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A scoping review of the literature

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ARTICLE

Inequalities in higher education in low- and middle-income countries: A scoping review of the literature

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Abstract

Motivation: Higher education is regarded as a key instrument to enhance socioeconomic mobility and reduce inequalities. Recent literature reviews have examined inequalities in the higher education systems of high-income countries, but less is known about the situation in low- and middle-income countries, where higher education is expanding fast.

Purpose: The article reviews the academic literature on higher education in low- and middle-income countries using a research framework inspired by social justice and capability approaches. It considers the financial, socio-cultural, human and political resource domains on which people draw, and how they relate to access, participation and outcomes in higher education.

Methods: A literature search for studies explicitly discussing in-country inequalities in higher education revealed 22 publications. Substantial knowledge gaps remain, especially regarding the political (and decision-making) side of inequalities; the ideologies and philosophies underpinning higher education systems; and the linkages between resource domains, both micro and macro.

Findings: The review highlights key elements for policy-makers and researchers: (1) the financial lens alone is insufficient to understand and tackle inequalities, since these are also shaped by human and other non-financial factors; (2) sociocultural constructs are central in explaining unequal outcomes; and (3) inequalities develop throughout one's life and need to be considered during higher education, but also before and after. The scope of inequalities is wide, and the literature offers a few ideas for short-term fixes, such as part-time and online education.

Policy implications: Inclusive policy frameworks for higher education should include explicit goals related to (in)equality, which are best measured in terms of the extent to which certain actions or choices are feasible for all. Policies in these frameworks, we argue, should go beyond providing financial support, and also address sociocultural and human resource constraints and challenges in retention, performance and labour market outcomes. Finally, they should consider relevant contextual determinants of inequalities.

KEYWORDS

capability approach, higher education, inequality, low-income countries, middle-income countries, resource deprivation, socioeconomic mobility, social justice

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1 | INTRODUCTION AND BACKGROUND

Around the world, policy-makers use education as a means for reducing socioeconomic inequalities (Ilie & Rose, 2016; UNESCO, 2020). Primary and secondary education were the main focus of development policy in the 1980s and 1990s, but in the 2000s more attention is being paid to higher education (HE) (Post et al., 2004). HE—for which we adhere to the UNESCO definition as “all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments, that are approved as institutions of higher education by the competent State authorities” (UNESCO, 1993)—is frequently described as a key instrument to tackle inequalities by creating a level playing field, i.e. providing equal socioeconomic opportunities. This is illustrated by the inclusion of HE in the Sustainable Development Goals (SDGs) target 4.3 and as a cross-cutting factor in many other goals (UN, 2015). Evidence from high-income countries (HICs), however, suggests that, in a context of worldwide HE expansion, students from disadvantaged backgrounds still have fewer opportunities during and after they are enrolled in HE. The situation in low- and middle-income countries (LMICs) is less well known, and a synthesis of the scholarship is long overdue. Our scoping review explores available evidence from HE systems in 16 LMICs and identifies research gaps and policy recommendations. We also introduce an analytical framework informed by social justice and capability approaches and literature reviews of inequalities in HICs to explore inequalities in terms of HE access, retention, performance and career outcomes.

Since the turn of the century, the expansion of HE systems has featured visibly in development strategies. Two elements help explain this prominence. First, research and key international development players such as the World Bank and the International Monetary Fund (IMF) have emphasized the high economic rate of return at the individual and household level of not only primary and secondary, but also higher, education (e.g. Peet et al., 2015). Towards the end of the 1990s, it became increasingly clear that “economic development cannot be achieved by primary and secondary school graduates alone” (Handa & Gordon, 1999, p. 279), and that inclusive HE is necessary to make use of societies' full potential for human capital (Postiglione, 2011). Second, access to HE has been redefined as a driver for democratic socialization and citizenship (Post et al., 2004). This was set out in the Bologna Declaration on HE in Europe (EHEA, 1999) and in other landmark publications in international development around the same time, such as *Higher Education in Developing Countries: Peril and Promise*, which promotes budgetary support to HE in LMICs (Task Force on Higher Education and Society, 2000). Parallel to these developments, recent decades have seen a massive rise in HE enrolment worldwide, which has typically not been matched with a similar increase in resources (Ilie & Rose, 2016). Per student, investment in HE has decreased—except in universities that cater to the elite (Carnoy, 2011). This lack of resources heightens the need to consider quality, but also equality, in the distribution of national resources through HE systems.

In this scoping literature review, we explore the state of research on inequalities in HE in LMICs, presenting our analytical framework in section 2 and the documented evidence base in HICs in section 3. Section 4 describes our methodological approach and the characteristics of scholarship. We present and analyse the literature on LMICs in section 5. Section 6 concludes.

Our findings suggest a lack of research on in-country inequalities. Most literature focuses on the expansion of HE systems for the population at large. The less abundant literature that deals with the quality of education (a term that is almost never defined) tends to discuss resource deprivation and scarcity; it does little to explain why certain individuals and groups are disproportionately affected, thus creating unequal outcomes. The few publications that engage with in-country inequalities stress that these exist at different stages, from access to career outcomes. The findings underline the need to look beyond financial interventions and pay more attention to approaches that combine economic,

sociocultural, human and political elements. Three notable knowledge gaps in LMIC-focused studies have to do with how inequalities interact with: (1) political resources; (2) ideologies and philosophies underpinning HE systems; and (3) the linkages between different types of resources and multidimensional resource deprivations. Based on these findings, the discussion and conclusion section also makes recommendations for both research and policy, and for the further development and use of our analytical framework.

