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How Prevalent Is Downward Rigidity in Nominal Wages? International Evidence from Payroll Records and Pay Slips

Michael W. L. Elsby and Gary Solon

In Chapter 2 of *The General Theory of Employment, Interest and Money* (1936), John Maynard Keynes put forward an assumption of downward rigidity in nominal wages as the cornerstone of his analysis of what happens in the labor market during the business cycle. According to this analysis, if the real value of the existing nominal wage exceeds the market-clearing level, downward nominal rigidity prevents arbitrage toward that level. Instead, employment is determined by the demand side of the labor market, and the excess supply of labor at that wage manifests as high unemployment. Keynes's brief theoretical account of why workers refuse to accept a nominal wage reduction, even when unemployment is the consequence, involved workers' concern about their wages relative to their reference group. Keynes did not directly address why workers would be *so* preoccupied with their relative wage that they would prefer losing their job, even during a recession, to accepting a wage cut. Keynes's empirical basis for his assumption was that, "whether logical or illogical, experience shows that this is how labour in fact behaves." He did not provide any quantitative evidence to support this observation.

In the 80-plus years since publication of *The General Theory*, Keynes's premise of downward nominal wage rigidity has continued to be highly influential. This has much to do with its potential to address some enduring macroeconomic questions: to the extent that downward rigidity prevents the real value of nominal wages from adjusting downward sufficiently in times of recession, it offers a potential account

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for cyclical unemployment fluctuations. In addition, by implying that higher inflation might enable real wage reductions that otherwise would be impeded by downward nominal wage rigidity, it provides a potential foundation for a Phillips curve trade-off between inflation and unemployment. A quintessential implication, noted prominently in Tobin's (1972) presidential address to the American Economic Association and extended in Akerlof, Dickens, and Perry's (1996) influential paper, is that positive inflation can "grease the wheels of the labor market."

As rates of inflation have subsided in recent decades, and with the onset of the Great Recession, interest in Keynes's hypothesis of downward nominal wage rigidity has naturally revived, inspiring an array of modern applications. Formal theories of the Phillips curve in the short and long run have been developed and extended to analyze the persistent rise in US unemployment that accompanied the Great Recession (Benigno and Ricci 2011; Daly and Hobijn 2014). In international macroeconomics, the adverse interaction of downward nominal wage rigidity with currency pegs has been advanced as a key determinant of recent rises in unemployment in the eurozone and its periphery (Schmitt-Grohé and Uribe 2016). Most recently, the asymmetric nature of downward nominal wage rigidity has been invoked to provide a potential explanation for asymmetries in unemployment fluctuations over the business cycle (Dupraz, Nakamura, and Steinsson 2018).

An attractive feature of Keynes's hypothesis is that, in principle, it is amenable to empirical testing. An economy subject to a binding downward constraint on nominal wage changes should bear two hallmarks: a scarcity of nominal wage cuts and a consequent abundance of nominal wage freezes. Accordingly, a large empirical literature has sought to provide measures of the frequencies of nominal wage cuts and freezes, aided by the increasing availability of the requisite longitudinal data on individual wages.

Until recently, most such evidence had been based on reports of job stayers obtained from household surveys. That evidence, defying simple conclusions, seemed to suggest not only that nominal wage cuts are quite common (indicating a degree of downward flexibility in nominal wages) but also that nominal wage freezes are similarly common (indicating a degree of nominal rigidity). To complicate matters further, both results have been discounted on the grounds that they could be artifacts of the considerable response error in household surveys. Thus, despite the seeming testability of Keynes's hypothesis, a clear assessment of the empirical basis for downward nominal rigidity has proved elusive because of the difficulty of obtaining reliable estimates of the incidence of nominal wage changes.

The main point of the present paper is to draw attention to a more recent literature that, cumulatively, has made considerable progress on these challenges. In our view, the most compelling way to address a concern over measurement error is to seek more accurate data. The literature we survey focuses on wage data taken from employers' payroll records and pay slips. We believe this growing body of evidence has been undernoticed, perhaps because the studies have been scattered across many countries and across journals in multiple fields in economics, but also because several sources of such data have become available only recently.

Here we gather studies for Great Britain, the United States, West Germany, Austria, Italy, Spain, Mexico, Ireland, South Korea, Portugal, Sweden, and Finland. Collectively, they make an important point: except in extreme circumstances (when nominal wage cuts are either legally prohibited or rendered beside the point by very high inflation), nominal wage cuts from one year to the next appear quite common, typically affecting 15–25 percent of job stayers in periods of low inflation. Consistent with this picture of downward flexibility, nominal wage freezes are found to be much less frequent, typically affecting less than 8 percent of job stayers, and there is little evidence for large accumulations of wage freezes in times of low inflation.

None of this denies the existence of some nominal wage stickiness. Like most of our readers, we have our salaries set in nominal terms and typically see them adjusted only once a year. But does it follow from such apparent wage stickiness that nominal wages *cannot* be cut, even when inefficient layoffs or hiring decisions are the alternative? In light of the emerging evidence from more accurate wage data, we will conclude that the assumption that nominal wages cannot be cut needs to be reconsidered.

Some Modern Perspectives on the Economics of Downward Wage Rigidity

It has been more than 80 years since Keynes posited that nominal wages cannot be cut and that inefficient layoffs into unemployment are the result. As documented above, many (though far from all) modern macroeconomists still use these assumptions as key elements of their analysis. Even so, much has changed over these 80-plus years in how labor economists and macroeconomists think about the labor market, and some of the new ideas matter for the economics of downward wage rigidity and its potential effects on labor market allocations.

