over the course of time. Overall, there is no consistent or strong indication that professional studies are losing their comparatively high labor market rewards over time.

Trends for graduates among the *hard fields* are mixed as well. While graduates from *engineering* have experienced a significantly higher relative risk of being unemployed, they were able to improve their occupational prestige in comparison to graduates from *sciences* across periods. For *business* graduates, their relative chances of attaining service class positions have been significantly increasing. At the same time, these graduates also have increased their average occupational prestige scores. Graduates from *business* experienced a slight decrease in their chances of accessing the upper service class only, but this coefficient is insignificant. Overall, *business* graduates tended to improve their relative position in the labor market compared to graduates from *hard fields*.

Among the *soft fields*, neither the *humanities* nor *social services* had constantly increasing unemployment risks over time in comparison to *science* graduates. Hence, there are few indications these graduates have had to struggle more to find employment. However, their relative chances of accessing the service class have declined. Particularly graduates from the *humanities* have significantly lower chances of attaining the upper part of the service class. This also holds true with regard to occupational prestige. While graduates from *soft fields* appear to be unaffected by increasing labor market exclusion, they are increasingly found in inadequate occupational positions below the service class. As described earlier, there is indeed some indication of growing labor market disadvantage for graduates from *soft fields*, at least in terms of occupational outcomes. However, when looking again at detailed figures, these changes tend to be weak and inconsistent over time such that one cannot talk of a severe deterioration of labor market returns among *soft fields* relative to *hard fields* across the last three decades.

Table 18 Linear change coefficients from pooled OLS models

<i>Field of study</i> (Ref. Science)	Risk of unemployment	Service class I/II	Service class I	Occupational prestige
Teaching	-0.002 (-1.59)	0.001 (0.71)	-0.007 (-3.34)**	1.204 (9.44)***
Med./Pharm.	0.002 (2.00)*	0.001 (0.52)	-0.006 (-3.56)***	1.070 (6.38)***
Law	0.001 (0.61)	0.001 (0.73)	-0.008 (-3.49)***	1.300 (7.24)***
Engineer./Agron.	0.002 (2.22)*	0.001 (0.51)	-0.000 (-0.20)	0.670 (6.01)***
Bus./Manag./Econ.	0.001 (1.27)	0.008 (4.73)***	-0.003 (-1.58)	0.728 (6.33)***
Hum./Soc./Arts	0.001 (1.06)	-0.005 (-2.83)**	-0.010 (-4.67)***	-0.295 (-2.13)*
Social Serv./Educ.	-0.001 (-1.16)	-0.007 (-3.55)***	0.002 (1.78)	-0.178 (-1.06)
N	48698	46460	46460	46140

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* *Linear probability models* with heteroscedasticity-consistent standard errors in case of binary outcomes; t-values in parentheses; all models include linear change coefficients for gender, tertiary institution and citizenship; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In general, field of study differences tend to be rather small and inconsistent over the last thirty years. Regarding unemployment, changes among fields of study appear to be restricted to certain periods with no discernible trend over time. Accordingly, only two linear changes appear to be significant in this pooled analysis. Aside from the *soft fields*, all linear change coefficients on occupational prestige are significantly positive, indicating increasing prestige gaps relative to *science* graduates over time. Apparently, graduates from *science* are increasingly disadvantaged in terms of occupational prestige compared to other graduates from *hard fields* or professional fields. As indicated by the *UNIDIFF* model and by comparing the coefficient of determination over time (see footnotes 279 and 280), changes are small and divergent enough to state that field of study differences remained considerably stable over time. Hence, we do not find evidence for *hypothesis 1* which expected stronger field of study differences in labor market returns throughout educational expansion. Nevertheless, the following section illustrates whether the mechanisms from the theoretical section, changes in signaling value, demand-driven changes or variations by macroeconomic or macrostructural conditions, can account for divergent changes in labor market returns by field of study.

9.4.4 Mechanisms for changing effects in field of study

From a supply-side perspective, fixed effects models indicate whether *signaling*, resulting from *selectivity*, *occupational specificity* or *sex composition*, has an impact on unemployment risks or occupational returns. From a demand-side perspective, contingency tables between field of study and segments of the service class give hints at whether changes in occupational returns to one's field of study can be attributed to *demand shifts* in the service class.²⁸¹ Third, changes in the effect of field of study may not be due to qualitative changes in the educational or occupational distribution but vary with *macroeconomic* or *macrostructural conditions*.

Changes in signaling value

Table 19 shows coefficients from fixed effects models predicting unemployment rates and proportions of the service class. Both *FE* and *FE linear trend* include three signaling characteristics: *selectivity*, *occupational specificity* and *feminization*. Moreover, both model specifications control for field of study fixed effects and year fixed effects. By holding one's field of study constant, regression coefficients for signaling characteristics refer to effects of changes *within* fields of study. Year fixed effects account for unobserved period effects that

²⁸¹ Of course, it would be better to have time-varying demand measures that are completely independent from employees' actual distributions. Nevertheless, this approach gives helpful hints at demand shifts in the tertiary labor market over time.

impact all fields of study equally. *FE linear trend* additionally adjusts for field-specific linear time trends.

For both *FE* and *FE linear trend* the effects of all three signaling characteristics on unemployment and service class are far from reaching statistical significance.²⁸² Contrary to expectations, *selectivity* has a positive impact on unemployment rates and a negative impact on service class attainment. Hence, an increasing signaling value in terms of *selectivity* does not come along with increasing labor market rewards. While *feminization* increases the incidence of unemployment in the *FE* specification, this disappears when controlling for field-specific linear trends. Feminization has also no clear effect on service class attainment. With the exception of the trend-adjusted effect on unemployment, the coefficient for *occupational specificity* points into the assumed direction: Growth in *occupational specificity* accompanies increasing labor market rewards among fields of study. Nevertheless, these results do not reveal any strong evidence that supply-side signaling characteristics of one's field of study are responsible for changes in field of study differences over time.²⁸³ Hence, the analysis does not provide evidence for *hypothesis 1a*.

Table 19 The effects of signaling characteristics among fields of study on labor market returns.

	Unemployment rate (ln)		Proportion service class ^a	
	FE	FE linear trend	FE	FE linear trend
Selectivity	0.354 (0.593)	0.499 (0.843)	-0.044 (0.039)	-0.137 (0.106)
Specificity	-1.957 (1.771)	0.336 (1.343)	0.477 (0.290)	0.140 (0.268)
Feminization (ln)	0.435 (0.326)	-0.186 (0.436)	-0.000 (0.043)	0.019 (0.064)
R ²	0.633	0.721	0.952	0.962

Source: German *Microcensus*, Scientific-Use-Files 1989-2008 and *Konstanz Student Survey*; *Notes:* N=77; cluster-robust standard errors in parentheses; FE = OLS with field of study fixed effects and year fixed effects; FE linear trend = OLS with field of study fixed effects, year fixed effects and field-specific linear trends; ^a fourth power; *social services* was not included due to small sample size; + $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;

Demand-side changes

Table 20 shows the simple bivariate relationship between field of study and three different service class segments across seven periods. This table clearly indicates high labor

²⁸² However, this may not be surprising as fixed effects estimates eat up lots of degrees of freedom and thus have relatively large standard errors. As fixed effects already soak 98 per cent of variation in *occupational specificity* and *sex composition*, one could worry about attenuation bias in this fixed effects modeling. However, estimates from pooled OLS regressions for these variables do not reveal any different results.

²⁸³ A lagged approach seems to be more reasonable, as employers need to have time to learn about changes in signaling characteristics among different fields of study. However, this is hard to operationalize with existing data. In order to ensure a 3-5 year lag in the independent variables for all points in time, only six years could be chosen for the analysis (1993, 1995, 1996, 2000, 2004 and 2008). Due to a low sample size (N=42), these results tend to be less meaningful. Nevertheless, this lagged approach does not reveal any different results.

market segmentations among high-skilled occupational positions in West Germany. Students from different fields of study have distinct occupational destinations after graduation. As with vocational training market, West Germany's *qualificational space* is evident in the tertiary labor market, too.

While graduates from *medicine*, *teaching* and *soft fields* were overwhelmingly employed in social services, graduates from *law* were common in administrative and managerial positions. Although segmentation is not as strong among these groups, graduates from *hard fields* mainly enter occupations in the technical expert segment. Only graduates from *business* seem to have no distinct occupational area at the beginning of the 1980s, since the administrative and management segment includes only a small fraction among the service class at that point. While many *business* graduates found employment in administrative and managerial occupations, most of them, however, were employed in non-service class positions. These graduates had a high probability of entering non-service class positions because matching occupational positions with administrative or managerial tasks were common among routine non-manual positions of higher grade (*EGP IIIa*).

Table 20 indicates changes in tertiary graduates' occupational destinations over time, reflecting compositional changes within the service class (see chapters 7.5.1 and 8.5.1). While expert positions remained rather constant, administrative and managerial jobs more than doubled between 1980 and the mid-2000s as the share of social service positions shrank. Hence, this non-traditional administrative and managerial segment has been upgraded and increasingly offers high-skilled positions demanding higher education.

Throughout these compositional changes, *business* graduates became more common among the administrative and management segment while decreasing in non-service class positions. Hence, *business* graduates' slight improvement in service class access can be attributed to the fact that they are increasingly demanded in the expanding administrative and management segment. Yet despite these large shifts in the service class, quite a substantial proportion of graduates from *business* (30 per cent) did not gain access to the service class in recent times. Still, they remain the group including the highest proportion of labor market entrants working in positions below the service class. Why have they not profited more strongly from this compositional shift? Apparently, graduates from other fields were also able to increasingly find employment in new occupational areas. For instance, *science* graduates were able to increase their proportion in administrative and managerial positions almost fourfold from 12 per cent to 47 per cent during this observation period. At present, the administrative and management sector is also the dominant employment area for graduates

from the *sciences*. However, this may not be surprising since graduates from *science* are equipped with mathematical and technical skills that could be highly demanded in this segment.

As opportunity structures among the service class segment social services have reduced, graduates from *soft fields* have particularly suffered from reduced employment opportunities in this traditional occupational segment. Hence, occupational shifts away from traditional graduate positions tend to be responsible for somewhat decreasing relative chances in attaining the service class among *humanities* and *social services* graduates. However, as argued earlier, the share of graduates from *soft fields* who enter occupational positions below the service class has not risen dramatically. This is due to the fact that these graduates were partly able to compensate their decreasing employment opportunities in social services by gaining access to non-matching administrative and managerial positions. In the most recent period, a near stable proportion of *humanities* graduates found work in administrative and managerial positions as in non-service class positions. Hence, a substantial part of the administrative and management segment appears to be open to graduates from fields of study other than *law* and *business*.²⁸⁴ This also implies that occupational returns for graduates from *soft fields* could have been clearly worse given the fact that the recruitment potential among *business* graduates that is not allocated to the service class is still very high.

Overall, this disaggregated analysis of the service class provides some evidence in favor of *hypothesis 1b*. The rather modest changes in field of study differences over time tend to be attributable to compositional changes in the high-skilled labor market, which alter demand for skills that are more or less taught by different fields of study.²⁸⁵

²⁸⁴ In the most recent period, only two thirds of administrative and managerial positions are occupied by matching graduates from *law* and *business*.

²⁸⁵ Although there are general differences among men and women in the relative size of the three service class segments, compositional changes over time were similar (see Table 13). Separate contingency tables for both sexes indicate that the changes in field-specific attainment of service class segments apply to men as well as women in more or less the same way.

Table 20 Distribution of service class segments by field of study (in per cent)

	1980				1985-87			
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	III-VII
Higher education graduates	13	23	50	14	19	22	42	17
<i>Field of Study</i>								
Teaching	2	0	96	3	4	0	87	9
Medicine/Pharmacology	0	0	98	2	1	1	94	4
Law	86	0	5	9	85	0	3	12
Science/Mathematics	12	53	25	11	22	40	27	12
Engineering/Agronomics	11	65	9	16	10	67	5	19
Business/Management/Economics	33	20	6	42	46	12	4	37
Humanities/Social Sciences/Arts	3	10	72	14	8	8	68	16
Social services/Education	1	1	87	11	3	1	83	13
	1989-93				1995-96			
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	III-VII
Higher education graduates	22	25	33	21	24	26	30	21
<i>Field of Study</i>								
Teaching	7	0	80	12	2	1	83	13
Medicine/Pharmacology	1	0	93	6	0	1	93	5
Law	83	0	3	14	86	1	2	12
Science/Mathematics	27	45	12	17	30	44	8	18
Engineering/Agronomics	14	66	4	17	14	60	4	22
Business/Management/Economics	44	11	4	41	47	16	3	34
Humanities/Social Sciences/Arts	10	6	63	21	9	2	72	17
Social services/Education	6	2	68	25	5	2	70	22
	2000				2004-05			
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	III-VII
Higher education graduates	28	26	28	18	30	24	30	17
<i>Field of Study</i>								
Teaching	4	1	88	7	3	0	91	6
Medicine/Pharmacology	1	1	94	3	0	0	98	1
Law	82	3	4	12	86	2	2	10
Science/Mathematics	48	31	10	12	48	32	10	10
Engineering/Agronomics	17	64	2	17	16	65	3	16
Business/Management/Economics	50	15	4	31	53	16	3	29
Humanities/Social Sciences/Arts	16	6	55	23	18	8	55	20
Social services/Education	5	3	70	22	8	3	70	19
	2006-08							
	I/II ^a	I/II ^b	I/II ^c	III-VII				
Higher education graduates	31	21	32	17				
<i>Field of Study</i>								
Teaching	3	1	92	5				
Medicine/Pharmacology	1	1	96	2				
Law	88	1	2	9				
Science/Mathematics	47	31	10	12				
Engineering/Agronomics	18	67	3	13				
Business/Management/Economics	53	14	2	30				
Humanities/Social Sciences/Arts	18	8	54	20				
Social services/Education	8	3	69	19				

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* ^a = administrative/management; ^b = experts; ^c = social services.

Effects of the business cycle and structural imbalances

This section investigates how macroeconomic and macrostructural conditions affect graduates from different fields of study. It is commonly argued that field of study differences become pronounced during business cycle downturns or an oversupply of tertiary graduates, causing graduates from fields with lower signaling capacity (e.g. the *soft fields*) to be crowded out of the labor market by graduates from *hard fields*.

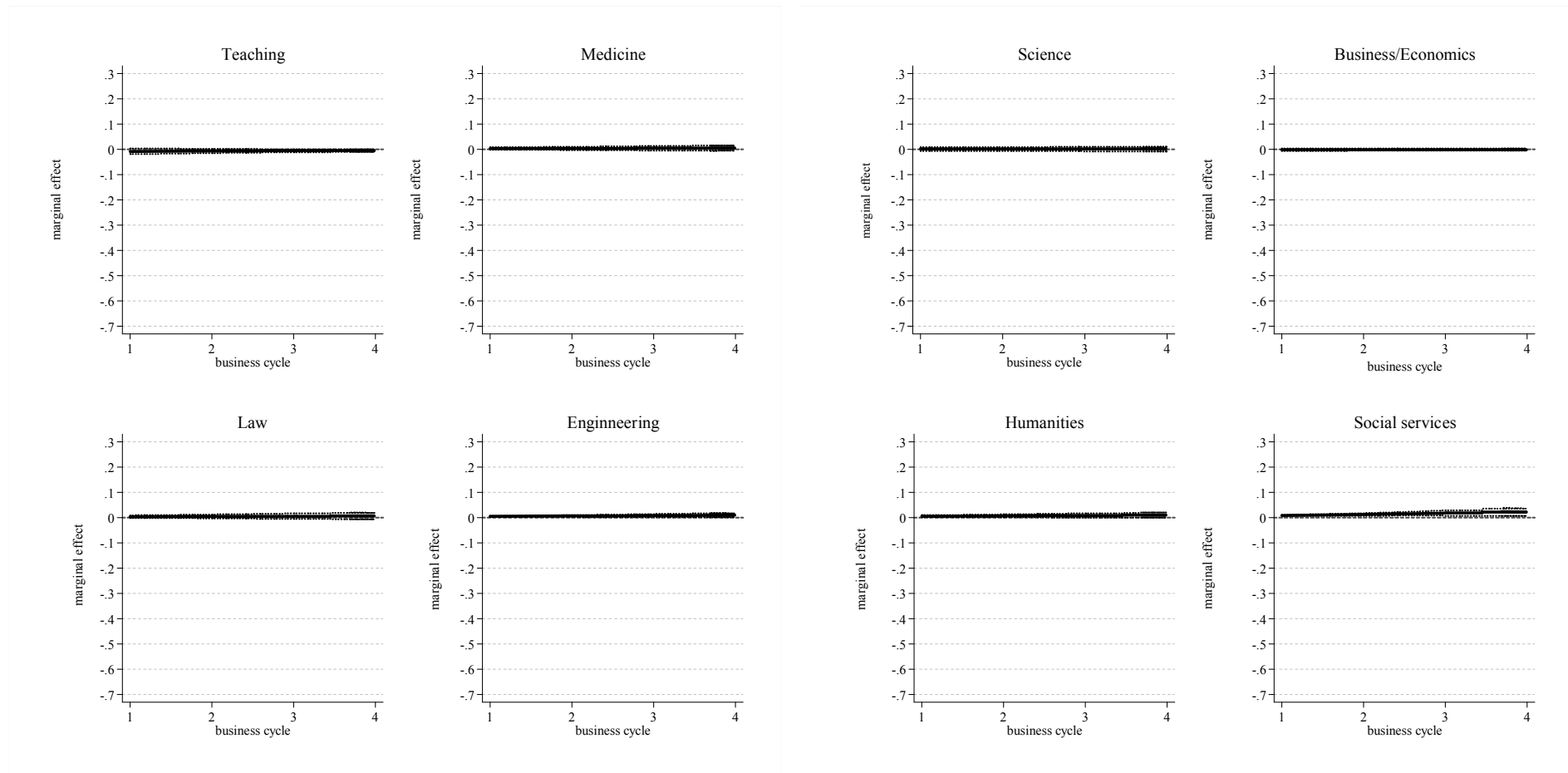
Figure 29 and 30 depict the marginal effect (ME) of the business cycle for eight field groups on unemployment and access to the service class respectively. These figures clearly confirm the sixth chapter results that recessions do not lead to cyclical crowding-out among tertiary graduates. Tertiary graduates, regardless of their field of study, are protected from unemployment risks during worsening economic conditions. If at all, only graduates from *social services* tend to be slightly negatively affected by the business cycle in their unemployment probability. Figure 30 also reveals that no graduates experience effects resulting from cyclical downward mobility, i.e. higher education graduates do not need to accept inadequate occupational positions below the service class throughout the business cycle. Hence, these findings support Gangl's (2003b, 2002) results that business cycle developments have no effect on occupational outcomes. By contrast, we see slightly positive business cycle effects among *science* and *business* graduates. Graduates from these fields have a higher probability to attain the service class when economic conditions worsen. This might indicate that under severe economic conditions, service class positions tend to be increasingly structured by educational attainment than in better economic times. Particularly skills that are learned in *business* and *science* studies appear to be increasingly demanded.

This picture looks somewhat different when analyzing structural imbalances between supply and demand in the tertiary labor market. Figure 31 and 32 depict the marginal effects of the labor supply-demand ratio on the probability of being unemployed or accessing the service class. Figure 31 indicates no significant impact of structural imbalances on graduates from any field of study. Hence, regardless of their field of study, tertiary graduates remain unaffected by increasing unemployment when competition for service class positions grows. By contrast, Figure 32 indicates more substantial differences between fields of study in the marginal effect of the labor supply-demand ratio on the probability of attaining the service class. While graduates from *law* and *engineering* are not significantly affected in their propensity of accessing the service class when job competition among higher education graduates tightens, graduates from *medicine* are significantly affected only under moderate changes in the supply-demand relation. Conversely, the marginal effect is significantly

negative among graduates from *teaching*, *humanities*, *social services* and the *sciences* and becomes increasingly negative the larger the oversupply of tertiary graduates is. Particularly for *social services* graduates, the marginal effect on access to the service class exponentially decreases when the ratio worsens. Hence, both *soft fields* and one *hard field*, *science*, are more severely affected by structural downward mobility than most of the other fields. Among *business* graduates, the marginal effect is significantly positive, indicating a higher probability of attaining the service class when a higher number of tertiary graduates compete for fewer service class positions. Amidst high competition among tertiary graduates, employers tend to increasingly trust *business* graduates with high-skilled positions as they possibly attribute universally important skills to them. In general, tertiary graduates, regardless of their field of study, remain employed during structural imbalances and are able to find jobs below the service class, thereby displacing lower educated groups from their traditional positions.

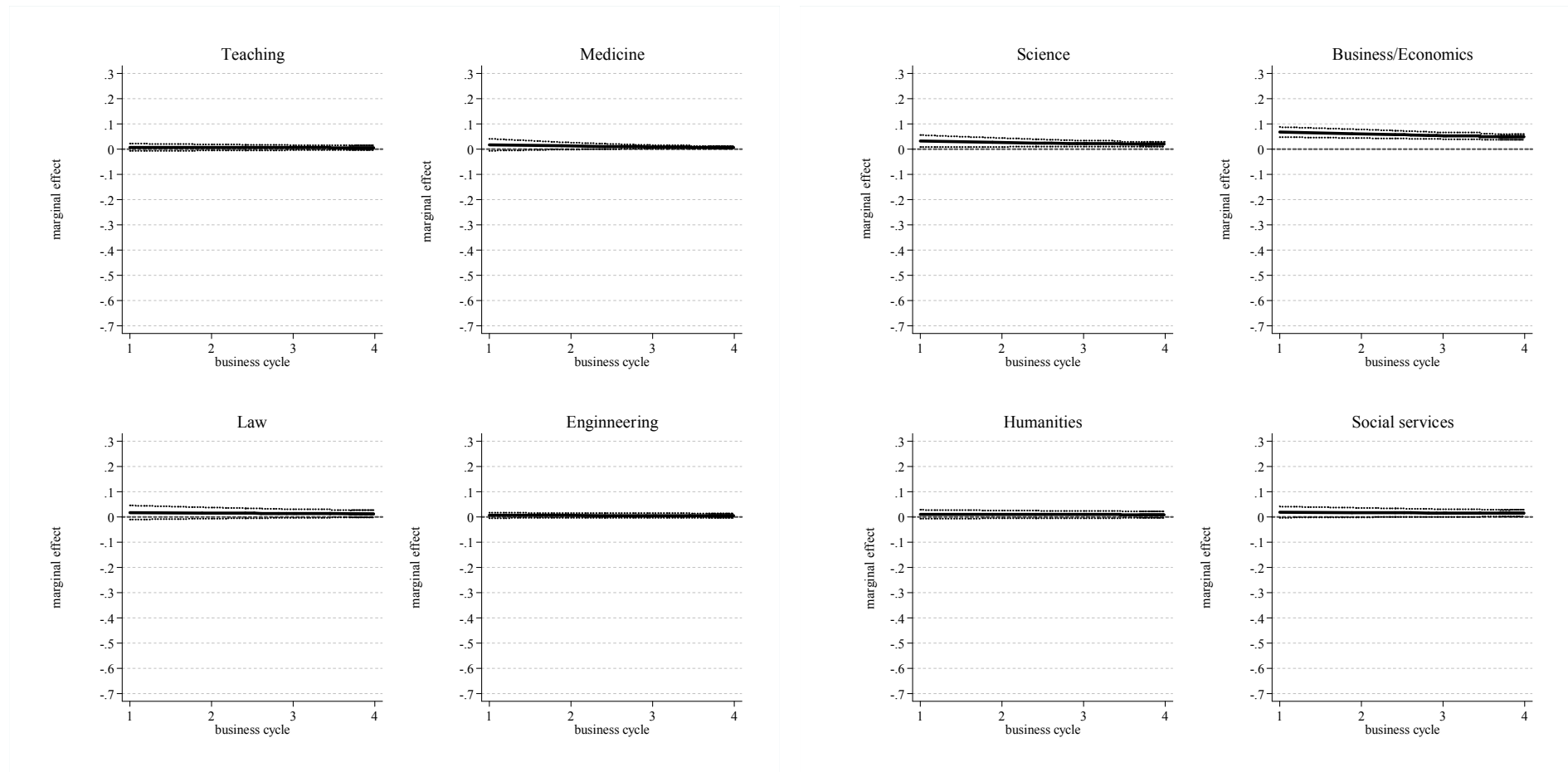
Overall, graduates from all fields of study are clearly unaffected by changing macroeconomic conditions. Labor supply-demand imbalances also have no impact on unemployment risks among tertiary graduates, regardless of their field of study. This tends to provide no evidence for *hypothesis 1c*. Nevertheless, structural downward competition is dependent on one's field of study, i.e. in times of an oversupply of highly educated graduates, some fields of study have a higher propensity of working in positions below the service class than others. However, structural imbalances cannot be responsible for differences in service class returns between graduates from *soft fields* and graduates from *science* as both are similarly affected by downward mobility.

Figure 29 Marginal effect (ME) of the business cycle on the probability of being unemployed



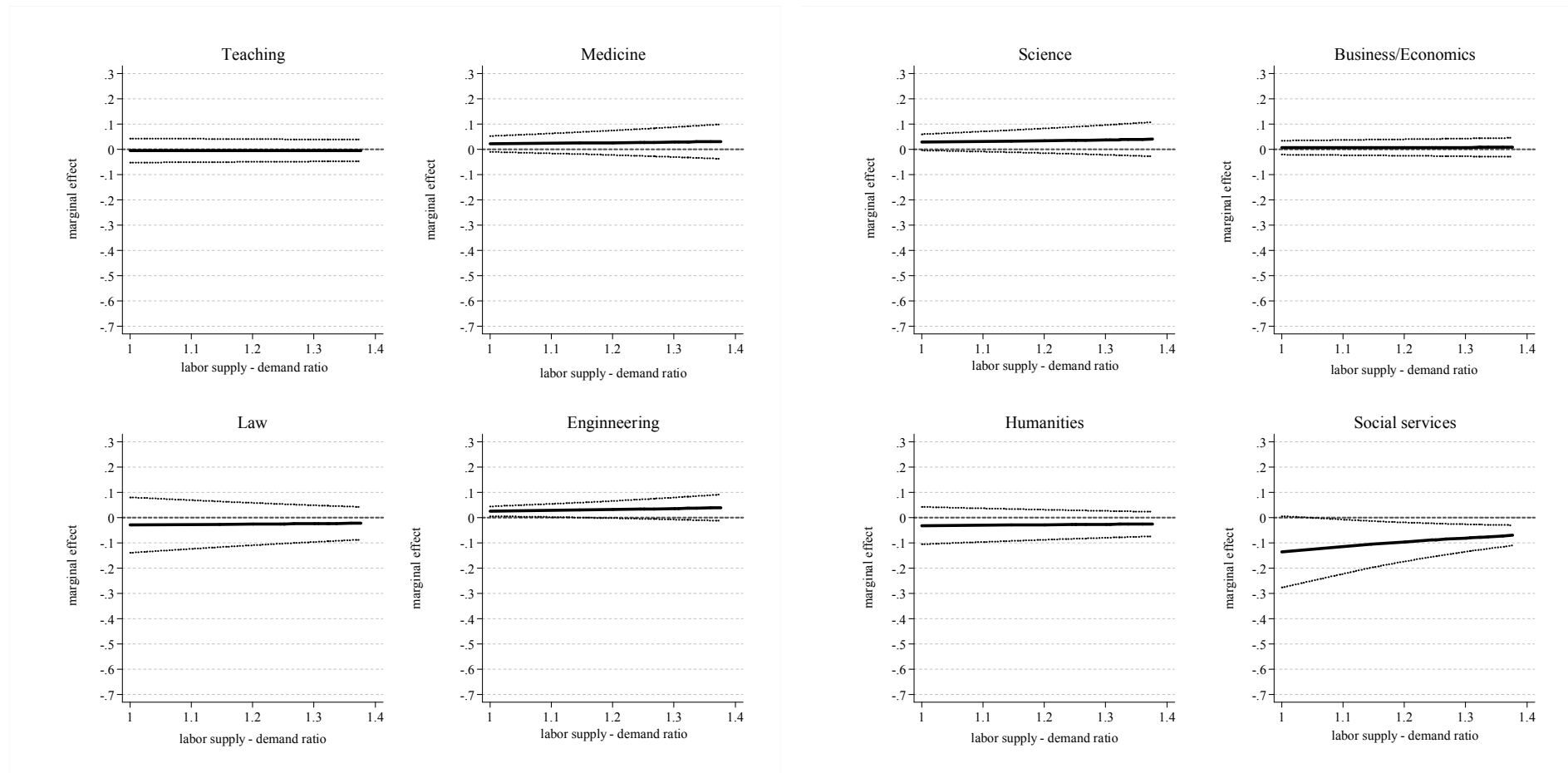
Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: labor supply-demand ratio is held constant at the mean; citizenship, tertiary institution and gender set on German, university and male.

Figure 30 Marginal effect (ME) of the business cycle on the probability of attaining the service class



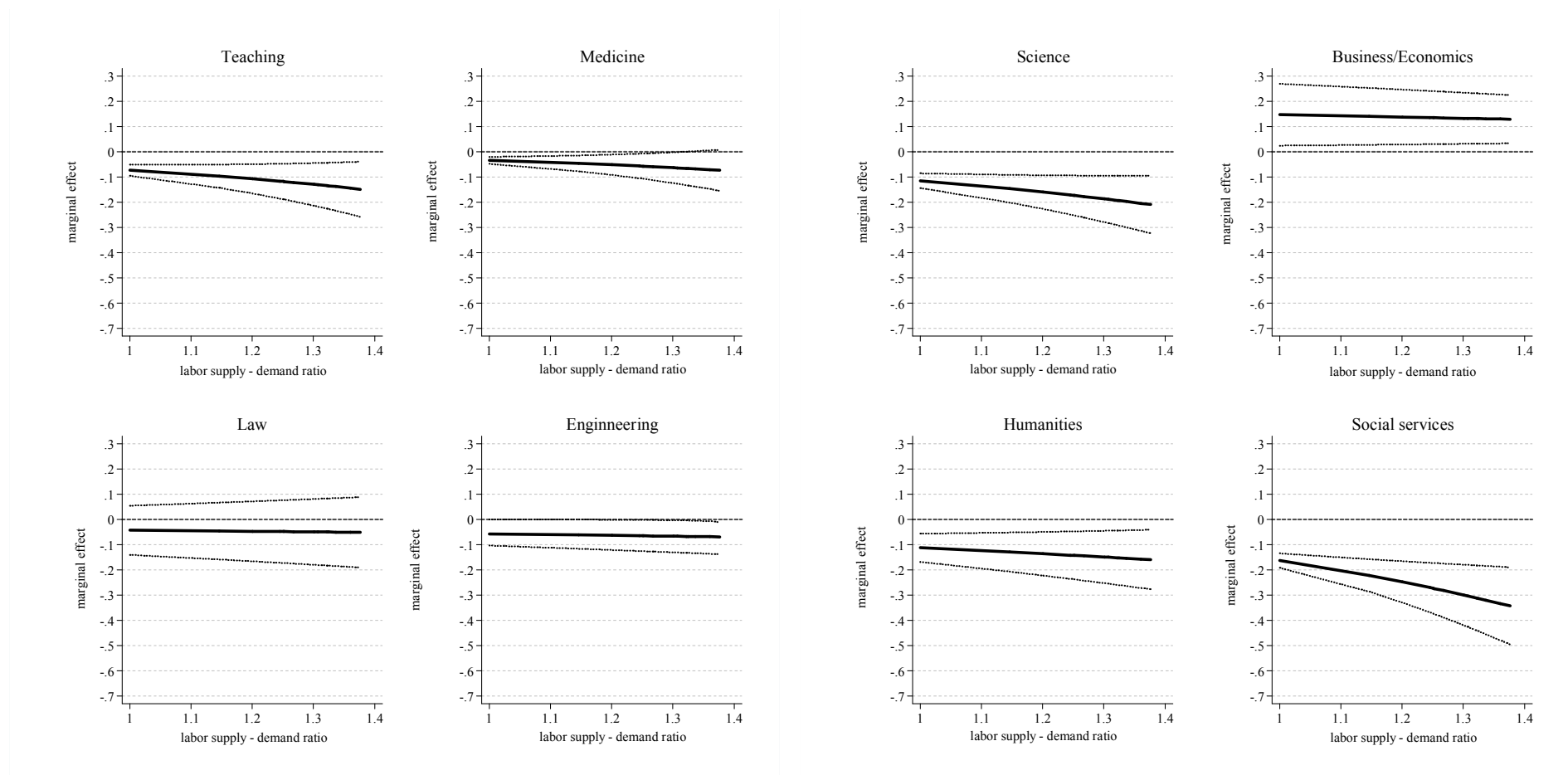
Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: labor supply-demand ratio is held constant at the mean; citizenship, tertiary institution and gender set on German, university and male.

Figure 31 Marginal effect (ME) of the labor supply-demand ratio on the probability of being unemployed



Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: Business cycle is held constant at the mean; citizenship, tertiary institution and gender set on German, university and male.

Figure 32 Marginal effect (ME) of the labor supply-demand ratio on the probability of attaining the service class



Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: Business cycle is held constant at the mean; citizenship, tertiary institution and gender set on German, university and male.

9.4.5 *Field of study as mediator for gender differences*

This section attempts to identify the extent to which one's field of study mediates gender differences in labor market returns. Is there still a direct effect of gender when taking fields of study into account? Furthermore, this section analyzes whether the declining gross effect of gender in access to the upper service class over time can be attributed to a decreasing field of study differences among the sexes. Based on section 9.4.2, we know that gender segregation in higher education has declined, but only moderately. Section 9.4.3 also showed that there are no major shifts in field of study differences over time. Given this, there appears little support for a declining indirect effect via the field of study on gender inequalities in the labor market. Lastly, the section tests an interaction between gender and field of study differences on labor market outcomes.

Decomposing the gender effect

Using the *KHB* method, the first three columns in Table 21 decompose the gender effect in terms of *average marginal effects* on the probability of being unemployed into direct and indirect effects via fields of study and tertiary institution in the 1980s, 1990s and 2000s. All analyses treat citizenship as *concomitant variable*. The *KHB* method has the additional advantage of disentangling the contribution of single mediators.

The total effect of gender on unemployment is positive and statistically significant in the 1980s: female graduates were on average 3.8 percentage points more likely than male graduates to experience unemployment. This female disadvantage is attributable to a strong direct effect (almost two thirds) and a weaker indirect effect via the field of study (one third). For the most part, this indirect effect in the 1980s operates via the fields *engineering* (more often chosen by men and lower risk of unemployment) and *social services* (more often chosen by women and higher risk of unemployment). By contrast, the mediating role of the tertiary institution is weak. In the 1990s, the total effect of gender in terms of *AMEs* decreased by more than one third compared to the former decade. While the direct effect was persistent, the indirect effect almost vanishes. Hence, the reduction in total effect can be predominantly attributed to a decreasing indirect effect via the field of study. In the 2000s, field of study differences were not able to account for gender inequality in the labor market in terms of unemployment. The phasing out of this indirect mechanism appear to be not so much due to declining gender segregation in fields of study, but to the fact that female-dominated fields (e.g. *teaching*) have become less affected by unemployment over time relative to male-dominated fields (e.g. *engineering*) (see Figure 26). Between the 1990s and 2000s, the direct

effect of gender decreased by nearly half, i.e. gender disadvantages that are unrelated to one's field of study also weakened. Overall, reductions in both direct and indirect effect contributed to decreasing gender differences in unemployment risks across decades. Still, there is a gross effect of gender in the 2000s that is fully driven by a significant direct effect.

Regarding service class positions, it is evident that women are particularly disadvantaged in access to the upper part compared to men, though they have higher chances of accessing lower service class positions (see chapter 7; Gundert & Mayer, 2012). Therefore, I apply the *KHB* method to analyze the gender gap in attaining service class I positions vs. all other classes.²⁸⁶ The middle three columns of Table 21 decompose the total gender effect on access to the upper service class into direct and indirect effect via fields of study and tertiary institution across three decades. In the 1980s, we see a strongly significant total effect of gender: on average, women have a substantially lower probability (nearly 27 percentage points) of attaining the upper service class compared to men. More than half of the total effect can be attributed to gender differences in fields of study and tertiary institutions. Hence, the mediating effect of men's and women's field of study differences is even better able to explain gender inequality in access to the upper service class compared to unemployment risks in this decade. This indirect effect largely operates via fields such as *teaching*, *social services* and *humanities*: While these field groups comprise mostly women, they provide the smallest chances of attaining the upper service class among all fields in the 1980s.²⁸⁷ Still, the direct effect is substantial and significant: Holding field of study constant, women have a probability of accessing the upper class that is, on average, 12.4 percentage points higher than men's in this decade. In the 1990s, the total effect of gender in terms of *AMEs* is reduced by a fifth, but remains highly significant. This reduction can be attributed almost equally to a decline in direct and indirect effect via fields of study. In the 2000s, the total effect further decreased but stayed large (17.9 percentage points). Overall, the total effect has reduced by more than one third over time. Nevertheless, both direct gender effect and indirect effect via fields of study on access to the upper service class remain quite large. The total effect reduction between the 1990s and 2000s is due to a reduction in both direct and indirect effect again. The indirect effect has slightly increased in relative size though, as evidenced by

²⁸⁶ Decomposing effects in a multinomial logit model contrasting between upper and lower service class as well as non-service class positions shows that women have significant advantages in access to service class II vs. non-service class positions over men. The reverse gender gap is almost fully mediated by fields of study in all decades.

²⁸⁷ The tertiary institution does not contribute to this indirect effect. By contrast, it suppresses a stronger indirect effect since women less often enter *Fachhochschule*, whose graduates are slightly disadvantaged in access to the upper service class.

increasing confounding percentage (54 to 58 per cent). Hence, field of study differences by gender remain an important mediator for gender inequality in occupational returns.

Why is this mediating role of the field of study so persistent? This indirect effect has not been decreasing more strongly because gender segregation in higher education has been rather persistent (see Figure 25) and, at the same time, changes in field of study differences in access to the upper service class were small (see lower graph of Figure 27). Overall, this analysis provides evidence for *hypothesis 2a*, which posits that female disadvantages in non-pecuniary labor market returns are partially mediated by field of study differences.²⁸⁸ While the mediating effect of the field of study on unemployment risks levels off across time, differences between men's and women's study areas account for more than half of differing access probabilities between sexes to the upper service class in all decades. In addition, *hypothesis 2b* posited that declining gender inequalities in accessing the upper service class are largely not attributable to a reduced mediating role of one's field of study. This decomposition analysis seems to provide evidence for this as the direct effect of gender that is unrelated to one's field of study equally accounts for the prevailing decline in gender inequality in accessing upper service class positions. In fact, the relative size of this indirect effect via fields of study became slightly larger over time.

²⁸⁸ In order to provide a full picture on gender differences in labor market returns, the last three columns in Table 21 additionally indicate the results of the *KHB* method applied to occupational prestige. Accordingly, female tertiary graduates have significant advantages over male graduates in the *reduced* model across all decades. Hence, this confirms the previous results that women have comparatively good labor market prospects when considering occupational prestige (see chapter 8). Once we hold field of study and tertiary institution constant, this female advantage reverses: Women have on average slightly lower occupational prestige than men. The small negative effect of gender in the *full* model is, however, insignificant at 5 percent level in the 2000s. Hence, gender differences in fields of study favor women over men in terms of occupational prestige. Moreover, female occupational prestige advantages can be attributed to women's lower propensity of studying at *Fachhochschule*.

Table 21 Decomposing the total effect of gender into direct and indirect effect via fields of study and tertiary institution (*KHB* method)

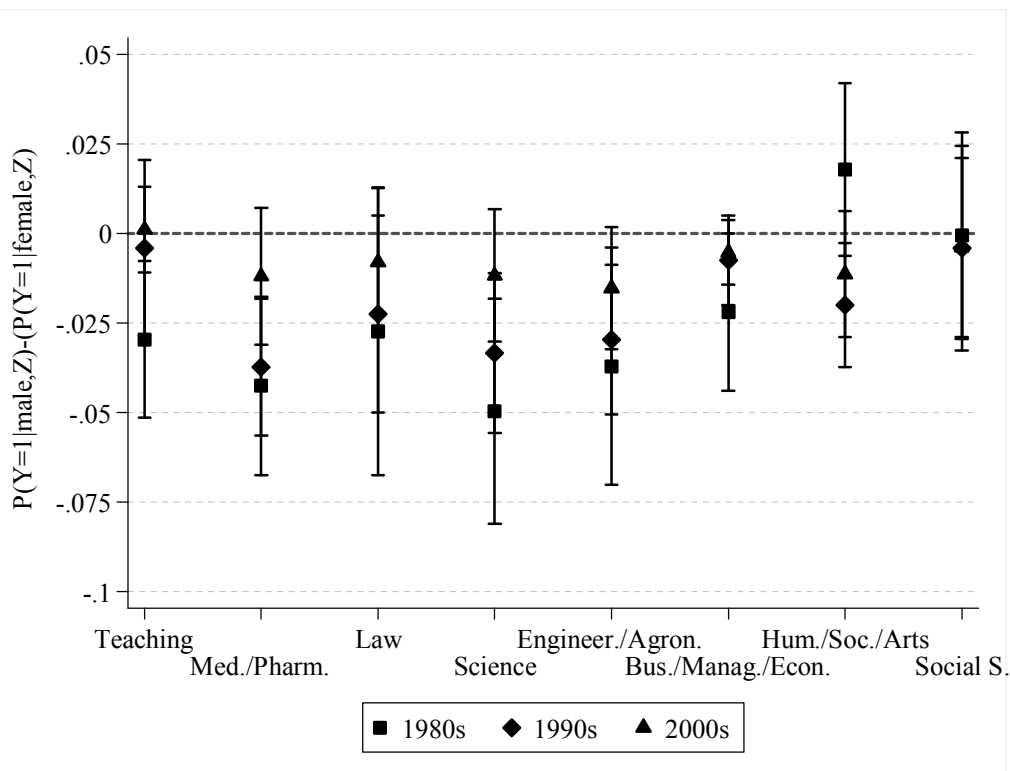
Gender	Risk of unemployment			Access to service class I			Occupational prestige		
	1980s	1990s	2000s	1980s	1990s	2000s	1980s	1990s	2000s
<i>Total effect</i>	0.038 (9.57)	0.024 (7.95)	0.013 (4.54)	-0.268 (-36.44)	-0.220 (-36.85)	-0.179 (-29.44)	2.85 (5.68)	1.58 (3.68)	4.84 (11.91)
<i>Direct effect</i>	0.025 (5.84)	0.021 (6.38)	0.013 (4.26)	-0.124 (-14.25)	-0.099 (-14.33)	-0.075 (-11.01)	-2.53 (-4.55)	-1.98 (-4.20)	-0.79 (-1.80)
<i>Indirect effect</i>	0.013	0.003	-0.000	-0.143	-0.121	-0.104	5.38 (9.00)	3.55 (7.27)	5.63 (12.60)
via teaching	0.001	-0.001	-0.003	-0.061	-0.044	-0.067	0.49	0.87	2.12
via med./pharm.	-0.000	-0.000	0.000	0.003	0.005	0.010	0.72	2.07	2.48
via law	-0.000	-0.000	0.000	-0.001	0.000	-0.000	-0.31	0.09	0.31
via eng./agron.	0.004	0.004	-0.001	-0.009	-0.004	-0.007	1.14	0.91	-0.17
via bus./manag./econ.	0.002	0.001	0.001	0.015	0.009	0.010	1.25	0.39	0.28
via hum./soc./arts	0.001	-0.001	0.002	-0.026	-0.039	-0.032	-0.46	-0.61	-0.64
via social serv./educ.	0.003	-0.000	0.001	-0.085	-0.058	-0.033	-1.33	-1.50	-0.50
via tertiary institution	0.001	0.001	0.001	0.020	0.010	0.015	3.88	1.33	1.75
<i>Relative measure</i>									
Confounding percentage	34.67	12.41	-0.31	53.55	54.92	57.98	188.84	225.45	116.35

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; Notes: In case of binary outcomes effects are shown as *average marginal effects (AMEs)*; citizenship treated as *concomitant variable*; z-values for indirect effects on binary outcomes not shown, as standard errors for *AME* method are unknown (Kohler et al., 2011: 431).

Are female disadvantages dependent on field of study?

Figure 33 depicts probability differences (*discrete change effects*) in unemployment between men and women for different fields of study across all three decades. Given a generally low risk of unemployment among tertiary graduates, differences between the sexes are not strong and do not substantially vary among fields of study. Aside from *soft fields*, male graduates had a lower unemployment risk than female graduates in all fields in the 1980s. Nevertheless, female disadvantages are statistically insignificant in *law* and *business*. While in this period gender differences in female-dominated *soft fields* were marginal (*social services*) or indicate employment opportunities in favor of women (*humanities*), female disadvantages appeared to be most pronounced and significant in male-dominated fields (e.g. *science* and *engineering*). In the 1980s, the male-dominated *science* and the female-dominated *humanities* significantly differ in terms of gender differences in unemployment risks. Nevertheless, the gender gap in unemployment was also relatively large in *teaching* studies, a female-dominated field.

Figure 33 Field-specific probability differences between sexes in unemployment

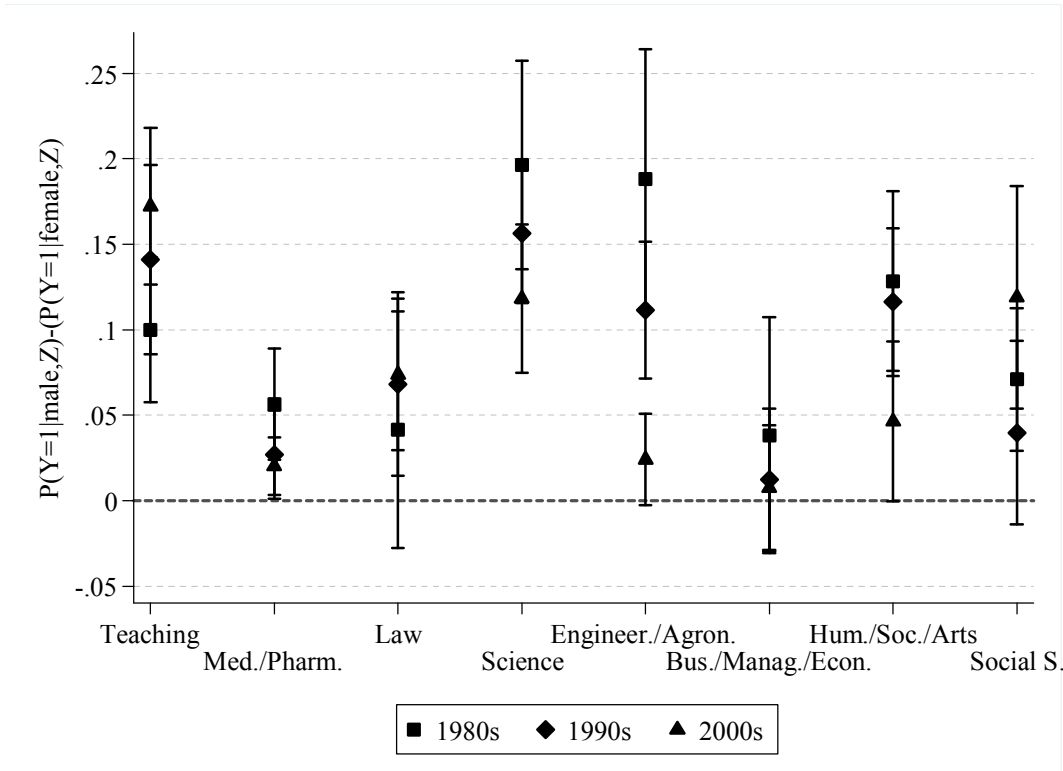


Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* *Discrete change effects (DCs)* for men compared to women; calculated after logit models including field of study, gender, citizenship, tertiary institution and interactions between field of study and gender; citizenship and tertiary institution are set on German and university; Ranges within capped spikes indicate 95% confidence intervals (CI).

Over time, none of the fields show significant changes in gender differences. Aside from female-dominated *soft fields*, the gender gap in unemployment risks has decreased over time in all fields, particularly between the 1990s and 2000s. Surprisingly, the gender effect in *humanities* reversed and became significant in the 1990s: male graduates had a lower probability of being unemployed than female graduates in this field. Although field-specific trends themselves are not significant, gender differences have become insignificant in all field groups in the most recent decade. In the 2000s, men and women did not substantially differ in terms of joblessness regardless of a field of study's sex composition.

Focusing on *hypothesis 2c*, which predicts that sex differences are stronger in traditionally male fields than in integrated or female-dominated fields, results provide some weak evidence only in the 1980s. In the 1990s and 2000s, however, gender differences in unemployment risks varied less among fields of study. This clearly does not support *hypothesis 2c*.

Figure 34 Field-specific probability differences between sexes in access to upper service class



Source: German Microcensus, Scientific-Use-Files 1980-2008; Notes: Discrete change effects (DCs) for men compared to women; calculated after a logit model including field of study, gender, citizenship, tertiary institution and interactions between field of study and gender; citizenship and tertiary institution are set on German and university; Ranges within capped spikes indicate 95% confidence intervals (CI).

Across every field group and decade, Figure 34 indicates probability differences (*discrete change effects*) between male and female graduates in attaining the upper service class. At first glance, we see that male graduates have advantages in terms of accessing the upper service class over female graduates in all decades and field groups. Nevertheless, there are some interesting differences between field groups in the strength of gender gap in upper service class attainment.

In the 1980s, women were most disadvantaged in traditionally male fields such as *science* and *engineering* (probability difference of almost 20 percentage points). But we also see significant advantages for men in traditionally female fields such as *teaching*²⁸⁹, *humanities* and *social services*. Gender differences were insignificant or almost insignificant only in integrated fields such as *business*, *law* and *medicine*. In the 1990s, the gender class gap shrank among male-dominated fields of study including *science* and particularly *engineering*. While gender differences have also decreased in *medicine*, *business* and *social services*, the gender class gap became more pronounced or persisted in *teaching*, *law* and the *humanities*. In the 2000s, we see a remarkable development: while the gender gap stayed quite persistent in *science*, gender differences in upper service class attainment became insignificant in *engineering*. This change in probability differences is even significant between the 1990s and 2000s. Furthermore, probability differences between female and male graduates from *business* and *humanities* in access to the upper service class became insignificant in this period. Interestingly, gender differences have become more pronounced in female-dominated fields such as *teaching* and *social services*. While these trends are non-significant, gender gaps are statistically significant for both fields in the 2000s.

Although gender-based inequality in accessing the upper service class was worst in male-dominated fields in the 1980s, it was pronounced in female-dominated fields as well. Male graduates also had clear advantages over female graduates in access to the upper service class in female-dominated fields. This gender class gap was weakest in integrated fields of study.²⁹⁰ Over time, we do not see a consistent decline of female disadvantages in access to the upper service class across all fields of study. The gender class gap has been largely

²⁸⁹ This may be due to the fact that few men opt for *teaching* studies preparing for *Grund-* and *Hauptschule* categorized as lower service class and more often choose studies that prepare for *Gymnasium* being classified as upper service class.

²⁹⁰ With regard to occupational prestige, female graduates are most disadvantaged and more so over time in the professional studies law and medicine while they have (increasing) advantages in the male-dominated fields of *science* and *engineering* over time. This could be due to intra-field group differences in the gender-specific choice of fields of study.

reduced in male-dominated fields, particularly *engineering*, while it has grown in female-dominated fields (with the exception of *humanities*). Therefore, *hypothesis 2c* can be rejected.

9.4.6 *Field of study as mediator for institutional differences*

The previous chapters showed that *Fachhochschule* graduates are disadvantaged in service class attainment and occupational prestige compared to university graduates. In contrast to previous research (e.g. Müller et al. 2002), I find rather stable differences in labor market returns between *Fachhochschule* and university graduates. Since university and *Fachhochschule* substantially differ in the supply of fields of study, this section attempts to clarify the extent to which field of study mediates differences in labor market returns between graduates from these institutions.

Most importantly, *Fachhochschulen* do not offer *Staatsexamen* degrees; only universities can offer fields of study that lead into the traditional professions (see Table C15). While male graduates at *Fachhochschule* mostly concentrate on *engineering* and *business* (almost 80 per cent) in all decades, their counterparts at university are more equally distributed across majors. Over time, the share of male *business* students at *Fachhochschule* increased, while the share of male *engineering* students decreased. Since the proportion of male graduates from *hard fields* and *business* majors likewise increased at university, these distributions became somewhat more similar between the 1980s and the 1990s. This view is also confirmed by the decreasing *UNIDIFF* parameter for men, depicting the association between fields of study and tertiary institution (see Figure C11).

While women at university mostly selected *teaching* and *soft fields* in the 1980s, women at *Fachhochschule* had less access to *teaching* studies, but were more often enrolled in *social services* than their female counterparts at university. Due to a lack of professional studies the share of female graduates in *engineering* and *business* was also considerably higher at *Fachhochschule* than at university. Over time, women at *Fachhochschule* substantially increased their share in *business* and decreased their share in *soft fields*. While these changes have been similar at university, they were not as strong as those at *Fachhochschule*. Still, among women, substantial differences between these institutions in fields of study distributions remain. Accordingly, the *UNIDIFF* parameter does not indicate any consistent trend in the association between field of study and tertiary institution among women over time.

Despite some changes across periods, the *constant association* model is preferable for both sexes according to a *BIC* comparison (see Table C16). Overall, this shows that university

and *Fachhochschule* clearly differ in the supply of fields of study and remain so throughout the observation period. To what extent can these different distributions account for differences between graduates from both institutions in terms of labor market rewards?

Decomposing the institution effect

The first three columns of Table 22 decompose the total effect of tertiary institution in terms of *AMEs* on the probability of being unemployed into direct and indirect effect via the field of study for three decades separately. In all decompositions, gender and citizenship are treated as *concomitant variables*. As already shown in chapter six, *Fachhochschule* graduates have slight, but significant, advantages in terms of avoiding unemployment over university graduates. In fact, this advantage can be partly attributed to field of study distributional differences between these institutions. In the 1980s, controlling for field of study explains almost 55 per cent of the total effect of tertiary institution on the probability of being unemployed. This is due to the fact that *Fachhochschule* predominantly offered fields of study that had a comparatively low risk of unemployment in this period (e.g. *engineering* and *business*). Across decades, this indirect effect via fields of study completely vanished, while the direct effect remained stable. Hence, the reduction in the total effect of tertiary institution over time is completely attributable to the phasing out of this indirect effect. The single contributions of fields of study indicate that this reduction can be mainly attributed to *engineering* and *teaching*.²⁹¹ Nevertheless, the remaining total and direct effect is significant at the 5% level, i.e. *Fachhochschule* graduates still have advantages over university graduates in terms of avoiding unemployment in the 2000s. This effect remains unexplained by one's field of study.

The seventh chapter showed that *Fachhochschule* and university graduates have rather similar chances in attaining the upper service class. Therefore, I do not apply the *KHB* method to the upper part of the service class. By contrast, these differences were much more pronounced in access to the overall service class. The middle three columns in Table 22 break down the total effect of tertiary institution on access to the service class into direct and indirect effects via fields of study. In comparison to university graduates, *Fachhochschule* graduates had strong disadvantages in attaining service class positions in the 1980s (almost 15 percentage points). 40 per cent of this negative effect can be attributed to field of study differences. This indirect effect largely operates via professional studies, such as *teaching* and *medicine* (i.e. unavailable at *Fachhochschule* and yielding high chances of attaining the

²⁹¹ This is due to the fact that graduates from *engineering*, that are more often found at *Fachhochschule*, have an increasing probability of being unemployed over time, while *teaching* graduates, that are more often found at university, experience the reverse development.

service class) and *business* (i.e. offered strongly at *Fachhochschule* and yielding low chances of attaining the service class). In the 1990s, the total effect of respondents' tertiary institution decreased, but remained highly significant. While a reduction in direct and indirect effect contributed to the decreasing total effect, the reduction in the direct effect was more pronounced than the indirect effect. In the 2000s, the total effect became larger again and almost reached the base level in the 1980s. While the direct effect stayed more or less the same, the indirect effect via fields of study was fully responsible for the increasing total effect in *AMEs* from the 1990s to the 2000s. In the long run, the direct effect of tertiary institution has decreased, while the indirect effect via fields of study has somewhat increased. As a consequence, direct and indirect effects contribute in equal shares to the total effect in recent times. This decomposition indicates that the increasing indirect effect operates primarily through *teaching*, *medicine* and *business*, but for different reasons. On the one hand, *teaching* and *medicine*, which are largely unavailable at *Fachhochschule*, were able to improve their access chances to the service class in the 2000s (see Figure 26). On the other hand, the share of *business* graduates, who have generally smaller chances of attaining the service class, has increased considerably stronger at *Fachhochschule* than at university.