To begin with, the interpretation of Keynes summarized in our opening paragraph provides a simple “spot market” view of the labor market. But a distinctive characteristic of employment relationships is that they are frequently long term in nature: employees often work for the same employer for extended periods of time. This observation has important implications for the economics of wage rigidity. As noted since the seminal work of Becker (1962), the effective price of labor ceases to be simply the flow wage; rather, it is the expected present discounted value of the stream of wages anticipated over the course of the employment relationship. In addition, the seeming paradox of Keynes’s theory—that workers will refuse nominal wage cuts, even when unemployment is the alternative—is thrown into sharper relief once the durability of employment relationships is acknowledged. The theory implies that an existing gainful exchange of labor is forfeit by a refusal to countenance a wage cut, even when it is mutually advantageous for both firm and worker to do so (Barro 1977). A corollary of these implications is that all that is required to obviate such inefficient layoffs is that (the present value of) wages be sufficiently flexible *at the point when separation is potentially at issue*. Subject to this requirement, flow wages can otherwise be arbitrarily rigid and indeed can accommodate many of

the outward signs of downward nominal wage rigidity. Nominal wages can remain constant for periods of time if neither firm nor worker wishes to separate. And when nominal wages are adjusted, they naturally will rise more often than they fall, owing, for example, to the presence of inflation (Malcomson 1997).

This perspective cautions against leaping from the premise of apparent wage stickiness to the conclusion that inefficient layoffs, and therefore increased unemployment, must ensue. Because these arguments have informed the majority of modern macroeconomic analyses of labor markets, it is important to articulate potential channels through which rigid wages in general, and downwardly rigid nominal wages in particular, still may affect labor market allocations.

A first channel relates to another conceptual development in macroeconomic modeling that considers the implications of wage rigidity for hiring as well as layoff decisions. Becker's (1962) insight suggests that hiring incentives will be shaped by the present value of wages firms must offer to newly hired workers. Hires will fall more precipitously during recessions if firms perceive such present values to be inflexible—for example, if the wages of *both* newly hired *and* incumbent workers are sticky (Shimer 2004; Hall 2005). Importantly, there is evidence to suggest that the wages of newly hired and incumbent workers are not set in isolation. Bewley's (1999) interviews of managers highlighted the role of the internal wage structure within firms in linking the wages of new hires to those of incumbent workers. If new hires are paid according to existing wage structures, perhaps for reasons of equal treatment, any rigidity in incumbent wages is then propagated onto the wages of new hires (Gertler and Trigari 2009; Snell and Thomas 2010). An implication of this view is that any downward rigidity in nominal wages of job stayers will additionally contribute to downward nominal rigidity among new hires' wages, thereby depressing hiring incentives in times of recession.

A second channel relates to an even better-known message from Bewley's (1999) book. In a variation on Keynes's assumption that workers refuse wage cuts, what Bewley heard from the managers he interviewed was that even if they did not withdraw their labor altogether, workers disgruntled by a wage cut would be likely to exert less effort on the job. Employers therefore are reluctant to impose wage cuts for fear of adverse productivity consequences. This evidence reinforces our impression that downward wage stickiness is indeed a fact of labor market life. It is also natural to hypothesize that the prospect of such productivity losses might have allocational effects. The evidence provides a potential motive for excess layoffs that, in the words of one of Bewley's interviewees, "get the misery out the door."¹ Likewise, the anticipation of

¹Another of Bewley's (1999) messages, which we believe the economics profession has mostly overlooked, suggests that downward stickiness may not be so extreme as to force inefficient layoff or hiring decisions. On p. 16 of his introductory chapter, Bewley says that his "mistaken" prior view had been that "an individual firm could save a significant number of jobs by reducing pay. This is seldom true, and the firms for which it is true are precisely the ones most likely to cut pay." His detailed evidence appears in his section 11.3, which begins, "I was surprised to learn that most managers did not believe that pay cuts would prevent many layoffs." This finding is altogether consistent with the Becker–Barro–Malcomson point that short-term wage stickiness need not induce inefficient allocation decisions.

such productivity losses in the future might in turn further retard firms' incentives to hire. Both of these forces might be expected to contribute to unemployment in times of recession.

Collectively, these developments in economic thinking (along with many others not discussed here) recognize that the labor market is much more complex than the bare-bones model presented in Keynes (1936). Nevertheless, there remain important potential channels through which downward wage rigidity can have unemployment consequences, on both hiring and layoff margins. We still are left with the same fundamental questions: Just how prevalent is downward rigidity in nominal wages, and what are the ramifications for the efficiency of layoff and hiring decisions? Our answers to these questions should be informed by the best available evidence, which is the subject of the remainder of this paper.

Evidence from Employer Payroll Records and Pay Slips

Most studies on nominal wage rigidity have sought to provide measures of year-to-year changes in individual workers' nominal wages from longitudinal microdata. Because much evidence shows that those changing employers typically realize wage changes, these studies have focused on the subsample of individuals who are job stayers.² For a long time, the majority of such measures were based on longitudinal analyses of household surveys, inspired by influential early studies of the Panel Study of Income Dynamics and the Current Population Survey in the United States (McLaughlin 1994; Card and Hyslop 1996; Kahn 1997). As we have noted, such studies typically have found not only a substantial fraction of nominal wage cuts among job stayers but also a similarly common incidence of nominal wage freezes. For example, our own 2016 *Journal of Labor Economics* paper with Donggyun Shin, which tracked job stayers from one January to the next in the Current Population Survey, found that the percentage measured as receiving a nominal wage cut was regularly between 15 and 25 percent (Elsby, Shin, and Solon 2016). In the same data, the percentage recorded with zero nominal wage change was frequently in the range of 10 to 20 percent.

However, such findings have been open to the criticism that household survey reports of wages are notoriously subject to response error. As many authors have pointed out, such errors could bias the results in either direction—that is, toward finding either more or less wage rigidity. On one hand, differences in individual response errors across survey years may exaggerate the appearance of wage flexibility: for example, someone whose nominal wage did not really decrease could still be measured as receiving a wage cut, and cases in which nominal wages truly

²As foreshadowed by the discussion in our previous section, an important example of what these studies have *not* attempted to measure is the rigidity of the wages of newly hired workers. Addressing this question empirically is surprisingly difficult because it calls for hiring wage data over time for the same jobs within the same firms, and such data are hard to come by. The effort by Martins, Solon, and Thomas (2012) uses the same Portuguese census of employers we cite later in this article and finds that real hiring wages in Portugal were highly procyclical over the period from 1982 to 2008.

did not change could be recorded as wage changes. Such concerns have motivated some authors, such as Akerlof, Dickens, and Perry (1996) and Altonji and Devereux (1999), to suggest that the appearance of frequent nominal wage cuts in household surveys is an artifact of measurement error. On the other hand, if wage reports are subject to rounding errors, modest wage changes will be recorded as wage freezes, exaggerating the appearance of wage rigidity. The upshot, of course, is that the nature of the bias depends on the presumed structure of response errors. Indeed, one approach taken in a portion of the literature, exemplified by some of the work discussed in this journal by Dickens et al. (2007), has attempted to correct for measurement error by imposing assumptions about the measurement error process.

The studies we review here take a more direct, and we think more persuasive, approach to addressing concerns over measurement error—namely, to seek more accurate data. In particular, we turn to administrative data from payroll records and pay slips that allow a researcher to track individual workers and the jobs they do across years and that contain accurate information on wages. Our survey identified 13 such sources of data for 12 countries. We distill relevant information from these in Table 1. For each study, the table summarizes the data source, the wage measure,³ and the percentages of job stayers recorded as receiving either nominal wage cuts or zero change in their nominal wages. In the remainder of this section, we provide some context for the contents of Table 1. We pay particular attention to how each study addresses the measurement challenges noted above and the implications for the prevalence of downward nominal wage rigidity.

Great Britain

The first steps in the quest for more accurate wage data were taken in the British literature, so we will begin there. The first row of Table 1 summarizes the pioneering study by Smith (2000), who analyzed the 1991–1996 waves of the British Household Panel Study. In many respects, this longitudinal household survey resembles the Panel Study of Income Dynamics for the United States. Indeed, Smith’s initial results based on these data resembled those based on US household surveys, measuring nontrivial minorities of respondents as receiving both wage cuts and wage freezes.

Smith also discovered, however, that the British Household Panel Study incorporated a feature that was unique at the time: respondents were allowed to check their pay slips when reporting their wages, and the survey recorded who did so. Smith’s results thus provided a first glimpse of the implications of more accurate wage data for the prevalence of downward nominal wage rigidity.

The results were striking. Even among the subsample of respondents who consulted their pay slips, the incidence of nominal wage cuts remained considerable;

³In most instances, the measure does not include nonwage compensation. In the United States, where fringe benefits such as employer-provided health insurance loom large, this is a potentially significant omission. Lebow, Saks, and Wilson (2003) have argued that fringe benefits are an additional dimension for adjustment in compensation, so overlooking them is likely to make total compensation seem less flexible than it actually is. A similar point applies to variation in work effort.

the percentage with negative nominal wage change was 17.8 percent. By contrast, a much smaller percentage of the subsample who consulted their paychecks, just 5.6 percent, reported zero nominal wage change. Set in a context of low inflation rates—which averaged around 3 percent in Britain over Smith’s sample period—the abundance of wage cuts and paucity of wage freezes are especially notable.

At the time, Smith (2000) was at pains to acknowledge surprise at her results: “Some of the results in this paper may seem difficult to believe—the quite common occurrence of nominal pay cuts, for example. It may well be that the difficulty in believing them stems not from the weight of contradictory evidence, but rather from conventional wisdom that has survived because of the previous lack of evidence either way.” Since then, however, evidence amassed from a diverse range of sources has vindicated Smith’s early findings.

Inspired by Smith’s (2000) results, Nickell and Quintini (2003) identified another source of accurate wage data in the New Earnings Survey for Great Britain. This survey comprises a 1 percent sample of income tax-paying workers, defined by those whose National Insurance numbers (for social security) end in a given pair of digits. Because the same pair of digits has been used since the survey’s inception, this survey allows one to track the same individuals over time. In the spirit of Smith’s use of reports from pay slips, the New Earnings Survey data are also thought to provide unusually accurate information on individual earnings because the survey is administered to employers, who are legally required to report such information from their payroll records for a reference week each April.

The data from the New Earnings Survey also come with additional methodological advantages over the British Household Panel Study. Accompanying the data on weekly earnings are employer-reported payroll data on employee work hours for the survey reference week, permitting an analysis of hourly wages. Moreover, the New Earnings Survey records separate measures of components of earnings and hours, most notably those attributable to overtime. Because it is not obvious that, for example, reductions in hourly earnings associated with reductions in overtime should be interpreted as wage cuts, an advantage of the New Earnings Survey is that it allows one to focus on hourly wages exclusive of overtime. Finally, because it is based on a 1 percent sample of income tax-paying workers in Britain, the sample sizes it offers are large.

Nickell and Quintini’s (2003) results dovetail with Smith’s (2000) earlier findings. For the 1991–1996 period, over which the two studies overlap, the New Earnings Survey data produce results that mirror closely those for the respondents to the British Household Panel Study who checked their pay slips. When Nickell and Quintini widened their analysis to their full 1975–1999 sample period, they continued to find substantial numbers of nominal wage cuts and a relative scarcity of nominal wage freezes.

Motivated by the onset and aftermath of the global financial crisis, our 2016 paper with Donggyun Shin replicated Nickell and Quintini’s (2003) analysis and provided an update through the Great Recession to the year 2012. As summarized here in the second row of Table 1, our measured percentages of job stayers with