Lastly, Table 22 decomposes the total effect of tertiary institution on occupational prestige. Across all decades, we see a strong total effect, which somewhat decreases between the 1980s and 1990s, but stabilizes in the 2000s. In the 1980s, nearly 40 per cent of the total effect can be attributed to field of study differences (indirect effect). The entire inequality reduction in accessing the service class in the 1990s can be attributed to a declining direct effect. The field of study remains an important mediating factor between tertiary institution and occupational prestige. In relative terms, the indirect effect explains around half of the total effect since the 1990s. Most of the indirect effect runs via *medicine*, since these graduates have extraordinarily high prestige values and *Fachhochschule* does not offer this field.

Summing up, we cannot reject the *hypothesis 3* that field of study differences mediate the disparity in occupational returns between *Fachhochschule* and university graduates. Aside from unemployment, the field of study stayed an important mediator for differences in occupational returns between these institutions. Overall, we see little change in the occupational returns gap between university and *Fachhochschule* graduates over time. Taking field of study into account, the direct effect of tertiary institution somewhat decreased but remains significantly strong. Even when accounting for field of study, there has not been true convergence in occupational returns between university and *Fachhochschule* graduates.

Table 22 Decomposing the total effect of tertiary institution into direct and indirect effects via field of study (*KHB* method)

	Risk of unemployment			Access to service class			Occupational prestige		
	1980s	1990s	2000s	1980s	1990s	2000s	1980s	1990s	2000s
Tertiary institution									
<i>Total effect</i>	-0.015	-0.009	-0.007	-0.146	-0.119	-0.135	-36.66	-28.44	-28.11
	(-3.38)	(-2.75)	(-2.30)	(-21.83)	(-19.75)	(-21.68)	(-73.12)	(-66.69)	(-66.51)
<i>Direct effect</i>	-0.007	-0.006	-0.007	-0.090	-0.068	-0.068	-22.69	-13.57	-14.24
	(-1.40)	(-1.78)	(-2.00)	(-12.54)	(-10.72)	(-11.09)	(-39.55)	(-28.79)	(-29.72)
<i>Indirect effect</i>	-0.008	-0.003	-0.000	-0.056	-0.051	-0.068	-13.97	-14.86	-13.87
							(-31.64)	(-40.02)	(-38.09)
via teaching	-0.001	0.001	0.003	-0.007	-0.005	-0.013	-0.50	-0.64	-2.31
via med./pharm.	0.002	0.002	-0.000	-0.018	-0.025	-0.024	-9.48	-10.62	-8.47
via law	-0.000	0.001	-0.000	0.000	-0.002	0.000	-1.01	-1.47	-2.22
via eng./agron.	-0.005	-0.004	0.001	-0.009	-0.002	-0.004	-1.42	-0.86	0.15
via bus./manag./econ.	-0.003	-0.003	-0.003	-0.025	-0.017	-0.031	-1.80	-1.00	-1.36
via hum./soc./arts	-0.001	0.000	-0.002	0.003	0.002	0.007	0.34	0.43	0.64
via social serv./educ.	0.000	-0.000	0.000	-0.000	-0.002	-0.003	-0.11	-0.68	-0.30
<i>Relative measure</i>									
Confounding percentage	54.92	29.67	5.55	38.13	42.73	50.09	38.10	52.27	49.35

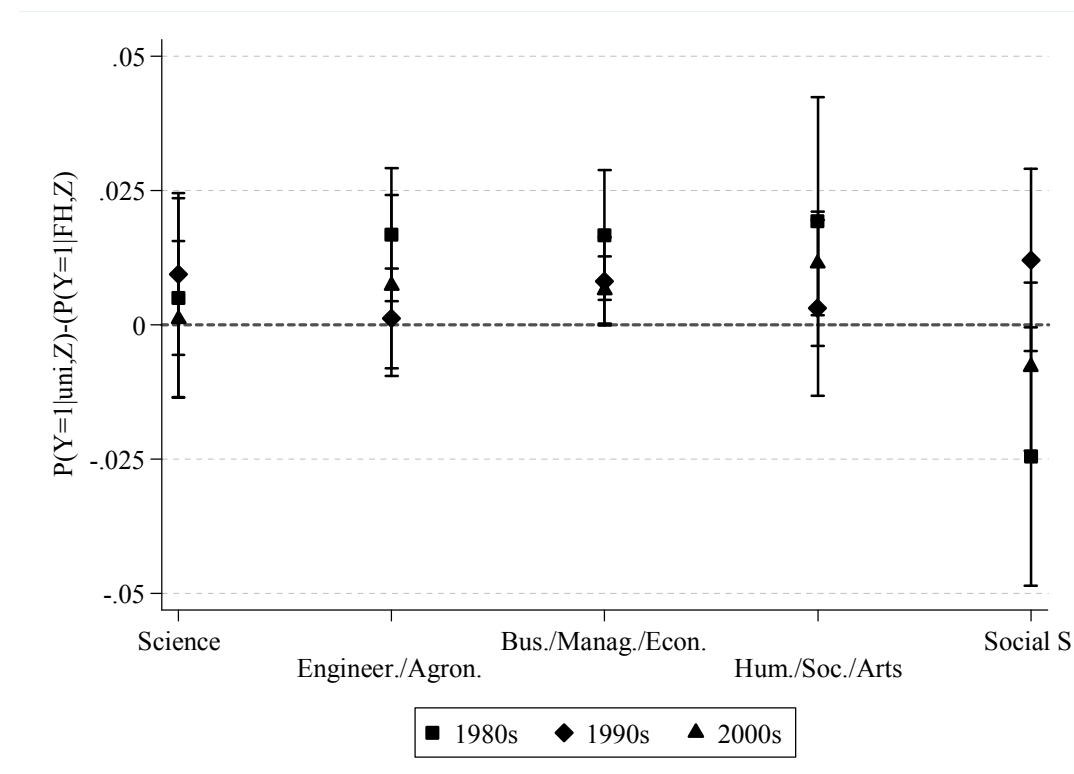
Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* effects are shown as *average marginal effects (AMEs)*; citizenship treated as *concomitant variable*; z-values for indirect effects on binary outcomes not shown, as standard errors for *AME* method are unknown (Kohler et al., 2011: 431).

Are disadvantages of Fachhochschule graduates dependent on their field of study?

Although I did not specify any hypotheses on the interaction between tertiary institution and field of study, it seems worthwhile to consider whether institutional effects are similar across fields of study. In the following analysis, professional fields of study such as *law*, *teaching* and *medicine* are excluded because they are unique to university studies.

Figure 35 indicates *discrete change effects* in the probability of being unemployed between university and *Fachhochschule* graduates among five remaining field groups and across time. This figure illustrates that differences between these graduates are generally low in all fields and decades. Aside from *social services* studies in the first and last decade, *Fachhochschule* graduates have had advantages over graduates from university in terms of avoiding unemployment. However, university graduates were significantly disadvantaged only in *engineering* and *business* in the 1980s and 2000s. Nevertheless, these fields comprise the largest number of students at *Fachhochschule*.

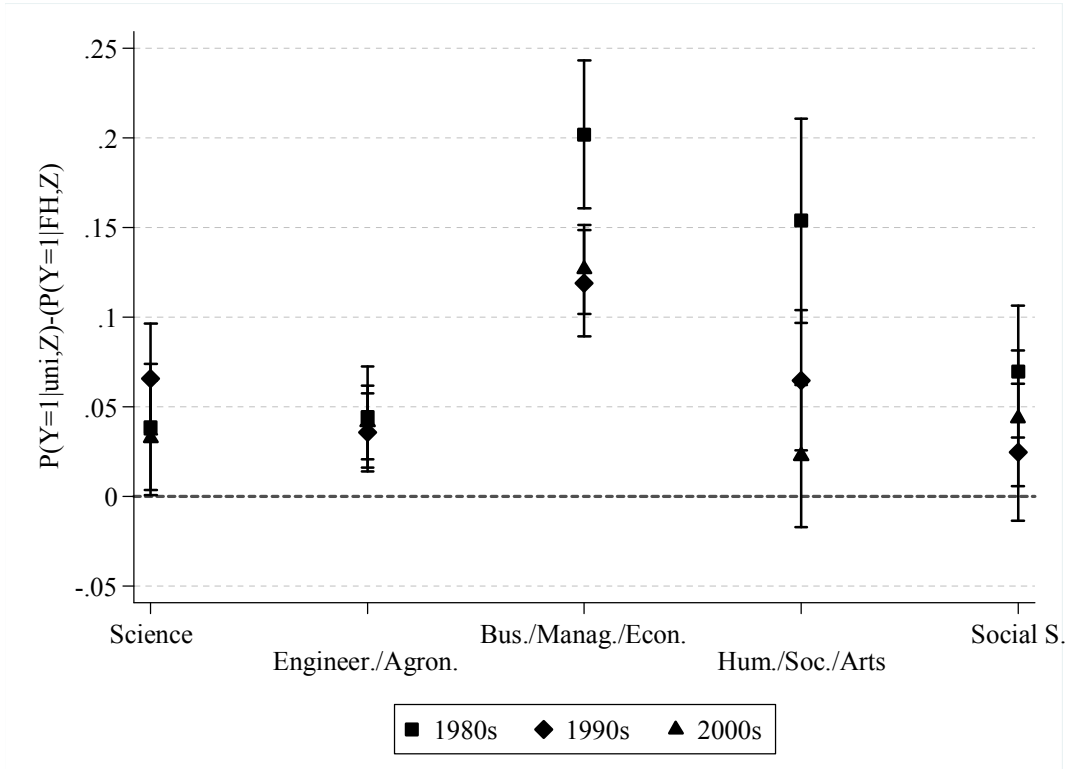
Figure 35 Field-specific probability differences between university and *Fachhochschule* graduates in unemployment



Source: German Microcensus 1980-2008, Scientific-Use-Files; Notes: Discrete change effects (DCs) for university graduates compared to *Fachhochschule* graduates; calculated after logit models including field of study, tertiary institution, gender, citizenship and interactions between field of study and tertiary institution; citizenship and gender are set on German and male; Ranges within capped spikes indicate 95% confidence intervals (CI).

Figure 36 reveals probability differences between university and *Fachhochschule* graduates in accessing the service class. In the 1980s, university graduates had significant advantages in attaining the service class over *Fachhochschule* graduates in all fields. The advantages are most pronounced in *business*, though less so in the *hard fields* and *social services*. Over time, differences between first- and second-tier institutions remained rather small among *hard fields* and *social services*. Nevertheless, for both *engineering* and *science*, the probability difference in attaining the service class between graduates from *Fachhochschule* and university stayed significant in the last decade. *Fachhochschule* graduates who majored in *humanities* are consistently able to improve their relative position compared to their university counterparts across decades. While this trend among the *humanities* was nearly significant from the 1980s to 1990s, *humanities* graduates from both institutions did not significantly differ in the 2000s.

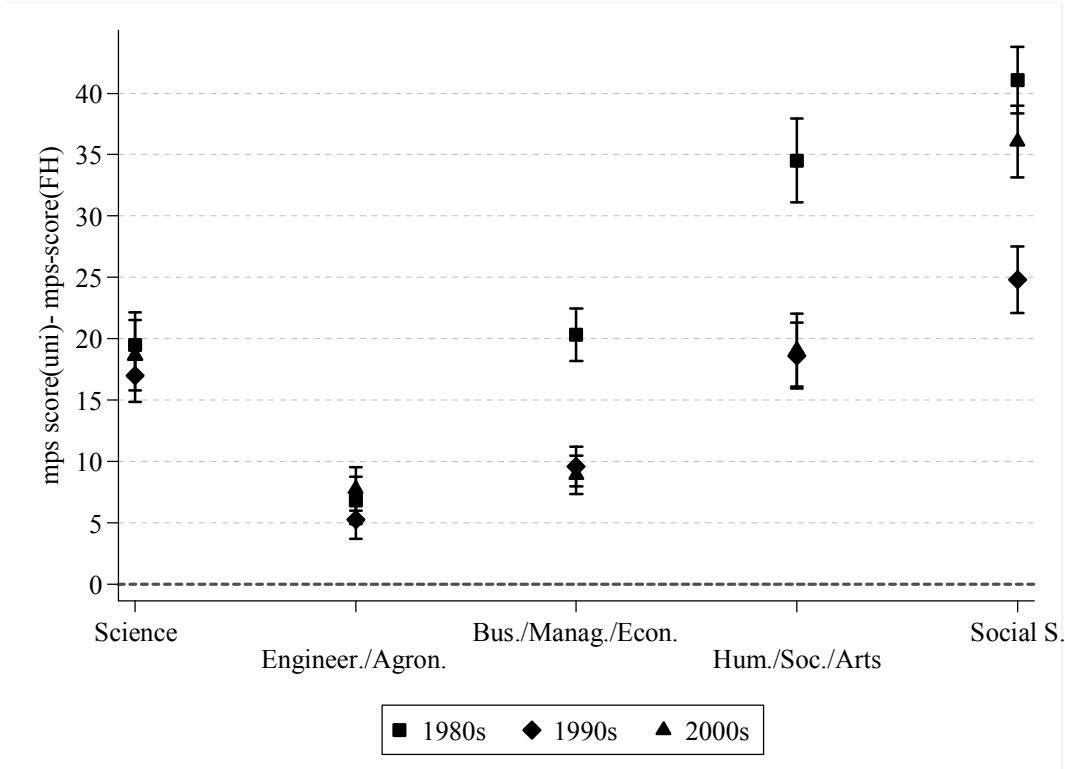
Figure 36 Field-specific probability differences between university and *Fachhochschule* graduates in access to the service class



Source: German *Microcensus* 1980-2008, Scientific-Use-Files; Notes: Discrete change effects (DCs) for university graduates compared to *Fachhochschule* graduates; calculated after logit models including field of study, tertiary institution, gender, citizenship and interactions between field of study and tertiary institution; citizenship and gender are set on German and male; Ranges within capped spikes indicate 95% confidence intervals (CI).

Fachhochschule graduates were able to significantly decrease their disadvantages compared to university graduates in *business* studies from the 1980s to the 1990s. Still, *Fachhochschule* graduates from *business* had a substantially lower probability of attaining the service class than university graduates in the 2000s. While *business* graduates are generally disadvantaged in terms of service class attainment, those at *Fachhochschule* tend to be most underprivileged.

Figure 37 Field-specific differences between university and *Fachhochschule* graduates in occupational prestige



Source: German *Microcensus* 1980-2008, Scientific-Use-Files; Notes: Estimates obtained from linear regressions including field of study, tertiary institution, gender, citizenship and interactions between field of study and tertiary institution; Ranges within capped spikes indicate 95% confidence intervals (CI).

Focusing on occupational prestige, Figure 37 indicates significant advantages for university graduates over *Fachhochschule* graduates across all fields of study. Differences are most pronounced in *soft fields*, compared to *engineering* where they are least pronounced. Again, we see no significant changes in the institutional effect over time for the *hard fields*. While *Fachhochschule* graduates were significantly less disadvantaged compared to university graduates in *social services* in the 1990s, this change nearly reversed in the 2000s. Once again, we see university graduates’ advantage significantly decrease relative to their counterparts at *Fachhochschule* among *business* and *humanities* in the 1980s and 1990s.

However, we do not see any further decline in the institutional gap between the 1990s and the 2000s. Hence, this analysis further illustrates that differences in occupational returns between university and *Fachhochschule* graduates did not consistently converge across the last thirty years.

9.4.7 PhD vs. university degree

The following section assesses whether PhD graduates have additional advantages in terms of labor market returns compared to conventional university graduates. *Fachhochschule* graduates are excluded because this institution is not allowed to bestow a PhD upon students. This analysis is further restricted to recent periods in 1999-2003 and 2004-2008 as I lack information on doctoral degrees before 1999. Hence, I am unable to consider long-term trends in the value of a PhD. Graduates with a doctoral degree may have increasing advantages over university graduates throughout educational expansion since a PhD is a more distinctive signal amidst the rising popularity of university degrees. For the last period, I am able to look at differences between fields of study in the relative returns of having a PhD. Between 2004 and 2008 I have information on both, doctoral degrees and field of study.

Table 23 Distribution of PhD and university graduates (in per cent)

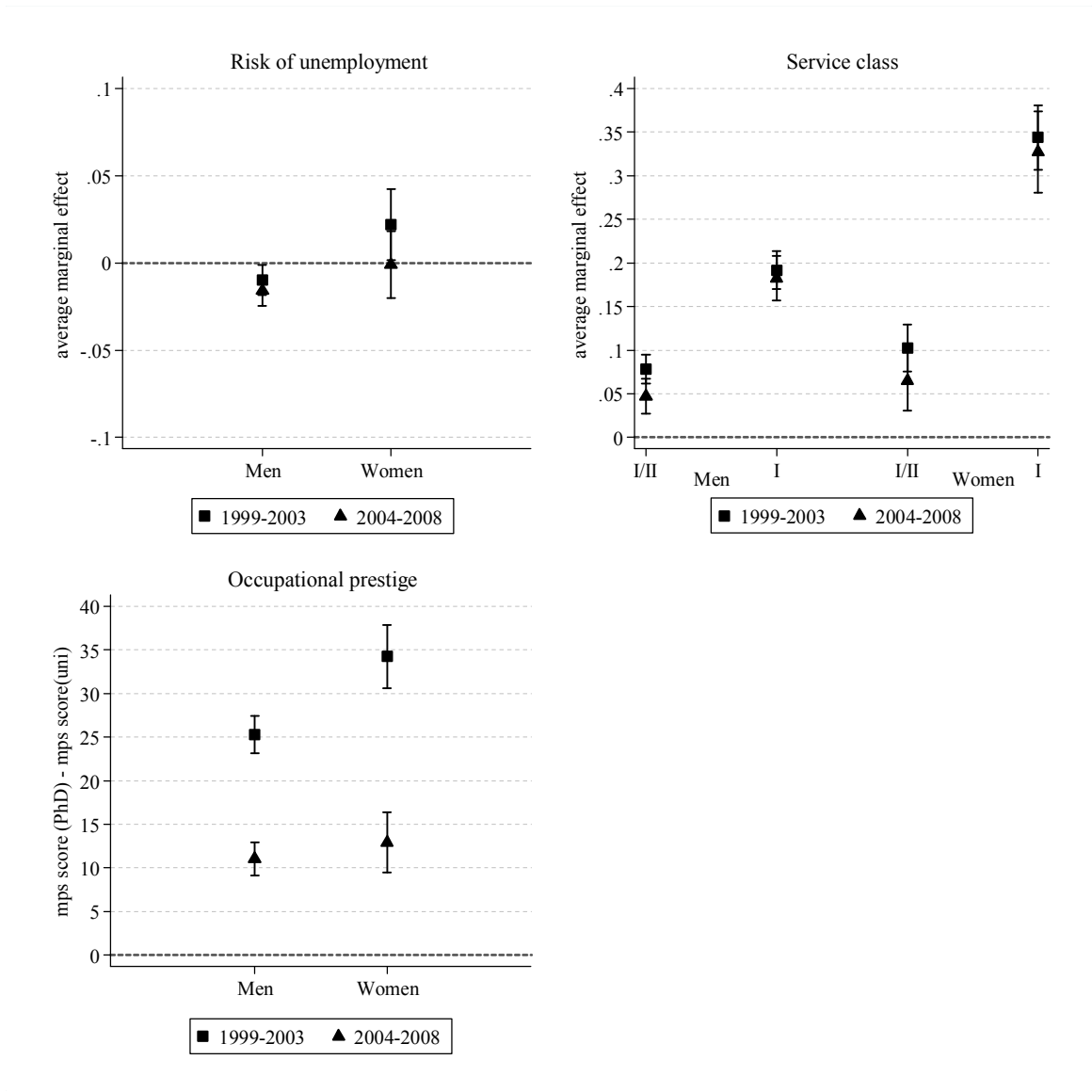
Men	1999	2000	2001	2002	2003
University	83	81	84	84	77
PhD	17	19	16	16	23
N	1626	1601	1745	1654	1876
	2004	2005	2006	2007	2008
University	78	85	85	85	83
PhD	22	15	15	15	17
N	1765	1529	1664	1610	1674
Women	1999	2000	2001	2002	2003
University	89	88	89	88	85
PhD	11	12	11	11	15
N	1285	1240	1317	1294	1389
	2004	2005	2006	2007	2008
University	85	91	91	91	89
PhD	15	9	9	9	11
N	1372	1268	1355	1555	1565

Source: German *Microcensus*, Scientific-Use-Files 1999-2008; *Notes:* Age group 35-39. *Fachhochschule* graduates (*CASMIN* 3a) are not part of this cross tabulation.

Table 23 indicates the proportion of PhD graduates among all university graduates between 1999 and 2008 for men and women separately. As this table indicates, the proportion of PhD graduates among men and women stayed constant in the last ten years with a strong

increase only in 2003 and 2004. After the peak in the mid-2000s, this share returned to its base level at the end of the observation period. Hence, we do not see consistent inflation of PhD degrees over the last ten years. Breaking this comparison down by gender, women acquire fewer doctoral degrees relative to men. This gender gap is evident across the 2000s. Hence, while women have reached parity with men terms of university degrees, they continue to lag behind men in doctoral degrees.

Figure 38 Differences between PhD graduates and university graduates in labor market rewards



Source: German *Microcensus*, Scientific-Use-Files 1999-2008; Notes: Effects on service class attainment and risk of unemployment shown as *average marginal effects (AMEs)*; effects on occupational prestige shown as difference in magnitude prestige scores (mps); controlling for citizenship; not controlling for field of study as information in the first period is only available in 2000; Ranges within capped spikes indicate 95% confidence intervals (CI).

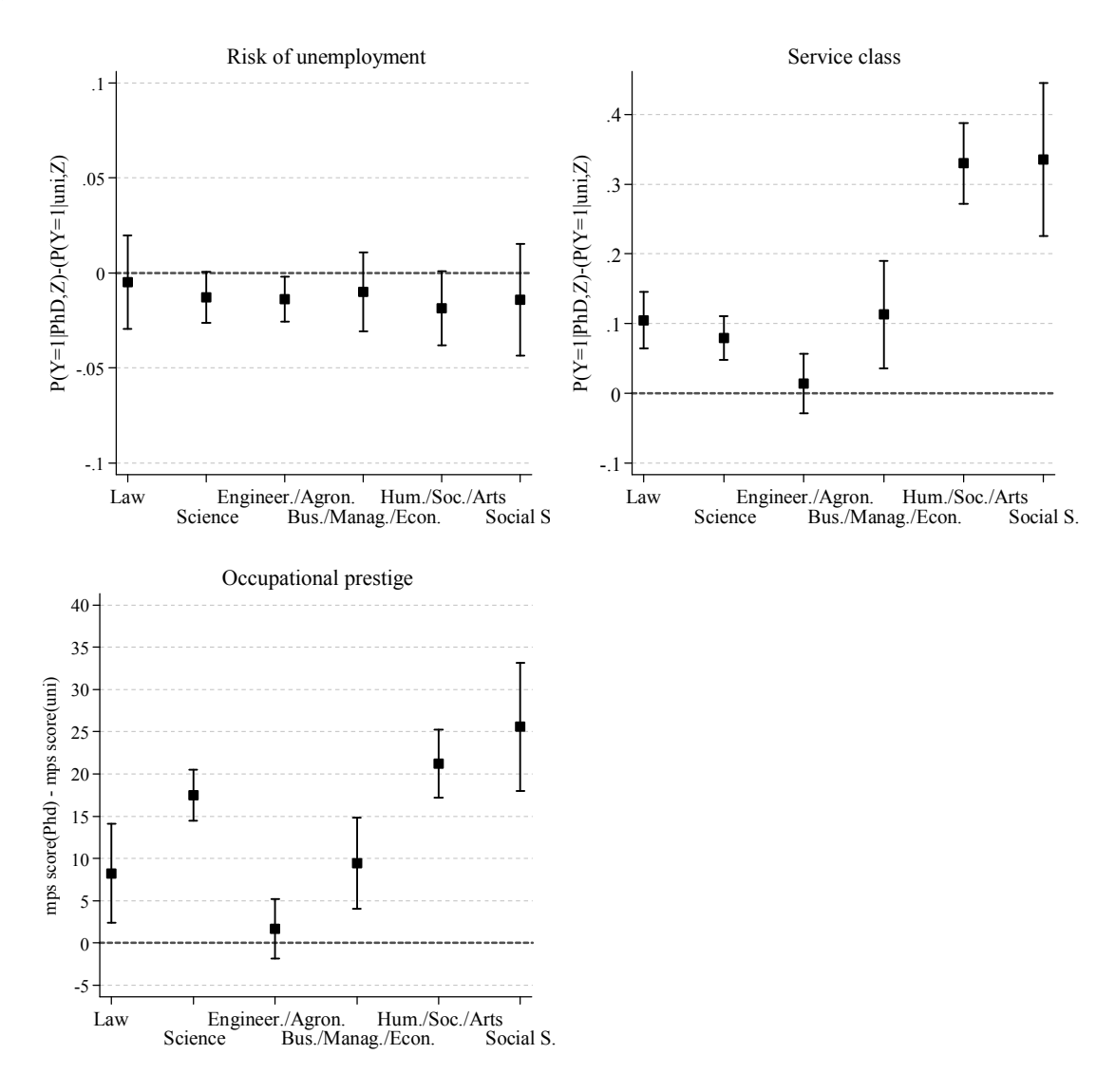
The two upper graphs in Figure 38 indicate the relative returns according to *average marginal effects (AMEs)*, predicting, on average, the probability of being unemployed and being member of the service class for PhD graduates compared to university graduates. The lower graph indicates occupational prestige differences between these graduates in terms of magnitude prestige scores (mps). These results are shown for men and women separately.

Regarding the risk of unemployment, PhD graduates do not appear to substantially differ from university graduates. Male PhD graduates have a slightly lower probability of being jobless than male university graduates in both periods. While female doctoral graduates have a significantly higher propensity of being unemployed in period 1999-2003, the *AME* for women became insignificant at the 5% level in period 2004-2008. Hence, female PhD graduates have been able to reduce their disadvantages in terms of unemployment compared to university graduates. Overall, a PhD seems to have restricted value in terms of avoiding unemployment.

Among service class attainment, male and female PhD graduates have significant advantages in terms of *AMEs* over university graduates in both periods. This is especially evident in upper service class attainment. Hence, additionally having a PhD is much more valuable and makes a difference in accessing the most advantageous occupational positions. This comes as no great surprise given that university graduates, in general, have extraordinarily high *absolute* chances of attaining positions in the service class as a whole (see chapter 7.5.2). Across periods, the value of a PhD in accessing the service class has somewhat decreased. Nevertheless, PhD graduates still have significant advantages over university graduates in accessing the service class, especially in accessing the upper service class. While male and female PhD graduates tend to differ only marginally in their relative advantages of attaining the service class as a whole, they strongly differ in their *AMEs* compared to university graduates' prospects of accessing the upper service class. Thus, female PhD graduates have stronger relative advantages over university graduates in accessing the upper service class fraction than male PhD graduates over their male counterparts at university

Looking at occupational prestige, the advantages for PhD graduates compared to university graduates are substantial for both sexes, but significantly decrease over time, in particular for women. While women had clear advantages in the relative value of a PhD compared to men in the period 1999-2003, these differences vanished in recent times.

Figure 39 PhD vs. university degree by field of study



Source: German *Microcensus*, Scientific-Use-Files 2004-2008; Notes: Estimates obtained from models including field of study, PhD, gender, citizenship and interaction terms between field of study and PhD. In case of binary outcomes the figure indicates *discrete change effects (DCs)* in terms of probabilities between PhD holders and university graduates (gender and citizenship set on male and German); Ranges within capped spikes indicate 95% confidence intervals (CI).

In a next step, I consider differences between fields of study in the effect of having a PhD on each respective outcome in the most recent times (Figure 39). *Teaching* studies are not considered in the analysis as only few students acquired a PhD in this subject. Due to smaller sample sizes in this differentiated analysis, I refrain from conducting separate analyses for men and women. In this analysis, I estimate field-specific probability differences between PhD and university graduates for binary outcomes based on a logistic regression models, including interactions between field of study and PhD and controlling for gender and

citizenship. With regard to occupational prestige, the lower graph illustrates the PhD advantage in terms of prestige scores over university graduates for these different fields.