Table 1

Percentages of Job Stayers Receiving Year-to-Year Nominal Wage Cuts and Freezes

<i>Study</i>	<i>Data source</i>	<i>Wage measure</i>	<i>Percentage receiving wage cuts</i>	<i>Percentage receiving wage freezes</i>
Smith (2000)	British Household Panel Study, 1991–1996	Usual weekly pay from recent pay slip	17.8	5.6
Elsby, Shin, and Solon (2016)	British New Earnings Survey, 1975–2012	Earnings/hours excluding overtime for reference week in April	4.9 ^a –23.5	0.4 ^a –9.1
Jardim, Solon, and Vigdor (2019)	Washington State unemployment insurance records, 2005–2015	Quarterly earnings/hours	20.4–33.1	2.5–7.7
Bauer, Bonin, Goette, and Sunde (2007)	West German IABS-R ^b from social security records, 1975–1976, 1980–1981, ..., 2000–2001	Annual earnings/work days for full-time workers employed on July 1	9.4–24.9	3.9–11.2
Evidence prepared for this survey by Andreas Steinhauer and Josef Zweimüller	Austrian Social Security Database, 2002–2012	Annual earnings/work days for full-time workers employed on March 15	13.0–18.6	0.1–1.5
Devicienti, Maida, and Sestito (2007)	Worker History Italian Panel from social security records, 1988–1989 and 1998–1999	Annual earnings/work days for full-time workers	7.7 and 18.3	4.0 and 8.5
Evidence prepared for OECD (2014) by Marcel Jansen, Sergi Jiménez, and José Ignacio García Pérez	Spanish Muestra Continua de Vidas Laborales from social security records, 2007–2010	Monthly earnings for full-time full-month workers	18.0–31.0	1.8–8.4
Castellanos, García-Verdú, and Kaplan (2004)	Mexican Social Security Institute records, 1985–2001	Daily comprehensive ^c wage on last day of quarter	0.2 ^a –10.7	3.9 ^a –16.5 ^d
Doris, O'Neill, and Sweetman (2015)	Irish EU Survey of Income and Living Conditions, 2006–2011	Earnings/hours from recent pay slip for full-time full-year workers ^c	24.5–50.1	3.3–14.2
Park and Shin (2017)	South Korean Survey of Labor Conditions by Type of Employment, 2008–2013	Monthly earnings/hours excluding overtime and incentive pay in June	25.3–56.0	0.0–0.2

Continued on next page

nominal wage cuts ranged from a low of 4.9 percent in the period 1979–1980 (when inflation was around 20 percent) to a high of 23.5 percent in the wake of the Great Recession in both 2009–2010 and 2011–2012. Strikingly, the latter is by no means an aberration: over the last 20 years of the sample period, when the inflation rate in Britain hovered around 3 percent, the percentage of job stayers receiving nominal wage cuts was regularly close to 20 percent. Mirroring this impression of downward

Table 1 (Continued)

Percentages of Job Stayers Receiving Year-to-Year Nominal Wage Cuts and Freezes

<i>Study</i>	<i>Data source</i>	<i>Wage measure</i>	<i>Percentage receiving wage cuts</i>	<i>Percentage receiving wage freezes</i>
Carneiro, Portugal, and Varejão (2014)	Portuguese Quadros de Pessoal, 1986–1989, 1991–2000, and 2002–2016	Monthly base wage/normal monthly hours for full-time workers in reference month ^f	2.2–6.3	3.2–76.0
Ekberg (2004)	Employer surveys by Confederation of Swedish Enterprise, 1970–1990 and 1995–1999	<u>White-collar:</u> Comprehensive ^g earnings/hours in reference month	<u>White-collar:</u> 0.1 ^a –10.0	<u>White-collar:</u> 0.2 ^a –6.0
		<u>Blue-collar:</u> Hourly base wage in second quarter	<u>Blue-collar:</u> 0.3 ^a –3.9	<u>Blue-collar:</u> 0.0 ^a –0.3
Vainiomäki (forthcoming)	Statistics Finland data based mostly on employer surveys by employer associations, 1995–2013	Earnings/hours excluding overtime in September, October, or fourth quarter	11.1–22.9	0.3–17.1

Note: Job stayers are defined as workers staying with the same employer; the British, Irish, Korean, Swedish, and Finnish studies also require that the workers stay in the same job within the firm.

^aThese data points correspond to periods of high inflation. They relate to 1979–1980 for Great Britain, when the inflation rate reached 20 percent; a period of hyperinflation in Mexico in the 1980s; and a period from the mid-1970s to the early 1980s in Sweden when the inflation rate regularly reached double digits.

^bThe IABS-R is part of the German Institute for Employment Research Employment Samples (IABS). It is a 2 percent random sample drawn from social security records.

^cThe Mexican wage measure “is a comprehensive measure of wages plus benefits, including payments made in cash, bonuses, premiums, room and board, commissions, benefits in kind and any other amount paid or benefit received.”

^dThis excludes three outliers in the periods 1991:4–1992:4, 1996:4–1997:4, and 1998:4–1999:4, when increases in nominal minimum wages were not synchronized with the reporting dates. In each of these cases, the incidence of wage freezes exceeded 30 percent, at the expense of similar declines in the incidence of wage increases.

^eThe results from pay slips on earnings per hour are not reported in Doris, O’Neill, and Sweetman (2015), but they were kindly provided to us by Aedin Doris.

^fAdditional results not reported in Carneiro, Portugal, and Varejão (2014) were kindly provided to us by Pedro Portugal.

^gThe wage measure we cite for Swedish white-collar workers includes overtime, bonuses, and fringe benefits. Our reported percentage receiving wage cuts is a weighted average of the percentages Ekberg (2004) reports for white-collar workers who do and do not receive such supplementary payments.

flexibility, the incidence of zero nominal wage change was much smaller, varying from a low of 0.4 percent in the high-inflation period of 1979–1980 to a high of 9.1 percent in 2011–2012 and remaining below 3 percent in most years of the sample.

Like earlier researchers, we were intrigued by these findings, which motivated us to question whether similar studies might be feasible for other countries. As the

remaining rows of Table 1 attest, it turns out that a body of such studies now exists, albeit one that has accumulated sporadically over a variety of journals spanning a range of fields of economics and that, in some cases, has become available only very recently.

United States

Although it is possible to access individual earnings data from some administrative sources in the United States, until recently it seemed that none contained the data on individual hours required to permit an analysis of hourly wages. However, thanks to the research of Kurmann, McEntarfer, and Spletzer (2016), considerable progress has been made on this seeming impasse. Their starting point was that US employers are obliged to report payroll data to state unemployment insurance agencies to enable determination of their employees' benefit entitlements in the event that the employees become unemployed and file an unemployment insurance claim. In most states, this requires employers to report the quarterly earnings of their employees. The key discovery by Kurmann, McEntarfer, and Spletzer was that a few states—Minnesota, Rhode Island, and Washington—also require employers to report their employees' quarterly hours of work. Among these, the case of Washington is especially useful because entitlement to unemployment insurance benefits in that state depends on hours as well as earnings, so the reports of both variables are thought to be especially accurate. Moreover, because these data are a near-complete census of employees in the state, they allow a researcher to track over time the wages of employees who remain with the same employer.

Two research teams—Kurmann and McEntarfer (2018) and Jardim, Solon, and Vigdor (2019)—have used the Washington data to study job stayers' year-to-year changes in quarterly average hourly earnings, and both have obtained results similar to those in the British studies. The third row of Table 1 summarizes the results from Jardim, Solon, and Vigdor, which are for the period 2005–2015. This period includes years before, during, and after the Great Recession, so although inflation was moderate throughout the period, business cycle conditions were wildly variable. Even during the expansion periods, the percentage receiving nominal wage cuts was more than 20 percent, with a minimum of 20.4 percent between the first quarters of 2006 and 2007. The percentage rose even higher during the Great Recession, with a high of 33.1 percent between the fourth quarters of 2008 and 2009. Mirroring this, the percentage receiving no nominal wage change typically remained below 4 percent, varying from a low of 2.5 percent between the fourth quarters of 2006 and 2007 to a maximum of just 7.7 percent at the height of the recession between the second quarters of 2009 and 2010. We are struck by the extent to which these results echo the British ones summarized above.

A contrast with the British studies using the New Earnings Survey, however, is that those studies were able to adopt a wage measure that explicitly excludes overtime pay and hours. Because overtime cannot be separated out in the Washington data, it is possible that some of the wage cuts measured for Washington could reflect reductions in overtime. As we noted above, these arguably should not be interpreted

economically as wage reductions. Jardim, Solon, and Vigdor (2019) therefore redid their analysis for a subsample of workers who appeared to work 40 hours a week every week in each quarter. Even in this subsample, the frequency of nominal wage cuts was striking, ranging from a low of 14.5 percent between the third quarters of 2006 and 2007 to a high of 31.8 percent between the fourth quarters of 2008 and 2009.⁴

Evidence from Other Countries

Payroll records or pay slips have been used to study job stayers' nominal wage changes in many other countries, as shown in the remainder of Table 1. An Irish study included evidence similar to Smith's (2000) pay slip–based evidence for Great Britain. In Portugal and South Korea, the data were generated by government surveys of employers. In Sweden and Finland, the employer surveys were conducted by employer associations. As Table 1 documents, all of these studies allow an analysis of hourly wages similar to those we have summarized above for Great Britain and the United States.

In the studies for West Germany, Austria, Italy, Spain, and Mexico, the data are taken from employers' reports to their countries' social security systems. Since social security provisions typically do not require information on hours worked, most of these studies instead have focused on measurement of a daily wage. For West Germany, Austria, and Italy, this is computed as the ratio of annual earnings to days worked at a given employer. For Mexico, the daily wage is that measured on the last day of each quarter. Similarly, in Spain, the wage measure is based on monthly earnings for individuals who worked for the entire month. To allay concerns that changes in measured daily wages reflect changes in hours worked per day, all but one of these studies (the Mexican case) additionally focus on individuals recorded as working full time in the administrative data.

Not surprisingly, the patterns vary considerably across countries. We think it is a fair summary to say that, outside of conditions of very high price inflation, most of the countries continue to show substantial minorities of job stayers receiving nominal wage cuts and much smaller minorities experiencing zero nominal wage change.

According to the Italian study by Devicienti, Maida, and Sestito (2007), for example, in the period 1988–1989, when inflation was a relatively high 6.5 percent, the percentage receiving nominal wage cuts was “only” 7.7 percent. In the period 1998–1999, when inflation was under 2 percent, the percentage receiving wage cuts was 18.3 percent. Qualitatively similar results are reported for West Germany by Bauer, Bonin, Goette, and Sunde (2007) and for Spain by the OECD (2014), except that the percentage receiving wage cuts ran somewhat higher, peaking at 24.9 percent in 1995–1996 for West Germany and at 31.0 percent in 2009–2010 in

⁴A preliminary manuscript by Grigsby, Hurst, and Yildirmaz (2018) that uses US data from the ADP payroll processing company finds that base pay reductions are rare in expansion years, but that reductions in overall earnings per hour are strikingly common, even with overtime excluded. This finding regarding the role of compensation other than base pay (such as bonuses) in nominal wage adjustment echoes a similar finding in the literature on cyclicality in *real* wages (see Shin and Solon 2007 and the references therein).

the aftermath of the especially severe Great Recession in Spain. For all three countries, the percentage of job stayers recorded with no wage change never rose much above 10 percent.

The Austrian evidence, kindly prepared for this survey by Andreas Steinhauer and Josef Zweimuller, again points to a considerable prevalence of nominal wage cuts. Over a 2002–2012 sample period that rarely saw inflation rise above 3 percent, the percentage receiving nominal wage cuts ranged from 13.0 to 18.6 percent. Strikingly, nominal wage freezes were exceedingly rare in the Austrian data, affecting less than 2 percent of job stayers. Vainiomäki's (forthcoming) results for Finland are fairly similar. The percentage receiving nominal wage cuts was always more than 11 percent and was usually more than 15 percent. In all but two of the sample period's 18 years, the percentage with wage freezes was 5 percent or less.

Inflation plays a particularly important role in the Mexican results reported by Castellanos, García-Verdú, and Kaplan (2004). In the early part of their 1985–2001 sample period, when annual inflation soared (reaching almost 160 percent!), nominal wage cuts were extremely rare. At the end, when inflation was just starting to moderate to single digits, the percentage receiving wage cuts had risen to 10.7 percent. At the same time, aside from a few periods in which rises in the nominal minimum wage were delayed, no more than 16.5 percent of job stayers experienced no change in their nominal wage.