As these figures depict, PhD graduates are less likely to be unemployed compared to university graduates in all fields of study. However, this PhD effect is rather weak among all fields of study. Aside from *engineering*, these differences are insignificant at the 5% level. Regarding employment opportunities, the PhD effect tends to be similar among fields of study. However, Having a PhD is significantly beneficial for both service class access and occupational prestige across all field groups, except *engineering*. While PhD graduates in *engineering* have a marginally lower risk of unemployment, they do not benefit from their additional degree in terms of occupational rewards compared to their respective university counterparts. Among all other fields, the PhD effect is significantly positive both in access to the service class and in terms of occupational prestige. Nevertheless, we see substantial differences among fields of study in the value of a PhD. Doctoral graduates from *soft fields*, *humanities* and *social services* have a probability to attain the service class that is almost 35 percentage points higher than the probability among university graduates in their field. By contrast, this probability advantage is less than 10 percentage points for PhD *science* graduates. PhD graduates from *law* and *business* are also relatively less advantaged compared to PhD graduates in *soft fields*. The same variation in PhD effects among fields of study is evident for occupational prestige, but to a lesser extent; particularly comparing *soft fields* and the *sciences* the PhD advantage is less pronounced. Nevertheless, both *humanities* and *social services* significantly differ in their PhD effect from all other groups (except from *science* in terms of occupational prestige). Hence, university graduates from fields of study that provide a rather weak signaling value in the labor market tend to profit most from additionally pursuing a PhD. Thus we cannot reject *Hypothesis 4b* positing that relative returns to a PhD compared to a university degree are larger among graduates from *soft fields* than among graduates from *hard fields*.

9.5 Summary

The three previous chapters concentrated on changes in the relative returns to higher education over lower educational groups across various labor market outcomes. The prime aim of this chapter was to supplement the present results on vertical differentiations with an analysis of horizontal differentiations in higher education, i.e. field of study. Many authors claim that throughout educational expansion field of study differences in labor market rewards would have become more pronounced. Yet this assumption has so far not been

empirically tested. While this question is highly relevant, field of study differences have also been proposed as an important mediating component for gender inequality and differences between first-tier and second-tier tertiary institutions. In this regard, the chapter attempted to supplement the previous results of this book on gender inequalities and inequalities between university and *Fachhochschule* by additionally taking the field of study into account. Lastly, the chapter looked at a further vertical gradation in higher education, which is often neglected in empirical research, namely the value of doctoral degrees compared to university degrees in labor market returns.

With regard to unemployment risks, we see few consistent trends in field of study differences. While changes in field of study effects are, in general, volatile and less systematic, only graduates from *engineering* have experienced rising relative unemployment risks over time. Since *engineering* is clearly one of the most occupation-specific fields, they may be rather affected by unemployment compared to mismatches with inadequate occupational positions when the supply of engineers exceeds demand in the labor market. Most importantly, graduates from *soft fields* did not become increasingly affected by unemployment compared to *science* graduates over time. Compared to *engineering*, humanities and social services graduates even improved their relative position in terms of avoiding unemployment. As already indicated in chapter 6, tertiary graduates have comparatively low unemployment risks over time, this chapter additionally showed that unemployment risks did not increasingly vary across fields of study.

As to occupational returns, graduates from *law* and particularly *medicine* are clearly advantaged over graduates from other fields of study in terms of attaining the (upper) service class and occupational prestige. This advance has been slightly reduced in upper service class attainment over time. While graduates from *soft fields*, particularly *social services*, were already disadvantaged in upper service class attainment compared to graduates from *hard fields* in the early 1980s, occupational prestige differences and differences in access to the service class as a whole had been rather low. Over the last thirty years, relative occupational returns for graduates from *soft fields* only slightly decreased compared to graduates from *hard fields*. While differences between *soft* and *hard fields* remained constant in the 1990s, the gap became somewhat more pronounced in the 2000s. However, graduates from *social services* were even able to slightly improve their relative chances of attaining upper service class positions over time. Hence, we do not see a consistent or strong deterioration of relative occupational rewards for graduates from *soft fields*, as suggested by previous authors. At the start of the 1980s, *business* graduates were strongly disadvantaged compared to graduates

from all other fields in terms of service class attainment and occupational prestige. Over time, they were able to considerably reduce these disadvantages. Nevertheless, *business* graduates remain the group that is most disadvantaged in access to the most beneficial occupational positions.

Altogether, field of study differences in unemployment risks and occupational returns in West Germany did not become stronger over time. Formal tests based on log-linear models and using the coefficient of determination confirm this view. Despite educational expansion, all tertiary graduates continue to have comparatively good chances of attaining high-skilled positions in the labor market. Employers tend to rely on applicants' field of study as selection criterion in job allocation procedures as they always have. This chapter also attempted to explore the mechanism behind these marginal changes in the effect of field of study on labor market rewards. Using field of study fixed effects models we see no evidence for *signaling* effects of fields of study in the West German labor market. Supply-side changes in terms of *selectivity*, *occupational specificity* or *sex composition* among fields of study appear to have had no impact on changes in field-specific labor market rewards. Why does one's field of study not become more important throughout higher education expansion in West Germany? Obviously, one could argue that educational expansion has been rather moderate in West Germany. In this regard, a tertiary degree alone may still be a sufficient indicator of potential productivity in West Germany and therefore does not constitute a noisy signal as proposed by Jackson et al. (2005). Besides, given that educational expansion is weak, signaling characteristics such as a *selectivity* differences between fields of study may not change as much as necessary to cause changes in employers' job allocation decisions.

Variation among fields of study in labor market rewards may depend on the magnitude of returns among all higher education graduates. That is, only when the returns to tertiary education become worse, the effect of one's field of study becomes larger. For West Germany, the advantages associated with higher education remained rather stable over time and there appear few indications of a growing mismatch between supply and demand among tertiary graduates (see chapter 7). Given these stable occupational returns, field of study differences do not markedly change either. Although graduates from *soft fields* tend to be somewhat more affected by *structural* downward mobility than other fields in case of an oversupply of tertiary graduates, this phenomenon likewise affects the *sciences*. Besides, no graduates appear to be affected by *cyclical* crowding-out or downward mobility during economic downturns.

First and foremost, strong linkages between horizontal differentiations in higher education and partial labor markets in the high-skilled *occupational labor market* shape the labor market rewards for graduates from different fields of study. In an *occupational labor market* such as West Germany, field of study differences in occupational returns appear to be demand-related. The differentiated analysis by service class segments showed that graduates are largely allocated to jobs in those occupation-specific high-skilled segments that match their field of study. In this regard, the fields of study *medicine*, *law* and *teaching* are exceptional since allocation into jobs grants exclusive *licenses* to work in professional positions. Hence, occupational closure mechanisms surrounding the professions ensure that graduates from these programs do not need to compete with graduates from other fields upon labor market entry. Not surprisingly, professionals have comparative advantages in access to prestigious top-level positions in the labor market. But also other field groups have distinct occupational segments where most of the graduates find employment in service class positions. Other than in professions, however, coordination between fields of study and labor market segments is more informal and market-based but appears to be no less than successful. This is due to the fact that the *certifying* role of educational attainment, i.e. the signaling of knowledge, expertise or specific skills that is learned in the educational system, is also distinctive in German higher education. The assumption of a national *labor* and *job queue*, where all graduates from higher education compete for all available job vacancies seems to be unrealistic for the German institutional setting, e.g. engineers never have to compete with humanities majors for engineering jobs.

Due to this *qualificational space*, changes in the effect of one's field of study on labor market rewards are a matter of short-term demand-supply imbalances among occupational segments or long-term compositional changes in the occupational structure. Over time, graduates from *business* have slightly increased their chances of attaining the service class thanks to expansion in administrative and managerial jobs, which demand skills and knowledge particularly suitable to this field. By contrast, as the share of social services jobs have shrank, graduates from *soft fields* have faced increasing difficulties in accessing service class positions. Nevertheless, graduates from *humanities* and *social services* have also been able to find employment in these new administrative and management jobs. Therefore, the decline in occupational returns among *soft fields* was not as strong as expected compared to *hard fields*. Apparently, graduates from academic *soft fields* signal skills that allow them to gain access to high-skilled jobs in non-matching occupational areas. Hence, irrespective of the

occupational segment, employers in West Germany tend to continue to recognize the value of *soft fields*.

Future research on trends in field of study differences should have a look at cross-national comparisons. It would be interesting to see how the effect of one's field of study develops over time, considering particularly variation in educational expansion and heterogeneity in the strength of linkages between higher education and labor market outcomes. *Signaling* characteristics of the field of study, such as *selectivity*, may matter only in countries with massive higher education expansion or where occupational placement is less pre-structured by the educational system. For instance, Kim and Kim (2003) found that field of study differences in access to the service class are, in general, stronger in the United Kingdom than in West Germany. They argue that field of study is a stronger selection criterion in the United Kingdom than in West Germany because tertiary degrees in UK are weak indicators of potential productivity thanks to their rather general orientation. Given this, field of study differences may have become more pronounced throughout educational expansion only in countries that rely chiefly on *internal labor markets (ILMs)*, such as the United Kingdom.

Focusing on gender inequality at the tertiary level, this analysis reveals that differences in unemployment risks in the 1980s and, in particular, access to upper service class positions are partly mediated by one's field of study. Over time, disadvantages for female tertiary graduates in unemployment risks have declined but still exist. This decline is due to a decreasing direct effect of gender and a vanishing of the indirect effect via field of study. Hence, gender segregation in higher education was unable to account for female disadvantages in unemployment risks in most recent times. In access to the upper service class, the mediating role of one's field of study is more pronounced: across all decades more than half of the total gender effect can be attributed to field of study differences between women and men. Over time, female disadvantages in access to the upper service class decreased by one third. Again, this reduction can be attributed to a decline in direct gender effect and an indirect mechanism via field of study. As this direct effect reduction was somewhat more pronounced, declining mechanisms of gender inequality unrelated to one's field of study contributed slightly more to the reduction in gross gender effect. Nevertheless, after accounting for study major, female tertiary graduates still have strong disadvantages in attaining top-level service class positions compared to male graduates. Overall, this stresses the importance of considering horizontal differentiations in educational attainment when analyzing gender inequalities in non-pecuniary labor market rewards.

This analysis provided no evidence for the assumption that female disadvantages in labor market rewards are particularly strong in male-dominated fields. We only found weak empirical support for this hypothesis when analyzing unemployment in the 1980s: While female disadvantages were most pronounced in the male-dominated *hard fields*, they had been rather weak (*social services*) or non-existent (*humanities*) in the female-dominated *soft fields*. Over time, these differences in gender inequality decreased. In the most recent decade, the probability of being unemployed differed non-significantly between sexes across all field groups. Among male- and female-dominated fields, male graduates had strong advantages over female graduates in accessing the service class in the 1980s. This male advantage was less pronounced among integrated fields like *law* or *business*. Over time, female disadvantages in service class attainment have been largely reduced in male-dominated fields, in particular *engineering*, while it has grown in female-dominated fields such as *teaching* or *social services*. Hence, gender inequality appears to be largely independent from the sex composition among fields of study.

As with gender differences, the field of study appears to play an important role in mediating differences in labor market returns between graduates from university and *Fachhochschule*. While *Fachhochschule* graduates have a lower risk of being unemployed compared to their university peers, field of study differences account for more than half of this effect in the 1980s. Over time, this *Fachhochschule* advantage in unemployment risks decreased because field of study differences were decreasingly able to account for differences in unemployment risks. Still, we see slight advantages among *Fachhochschule* graduates in the 2000s that are mostly unrelated to one's field of study. Again, this confirms the view from chapter six, namely that graduates with a more applied training have advantages in terms of avoiding unemployment over graduates with general training. However, *Fachhochschule* graduates have had strong disadvantages in terms of occupational returns compared to university graduates. While this tertiary institution effect on access to the service class somewhat decreased in the 1990s, it almost returned to the base level in the 2000s. One's field of study strongly mediates these differences in access to the service class. 40 to 50 per cent of this gross institutional effect vanishes when holding the field of study constant. While the direct institution effect that is unrelated to one's field of study somewhat decreased over time, the indirect effect via fields of study remains largely persistent. As to occupational prestige, the large gap between graduates from both institutions only decreased between the 1980s and the 1990s. This reduction is fully attributable to a decreasing direct effect that is unexplained by the field of study. Likewise, the indirect effect via fields of study remains persistent.

Almost half of this disadvantage in prestige scores among *Fachhochschule* graduates can be attributed to distributional differences in fields of study. Overall, there is no indication for a strong convergence in occupational returns between *Fachhochschule* and university graduates. On the one hand, this is because the different supply of fields of study at both institutions has historically grown and is therefore rather stable. That is, as long as the professions, thanks to occupational closure, are advantaged in terms of labor market rewards, *Fachhochschule* graduates will always be disadvantaged in occupational returns due to lacking fields of study preparing for these jobs. On the other hand, while the effect which remains unexplained by fields of study somewhat decreased, *Fachhochschule* disadvantages net of fields of study substantially remained. Clearly, this analysis stresses that prior to looking at substantive explanations for differences in labor market rewards between first-tier and second-tier institution, e.g. human capital vs. selection, one must take structural differences in the supply of fields of study into account. Further, we do not see any substantial differences among fields of study in this institutional effect on unemployment risks. With regard to occupational returns, however, variation among fields of study is somewhat more pronounced. While *Fachhochschule* graduates are stronger disadvantaged compared to university graduates in *business* studies than in all other fields, it is *Fachhochschule* graduates in *soft fields*, in particularly *social services*, that are most underprivileged in terms of occupational prestige compared to their peers from university.

Finally, I investigated differences in labor market returns between PhD graduates and university graduates. This further vertical differentiation among university education is often neglected in empirical research concentrating on the educational level. PhD graduates from both sexes have clear advantages in terms of occupational attainment over university graduates, while a PhD appears to be less beneficial in avoiding unemployment. Acquiring a PhD is valued in the labor market particularly for attaining top-level positions in the upper service class. However, the occupational benefits attributable to a PhD have somewhat decreased across the 2000s. Credential inflation cannot be the reason for this decline, as the proportion of PhD graduates remained rather constant for both sexes during this smaller period of observation. PhD studies are particularly beneficial in improving relative occupational returns over conventional university graduates among the *soft fields*. Hence, university graduates from fields of study that are comparatively disadvantaged in terms of labor market rewards tend to profit most from additionally pursuing a doctoral degree upon labor market entry.

Chapter 10 Summary and conclusions

The aim of the book has been to assess long-term trends in the returns to education, focusing particularly on the *absolute* and *relative* returns to higher education among men and women in West Germany between 1976 and 2008. From both a macroeconomic and individual perspective it is important to know how the returns to education in the labor market change throughout the course of time. Do individual investments in education still offer labor market rewards comparable to former times? While *absolute* returns to education indicate actual labor market outcomes among individuals with given educational attainment, *relative* returns assess the relative advantages of higher education graduates in labor market rewards over lower educational groups, e.g. *Abitur* holders. Changes in *absolute* returns to education over time are thus influenced by the balance between educational expansion and occupational upgrading, i.e. job competition and opportunity structures in the labor market. By contrast, changes in *relative* returns over the course of time illustrate changes in the labor market value of educational attainment net of changes in the marginal educational and occupational distribution. In relative terms, this book particularly investigated differences in labor market returns between university and *Fachhochschule* graduates as well as between doctoral and university graduates over time. Moreover, this analysis focused not only on vertical dimensions (i.e. university vs. *Fachhochschule*) but also on horizontal dimensions of educational attainment (i.e. one's field of study) and their changes over time.

I pursued a *micro-macro* framework, assuming that general micro-mechanisms which affect job matching outcomes between employers and job seekers remained stable over time. Likewise, this framework assumed that aggregate returns to education at a given time are shaped by the prevailing institutional, macrostructural and macroeconomic conditions. Hence, changes in the returns to education were argued to be due to macro-level developments since changing contextual conditions affect both employers and job seekers in their decision-making throughout the job matching process.

In order to give a complete picture of the changes in returns to education in the West German labor market, I made use of a *multidimensional concept of labor market outcomes*, considering the *risk of unemployment*, *social class destinations* as well as *occupational prestige*. Since macro-level changes were assumed to have a stronger impact on labor market outsiders, empirical analyses concentrated on comparing different *labor market entry cohorts*.

In terms of *unemployment risk*, higher education graduates have a rather low unemployment rate at all points in time. University graduates were affected by increasing joblessness only in the 1980s. Hence, *absolute* returns in terms of avoiding unemployment among tertiary graduates remain high. Comparing the sexes, female graduates from tertiary education have generally higher unemployment rates than their male counterparts. In light of worsening macroeconomic circumstances, both male and female tertiary graduates have continued to be successful in finding employment. Participating in vocational training is also a crucial factor for individual employment possibilities: Graduates who have completed vocational training had relative advantages in avoiding unemployment over graduates with general educational certificates. Even at the tertiary level, *Fachhochschule* graduates tend to have a slightly lower unemployment risk than university graduates. In general, we see a large divide in unemployment risks between skill groups, with comparably unskilled individuals with no vocational training or educational certificate on the one hand and graduates with either vocational training or higher education on the other. The educational stratification of unemployment appears to work in quite similar ways for both sexes. Over time, this gap in unemployment risks widened significantly for both sexes. Graduates from *Hauptschule* or *Realschule* who lacked vocational training have experienced substantially growing disadvantages compared to all other groups and have been increasingly pushed out of the labor market. Hence, unemployment risks have become more dependent on educational attainment relative to former times. Focusing on macro-level effects, structural imbalances between labor supply, educational expansion, and demand, occupational upgrading, have not had a strong impact on educationally stratified unemployment risks; by contrast, the business cycle does affect educational groups differently for both sexes. While tertiary graduates and graduates with vocational training are less affected by negative macroeconomic conditions, the poorly-educated without vocational training are highly vulnerable to business cycle effects and become increasingly jobless during economic downturns. Since macroeconomic conditions have worsened throughout several of the last business cycles, cyclical crowding-out can partially account for an increasing unemployment divide between the less-educated and higher educated groups over the course of time.

Absolute returns in service class access are largely determined by the relative strength of educational expansion and occupational upgrading in the labor market. In West Germany, occupational upgrading in terms of service class expansion has tended to essentially parallel the expansion of higher education for both sexes. Nevertheless, occupational upgrading somewhat lagged behind educational expansion in the 1980s. Accordingly, *absolute* returns to

higher education decreased during this decade. The fact that all educational groups experienced decreasing *absolute* returns across the 1980s suggests a crowding-out process from above. In the following decades, *absolute* returns to tertiary education have crept slightly upwards again. Thanks to occupational upgrading, the West German labor market has been able to absorb the increasing share of higher education graduates, placing them in adequate occupational positions. Hence, we do not see any indication of a consistent devaluation of higher education credentials across time.

With regard to *relative* returns, the association between educational attainment and class destinations has not significantly changed between mid-1970s and the end of the 2000s for both sexes. Given this long time span, the ED association has remained remarkably stable in West Germany. Among other things, this trend can be attributed to Germany's stable institutional setting, which provides strong linkages between education and labor market positions. *Relative* returns in access to the service class among higher education graduates have not strongly or consistently declined either. The sole exception remains between the 1980s and mid-1990s when university graduates' relative chances of attaining the service class compared to *Abitur* holders slightly decreased, particularly among women. From then on, *relative* returns to university education remained constant for men and even increased for women. The *relative* returns for *Fachhochschule* graduates in access to the service class stayed constant across the observation period. At the same time, there are indications that graduates below *Abitur* have become less able to attain the service class. Focusing on the most privileged positions in the upper service class, *relative* access advantages among tertiary graduates have even increased in the long run, particularly for women. Similarly, *relative* service class attainment among women seems to depend quite heavily on educational attainment as with men. Disaggregating the service class indicates that the slightly decreasing *relative* returns for university graduates seen in 1980s until mid-1990s are mostly attributable to compositional changes in the service class. As the share of administrative and managerial positions grew, which typically are less dependent on higher education compared to expert or social services positions, *Abitur* holders were able to slightly reduce their *relative* disadvantages compared to university graduates. As expected, the association between education and service class attainment is stronger in the public sector relative to the private sector, a trend which has even magnified over time. Overall, this analysis does not provide evidence for a consistent and substantial decoupling between educational attainment and class destinations in West Germany over the course of time.

Concerning occupational prestige, the results confirm that there is no significant erosion in the association between education and occupational attainment across labor market entry cohorts in West Germany. Again, the strength of this relationship decreased in the 1980s and somewhat in the 1990s, but slightly increased in the 2000s. This declining association can be predominantly attributed to changes in university graduates' occupational attainment: While their average occupational prestige decreased over time, their variation in prestige scores has increased. This is due to compositional shifts in university graduates' occupational destinations towards non-professional positions that involve lower prestige scores and are more diversified than traditional professions. Conversely, this development cannot be attributed to changing access patterns into the service class. Even if university graduates' relative advantages over *Abitur* holders in accessing the service class stayed the same throughout the 1980s and 1990s, the relationship between educational attainment and occupational prestige would have decreased. These compositional changes among university graduates' occupational attainment impact the association between education and occupational prestige independently from changes in the relative value of education among service class segments. This is because occupational prestige is determined primarily by an occupation's scarcity, which can thus be enhanced by closure mechanisms. Since throughout educational expansion university graduates have increasingly accessed non-traditional service class positions, which are not affected by occupational closure via *licensing*, their average occupational prestige has declined and increasingly varied.

Concentrating on *vertical differentiations* within higher education, *Fachhochschule* graduates have a slightly lower risk of unemployment than their university counterparts. Surprisingly, graduates from both institutions also do not differ greatly in terms of attaining the upper service class. Despite this, *Fachhochschule* graduates have more substantial relative disadvantages in accessing the service class as a whole and in average occupational prestige. Across the board, service class and prestige returns have not significantly converged between university and *Fachhochschule* graduates across time for either sex. The gap in these outcomes remains quite large, even when accounting for differing field of study distributions across these institutions. Nevertheless, field of study differences account for almost half of these disadvantages in labor market returns for *Fachhochschule* compared to university graduates. Furthermore, both male and female PhD graduates have relative advantages over university graduates in accessing the upper service class and attaining, on average, occupations with a higher prestige. These advantages are less pronounced in service class access as a whole and non-existent in unemployment differences. But this is possibly because

there is less variation in these outcomes among university graduates, i.e. an overwhelming part of university graduates are employed in the service class. Overall, this additional analysis confirms the stratifying role of educational attainment for labor market rewards in West Germany.

Among horizontal differentiations within higher education, the analyses do not indicate that differences between fields of study have intensified throughout educational expansion. Although graduates from *soft fields* had slightly decreasing occupational returns compared to *hard fields* in the 2000s, we do not see a consistent deterioration in their labor market rewards. Hence, one's field of study - and their corresponding differences in signaling capacity - has not become an increasingly salient job selection criterion among applicants in West Germany, counter to expectations. By contrast, analyses herein provide evidence that changes in the effect of one's field of study on occupational outcomes are rather driven by demand-side shifts in the occupational structure. For instance, business graduates were able to increase their service class attainment thanks to the expansion of matching occupations in the administrative and management segment. Moreover, this investigation revealed that female disadvantages among higher education graduates in accessing the upper service class are strongly mediated by fields of study. Nevertheless, female tertiary graduates still have lower chances of attaining the upper service class compared to men even after factoring this in.

What are we able to say overall regarding trends in returns to education in West Germany? Basically, returns to education stayed remarkably stable between the mid-1970s and the end of the 2000s. Credential inflation fears appear unjustified as higher education credentials have not devalued in the labor market over the last decades. In this regard, *absolute* returns to higher education in terms of accessing service class positions have remained exceptionally high. Furthermore, the historically strong association between educational attainment and occupational positions has also remained constant across time. Despite this, *relative* returns to education have not increased during this time either. But this may not be astonishing given this strong association in the past. Overall, individual investments in educational attainment still pay off in the West German labor market as in former times, both in *absolute* and *relative* returns. The 1980s appears to be the only period in which university graduates had larger problems upon labor market entry: While their unemployment risk was somewhat more pronounced during this time, *absolute* and *relative* returns in terms of occupational attainment decreased. Interestingly, commentators both in scientific and public circles proclaimed scenarios of credential inflation and a decoupling of the ED association during this time. Nevertheless, these difficult times for university

graduates were only temporary. While *absolute* and *relative* occupational returns slightly increased again, the risk of unemployment has become clearly more dependent on educational attainment. In this regard, the most salient development is the sharply increasing relative unemployment risk among the less-educated relative to the well-educated.

What are the (*policy*) *implications* of these results for the future? *Firstly*, these results suggest that furthering educational expansion may not harm the returns to education as drastically as feared. Despite higher education expansion in West Germany, changes in *absolute* returns to higher education have been quite small. For most of the observed time span, occupational upgrading and an increasing demand for higher education graduates offset the potential negative effects of educational expansion in terms of devaluation and downgrading. As this analysis has revealed, imbalances between supply and demand for higher education have been largely transitory in the West German labor market. These results match Gangl's (2003b) prediction that educational expansion may act as a catalyst for the occupational upgrading, thus triggering increases in labor productivity. The slight increase in *absolute* returns to education in more recent times may even indicate that demand for highly educated people currently exceeds the preexistent supply. Moreover, highly educated individuals' relative earnings have substantially increased in Germany over the last decade (e.g. OECD, 2011a; Giesecke & Verwiebe, 2008), suggesting a supply shortage as proposed by the *skill-biased technological change* hypothesis. Literature on changes in skill demands also provides evidence that firms increasingly require analytical, problem solving or communication skills rather than routine manual or routine cognitive skills (e.g. Spitz-Oener, 2006). In this regard, higher education graduates are clearly better equipped than the lower educated to satisfy the changing skill demand in the labor market. Thanks to their general skills and high learning ability, higher education graduates are more easily able to adapt to new skill requirements within a rapidly changing knowledge society. Given that higher education expansion in Germany has nearly halted since the mid-1990s and remains below the OECD average, further investments in the tertiary sector appear to be reasonable.

Secondly, despite educational expansion and compositional changes in the occupational structure, educational attainment continues to offer strong signals in terms of potential productivity in the West German labor market. Apparently, Germany's stable institutional setting creates an environment in which employers and employees are able to uphold their traditional roles. Changes in the macrostructural conditions are unable to substantially alter the advantages of higher education graduates relative to lower educational groups. Amidst educational expansion, employers continue to see the value of higher

education certificates in the job matching process. This is also emphasized by the fact that horizontal differentiations in higher education have not increased in importance throughout higher education expansion. Of course, this could be due to a rather modest educational expansion in West Germany by international comparison. However, given West Germany's stable institutional idiosyncracies, it is rather unlikely that a further increase in the number of individuals with higher education degrees may modify the strong signaling capacity of educational attainment.

In the early phases of educational expansion, the increasing share of university graduates was absorbed by the public service (Blossfeld & Becker, 1989). From the beginning of the 1990s, however, the public sector has been unable to keep pace with the growing share of tertiary graduates and place them in highly skilled positions. The book has clearly shown that occupational upgrading overwhelmingly took place in private industry. Accordingly, the private sector has become an increasingly important employer for tertiary graduates (see also Schubert & Engelage, 2006). Furthermore, the book identified compositional changes in the high-skilled labor market throughout occupational upgrading: Administrative and managerial positions gained in relative importance amidst a loss of traditional social services positions. As expected, access to service class jobs in the private sector as well as administrative and managerial positions is less dependent on higher education relative to the public sector and other professional areas. Nevertheless, employers in expanding high-skilled segments of the private sector seem to regard higher education as productive value as well. Despite the growing importance of private industry and new occupational areas in the administrative and management segment, occupational returns to higher education have not substantially changed. Therefore, I am quite confident that further compositional changes in the occupational structure will not drastically erode the association between educational attainment and labor market rewards.