The outliers in Table 1 are especially instructive. At one extreme are the results reported by Doris, O'Neill, and Sweetman (2015) for Ireland, where the Great Recession hit especially hard and involved a price deflation. In the period 2009–2010, the percentage of job stayers receiving nominal wage cuts reached a striking 50.1 percent. Even in the depths of the crisis in Ireland, the incidence of nominal wage freezes rose no higher than 14.2 percent.

In their results for South Korea, Park and Shin (2017) report a similarly extreme frequency of wage cuts, which affected as much as 56.0 percent of job stayers in 2008–2009, when both output growth and inflation were close to zero. An equally striking aspect of the South Korean data, however, is that the percentage of job stayers experiencing zero change in their nominal wage was negligible. The data for South Korea thus exhibit none of the empirical hallmarks of downward nominal wage rigidity, in precisely the macroeconomic context in which one might expect to find them.⁵

At the other extreme is Portugal, where Carneiro, Portugal, and Varejão (2014) report that nominal wage cuts were “virtually non-existent” throughout the 1987–2009 period, affecting no more than 6 percent of job stayers. This makes sense because Portugal has a national law that explicitly prohibits such cuts. Consistent with this, the incidence of nominal wage freezes in Portugal rose to unparalleled levels during the Great Recession, when zero change in hourly pay was recorded for up to 76.0 percent of job stayers.

⁵A newer study by Park and Shin (forthcoming) extends their evidence back to 1986.

At first blush, the situation seems somewhat similar in Sweden. For blue-collar workers, Ekberg (2004, chap. 1) reports that between 0.3 and 3.9 percent received hourly base wage cuts. He explains that, “given the framework of the terms of employment, it is impossible for the employers to cut wages unilaterally. Hence, a wage cut can only be achieved under mutual consent,” and even then it cannot violate applicable collective bargaining agreements. In stark contrast to the Portuguese case, however, almost none of these Swedish job stayers experienced a nominal pay freeze. Moreover, although Ekberg reports very low percentages of white-collar workers with wage cuts at the beginning of his sample period (when inflation was in double digits and very few white-collar workers received any supplementary pay), by the end inflation was much lower, a majority of white-collar workers received some supplementary pay, and the percentage receiving pay cuts rose as high as 10.0 percent.

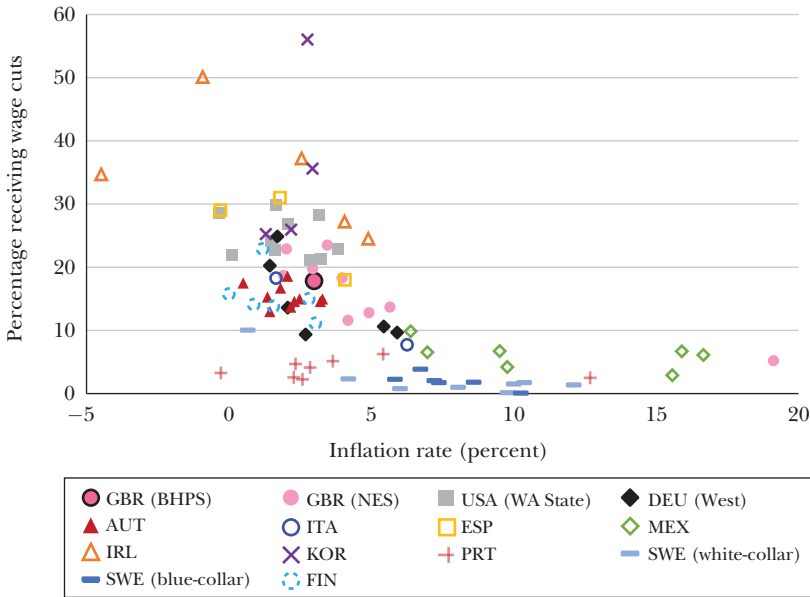
Figure 1 supplements Table 1 by providing a visual representation of the frequency of nominal wage cuts as a function of inflation. For the sake of a readable scale, the figure excludes the Mexican observations in which the inflation rate exceeds 20 percent (sometimes by a lot!) and the associated frequency of nominal wage cuts is negligible. Like Table 1, Figure 1 indicates that, outside of periods of particularly high inflation, most countries exhibit surprisingly high frequencies of nominal wage cuts. In addition, the figure reveals a general tendency for the frequency of wage cuts to rise as inflation falls. The glaring exception is Portugal, where a national prohibition of nominal wage cuts makes it the canonical example of Keynes’s premise that nominal wages cannot be cut. As discussed above, while nominal wage cuts appear to be rare in Sweden as well, there is little evidence there for an associated buildup of wage freezes. Otherwise, the evidence accumulated from payroll records and pay slips suggests that nominal wage cuts occur more commonly than most of us had thought.

Some Nuances

Having found that nominal wage decreases occur with surprising frequency, we can inquire further about how they are distributed throughout the labor market. Recent findings suggest that the overall flexibility we report is pervasive, in two senses.

First, Elsby, Shin, and Solon (2016) point out that the nominal wage cuts observed in the British New Earnings Survey “are remarkably pervasive across sub-groups of workers/jobs. For example, in 2011–2012, when the overall proportion of job stayers experiencing cuts was 23.5%, the proportions were 22% in the private sector and 26% in the public sector; 27% for union workers and 22% for nonunion workers; at least 20% for every single-digit occupation; and 32% for workers who received incentive pay in either 2011 or 2012 and 22% for workers who did not.” The study of Washington State data by Jardim, Solon, and Vigdor (2019) also presents some disaggregated analyses, and it similarly finds that the common occurrence of nominal wage cuts is pervasive across both industries and firm sizes. Even in the utilities industry—the industry that tends to show the fewest

Figure 1
Percentages of Job Stayers Receiving Year-to-Year Nominal Wage Cuts as a Function of Inflation