Thirdly, this stable association between educational attainment and class destinations is an important requirement for increasing social fluidity in Germany. As this ED association and the direct association between one's class origin and destination stayed constant over time, the reduction in inequalities of educational opportunities (IEO) was able to prompt greater social fluidity across cohorts in West Germany (Pollak, 2009). In addition, Breen and Luijkx (2007) suggest a compositional effect on cohort changes in social mobility (see also Hout, 1988). That is, social origin effects on class destinations are assumed to be weaker among higher educated than lower educated individuals. Thanks to an increasing share of higher education graduates throughout educational expansion, the overall social origin effect

eventually weakens. Other than Breen and Luijkx (2007), however, Pollak (2009) finds no compositional effect on cohort changes in social fluidity in West Germany. Social origin effects on class destinations appear to be more or less equally weak among all education groups in West Germany. Thus, social origin effects may have less leeway to impact labor market rewards in all partial labor markets thanks to West Germany's institutional framework (Pollak, 2009). Overall, trends in social mobility in West Germany tend to be mainly influenced by changes in the association between class origin and educational attainment. While Britain shows completely reverse developments in these three partial OED relationships and thus has become increasingly non-meritocratic, West Germany has been heading towards a meritocratic society. Hence, not every free-market economy seems to be incompatible with the notion of an education-based meritocracy, as suggested by Goldthorpe and Bukodi (2010). The cross-national differences in OED triangle changes over time stress the necessity of taking nation-specific contexts, i.e. the institutional framework and changes in macrostructural conditions, into account.

Fourthly, the most serious issue regarding social inequalities in West Germany appears to be the increasing labor market exclusion of the less-educated. Clearly, educational policy should be concerned with individuals who lack a degree or graduate from secondary education without vocational training, who are thus placed at the bottom of the *labor queue*. The problem is magnified by the fact that the proportion of the less-educated has remained largely stable across labor market entry cohorts, especially among male labor market entrants. In order to provide individuals with equal chances of participating in the labor market and thereby avoid long-term social issues, all young people should gain at least a minimum educational degree or equivalent training, which would allow them to successfully participate in the labor market or complete an apprenticeship. By raising the average skill level among vocational-bound individuals, we could also avoid a shortage of occupationally trained professionals amidst a growing share of individuals preferring higher education.

The empirical analyses provided in this book clearly have their *limitations*. *Microcensus* data do not provide a great deal of information on individual characteristics that possibly correlate both with educational attainment and labor market returns. This lack of individual controls, e.g. social origin, could potentially bias the changes in the returns to education over time. However, I am reasonably confident that the empirical results reported in this book would differ little even when controlling for social background. I expect this for two reasons. First, the impact of social origin net of educational attainment on labor market returns is rather modest in Germany (Pollak, 2009). Second, previous studies analyzing the

returns to education which have included social origin indicate that this variable did not considerably alter the effect of educational attainment on labor market rewards. While this book sought to assess how the gross returns to education develop amidst changing macro-level conditions, the lack of other potential signaling characteristics at the individual level is nevertheless a serious potential limitation.

A further constraint could be the use of cross-sectional, time series data. Despite the quality of these data, I cannot look at individual career patterns; rather I am only able to compare aggregate snapshots of the returns to education across labor market entry cohorts. Only with longitudinal data would I be able to capture changes in the dynamic nature of the transition from school to work. Moreover, as information on the first significant job is not provided by the data, labor market entry had to be approximated by using different age groups for school leavers with different years of education. As a consequence, individuals are possibly observed at different stages of their labor market entry phase. Overall, analyses are based on a unique, quality dataset suitable for long-term comparisons of the returns to education across different labor market entry cohorts and for identifying relationships between individual returns and institutional, macrostructural or macroeconomic changes. Nevertheless, this dataset is clearly limited in its ability to assess changes in the structure and process of individual career paths upon labor market entry.

A further limitation of this analysis is that I am unable to measure skill demand independently of supply, i.e. I only look at the job matching outcomes after they have happened but do not capture the underlying processes causing these outcomes. I am not able to differentiate between supply-side and demand-side explanations for the upgrading of the occupational structure since I do not know whether the demand for highly skilled individuals has risen independently of the growing supply of higher education graduates (Müller, 2000: 72f.). This also implies that recognizing a supply shortage is rather difficult when looking at the actual matching between employers and job seekers. Moreover, I provide rather indirect evidence about employers' hiring preferences and practices and how these develop across points in time. We still know comparably little about the underlying mechanisms that shape recruitment decisions.

What do these results suggest for future research? *Firstly*, researchers should be concerned with measuring skill demand independent of labor supply. For instance, future research may rely on the German IAB-job vacancy survey (Kettner, Heckmann, Rebien, Pausch, & Szameitat, 2011) which captures the overall economic availability of jobs and enables to analyze recruitment processes in more detail. In recent times, researchers have

increasingly measured changes in skill demand based on content analyses of job advertisements (e.g. Jackson, 2007; Dörfler & Van de Werfhorst, 2009; Kriesi et al., 2010). To my knowledge, such an analysis has not yet been carried out for Germany. Skill requirements on the occupational level and its changes over time may also be assessed by asking employees about the kind of activities they perform at the workplace (e.g. for Germany the *Qualification and Career Surveys* carried out by BIBB (*Federal Institute for Vocational Education and Training*) and IAB (*Institute for Employment Research*). By analyzing these data or job advertisements, we could, for instance, find out why access to administrative and managerial positions is less dependent on educational attainment than access to professional segments. Is it because these positions require fewer skills and expertise or because they demand individual characteristics other than educational attainment?

Secondly, we need more systematic and detailed analyses on the effects of social origin on labor market rewards that are not mediated by educational attainment. While the partial relationships between social origin (O) and educational attainment (E) as well as educational attainment (E) and class destinations (D) have been extensively addressed, research on the mechanisms by which direct effects of social origin on labor market outcomes arise are rather sparse. While direct effects of social origin on class destinations are comparatively small in West Germany, disaggregating the service class may again reveal specific patterns in this relationship. Given that the returns to education are weaker in administrative and managerial positions, could the direct effects of social origin be particularly strong in this sector? If social origin effects vary with occupational segment, how does this relate to differences in the demand for specific skills?

Thirdly, we need a more detailed comparison of temporal changes in the ED association across countries in order to identify the mechanisms behind cross-country differences in the development of the ED association. While the ED association in West Germany has remained rather constant, this has declined in other European countries, particularly Britain. Is this because of persistent institutional idiosyncracies, differences in the strength of educational expansion or differences in the occupational upgrading and the associated compositional changes? A proper understanding of cross-country differences also requires detailed analyses on the behavior of employers and the recruitment process. Why do employers in different countries react differently to changing macrostructural and macroeconomic conditions? More variation across countries in the ED association as well as macro-level changes will also enable more sophisticated analyses helping us to be much more

confident in whether changes in the returns to education can be causally attributed to specific macro-level factors (Gangl, 2003b).

Fourthly, it would be worthwhile to investigate long-term changes in the returns to education in West alongside East Germany. The book concentrated on West Germany in order to exploit the whole range of *Microcensus* data since the mid-1970s. In the German Democratic Republic (GDR), the returns to education should have been rather similar to those in West Germany since state socialist countries had a strong ideological purpose to transform their societies into education-based meritocracies (Bukodi & Goldthorpe, 2010). In fact, job matching outcomes tended to be similarly dependent on educational credentials in the Eastern and Western part of Germany prior to reunification (Solga & Konietzka, 1999). But how did the returns to education in the East change after transferring from a ‘command’ economy to a free-market economy and through the adoption of Western German institutions? As with Hungary (Bukodi & Goldthorpe, 2010), the returns to education may have declined, since employers were freer to decide which individual characteristics of job seekers they regard as valuable. Or is East Germany a unique case in which the labor market quickly adapted to the institutional framework of West Germany, thereby ensuring that the relative value of educational attainment remained strong and followed Western patterns?

Fifthly, research on the returns to education should put more emphasis on individuals’ later work careers or changes over the life course. Most of the studies on job matching processes concentrate on the transition from school to work. This study is no exception. The value of educational attainment may be particularly strong upon labor market entry, but declines or even vanishes in later stages of one’s career. How do effects of educational attainment change over the life course in Germany? Aside from requiring panel data, assessing long-term career returns to individuals’ educational attainment is, however, much more difficult than upon labor market entry as job matching outcomes increasingly depend on other intervening factors such as work experience or family formation. Nevertheless, we could ask whether individuals’ returns at later career stages in Germany depend on their structural conditions upon labor market entry or whether periodical changes in the skill demand and supply affect all age groups equally. Have the decreasing returns to education upon labor market entry in the 1980s prevailed at later career stages or were tertiary graduates able to make up for this loss across the life course due to an increasing skill demand? Aside from its limitations and suggestions for future research, this book has clearly shown that the historically strong relationship between educational attainment and labor market rewards in West Germany has remained largely stable across the last decades.

Returns to education in West Germany over time

Educational expansion, occupational upgrading
and the job matching process

Appendix

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Appendix A Data, sample and variables

In chapter 4.2.

Table A1 Sample loss depending on the selected age group (in per cent)

	Share of respondents enrolled in tertiary education			
	Age 25-34		Age 30-34	
	Men	Women	Men	Women
1976	4.27	1.39	1.19	0.42
1978	4.81	1.64	1.20	0.45
1980	5.10	1.87	1.28	0.54
1982	5.53	2.28	1.68	0.75
1985	5.79	2.93	2.04	0.84
1987	5.75	3.30	2.12	1.02
1989	5.78	3.25	1.71	0.85
1991	10.11	5.09	3.06	1.75
1993	10.40	5.28	3.14	1.81
1995	9.66	5.00	3.44	1.80
1996	10.53	6.02	4.27	2.33
1997	9.86	5.90	4.11	2.44
1998	9.36	5.66	3.85	2.33
1999	9.09	5.96	3.69	2.27
2000	9.24	5.91	3.91	2.40
2001	9.01	5.60	3.66	2.04
2002	9.81	5.92	3.85	2.08
2003	9.63	6.62	3.90	2.25
2004	9.91	6.46	3.84	2.14
2005	10.37	7.35	4.01	2.40
2006	10.59	7.86	3.93	2.66
2007	11.02	8.22	4.48	2.64
2008	13.04	9.68	5.61	3.73

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Table A2 Share of missing values in *CASMIN* classification (in per cent)

	Men	Women
1976	2.14	2.58
1978	1.73	3.60
1980	0.08	0.08
1982	1.14	1.35
1985	2.45	3.69
1987	2.45	2.92
1989	0.46	0.46
1991	10.75	11.53
1993	11.27	11.43
1995	5.30	5.68
1996	3.86	4.31
1997	3.10	3.24
1998	2.76	2.98
1999	2.79	2.82
2000	4.12	4.09
2001	2.95	3.00
2002	2.69	2.80
2003	3.69	3.71
2004	4.02	4.17
2005	0.22	0.28
2006	0.14	0.13
2007	0.18	0.22
2008	0.38	0.35

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* labor market entrants (age 20-34); individuals in full-time education or apprenticeship programs are not counted as missing values.

Table A3 Distribution of formal *citizenship* among labor market entrants (in per cent)

Men	German	West European	Turkish	Italian	Greek/ FSU	Others	N
1976-1980	94	1	1	1	0	2	35608
1982-1987	93	1	3	1	0	2	44485
1989-1993	91	1	3	1	1	3	36889
1995-1999	87	1	5	1	1	5	48680
2000-2004	88	1	4	1	1	5	44266
2005-2008	88	1	3	1	1	5	30267
Women							
1976-1980	93	1	2	1	1	2	34287
1982-1987	93	1	2	1	0	2	41390
1989-1993	92	1	3	1	1	3	35615
1995-1999	86	1	5	1	1	6	46729
2000-2004	86	1	4	1	1	6	41358
2005-2008	86	1	3	1	2	7	30944

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* no missing values on formal citizenship in every Scientific-Use-File.

Table A4 Occupational classification in upper and lower service class

<i>Service Class I</i>	<i>Service Class II</i>
Agricultural engineer	Optician
Horticultural engineer	Surveying technician
Forester, Gamekeeper	Technician for science of management
Mechanical engineer	Biologically and technically trained assistant
Electrical engineer	Physically and technically trained assistant
Building engineer	Draftsman
Engineer for cartography	Architectural draftsman, mappers and related pos.
Mining engineer	Wholesaler, export merchant
Other production engineers	Sales director and manager in commerce
Industrial engineer	Purchasing manager
Miscellaneous engineers	Banking expert
Architect	Advertising expert
Chemist, chemical engineer	Agent middleman, real estate agent
Physicist, physical engineer, mathematician	Assistant in economic and tax law
Captain (coasting and ocean shipping)	Financial expert, accountant
Technical ship officer, ship mechanist	Law (enforcement) officer
Entrepreneur, chief executive officer, NES	Journalist
Division manager, assistant manager, NES	Interpreter, translator
Auditor, tax accountant and related positions	Librarian, archivist, museum guide
Marketing and sales experts	Musician
Analyst, controller and related positions	Dramatic artist, singer
Executive consultant and related positions	Graphic artist
Delegates, minister, electoral officials	Art-related occupations
Executive staff in public administration	Artiste, professional
Executive staff in associations	Natural health professional
Head in associations, official	Kneader, medical bath attendant, physiotherapist
Upper-level civil servants	Pharmacology technician
Upper-middle-level civil servants	Therapeutic occupations, NES
Data processing expert, computer scientist, NES	Social worker, social pedagogue
Software developer	Remedial teacher
Computer personnel and related positions	Employment adviser, career consultant
Computer marketing expert	Teacher, NES
Datacenter service	Teacher for lower secondary school
Other data processing experts	Teacher for vocational school
Judge, prosecutor	Teacher for musical subjects
Legal representative, lawyer	Sports teacher
Physician	
Dentist	
Veterinary	
Pharmacist	
Professor and related positions	
Teacher for upper secondary school	
Scientist, NES	
Economist, NES	
Humanities scholar, NES	
Natural scientist, NES	
Social scientist, NES	
Education researcher, NES	
Psychologist	
Statistician, market researcher and related positions	
Clergy	
Advisory and scheduling expert	

Notes: German classification KldB (*Klassifizierung der Berufe*) version 1975; since 1993 *Microcensus* KldB version 1992 (three-digits); NES = not elsewhere specified.

Table A5 Occupational classification in service class segments

<i>I/II administrative/management</i>	<i>I/II experts</i>	<i>I/II social services</i>
Agricultural engineer	Mechanical engineer	Physician
Horticultural engineer	Electrical engineer	Dentist
Forester, Gamekeeper	Building engineer	Veterinary
Wholesaler, export merchant	Engineer for cartography	Pharmacist
Sales director and manager in commerce	Mining engineer	Professor and related positions
Purchasing manager	Other production engineers	Teacher for upper secondary school
Banking expert	Industrial engineer	Humanities scholar, NES
Advertising expert	Miscellaneous engineers	Social scientist, NES
Agent middleman, real estate agent	Architect	Education researcher, NES
Entrepreneur, chief executive officer, NES	Chemist, chemical engineer	Psychologist
Division manager, assistant manager, NES	Physicist, physical engineer, mathematician	Clergy
Auditor, tax accountant and related positions	Surveying technician	Journalist
Assistant in economic and tax law	Technician for science of management	Interpreter, translator
Marketing and sales experts	Biologically and technically trained assistant	Librarian, archivist, museum guide
Analyst, controller and related positions	Physically and technically trained assistant	Musician
Executive consultant and related positions	Draftsman	Dramatic artist, singer
Delegates, minister, electoral officials	Architectural draftsman, mappers and related pos.	Graphic artist
Executive staff in public administration	Captain (coasting and ocean shipping)	Art-related occupations
Executive staff in associations	Technical ship officer, ship mechanist	Artiste, professional
Head in associations, official	Scientist, NES	Natural health professional
Upper-level civil servants	Economist, NES	Kneader, medical bath attendant, physiotherapist
Upper-middle-level civil servants	Natural scientist, NES	Pharmacology technician
Financial expert, accountant	Statistician, market researcher and related pos.	Therapeutic occupations, NES
Data processing expert, computer scientist, NES	Advisory and scheduling expert	Social worker, social pedagogue
Software developer		Remedial teacher
Computer personnel and related positions		Teacher, NES
Computer marketing expert		Teacher for lower secondary school
Datacenter service		Teacher for vocational school
Other data processing experts		Teacher for musical subjects
Judge, prosecutor		Sports teacher
Law (enforcement) officer		
Legal representative, lawyer		
Employment adviser, career consultant		

Notes: German classification KldB (*Klassifizierung der Berufe*) version 1975; since 1993 *Microcensus* KldB version 1992 (3-digits); NES = not elsewhere specified.

Table A6 Field of study classification in major field groups

Field of study groups	Subjects
Teaching	Teacher at <i>Grundschule/Hauptschule</i> , teacher at <i>Realschule</i> , teacher at <i>Gymnasium</i> , teacher at <i>Sonderschule</i> (special schools), teacher at <i>Berufsschule</i> (vocational school), sports teacher
Law	Law
Medicine/Pharmacology	Human medicine, dentistry, veterinary medicine, pharmacology
Science/Mathematics	Mathematics, statistics, computer sciences, physics, astronomy, chemistry, food chemistry, biology, biological chemistry, biotechnology,
Engineering/Agronomics	Engineering sciences, mining, engine construction, electrical, engineering, traffic engineering, nautics, architecture, spatial planning, construction engineering, surveying and mapping, chemical engineering, environment protection, environmental technology, waste management, supply engineering, nuclear engineering, agronomics, farming, plant production, forestry, forest and wood management
Business/ Management/ Economics	Science of public administration, economics, business economics, tourism, marketing and promotion, banking, finance and insurances, management, accounting and taxation, engineering economics, security management
Humanities/ Social Sciences/ Arts	Christian theology, other religious studies, philosophy, history, librarianship, media studies, journalism, linguistics, cultural sciences, classical philology, german language and literature studies, anglistics, american studies, romance studes, slavic studies, extra-European linguistics, political science, social sciences, sociology, psychology, geography, art history, aesthetics, visual arts, performing arts, film and television, music, musicology, design, interior architecture, audiovisual techniques and media
Social services/Education	Social welfare services, social work, social pedagogy, therapeutic pedagogy, nursing science, nutrition science, health management, educational science

In chapter 9.3.2

Figure A1 Herfindahl-index

$$D_e = \left(1 - \sum_{O=1}^O \left(\frac{G_{eo}}{G_e} \right)^2 \right) \frac{O}{O-1}$$

D_e = dispersion of occupations (KldB 2-digits) in field of study e

G_{eo} = number of graduates in field e and KldB occupation o

G_o = number of graduates in field of study e

O = total number of occupations (KldB 2-digits)

Source: Dekker et al. (2002); *Notes:* German classification KldB (*Klassifizierung der Berufe*) version 1975; since 1993 *Microcensus* KldB version 1992.

Appendix B Sensitivity analyses

In chapter 5.3

Table B1 Educational distribution among labor market entrants (different operationalization) over time (in per cent)

Men	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b	N
1976-1980	23	40	11	6	4	3	5	9	60791
1982-1987	13	37	16	3	5	7	8	12	60815
1989-1993	10	29	19	3	6	11	10	14	48320
1995-1999	11	21	15	3	7	11	14	18	64925
2000-2004	12	18	16	4	7	11	14	17	57997
2005-2008	13	17	16	5	7	13	13	17	39544
Women	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b	N
1976-1980	24	35	18	8	2	3	2	7	56490
1982-1987	16	26	27	5	3	9	4	10	56727
1989-1993	12	19	27	4	4	16	6	12	46863
1995-1999	12	14	21	4	5	18	9	17	62323
2000-2004	12	11	20	5	6	18	9	18	56037
2005-2008	11	9	20	5	6	20	10	20	41877

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* *CASMIN* 1ab, 2ab: age 15-24; *CASMIN* 2c: age 20-29; *CASMIN* 3ab: age 25-34.

In chapter 5.4

Table B2 Class distribution among labor market entrants over time based on *EGP* routine (in per cent)

Men	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1982-1987	13	10	8	4	2	1	3	37	21	37606
1989-1993	16	9	9	4	2	1	4	36	19	32377
1995-1996	23	11	9	4	3	1	5	30	15	17707
2000-2004	29	12	9	4	3	1	5	26	13	14572
2007	27	11	9	4	3	0	7	24	14	6333
Women	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1982-1987	4	19	28	15	1	1	2	6	15	31263
1989-1993	7	19	31	21	1	0	2	7	12	28090
1995-1996	12	22	34	15	1	0	2	5	8	15246
2000-2004	19	21	33	13	1	0	2	4	7	12629
2007	21	21	31	14	2	0	2	3	7	5785

Source: German *Microcensus*, Scientific-Use-Files 1982-2007; Notes: Applying standard routine to operationalize the *EGP* class schema (Brauns, Haun & Steinmann, 1997).

In chapter 7.5.1

Table B3 Compositional changes within service class based on *EGP* routine (in per cent)

Men	Total				Service class			N
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	
1982-1987	9	6	7	77	41	27	32	37606
1989-1993	12	7	6	75	46	30	25	32377
1995-1996	16	11	7	66	47	32	22	17707
2000-2004	22	12	8	59	53	28	19	14572
2007	21	10	8	62	53	27	20	6333
Women	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	N
1982-1987	7	1	15	77	31	5	65	31263
1989-1993	9	2	15	74	37	7	56	28090
1995-1996	13	4	17	66	40	10	50	15246
2000-2004	17	4	19	60	42	10	48	12629
2007	17	4	21	58	41	9	51	5785

Source: German *Microcensus*, Scientific-Use-Files 1982-2007; Notes: Applying standard routine to operationalize the *EGP* class schema (Brauns, Haun & Steinmann, 1997); ^a = administrative/management; ^b = experts; ^c = social services.

Table B4 Results of modeling change in ED association excluding foreign residents

Model ^a	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
Men (N= 185299)							
Cond. ind.	148462.2	1127	0.00	-	35.7	134792.0	-
Const. assoc.	3266.3	1078	0.00	97.8	4.2	-9809.5	-
<i>UNIDIFF</i>	3113.6	1056	0.00	97.9	4.0	-9695.4	0.000
Women (N=162242)							
Cond. ind.	89026.5	1127	0.00	-	27.9	75506.0	-
Const. assoc.	3268.4	1078	0.00	96.3	4.1	-9664.2	-
<i>UNIDIFF</i>	3123.1	1056	0.00	96.5	4.0	-9545.6	0.000

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; Notes: 23 periods (P) by 8 educational levels (E) by 8 class destinations (D).

^a Model specifications:

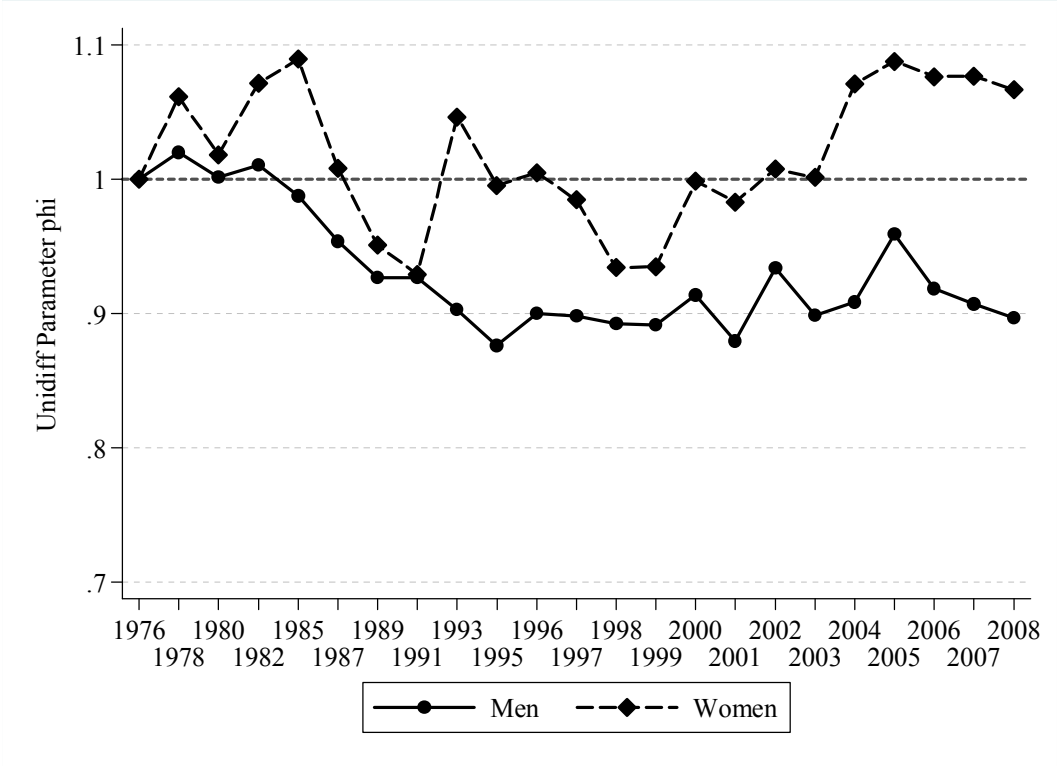
$$\text{Conditional independence: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP}$$

$$\text{Constant association: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \mu_{ij}^{ED}$$

$$\text{UNIDIFF: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \Phi_k \Psi_{ij}$$

Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with the difference in G² between constant association and *UNIDIFF*.

Figure B1 Change in the strength of ED association excluding foreign residents (*UNIDIFF* parameter phi)



Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Table B5 Results of modeling change in ED association based on *EGP* routine

Model ^a	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
Men (N=108595)							
Cond. ind.	97253.8	539	0.00	-	37.8	91003.9	-
Const. assoc.	1312.7	490	0.00	98.7	3.1	-4369.0	-
<i>UNIDIFF</i>	1274.0	480	0.00	98.7	3.1	-4291.8	0.000
Women (N=93013)							
Cond. ind.	59020.6	539	0.00	-	29.6	52854.1	-
Const. assoc.	1532.6	490	0.00	97.4	3.9	-4073.2	-
<i>UNIDIFF</i>	1439.1	480	0.00	97.6	3.7	-4052.4	0.000

Source: German *Microcensus*, Scientific-Use-Files 1982-2007; *Notes:* 11 periods (P) by 8 educational levels (E) by 8 class destinations (D); Applying standard routine to operationalize the *EGP* class schema (Brauns, Haun & Steinmann, 1997).

^a Model specifications:

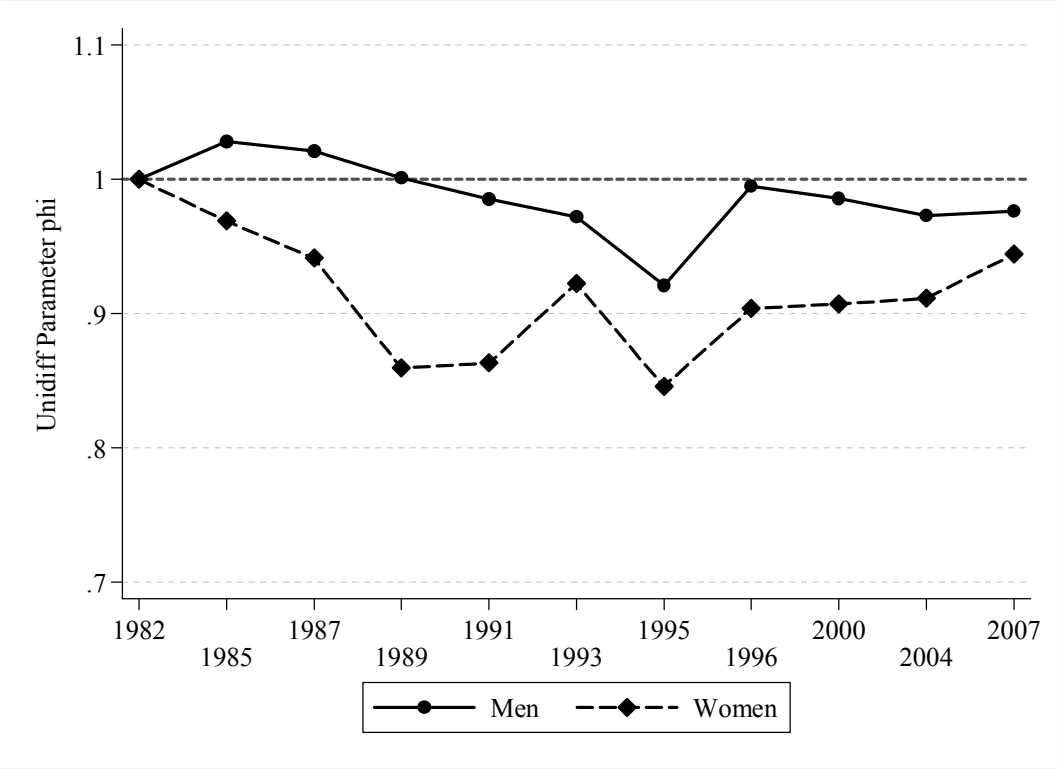
$$\text{Conditional independence: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP}$$

$$\text{Constant association: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \mu_{ij}^{ED}$$

$$\text{UNIDIFF: } \log(F_{ijk}) = \mu + \mu_i^E + \mu_j^D + \mu_k^P + \mu_{ik}^{EP} + \mu_{jk}^{DP} + \Phi_k \Psi_{ij}$$

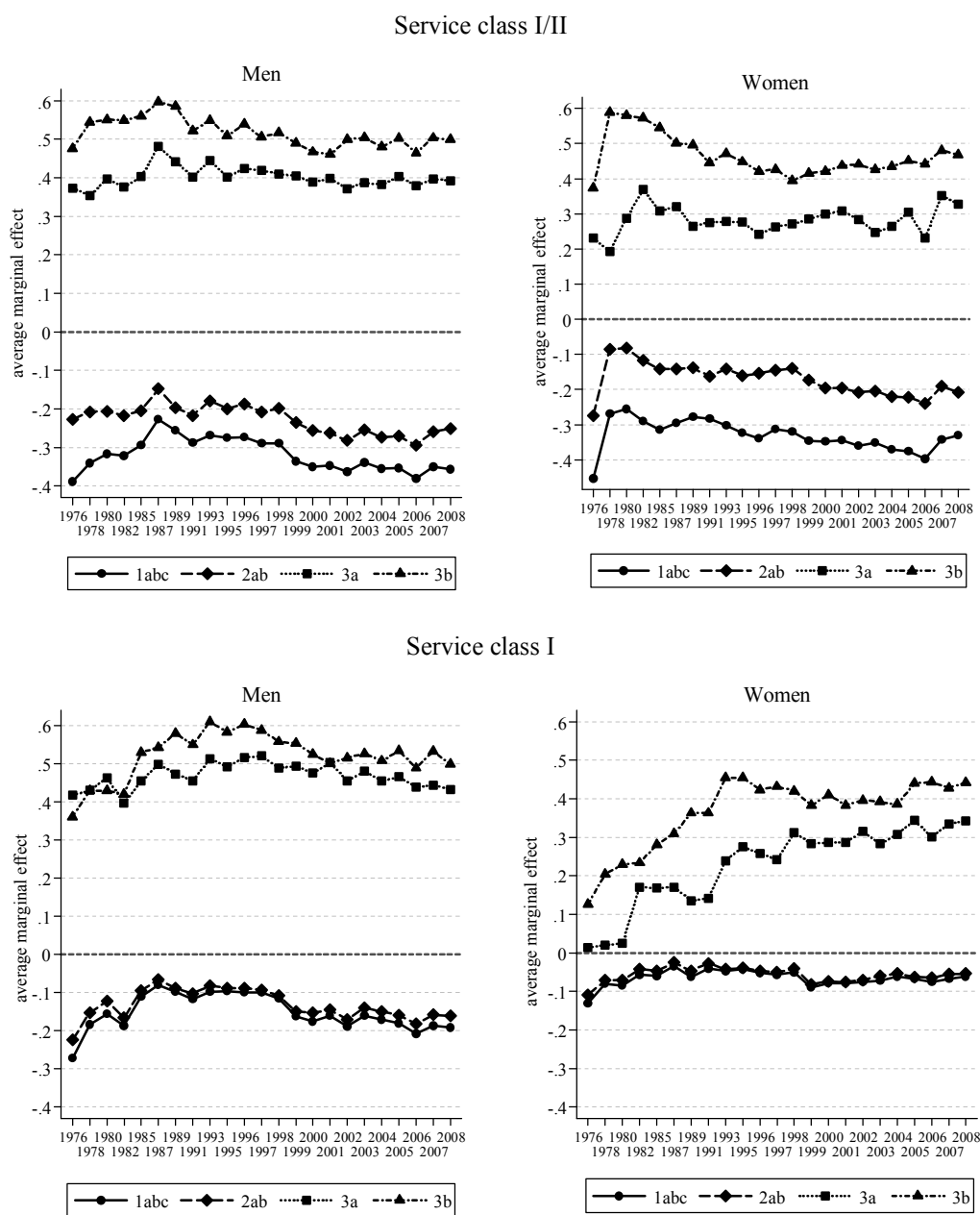
Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with difference in G² between constant association and *UNIDIFF*

Figure B2 Change in the strength of ED association based on *EGP* routine (*UNIDIFF* parameter phi)



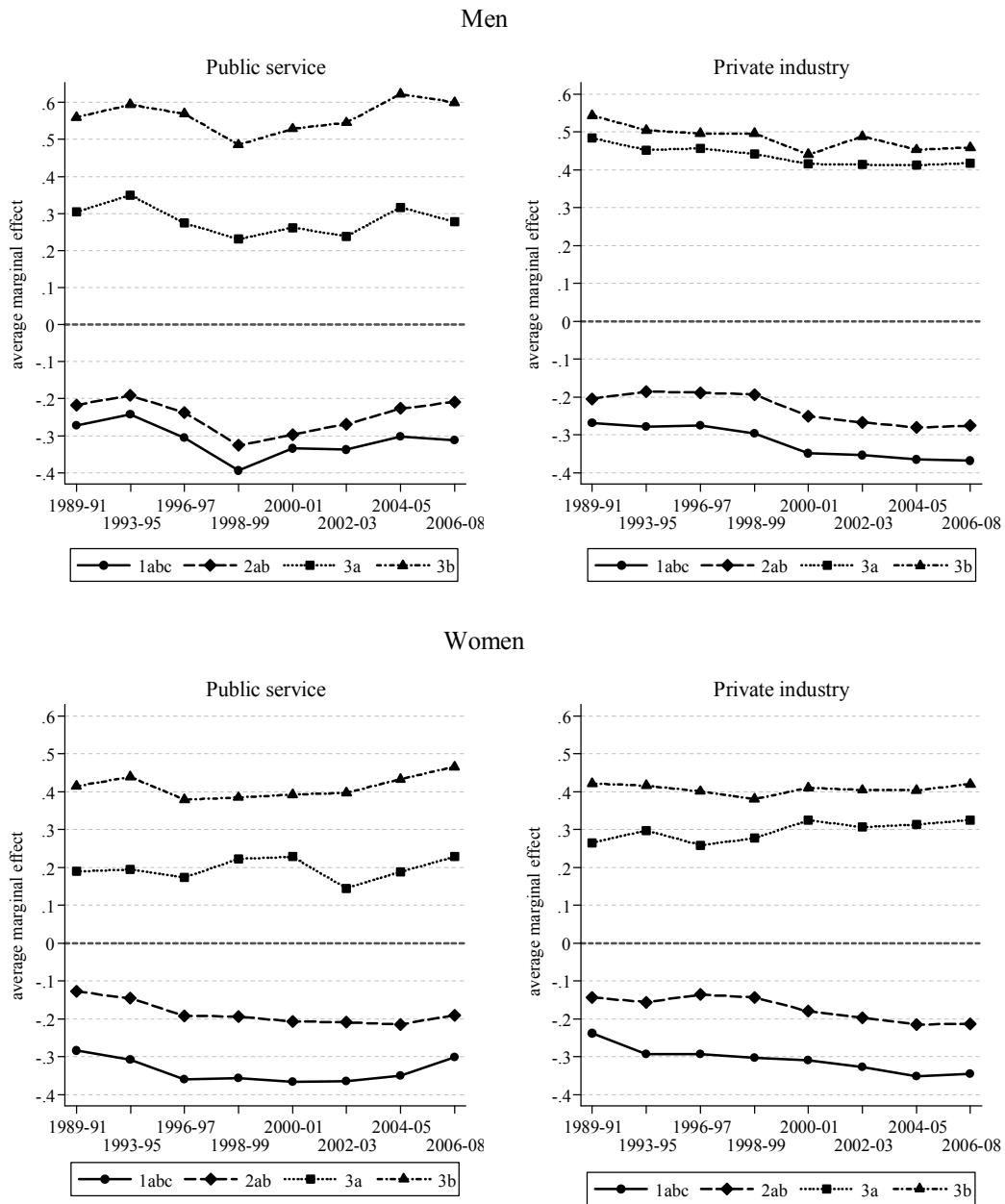
Source: German *Microcensus*, Scientific-Use-Files 1982-2007; Notes: Applying standard routine to operationalize the *EGP* class schema (Brauns, Haun & Steinmann, 1997).

Figure B3 Relative returns in access to the service class (AMEs)



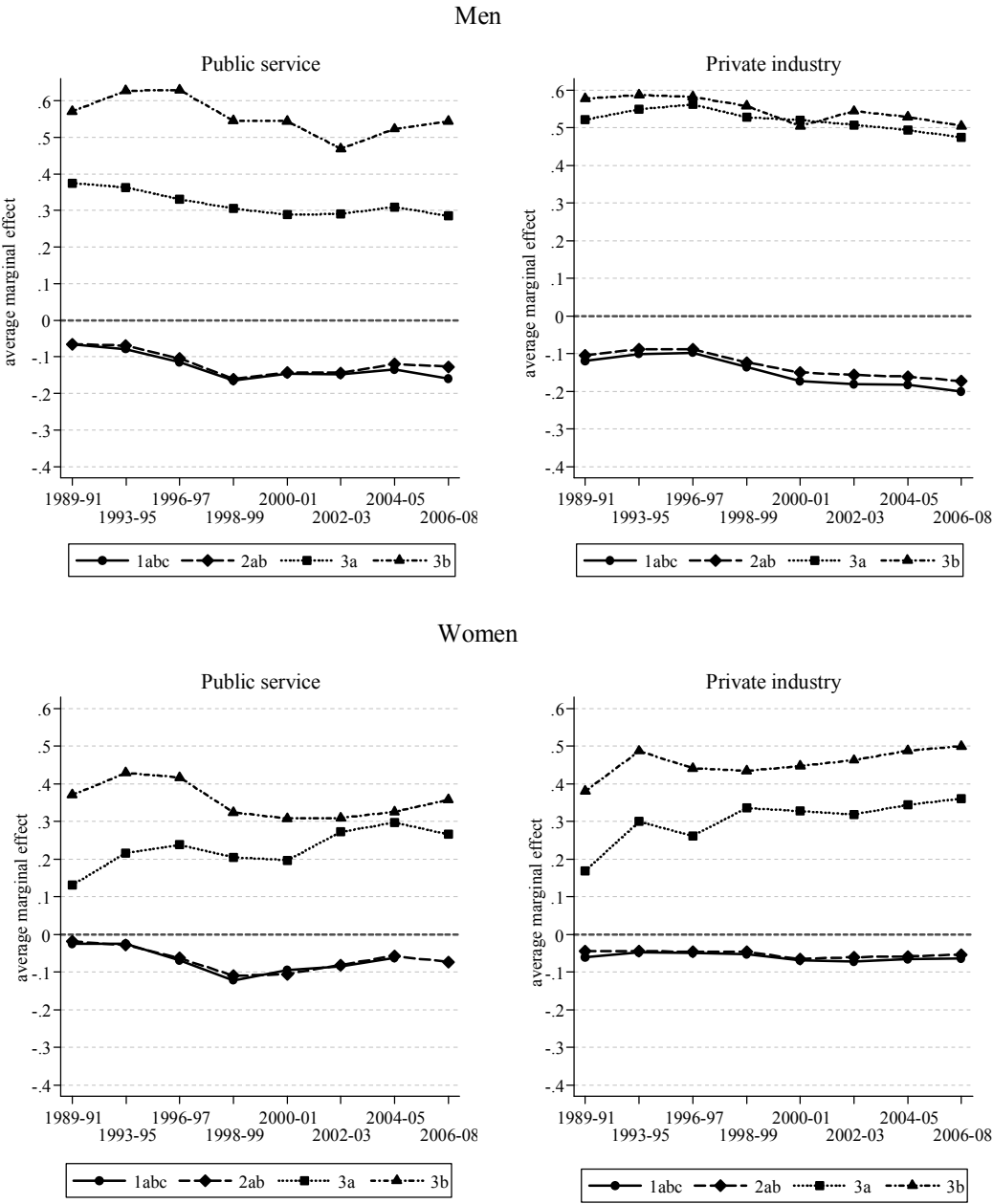
Source: German Microcensus, Scientific-Use-Files 1976-2008; Notes: Reference category: CASMIN 2c; effect estimates shown as average marginal effects (AMEs); controlling for citizenship.

Figure B4 Education and membership in service class: public service vs. private industry (AMEs)



Source: German Microcensus, Scientific-Use-Files 1989-2008; Notes: Reference category: CASMIN 2c; effect estimates shown as average marginal effects (AMEs); controlling for citizenship.

Figure B5 Education and membership in upper service class: public service vs. private industry (AMEs)



Source: German Microcensus, Scientific-Use-Files 1989-2008; Notes: Reference category: CASMIN 2c; effect estimates shown as average marginal effects (AMEs); controlling for citizenship.

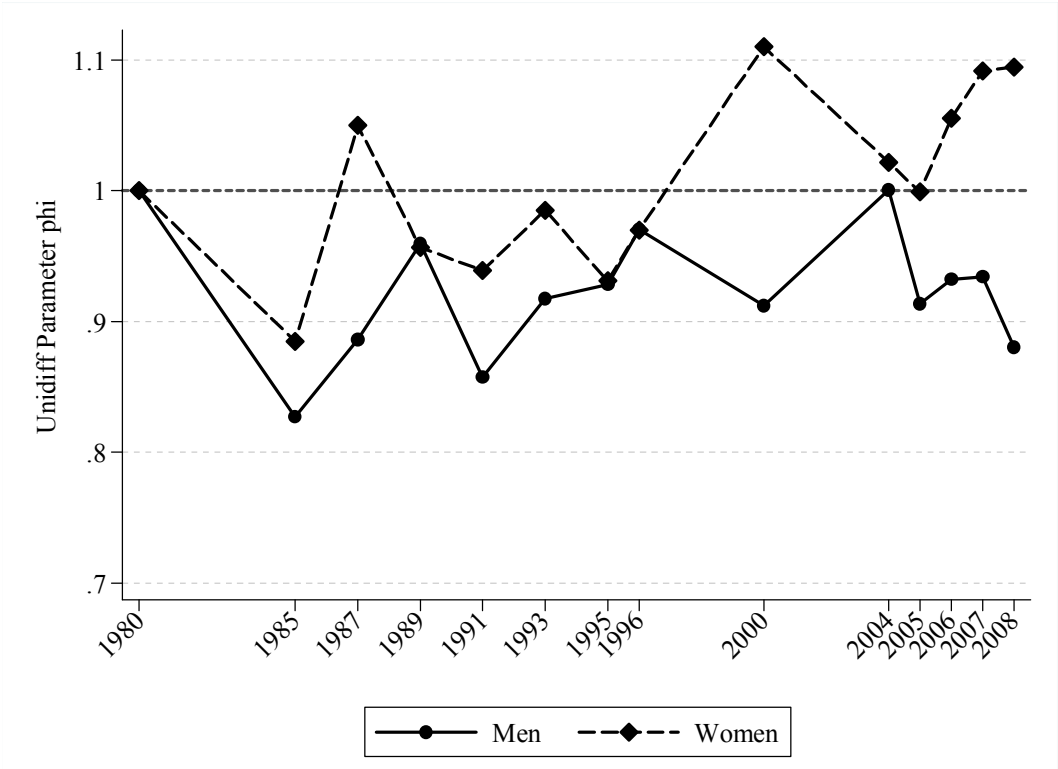
Table B6 Results of modeling change in association between field of study and social class

Model	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
Men (N=29123)							
Cond. ind.	8619.4	196	0.00	-	19.5	6604.7	-
Const. assoc.	451.7	182	0.00	94.8	3.5	-1419.1	-
<i>UNIDIFF</i>	432.3	169	0.00	95.0	3.4	-1304.9	0.000
Women (N=17383)							
Cond. ind.	7513.4	196	0.00	-	27.4	5599.8	-
Const. assoc.	371.6	182	0.00	95.1	4.7	-1405.3	-
<i>UNIDIFF</i>	350.8	169	0.00	95.3	4.5	-1299.2	0.000

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* 14 periods (P) by 8 field of study (F) by 3 class destinations (D).

Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with difference in G² between constant association and *UNIDIFF*.

Figure B6 Change in the strength of association between field of study and social class (*UNIDIFF* parameter phi)

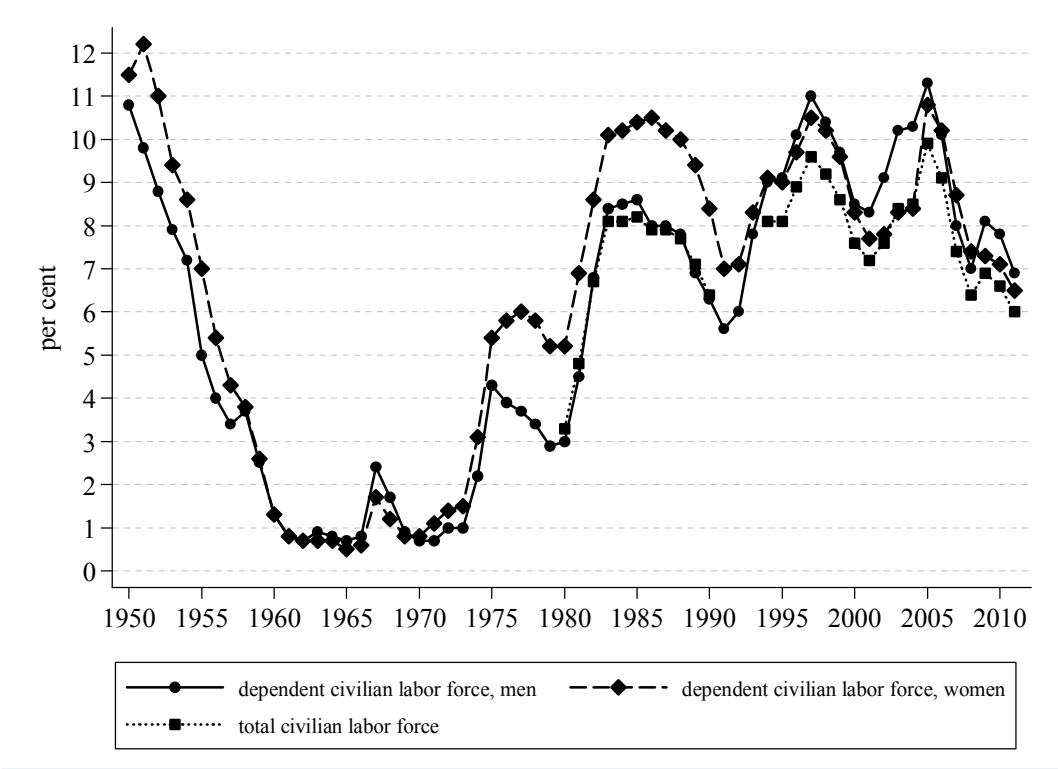


Source: German Microcensus, Scientific-Use-Files 1980-2008.

Appendix C Supplementary descriptives and analyses

In chapter 5.2

Figure C1 Trends in register-based unemployment rates



Source: Federal Employment Agency: *Arbeitslosigkeit im Zeitverlauf* (december 2012).

Table C1 Detailed educational distribution among male labor market entrants over time (in per cent)

<i>CASMIN</i>	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b
1976	14.32	51.19	14.88	3.10	0.95	2.29	5.07	8.20
1978	13.97	48.62	15.76	3.83	1.23	2.68	4.59	9.32
1980	10.81	51.37	15.34	3.87	1.72	2.91	4.88	9.11
1982	13.17	45.43	17.47	3.01	1.16	4.59	4.71	10.45
1985	11.45	41.84	20.12	2.42	1.43	6.10	6.08	10.57
1987	11.64	40.34	21.23	2.36	1.49	6.20	6.41	10.34
1989	10.26	35.46	22.23	2.90	2.11	8.53	7.32	11.19
1991	9.34	35.34	24.19	2.34	1.10	8.82	7.41	11.47
1993	9.44	31.20	22.44	2.97	1.77	10.12	8.94	13.12
1995	10.26	27.11	20.21	3.17	2.58	11.03	10.37	15.28
1996	11.05	26.28	19.09	2.79	2.42	10.01	12.09	16.27
1997	10.10	25.62	18.06	3.01	2.64	10.30	13.42	16.85
1998	9.81	24.17	18.38	2.73	2.60	10.83	13.78	17.71
1999	11.63	21.13	19.16	3.62	2.52	11.22	14.11	16.60
2000	10.86	22.65	18.90	3.38	3.07	11.15	12.43	17.56
2001	10.74	21.21	19.93	4.08	2.90	11.15	12.70	17.29
2002	11.33	20.84	20.24	4.16	2.76	10.45	14.13	16.10
2003	12.02	20.35	19.99	4.29	3.06	10.95	12.50	16.83
2004	12.03	20.61	20.61	4.55	3.23	11.12	12.01	15.84
2005	13.07	21.57	20.10	4.10	3.18	11.25	11.44	15.30
2006	12.47	20.58	20.04	4.73	3.57	12.02	11.21	15.38
2007	11.98	20.63	20.63	4.53	2.84	12.75	10.87	15.76
2008	12.48	20.88	20.57	3.87	2.79	12.76	10.90	15.75

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* For year-specific sample sizes (N) see Table 2 in chapter 4.2.

Table C2 Detailed educational distribution among female labor market entrants over time (in per cent)

<i>CASMIN</i>	1ab	1c	2a	2b	2c_gen	2c_voc	3a	3b
1976	23.04	42.87	21.03	4.48	0.97	1.73	1.73	4.16
1978	21.11	40.87	23.24	4.71	1.03	1.94	1.43	5.66
1980	14.75	44.30	24.82	5.52	1.51	1.83	1.34	5.92
1982	18.73	33.88	29.16	4.82	1.12	3.70	1.59	6.99
1985	16.36	27.99	32.58	4.01	1.56	7.25	2.15	8.11
1987	14.96	26.34	33.80	3.63	1.60	8.53	2.75	8.39
1989	12.82	22.75	33.79	4.25	2.16	12.01	3.25	8.98
1991	12.06	21.89	34.46	3.59	1.53	13.47	3.98	9.03
1993	11.39	20.30	31.76	3.79	1.56	15.41	4.77	11.02
1995	12.07	17.96	28.43	4.02	2.56	17.21	5.56	12.18
1996	13.07	17.77	26.19	3.58	2.97	16.52	7.16	12.73
1997	12.31	16.74	26.71	3.67	3.16	16.21	7.55	13.64
1998	11.52	16.05	26.25	3.71	2.84	16.65	8.38	14.60
1999	12.11	15.03	25.53	4.77	3.29	17.52	7.04	14.73
2000	12.61	14.42	25.45	5.29	3.27	16.79	7.80	14.37
2001	11.86	13.95	24.99	5.31	3.55	16.28	7.58	16.49
2002	12.82	12.89	25.78	5.01	3.55	15.71	8.95	15.29
2003	12.39	13.17	26.44	5.01	3.28	16.16	8.03	15.52
2004	11.97	12.07	26.26	5.06	3.67	17.18	7.79	16.00
2005	13.07	12.05	25.49	4.59	3.44	18.43	7.27	15.64
2006	11.90	11.18	25.73	5.14	3.35	19.23	6.68	16.79
2007	11.29	11.29	24.93	4.72	3.55	20.26	6.51	17.44
2008	11.26	10.53	25.02	3.79	3.52	19.52	8.16	18.20

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* For year-specific sample sizes (N) see Table 2 in chapter 4.2.

Table C3 Detailed class distribution among male labor market entrants over time (in per cent)

<i>EGP</i>	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1976	13.00	7.90	19.72	3.37	1.73	2.00	1.97	44.07	6.23	9405
1978	11.59	8.72	20.83	3.36	1.23	1.73	1.84	43.03	7.67	10439
1980	11.69	8.31	19.71	2.78	1.59	1.58	1.70	44.36	8.28	11112
1982	12.84	8.52	19.07	3.14	1.36	1.24	1.52	44.84	7.47	11288
1985	13.49	7.81	17.41	3.53	1.28	1.18	1.78	45.74	7.78	12614
1987	13.63	7.43	19.55	3.37	1.02	1.28	1.78	43.78	8.16	13056
1989	15.68	7.39	17.09	3.35	0.89	0.94	1.90	44.50	8.25	11536
1991	15.52	6.99	16.97	3.30	1.07	0.91	2.22	45.82	7.19	10524
1993	18.07	7.84	20.11	3.81	1.00	0.91	2.81	39.85	5.60	9564
1995	20.80	8.69	18.77	3.41	1.24	0.67	3.65	37.45	5.31	9168
1996	23.75	9.36	18.34	3.98	1.01	0.52	2.85	35.20	5.00	8324
1997	25.28	9.79	18.12	3.49	1.22	0.56	3.30	33.49	4.76	8062
1998	26.01	10.39	17.71	3.35	1.35	0.54	3.53	32.33	4.79	7971
1999	26.89	9.81	17.58	3.64	0.92	0.55	3.36	31.85	5.39	7798
2000	27.19	9.76	17.70	3.65	0.99	0.57	3.25	31.47	5.42	7897
2001	26.69	10.61	17.48	4.32	0.99	0.47	3.01	31.49	4.95	7946
2002	27.32	9.71	17.86	3.87	1.15	0.47	3.18	31.67	4.78	7734
2003	26.86	10.68	17.26	4.16	0.90	0.40	3.14	31.33	5.26	7229
2004	25.96	10.51	16.60	4.19	1.18	0.58	3.48	32.27	5.23	6772
2005	26.14	9.85	16.09	3.95	1.53	0.48	3.68	32.51	5.77	6079
2006	26.10	10.43	15.33	4.07	1.59	0.30	3.06	32.60	6.53	6368
2007	25.87	10.00	15.04	4.09	1.31	0.43	3.09	33.26	6.91	6278
2008	24.63	10.62	15.06	3.97	1.50	0.22	4.05	32.95	7.01	6395

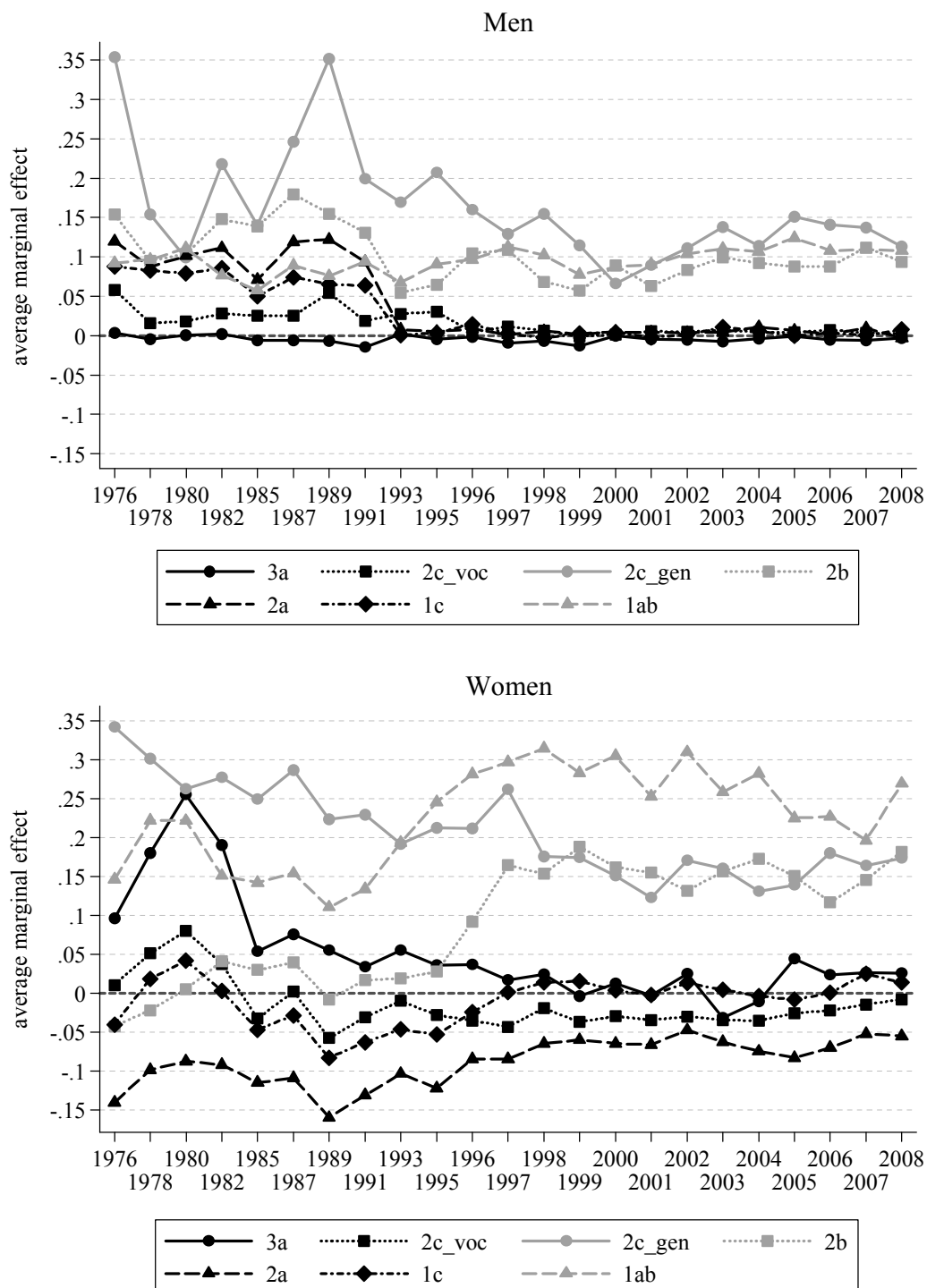
Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Table C4 Detailed class distribution among female labor market entrants over time (in per cent)