Notes: This figure provides a visual representation of the frequency of nominal wage cuts as a function of inflation based on the literature survey summarized in Table 1. Inflation rates corresponding to the NES data for Great Britain are from Elsby, Shin, and Solon (2016). Inflation rates for all other studies are from OECD data (<https://data.oecd.org/price/inflation-cpi.htm>). For studies with annual data, corresponding annual inflation rates are used. For studies with quarterly data, corresponding quarterly inflation rates are used and then simple annual averages are taken. For studies with many years of data, the figure plots a selected sample of years, chosen to include both the minimum and maximum percentage of wage cuts reported in Table 1 and otherwise evenly sampled across the available years. Finally, the figure focuses on periods for each study in which the inflation rate was no greater than 20 percent. Country abbreviations are OECD country codes. Other abbreviations: BHPS, British Household Panel Study; NES, New Earnings Survey.

nominal wage cuts—the percentage receiving cuts was almost always 15 percent or greater.⁶

Second, recent studies with access to rich employer-employee matched data have begun to investigate whether firms cutting wages do so for nearly all their workers or target the cuts on selected subgroups. For example, if 20 percent of all the job stayers in a particular period show wage cuts, this could happen because 20 percent of the stayers in every firm receive wage cuts or because the cuts occur

⁶Another type of heterogeneity that future research could explore is with respect to whether economic shocks are general or idiosyncratic to the firm. The recent study by Juhn, McCue, Monti, and Pierce (2018) concludes that “the transmission of firm-level shocks to earnings of stayers is minimal in the US labor market.”

universally in firms that employ 20 percent of stayers but not at all in other firms. Where between these extremes does the reality lie? To explore this question with the Washington State data, Jardim, Solon, and Vigdor (2019) created for each job stayer receiving a wage cut the following variable: the percentage of that worker's job-staying coworkers that also received a wage cut in the same period. In every period studied, it turned out that the majority of job stayers receiving nominal wage cuts worked for firms that cut the wages of between 10 and 50 percent of their job stayers. Jardim, Solon, and Vigdor also noted a tendency for these selective wage cuts to be more concentrated in the upper half of within-firm wage distributions. Park and Shin (2017) have reported similar findings for South Korea, noting that the prevalence of nominal wage cuts summarized in Table 1 stems from "a majority of employers cutting a fraction of their workers' wages fairly routinely."

We regard these details as promising points of departure for further research. They suggest that nominal wage cuts are not only surprisingly common but also broadly distributed across sectors and firms.

Summary and Discussion

For more than 80 years, many (though far from all) influential macroeconomic analyses of the labor market have been premised on the assumption that nominal wages cannot be cut. Some classic studies that used longitudinal household surveys to track job stayers from year to year measured a high incidence of wage cuts, but this evidence reasonably was discounted on the grounds that the measurement of frequent wage cuts could be an artifact of survey response error.

The main point of the present paper has been to synthesize a more recent international collection of studies that have sought out more accurate wage data from employers' payroll records and pay slips. Outside of circumstances where nominal wage cuts have been legally prohibited or rendered irrelevant by very high price inflation, most of this evidence has continued to show that nominal wage cuts occur more frequently than has commonly been supposed.

Most of us are surprised by this finding, not only because of the persistent influence of Keynes's (1936) contrary assumption in *The General Theory* but also because introspection, casual empiricism, and Bewley's (1999) interviews tell us that workers really do dislike nominal wage cuts and employers are therefore reluctant to impose them. But is this obvious aversion to wage cuts so extreme as to bind even when inefficient layoffs into unemployment are the alternative? The accumulated international evidence showing that nominal wage cuts occur frequently should inspire reconsideration of the commonly invoked assumption that nominal wages *cannot* be cut even when efficiency of allocation decisions is at stake.

Of course, because the evidence reviewed here is based on longitudinal tracking of job stayers, it pertains directly only to wage rigidity for incumbent workers. As discussed above, a related question is how flexible wages are for the hiring of new

workers. Some recent models have assumed that wage rigidity for incumbents spills over into wage rigidity for new hires. In that light, the evidence reported here is indirectly pertinent for hiring wages. If nominal wage cuts are feasible for incumbent workers, why would they not be for new workers?

The development of theoretically coherent and empirically relevant accounts of what happens in the labor market over the business cycle remains a crucial mission for economic research. We hope to support that effort by providing a more accurate picture of the frequency and nature of nominal wage cuts.

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References

- Akerlof, George A., William T. Dickens, and George L. Perry. 1996. "The Macroeconomics of Low Inflation." *Brookings Papers on Economic Activity*, no. 1, pp. 1–76.
- Altonji, Joseph G., and Paul J. Devereux. 1999. "The Extent and Consequences of Downward Wage Rigidity." NBER Working Paper 7236.
- Barro, Robert J. 1977. "Long-Term Contracting, Sticky Prices, and Monetary Policy." *Journal of Monetary Economics* 3(3): 305–16.
- Bauer, Thomas, Holger Bonin, Lorenz Goette, and Uwe Sunde. 2007. "Real and Nominal Wage Rigidities and the Rate of Inflation: Evidence from West German Micro Data." *Economic Journal* 117(524): F508–29.
- Becker, Gary S. 1962. "Investment in Human Capital: A Theoretical Analysis." *Journal of Political Economy* 70(5): 9–49.
- Benigno, Pierpaolo, and Luca Antonio Ricci. 2011. "The Inflation-Output Trade-Off with Downward Wage Rigidities." *American Economic Review* 101(4): 1436–66.
- Bewley, Truman F. 1999. *Why Wages Don't Fall during a Recession*. Cambridge, MA: Harvard University Press.
- Card, David, and Dean Hyslop. 1996. "Does Inflation 'Grease the Wheels of the Labor Market?'" NBER Working Paper 5538.
- Carneiro, Anabela, Pedro Portugal, and José Varejão. 2014. "Catastrophic Job Destruction during the Portuguese Economic Crisis." *Journal of Macroeconomics* 39(B): 444–57.
- Castellanos, Sara G., Rodrigo García-Verdú, and David S. Kaplan. 2004. "Nominal Wage Rigidities in Mexico: Evidence from Social Security Records." *Journal of Development Economics* 75(2): 507–33.
- Daly, Mary C., and Bart Hobijn. 2014. "Downward Nominal Wage Rigidities Bend the Phillips Curve." *Journal of Money, Credit and Banking* 46(S2): 51–93.
- Devicienti, Francesco, Agata Maida, and Paolo Sestito. 2007. "Downward Wage Rigidity in Italy: Micro-Based Measures and Implications." *Economic Journal* 117(524): F530–52.
- Dickens, William T., Lorenz Goette, Erica L. Groshen, Steinar Holden, Julian Messina, Mark E. Schweitzer, Jarkko Turunen, and Melanie E. Ward. 2007. "How Wages Change: Micro Evidence from the International Wage Flexibility Project." *Journal of Economic Perspectives* 21(2): 195–214.
- Doris, Aedin, Donal O'Neill, and Olive Sweetman. 2015. "Wage Flexibility and the Great

- Recession: The Response of the Irish Labour Market." *IZA Journal of European Labor Studies* 4(1): 18.
- Dupraz, Stéphane, Emi Nakamura, and Jón Steinsson.** 2018. "A Plucking Model of Business Cycles." December 20. <https://eml.berkeley.edu/~enakamura/papers/plucking.pdf>.
- Ekberg, John.** 2004. "Essays in Empirical Labor Economics." PhD Dissertation, Department of Economics, Stockholm University.
- Elsby, Michael W. L., Donggyun Shin, and Gary Solon.** 2016. "Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain." *Journal of Labor Economics* 34(S1): S249–91.
- Gertler, Mark, and Antonella Trigari.** 2009. "Unemployment Fluctuations with Staggered Nash Wage Bargaining." *Journal of Political Economy* 117(1): 38–86.
- Grigsby, John, Erik Hurst, and Ahu Yildirmaz.** 2018. "Aggregate Nominal Wage Adjustments: New Evidence from Administrative Payroll Data." Unpublished paper.
- Hall, Robert E.** 2005. "Employment Fluctuations with Equilibrium Wage Stickiness." *American Economic Review* 95(1): 50–65.
- Jardim, Ekaterina S., Gary Solon, and Jacob L. Vigdor.** 2019. "How Prevalent Is Downward Rigidity in Nominal Wages? Evidence from Payroll Records in Washington State." NBER Working Paper 25470.
- Juhn, Chinhui, Kristin McCue, Holly Monti, and Brooks Pierce.** 2018. "Firm Performance and the Volatility of Worker Earnings." *Journal of Labor Economics* 36(S1): S99–131.
- Kahn, Shulamit.** 1997. "Evidence of Nominal Wage Stickiness from Microdata." *American Economic Review* 87(5): 993–1008.
- Keynes, John Maynard.** 1936. *The General Theory of Employment, Interest and Money*. London: Macmillan.
- Kurmann, André, and Erika McEntarfer.** 2018. "Downward Wage Rigidity in the United States: New Evidence from Administrative Data." Unpublished paper. http://www.andrekurmann.com/files/wp_files/KM_December2018_final.pdf.
- Kurmann, André, Erika McEntarfer, and James Spletzer.** 2016. "Downward Wage Rigidity in the U.S.: New Evidence from Worker-Firm Linked Data." Unpublished paper. http://www.andrekurmann.com/files/wp_files/KMS_20160215.pdf.
- Lebow, David E., Raven E. Saks, and Beth Anne Wilson.** 2003. "Downward Nominal Wage Rigidity: Evidence from the Employment Cost Index." *Advances in Macroeconomics* 3(1).
- Malcomson, James M.** 1997. "Contracts, Hold-Up, and Labor Markets." *Journal of Economic Literature* 35(4): 1916–57.
- Martins, Pedro S., Gary Solon, and Jonathan P. Thomas.** 2012. "Measuring What Employers Do about Entry Wages over the Business Cycle: A New Approach." *American Economic Journal: Macroeconomics* 4(4): 36–55.
- McLaughlin, Kenneth J.** 1994. "Rigid Wages?" *Journal of Monetary Economics* 34(3): 383–414.
- Nickell, Stephen, and Glenda Quintini.** 2003. "Nominal Wage Rigidity and the Rate of Inflation." *Economic Journal* 113(490): 762–81.
- OECD.** 2014. "Sharing the Pain Equally? Wage Adjustments during the Crisis and Recovery." Chap. 2 in *OECD Employment Outlook 2014*. Paris: OECD Publishing.
- Park, Seonyoung, and Donggyun Shin.** 2017. "The Extent and Nature of Downward Nominal Wage Flexibility: An Analysis of Longitudinal Worker/Establishment Data from Korea." *Labour Economics* 48(October): 67–86.
- Park, Seonyoung, and Donggyun Shin.** Forthcoming. "Inflation and Wage Rigidity/Flexibility in the Short Run." *Economic Inquiry*.
- Schmitt-Grohé, Stephanie, and Martín Uribe.** 2016. "Downward Nominal Wage Rigidity, Currency Pegs, and Involuntary Unemployment." *Journal of Political Economy* 124(5): 1466–514.
- Shimer, Robert.** 2004. "The Consequences of Rigid Wages in Search Models." *Journal of the European Economic Association* 2(2/3): 469–79.
- Shin, Donggyun, and Gary Solon.** 2007. "New Evidence on Real Wage Cyclicity within Employer-Employee Matches." *Scottish Journal of Political Economy* 54(5): 648–60.
- Smith, Jennifer C.** 2000. "Nominal Wage Rigidity in the United Kingdom." *Economic Journal* 110(462): 176–95.
- Snell, Andy, and Jonathan P. Thomas.** 2010. "Labor Contracts, Equal Treatment, and Wage-Unemployment Dynamics." *American Economic Journal: Macroeconomics* 2(3): 98–127.
- Tobin, James.** 1972. "Inflation and Unemployment." *American Economic Review* 62(1/2): 1–18.
- Vainiomäki, Jari.** Forthcoming. "The Development of Wage Dispersion and Wage Rigidity in Finland." *Finnish Economic Papers* 29(1).