<i>EGP</i>	I	II	IIIa	IIIb	IVab	IVc	V	VI	VIIab	N
1976	3.40	16.29	36.54	19.76	0.88	2.09	1.45	12.98	6.60	8141
1978	3.28	17.55	37.56	18.61	0.74	1.75	1.46	11.67	7.37	8671
1980	3.53	16.89	37.21	17.83	0.80	1.41	1.36	12.49	8.48	8962
1982	3.92	18.26	36.10	19.27	0.75	0.99	1.13	11.75	7.81	9282
1985	4.76	18.43	33.52	19.87	0.61	1.03	1.10	13.23	7.45	10663
1987	4.75	18.39	34.68	19.31	0.63	0.78	1.08	13.10	7.28	11126
1989	6.03	17.61	35.46	18.98	0.52	0.46	1.21	12.65	7.08	9972
1991	6.19	17.57	36.06	17.89	0.47	0.39	1.06	13.67	6.68	9412
1993	8.44	19.66	39.97	14.06	0.51	0.30	1.65	11.27	4.15	8369
1995	9.69	22.16	39.90	12.72	0.47	0.17	1.46	9.96	3.48	7815
1996	10.86	22.91	39.88	12.03	0.54	0.08	1.77	8.94	2.98	7157
1997	11.69	22.02	41.97	11.19	0.56	0.09	1.76	7.93	2.80	6972
1998	13.02	22.83	39.94	10.51	0.82	0.13	1.70	7.91	3.13	6811
1999	13.51	22.74	39.79	11.36	0.57	0.20	1.42	7.40	3.01	6619
2000	13.43	22.26	39.34	11.59	0.55	0.20	1.79	7.96	2.87	6367
2001	14.25	23.17	37.51	12.00	0.62	0.11	1.48	8.32	2.54	6574
2002	14.58	24.05	37.19	11.86	0.63	0.14	1.46	7.73	2.37	6508
2003	13.86	23.31	38.26	11.94	0.63	0.17	1.22	7.96	2.65	6307
2004	13.62	24.29	36.81	12.60	0.75	0.10	1.51	7.66	2.67	6151
2005	14.51	24.11	37.05	12.52	0.92	0.11	0.96	7.29	2.53	5541
2006	15.01	23.76	37.05	12.02	0.93	0.10	1.12	7.30	2.70	5997
2007	15.23	24.05	36.93	12.11	0.90	0.07	1.20	6.14	3.36	5746
2008	16.23	23.92	36.79	11.24	0.79	0.02	1.26	6.79	2.96	5952

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Figure C2 Trends in AMEs of educational attainment on the probability of being inactive



Source: German Microcensus, Scientific-Use-Files 1976-2008; Notes: Dark grey short-dashed line indicates the reference category university graduates (CASMIN 3b); Effect estimates shown as average marginal effects (AMEs); controlling for citizenship.

Table C5 Significance levels of education effects (*AMEs*) on the probability of being unemployed in reference to university graduates

	Men									Women								
	1ab	1c	2a	2b	2c _gen	2c _voc	3a	Pseudo R ²	N	1ab	1c	2a	2b	2c _gen	2c _voc	3a	Pseudo R ²	N
1976	+	+	+	+	+	+	+	0.04	10092	+	+	+	+	+	-	+	0.01	8610
1978	+	+	+	+	+	+	-	0.05	10963	+	+	+	+	+	+	+	0.03	9176
1980	+	+	+	+	+	+	-	0.06	11603	+	+	-	+	+	+	+	0.03	9388
1982	+	+	-	+	+	+	-	0.06	12367	+	+	+	+	+	+	+	0.04	10109
1985	+	+	+	+	+	+	-	0.06	14125	+	+	-	+	+	+	+	0.05	12144
1987	+	+	+	+	+	+	-*	0.07	14549	+	+	-*	+	+	-	+	0.06	12483
1989	+	+	-*	+	+	-	-*	0.07	12575	+	-*	-*	+	+	-*	-	0.06	10939
1991	+	-	-*	+	+	-	-*	0.07	11181	+	-*	-*	+	+	-*	-	0.07	9991
1993	+	+	+	+	+	+	+	0.06	10667	+	+	-*	+	+	-*	-	0.08	9231
1995	+	+	+	+	+	+	-	0.07	10335	+	+	-*	+	+	-*	-	0.07	8694
1996	+	+	+	+	+	+	-	0.10	9439	+	+	+	+	+	-	+	0.09	7854
1997	+	+	+	+	+	+	-*	0.10	9296	+	+	-*	+	+	-*	-	0.11	7685
1998	+	+	+	+	+	-	-*	0.11	9070	+	+	-*	+	+	-*	-	0.10	7469
1999	+	+	+	+	+	-	-*	0.11	8827	+	+	-	+	-	-*	-	0.10	7230
2000	+	+	+	+	+	+	-	0.14	8739	+	+	-	+	-	-*	-	0.11	6865
2001	+	+	+	+	+	+	-	0.13	8798	+	+	+	+	+	-	+	0.11	7027
2002	+	+	+	+	+	+	-*	0.12	8798	+	+	+	+	+	-	-	0.10	7086
2003	+	+	+	+	+	+	+	0.12	8377	+	+	+	+	+	-	-	0.09	7009
2004	+	+	+	+	+	+	-	0.12	8104	+	+	+	+	+	+	+	0.10	6900
2005	+	+	+	+	+	+	-	0.14	7320	+	+	+	+	+	-	-	0.14	6340
2006	+	+	+	+	+	+	-	0.14	7518	+	+	+	+	+	-	-	0.16	6795
2007	+	+	+	+	+	+	-	0.16	7216	+	+	+	+	+	-	-	0.17	6482
2008	+	+	+	+	+	-	-*	0.15	7165	+	+	+	+	+	-	+	0.17	6582

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* + (-) indicates a higher (lower) *relative* unemployment risk; standard errors calculated with *margins*; * $p < 0.05$; controlling for citizenship.

Table C6 Education-specific unemployment risks and time-varying macro-level determinants (*log-odds ratios*)

Men	M1	M2	M3	M4
Intercept	-4.62 (0.11)***	-6.70 (0.37)***	-3.36 (0.15)***	-5.92 (0.35)***
Education (Ref. <i>CASMIN</i> 3ab)				
<i>CASMIN</i> 2c	0.61 (0.04)***	4.49 (0.42)***	0.73 (0.15)***	3.27 (0.53)***
<i>CASMIN</i> 2a	0.56 (0.03)***	3.21 (0.42)***	-0.49 (0.14)***	2.71 (0.47)***
<i>CASMIN</i> 2b	1.87 (0.04)***	4.60 (0.57)***	0.37 (0.17)*	3.75 (0.57)***
<i>CASMIN</i> 1c	1.11 (0.03)***	3.49 (0.48)***	-0.24 (0.11)*	2.61 (0.40)***
<i>CASMIN</i> 1ab	2.31 (0.03)***	2.90(0.55)***	1.06 (0.15)***	3.78 (0.41)***
LSD ratio (Δ)	-0.43 (0.09)**	1.22 (0.29)***	-0.58 (0.09)***	1.62 (0.29)***
Business cycle (Δ)	0.71 (0.01)***	0.72 (0.01)***	0.27 (0.04)***	0.19 (0.05)***
LSD ratio (Δ) *				
<i>CASMIN</i> 2c		-1.82 (0.44)***		-2.18 (0.42)***
<i>CASMIN</i> 2a		-2.34 (0.38)***		-2.74 (0.38)***
<i>CASMIN</i> 2b		-2.18 (0.46)***		-2.91 (0.47)***
<i>CASMIN</i> 1c		-1.67 (0.33)***		-2.46 (0.33)***
<i>CASMIN</i> 1ab		-1.73 (0.34)***		-2.35 (0.34)***
Business cycle (Δ) *				
<i>CASMIN</i> 2c			-0.04 (0.06)	0.04 (0.07)
<i>CASMIN</i> 2a			0.43 (0.06)***	0.53 (0.06)***
<i>CASMIN</i> 2b			0.62 (0.07)***	0.72 (0.07)***
<i>CASMIN</i> 1c			0.57 (0.05)***	0.67 (0.05)***
<i>CASMIN</i> 1ab			0.52 (0.05)***	0.62 (0.05)***
Citizenship (Ref. German)				
European	-0.02 (0.08)	-0.01 (0.08)	-0.02 (0.08)	-0.01 (0.08)
Turkish	0.32 (0.03)***	0.32 (0.03)***	0.31 (0.03)***	0.32 (0.03)***
Italian	-0.25 (0.07)***	-0.25 (0.07)***	-0.24 (0.07)***	-0.23 (0.07)***
Greek	0.64 (0.07)***	0.64 (0.07)***	0.65 (0.07)***	0.65 (0.07)***
Others	0.73 (0.03)***	0.73 (0.03)***	0.72 (0.03)***	0.73 (0.03)***
Pseudo R ²	0.1047	0.1050	0.1068	0.1073
N	227124	227124	227124	227124

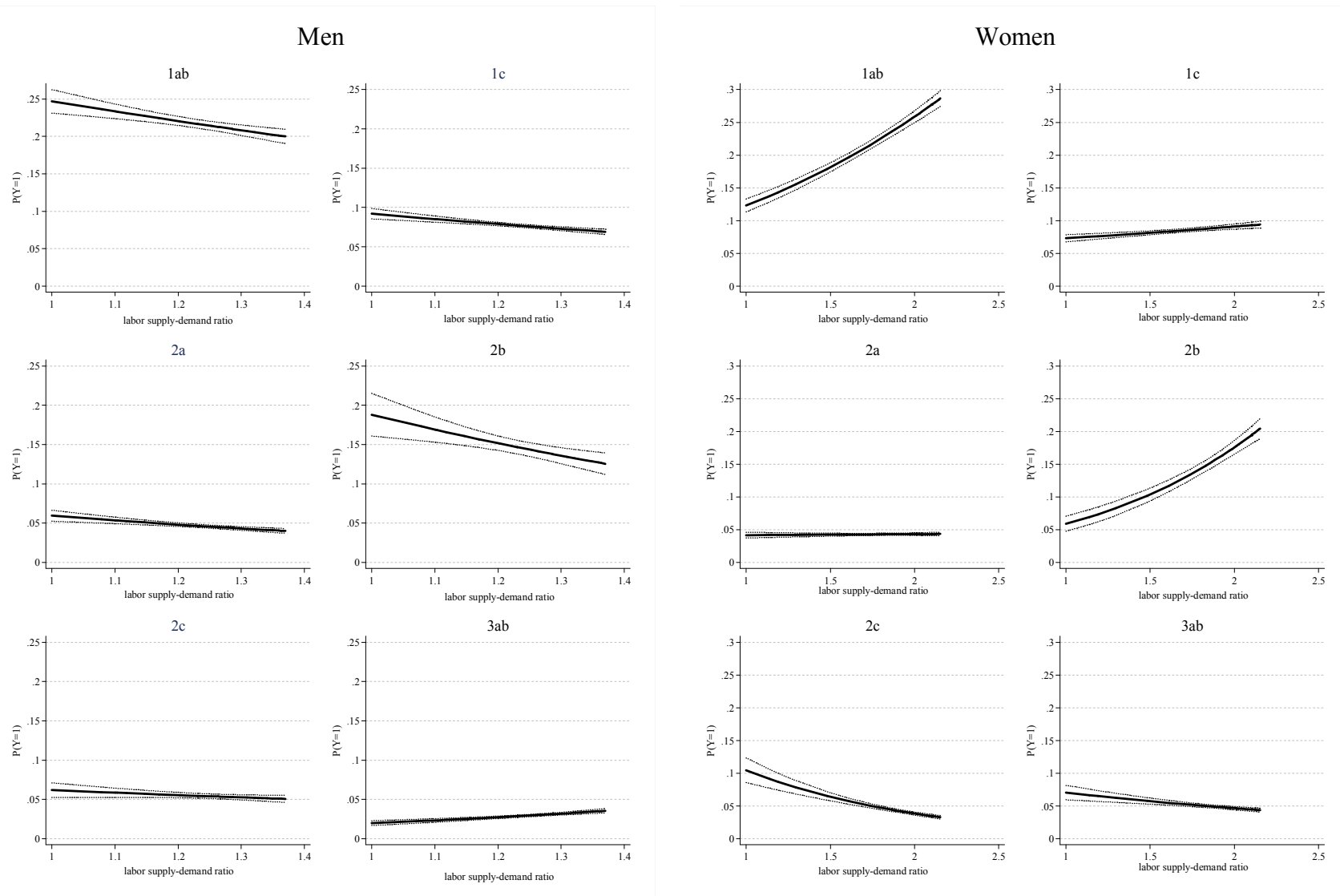
Source: German *Microcensus*, Scientific-Use-Files 1976-2008; standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table C7 Education-specific unemployment risks and time-varying macro-level determinants (*log-odds ratios*)

Women	M1	M2	M3	M4
Intercept	-4.91 (0.07)***	-3.33 (0.18)***	-4.57 (0.16)***	-3.22 (0.20)***
Education (Ref. <i>CASMIN</i> 3ab)				
<i>CASMIN</i> 2c	-0.15 (0.04)***	1.05 (0.28)***	-0.53 (0.23)*	0.98 (0.33)**
<i>CASMIN</i> 2a	-0.08 (0.03)*	-1.06 (0.21)***	-0.29 (0.18)	-1.19 (0.25)***
<i>CASMIN</i> 2b	1.29 (0.04)***	-1.91 (0.28)***	0.51 (0.21)*	-2.24 (0.33)***
<i>CASMIN</i> 1c	0.69 (0.03)***	-0.59 (0.20)**	0.62 (0.16)***	-0.64 (0.22)**
<i>CASMIN</i> 1ab	1.77 (0.03)***	-0.79 (0.20)***	1.13 (0.17)***	-0.98 (0.23)***
LSD ratio (Δ)	0.33 (0.03)***	-0.45 (0.09)***	0.32 (0.03)***	-0.44 (0.09)***
Business cycle (Δ)	0.70 (0.04)***	0.65 (0.02)***	0.53 (0.07)***	0.59 (0.07)***
LSD ratio (Δ) *				
<i>CASMIN</i> 2c		-0.62 (0.14)***		-0.63 (0.14)***
<i>CASMIN</i> 2a		0.49 (0.11)***		0.48 (0.11)***
<i>CASMIN</i> 2b		1.70 (0.15)***		1.66 (0.15)***
<i>CASMIN</i> 1c		0.65 (0.11)***		0.68 (0.11)***
<i>CASMIN</i> 1ab		1.39 (0.11)***		1.35 (0.09)***
Business cycle (Δ) *				
<i>CASMIN</i> 2c			0.19 (0.12)	0.05 (0.10)
<i>CASMIN</i> 2a			0.11 (0.09)	0.08 (0.08)
<i>CASMIN</i> 2b			0.40 (0.11)***	0.21 (0.11)
<i>CASMIN</i> 1c			0.03 (0.08)	-0.00 (0.08)
<i>CASMIN</i> 1ab			0.33 (0.08)***	0.13 (0.08)
Citizenship (Ref. German)				
European	0.05 (0.08)	0.04 (0.08)	0.05 (0.08)	0.04 (0.08)
Turkish	0.41 (0.04)***	0.38 (0.04)***	0.41(0.04)***	0.38 (0.04)***
Italian	-0.06 (0.08)	-0.03 (0.08)	-0.05 (0.08)	-0.03 (0.08)
Greek	0.66 (0.07)***	0.66 (0.07)***	0.67 (0.07)***	0.66 (0.07)***
Others	0.62 (0.04)***	0.60 (0.04)***	0.62 (0.04)***	0.60 (0.04)***
Pseudo R ²	0.0830	0.0871	0.0835	0.0872
N	192136	192136	192136	192136

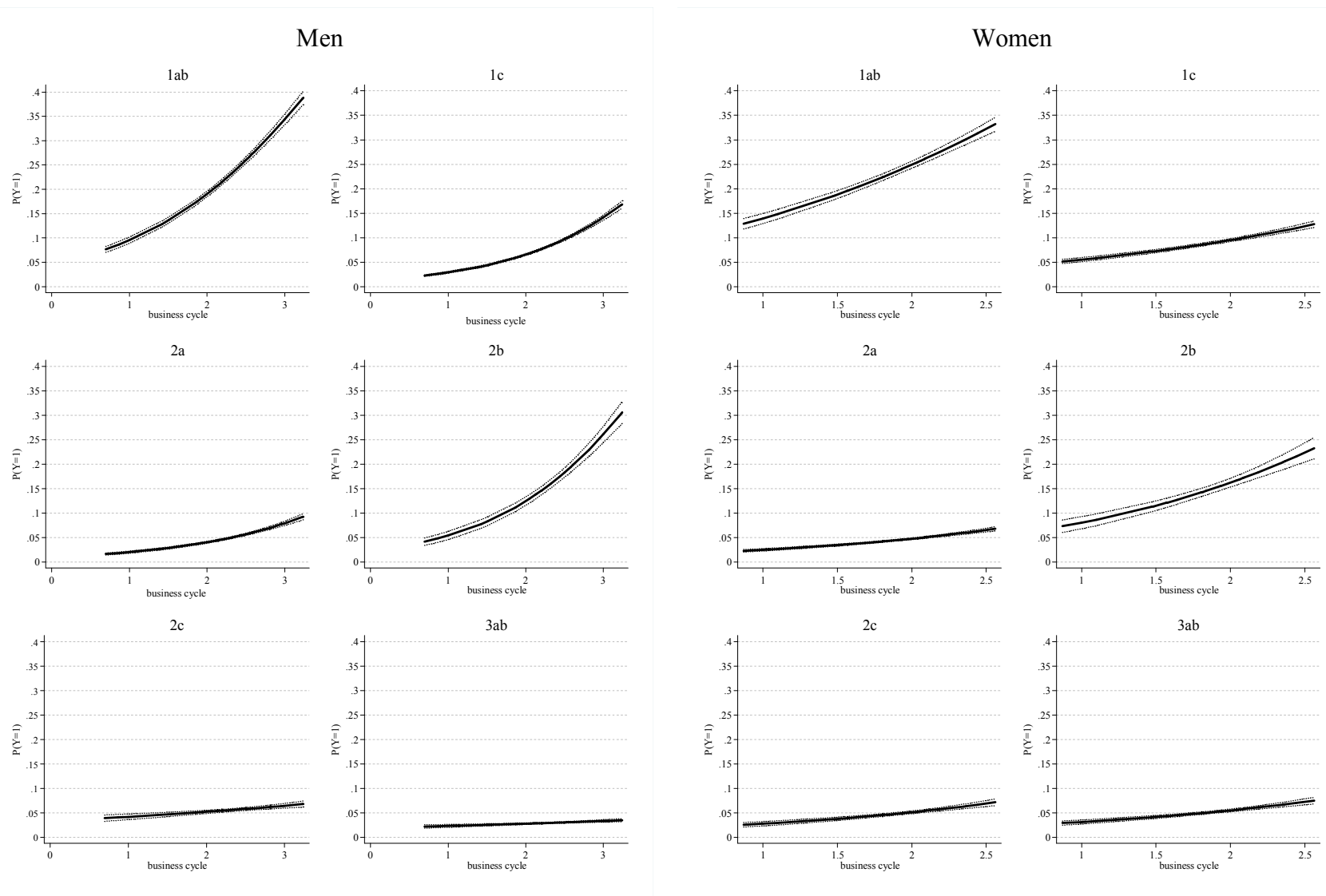
Source: German *Microcensus*, Scientific-Use-Files 1976-2008; standard errors in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure C3 Predicted probabilities of being unemployed by labor supply-demand ratio



Notes: Estimates obtained from model 4 in Tables C6 (men) and C7 (women). Business cycle is held constant at the mean; citizenship set on German.

Figure C4 Predicted probabilities of being unemployed by business cycle



Notes: Estimates obtained from model 4 in Tables C6 (men) and C7 (women). Labor supply-demand ratio is held constant at the mean; citizenship set on German.

Table C8 Service class access rates for *CASMIN* 1abc graduates (in per cent)

	Service class I/II		Service class I	
	Men	Women	Men	Women
1976	4.19	8.67	1.28	1.12
1978	3.36	7.93	0.81	0.91
1980	3.71	7.49	0.85	0.63
1982	3.05	6.89	0.95	0.76
1985	2.14	4.77	0.76	0.53
1987	1.98	5.33	0.73	0.66
1989	2.39	5.62	1.02	0.48
1991	1.73	5.82	0.66	0.94
1993	1.90	4.85	0.53	0.58
1995	2.75	5.68	0.91	0.79
1996	2.87	5.36	0.71	0.63
1997	3.06	5.17	0.94	0.46
1998	3.00	5.85	1.00	0.78
1999	2.94	5.28	1.02	0.66
2000	2.86	4.85	0.87	0.77
2001	3.97	5.63	1.59	1.20
2002	2.31	5.80	0.92	0.97
2003	3.29	5.47	1.22	0.59
2004	2.62	4.53	1.15	0.85
2005	2.54	4.08	1.04	0.52
2006	2.81	3.21	0.96	0.21
2007	2.98	4.25	1.13	0.55
2008	2.32	6.37	0.81	0.99

Source: German *Microcensus*, Scientific-Use-Files 1976-2008.

Table C9 Detailed compositional changes within service class among male labor market entrants (in per cent)

	I/II ^a	I/II ^b	I/II ^c	III-VII	N
1976	6.79	7.10	7.01	79.10	9405
1978	6.23	6.14	7.94	79.69	10439
1980	5.95	6.65	7.40	80.00	11112
1982	6.17	6.52	8.67	78.64	11288
1985	7.47	6.60	7.23	78.70	12614
1987	7.17	7.20	6.69	78.94	13056
1989	9.23	7.43	6.41	76.92	11536
1991	8.51	8.00	6.00	77.49	10524
1993	10.24	8.66	7.02	74.09	9564
1995	12.18	9.78	7.53	70.51	9168
1996	13.20	11.98	7.93	66.89	8324
1997	14.33	12.76	7.98	64.93	8062
1998	15.26	13.14	8.00	63.61	7971
1999	15.50	13.30	7.90	63.30	7798
2000	17.47	11.93	7.55	63.05	7897
2001	16.52	12.56	8.22	62.70	7946
2002	17.12	12.19	7.72	62.97	7734
2003	17.15	12.33	8.06	62.46	7229
2004	17.07	11.15	8.25	63.53	6772
2005	16.43	11.68	7.88	64.01	6079
2006	17.07	10.90	8.56	63.47	6368
2007	17.60	10.45	7.82	64.13	6278
2008	17.12	9.62	8.51	64.75	6395

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* ^a = administrative and management; ^b = experts; ^c = social services.

Table C10 Detailed compositional changes within service class among female labor market entrants (in per cent)

	I/II ^a	I/II ^b	I/II ^c	III-VII	N
1976	5.22	1.92	12.55	80.31	8141
1978	4.90	1.90	14.02	79.17	8671
1980	4.57	2.03	13.81	79.58	8962
1982	5.20	1.86	15.12	77.82	9282
1985	5.27	2.15	15.77	76.81	10663
1987	5.87	2.25	15.03	76.86	11126
1989	6.39	2.29	14.96	76.36	9972
1991	6.47	2.72	14.58	76.23	9412
1993	9.77	3.08	15.23	71.91	8369
1995	11.26	3.48	17.11	68.15	7815
1996	12.44	3.72	17.62	66.23	7157
1997	12.36	4.25	17.10	66.29	6972
1998	13.51	4.51	17.84	64.15	6811
1999	13.84	4.59	17.81	63.76	6619
2000	13.02	4.22	18.44	64.32	6367
2001	13.31	4.49	19.62	62.58	6574
2002	13.94	4.46	20.24	61.37	6508
2003	12.08	4.19	20.18	62.83	6307
2004	13.46	3.93	20.52	62.09	6151
2005	13.99	3.88	20.75	61.38	5541
2006	14.27	3.72	20.78	61.23	5997
2007	14.18	3.76	21.34	60.72	5746
2008	14.03	4.25	21.88	59.85	5952

Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* ^a = administrative and management; ^b = experts; ^c = social services.

Table C11 Service class composition in public service and private industry (in per cent)

Men	Total				Service class			
	I/II ^a	I/II ^b	I/II ^c	III-VII	I/II ^a	I/II ^b	I/II ^c	N
<i>Public Service</i>								
1989-1993	11 (2)	7 (2)	18 (4)	64 (14)	29	20	50	6620
1995-1999	12 (2)	9 (2)	21 (4)	58 (11)	29	20	51	7876
2000-2004	12 (2)	8 (1)	24 (4)	56 (10)	27	18	54	6389
2005-2008	13 (2)	10 (1)	28 (4)	49 (7)	26	19	54	3687
<i>Private Industry</i>								
1989-1993	9 (7)	8 (6)	3 (3)	79 (63)	44	40	16	24628
1995-1999	14 (12)	13 (11)	5 (4)	68 (55)	45	40	15	33431
2000-2004	18 (15)	13 (11)	5 (4)	64 (53)	51	36	13	31181
2005-2008	18 (15)	11 (9)	5 (4)	67 (57)	53	32	15	21432
Women								
<i>Public Service</i>								
1989-1993	7 (2)	3 (1)	41 (10)	51 (12)	13	5	82	6558
1995-1999	11 (3)	4 (1)	41 (10)	45 (11)	19	7	74	8342
2000-2004	10 (2)	4 (1)	47 (11)	39 (9)	17	6	77	7474
2005-2008	11 (3)	4 (1)	48 (11)	37 (8)	18	6	76	5307
<i>Private Industry</i>								
1989-1993	7 (6)	3 (2)	7 (5)	83 (63)	44	16	40	20867
1995-1999	13 (10)	4 (3)	10 (8)	72 (55)	48	15	37	27017
2000-2004	14 (11)	4 (3)	12 (9)	70 (53)	47	15	38	24420
2005-2008	15 (12)	4 (3)	13 (10)	68 (52)	47	12	41	17924

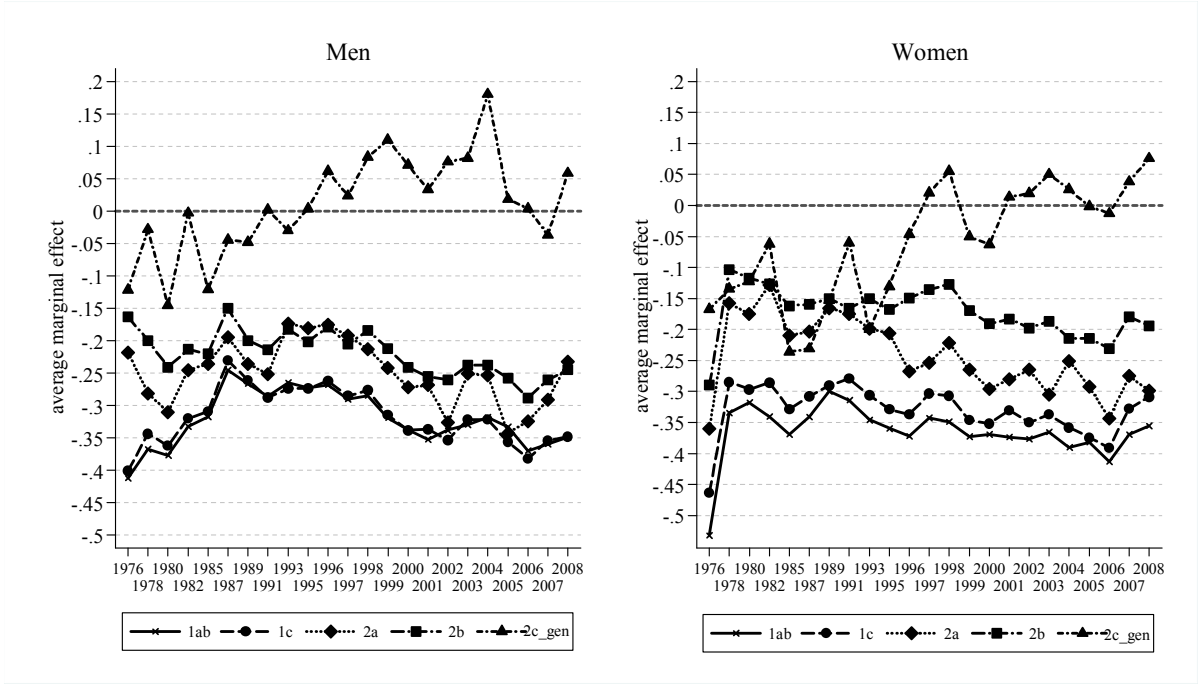
Source: German *Microcensus*, Scientific-Use-Files 1989-2008; Notes: ^a = administrative and management; ^b = experts; ^c = social services; Numbers in parentheses indicate proportions of classes in the respective sector on the labor market as a whole

Table C12 Segmental distribution in upper and lower service class (in per cent)

	Men					
	Service class I			Service class II		
	a	b	c	a	b	c
1976-1980	36	39	25	23	23	53
1982-1987	38	40	22	24	19	57
1989-1993	41	42	17	35	16	49
1995-1999	39	47	14	47	7	47
2000-2004	46	43	11	46	5	49
2005-2008	48	39	13	46	6	48
	Women					
	Service class I			Service class II		
	a	b	c	a	b	c
1976-1980	48	10	42	19	10	71
1982-1987	49	14	37	18	8	74
1989-1993	49	18	33	22	8	70
1995-1999	45	24	32	33	6	61
2000-2004	48	25	28	29	4	68
2005-2008	48	21	31	28	3	69

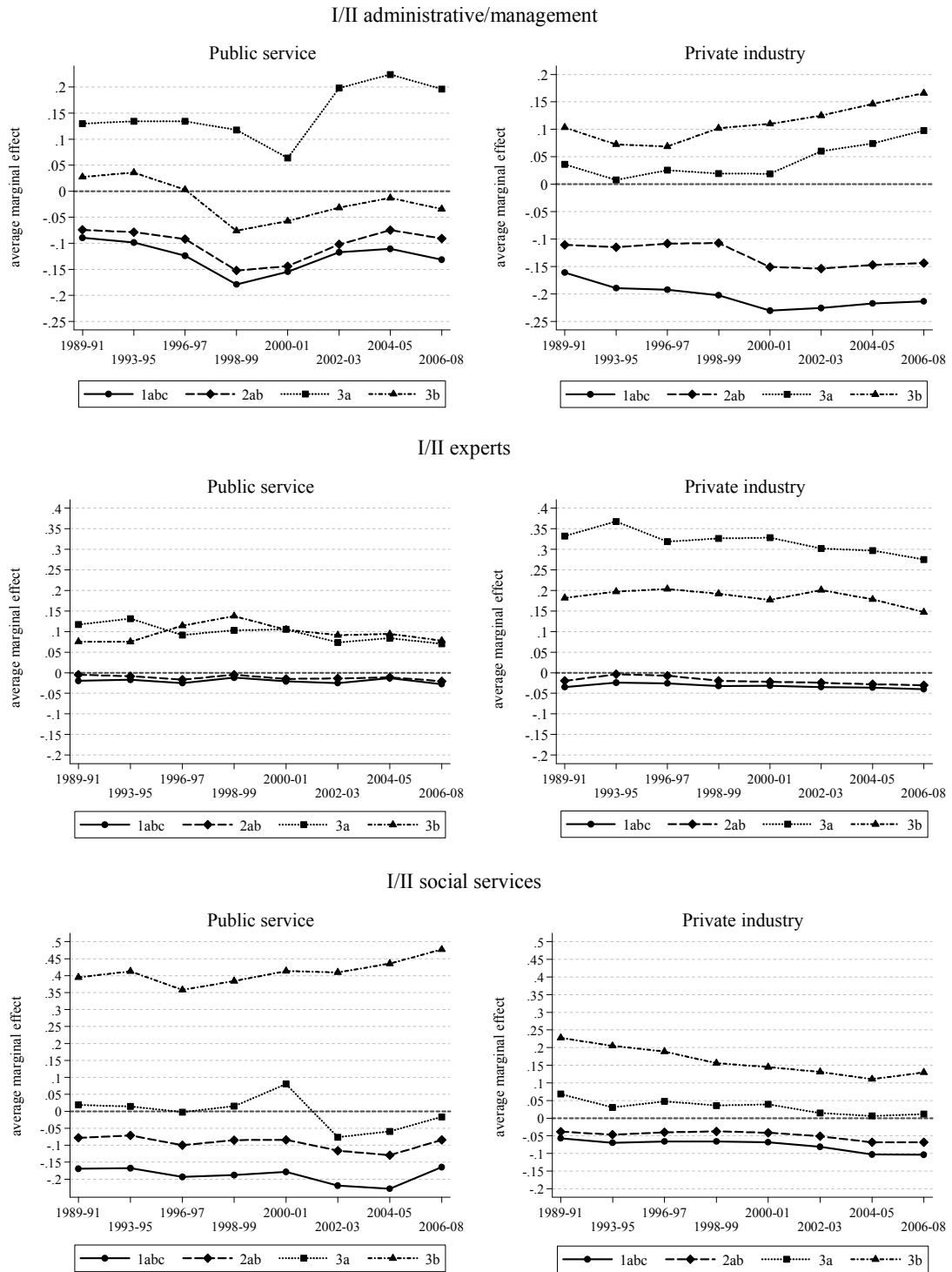
Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* ^a = administrative and management; ^b = experts; ^c = social services.

Figure C5 Detailed *relative returns (AMEs)* for *CASMIN* groups below tertiary level in access to the service class



Source: German *Microcensus*, Scientific-Use-Files 1976-2008; *Notes:* Reference category: *CASMIN* 2c_voc; effect estimates shown as *average marginal effects (AMEs)*; controlling for citizenship.

Figure C6 Differences between public service and private industry in the relationship between education and service class segments (*AMEs*)



Source: German *Microcensus*, Scientific-Use-Files 1989-2008; Notes: Reference category: *CASMIN* 2c; controlling for citizenship and gender; effect estimates shown as *average marginal effects (AMEs)*.

Table C13 Educational distribution in public service and private industry (overall per cent)

Men		<i>CASMIN</i>				
<i>Private Industry</i>	1ab	1c	2ab	2c	3a	3b
1989-1993	7	30	19	8	6	8
1995-1999	7	22	17	11	11	13
2000-2004	7	18	20	12	12	13
2005-2008	7	19	21	14	10	12
<i>Public Service</i>	1ab	1c	2ab	2c	3a	3b
1989-1993	1	4	6	2	3	5
1995-1999	1	3	5	2	3	5
2000-2004	1	2	5	2	2	5
2005-2008	1	2	4	2	2	5
Women		<i>CASMIN</i>				
<i>Private Industry</i>	1ab	1c	2ab	2c	3a	3b
1989-1993	7	20	32	11	2	4
1995-1999	5	15	27	16	5	9
2000-2004	6	12	27	16	6	10
2005-2008	5	10	27	20	5	11
<i>Public Service</i>	1ab	1c	2ab	2c	3a	3b
1989-1993	1	2	10	4	2	5
1995-1999	0	2	8	5	3	6
2000-2004	0	1	7	5	3	7
2005-2008	0	1	6	5	3	8

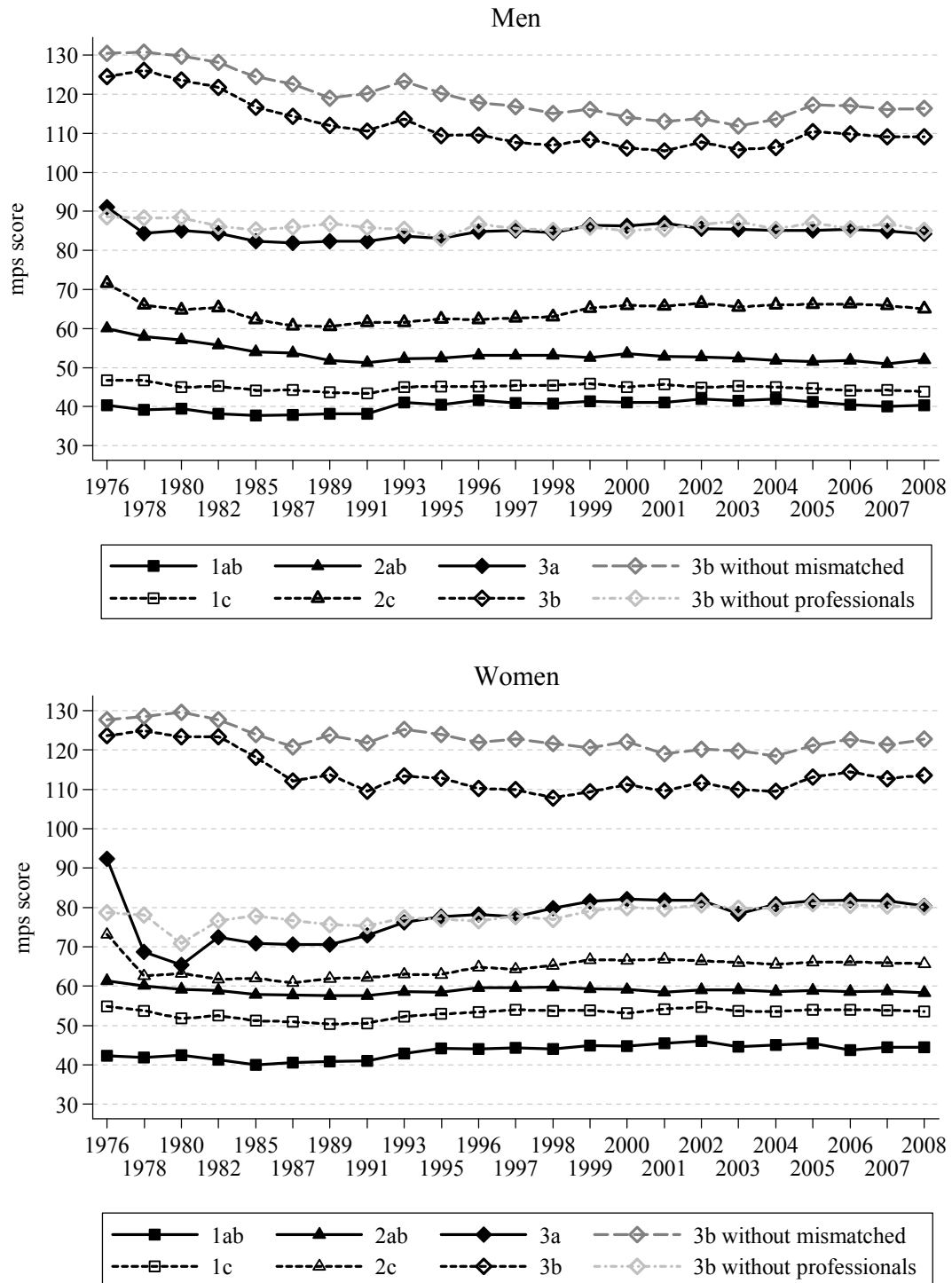
Source: German *Microcensus*, Scientific-Use-Files 1989-2008. *Notes:* Numbers indicate proportions of *CASMIN* groups in the respective sector on the labor market as a whole

Table C14 Decomposing the total effect of citizenship on occupational prestige into direct and indirect effect via educational attainment

Men	1970s/80s		1990s		2000s	
	Coef.	z	Coef.	z	Coef.	z
<i>Total effect</i>	-11.03	-43.01	-16.30	-55.99	-11.43	-40.26
<i>Direct effect</i>	-6.28	-23.63	-7.10	-23.49	-6.62	-22.86
<i>Indirect effect</i>	-4.75	-13.84	-9.19	-31.76	-4.82	-15.50
<i>Relative measure</i>						
Confounding percentage	43.03	-	56.41	-	42.13	-
Women	1970s/80s		1990s		2000s	
	Coef.	z	Coef.	z	Coef.	z
<i>Total effect</i>	-11.45	-42.81	-11.92	-35.34	-10.13	-30.51
<i>Direct effect</i>	-6.91	-24.97	-6.86	-19.74	-7.96	-23.57
<i>Indirect effect</i>	-4.54	-12.57	-5.06	-16.10	-2.17	-6.66
<i>Relative measure</i>						
Confounding percentage	39.62	-	42.43	-	21.46	-

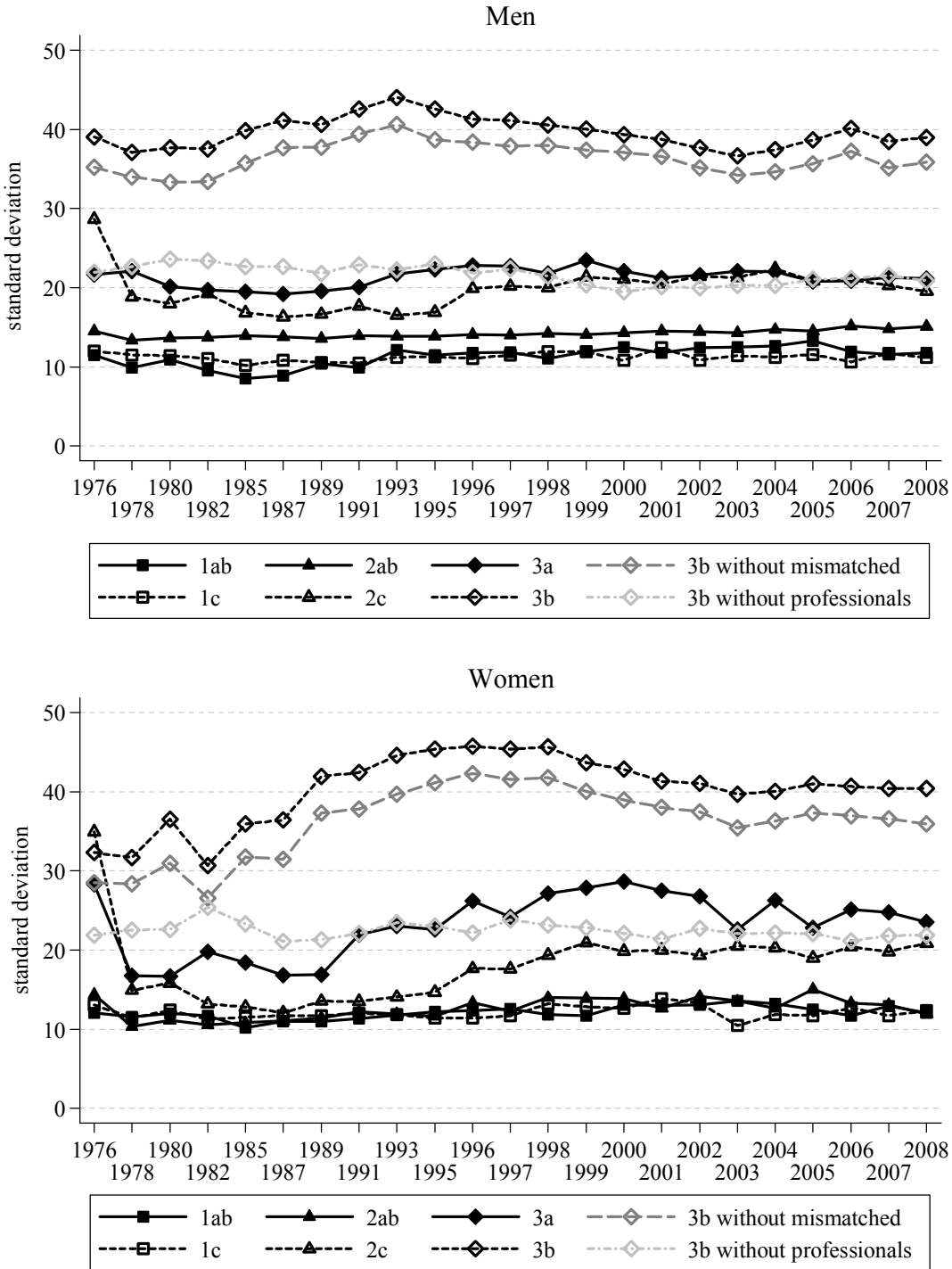
Source: German Microcensus, Scientific-Use-Files 1976-2008. Notes: KHB method (Karlson et al., 2012).

Figure C7 Simulations and university graduates' average occupational prestige



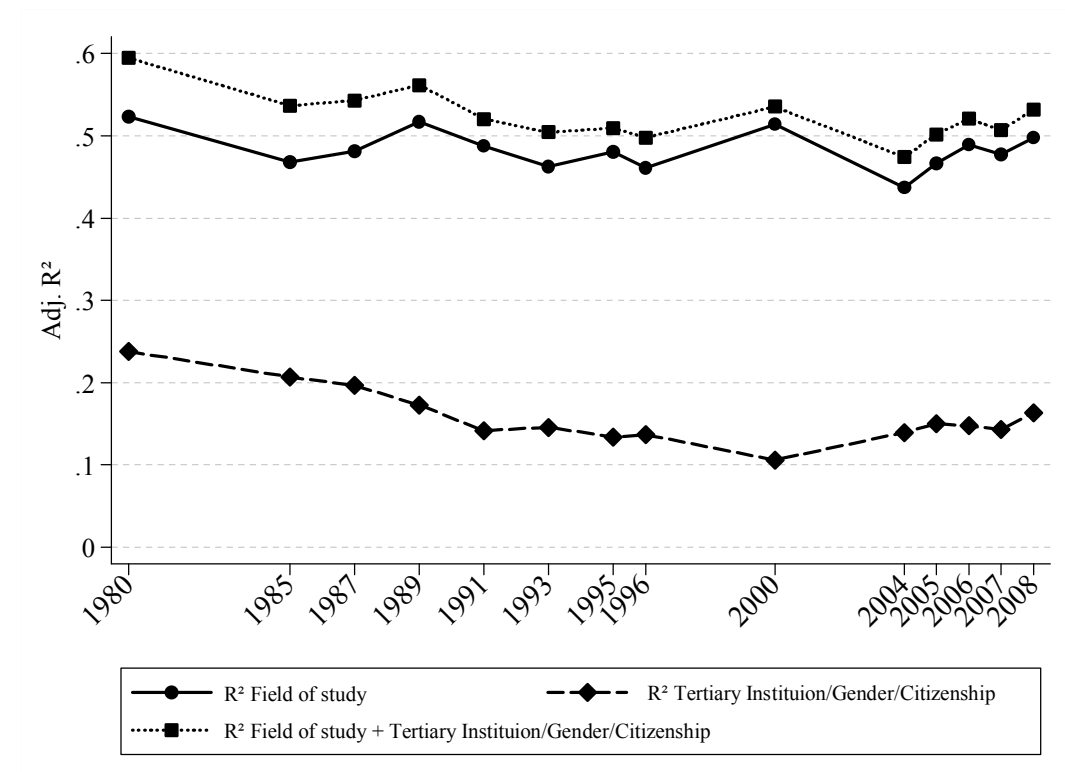
Source: German Microcensus, Scientific-Use-Files 1976-2008.

Figure C8 Simulations and university graduates' variability in occupational prestige



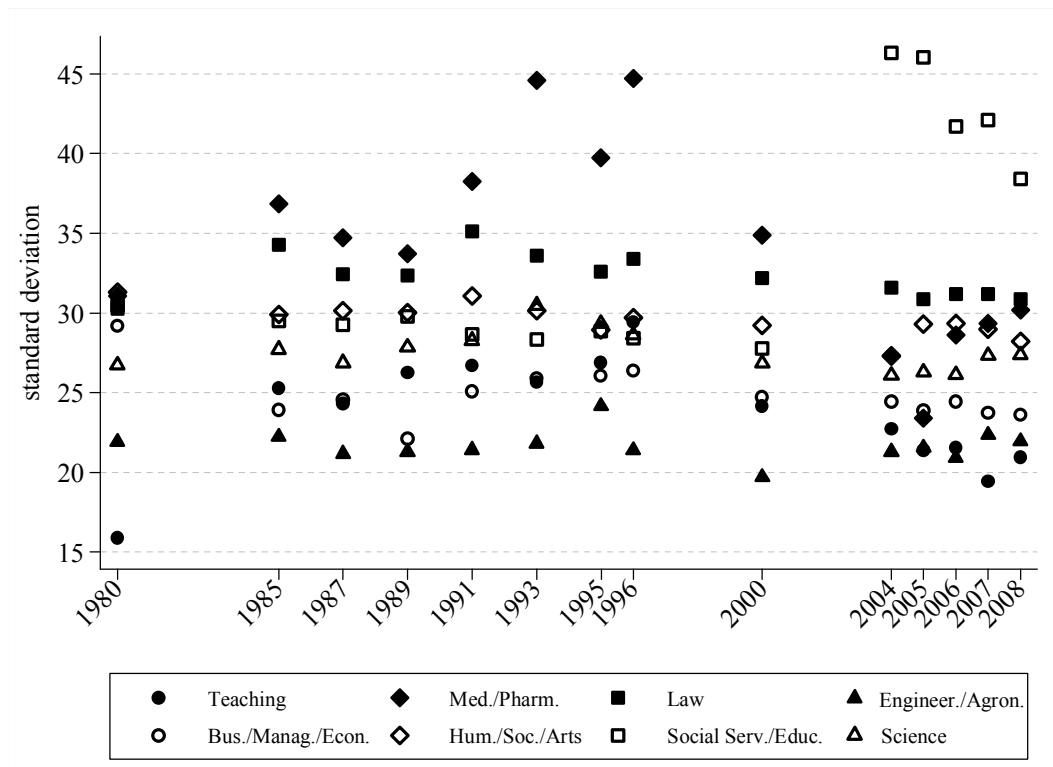
Source: German Microcensus, Scientific-Use-Files 1976-2008.

Figure C9 Proportion of explained variance in occupational prestige by field of study



Source: German *Microcensus*, Scientific-Use-Files 1980-2008.

Figure C10 Residuals' standard deviation by field of study



Source: German *Microcensus*, Scientific-Use-Files 1980-2008.

Table C15 Field of study distribution by tertiary institution (in per cent)

<i>Field of study</i>	Men					
	<i>University</i>			<i>Fachhochschule</i>		
	1980s	1990s	2000s	1980s	1990s	2000s
Teaching	12	5	10	1	1	1
Law	9	8	9	1	1	0
Medicine/Pharmacology	13	13	8	0	0	0
Science/Mathematics	16	20	15	13	13	10
Engineering/Agronomics	16	21	20	50	51	44
Business/Management/Economics	14	18	21	26	26	36
Humanities/Social Sciences/Arts	13	12	13	3	3	4
Social services/Education	7	3	4	4	4	5
N	5700	7740	6138	3354	5122	4251

<i>Field of study</i>	Women					
	<i>University</i>			<i>Fachhochschule</i>		
	1980s	1990s	2000s	1980s	1990s	2000s
Teaching	27	17	24	4	4	5
Law	4	7	8	2	1	2
Medicine/Pharmacology	11	14	10	2	2	0
Science/Mathematics	9	11	7	4	7	3
Engineering/Agronomics	3	6	6	16	16	16
Business/Management/Economics	5	11	13	22	30	46
Humanities/Social Sciences/Arts	19	24	22	15	14	10
Social services/Education	22	11	9	34	26	19
N	3991	5724	6595	1193	2690	2775

Source: German *Microcensus*, Scientific-Use-Files 1980-2008.

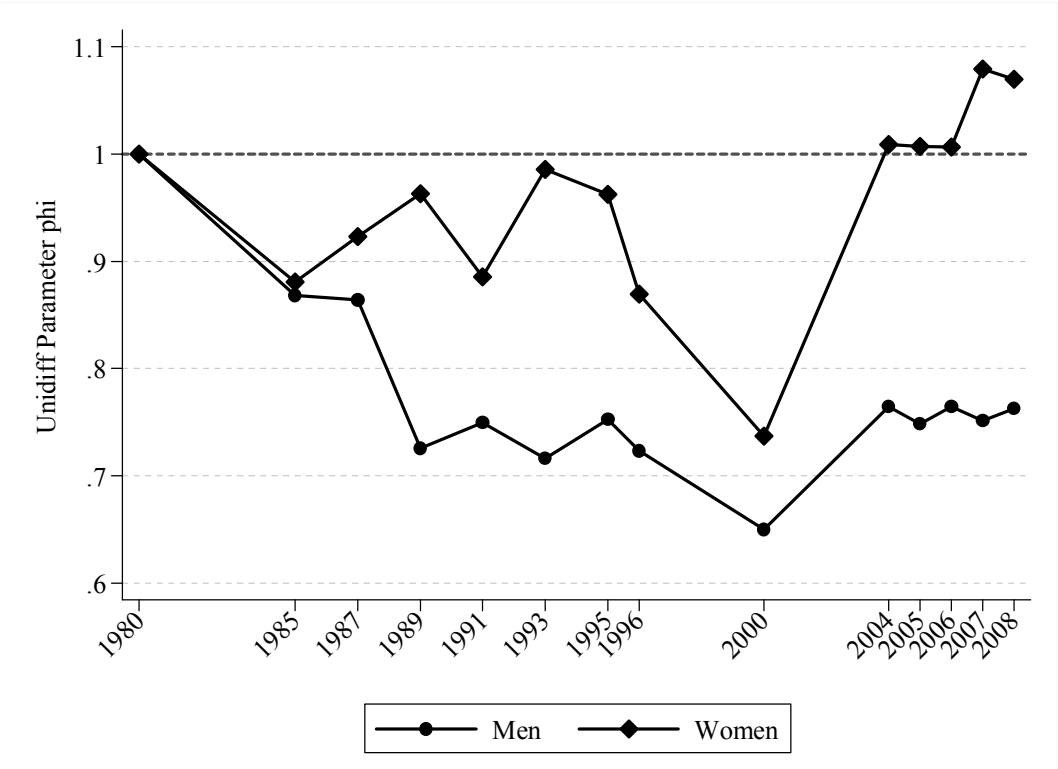
Table C16 Results of modeling change in association between field of study and tertiary institution

Model	G ²	df	p	rG ²	Δ (%)	BIC	G ² ₂ -G ² ₃
Men (N=32005)							
Cond. ind.	7875.4	98	0.00	-	19.9	6858.8	-
Const. assoc.	260.7	91	0.00	96.7	2.4	-683.3	-
<i>UNIDIFF</i>	219.1	78	0.00	97.2	2.2	-590.0	0.000
Women (N=22968)							
Cond. ind.	5182.6	98	0.00	-	19.3	4198.5	-
Const. assoc.	232.7	91	0.00	95.5	3.0	-681.1	-
<i>UNIDIFF</i>	196.7	78	0.00	96.2	2.7	-586.6	0.000

Source: German *Microcensus*, Scientific-Use-Files 1980-2008; *Notes:* 14 periods (P) by 8 fields of study (F) by tertiary institution (university vs. *Fachhochschule*).

Legend: G² = Deviance; df = degrees of freedom; rG² = % reduction of Deviance; Δ = dissimilarity index (% of misclassified cases); BIC = Bayesian Information Criterion; G²₂-G²₃ = p-value associated with difference in G² between constant association and *UNIDIFF*.

Figure C11 Change in strength of association between field of study and tertiary institution (*UNIDIFF* parameter phi)



Source: German Microcensus, Scientific-Use-Files 1980-2008.

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