2 | ANALYTICAL FRAMEWORK

We identified six comprehensive literature reviews on inequalities in HE in HICs. The analytical frameworks used in these reviews are inconsistent with each other and do not provide a ready-made approach for the present article. They do, however, stress two important elements. First, they identify “stages,” or “phases,” in HE—the distinction between access, retention, performance and career outcomes (Crawford et al., 2016). Second, they approach inequalities as multidimensional and intertwined in nature (Gorard & Smith, 2006; Herbaut & Geven, 2019; Younger et al., 2019).

A more useful starting point for developing an analytical framework is the debate on “quality education.” In a widely read paper, Tikly and Barrett (2011) propose a definition of quality as “developing whatever capabilities society and individuals have reason to value,” which directly resonates with the capability framework developed in the seminal work of Amartya Sen and Martha Nussbaum (see Anand et al., 2005, for a useful discussion). In this framework, well-being—which societies have the moral goal to maximize—is the result of the choices and actions, or “functionings” (all the “beings” and “doings”) that individuals make and take. The notion of capability reflects the set of feasible functionings a person can achieve. It is determined by choice (agency), personal characteristics and external factors. The connection with inequalities is self-evident here, as education capabilities may vary across individuals and countries and may, or may not, include functionings such as “becoming an educated professional” or even “studying.” It is not our intention to re-analyse each paper using the capability framework—we simply do not have the data to do that—and the operationalization of capabilities is notoriously difficult. The insights from the social justice and capabilities frameworks, however, especially as developed by Sosu et al. (2018) and Hodgkinson-Williams and Trotter (2018), provide useful distinctions between different levels of constraints and opportunities and their interactions. As Sen notes: “individuals belonging to the same disadvantaged group can differ in the extent to which they convert opportunities into achievements. This is a result of the different personal, environmental and social limitations they may encounter” (Sen, 1999, as cited in Sosu et al., 2018, p. 3).

Sosu et al. (2018) developed the conceptual analysis of these “different personal, environmental and social limitations” embedded in social, cultural and political resource deprivations, to construct a framework informed by social justice and capabilities that they then apply to the study on inequalities in Scottish education policy. We use their framework, with some adjustments, and also integrate elements from Hodgkinson-Williams and Trotter (2018), who developed a social justice framework to understand open educational resources and practices in LMICs. We structure our framework around four non-mutually exclusive analytical categories (Table 1) that we address, following Sosu et al. (2018), as “resource domains.” We also consider macro-level factors (such as the policy framework discussed by Sosu et al. (2018) in our review, which we discuss before the resource domains. While such factors are typically not extensively examined in the reviewed literature, they help understand why similar resources do not always provide the same outcomes for everyone by including the vantage point of states and institutions. They also allow us to put inequalities in HE in a global context shaped

TABLE 1 Framing the resource domains from a micro-level perspective

Domain	Definition	Level
Financial resources	Economic opportunity to make use of educational institutes	individual/community
Sociocultural resources	Non-physical, value determined by institutionalized hierarchies of cultural value (including networks)	community
Human resources	Carried by the individual—a result of agency, circumstance and personal characteristics	individual
Political resources	Level of influence on decision-making processes	individual/community

Note: definitions derived from Sosu et al. (2018) and Hodgkinson-Williams and Trotter (2018), with minor changes

by international relations. This attention to structural factors provides much-needed context to the resources of Table 1 (which they will affect differentially).

There are three main ways in which we slightly diverge from Sosu et al. (2018) when operationalizing our resource domains. First, keeping in mind the relevance of the life-course perspective, we consider the relevance of personal characteristics and past choices and actions, and thus add a human resource domain. This addition allows a more “dynamic” understanding of inequalities, such as Witenstein and Palmer (2013) propose, featuring the role of agency as well as external (structural) forces. Second, we merged the social and cultural domains, which are difficult to disentangle without going into considerations that are beyond the scope of this article. Third, we follow Hodgkinson-Williams and Trotter’s (2018) definition of political resources: where most definitions of political resources are limited to a focus on representation, political resources should also include broader issues of decision-making power.

3 | INEQUALITY IN HIGHER EDUCATION: HIGH-INCOME COUNTRIES

Before we discuss and apply our framework to the evidence in LMICs, we use it to present the evidence on inequalities in HE in HICs, synthesized in six literature reviews (see summary in Table A1). The aim is not to undertake a systematic comparison of findings between HICs and LMICs but rather to test our framework and to enrich the discussions in section 6.

3.1 | Macro-level developments and structural inequality

The six reviews highlight macro-level developments and inequalities that affect individual opportunities and capabilities. They invite caution when comparing educational outcomes; as Sen’s capabilities framework highlights, similar constraints may translate into different opportunities depending on the context. The two most represented contexts are the UK and the US; class is portrayed as the main divider in the UK (e.g. Crawford et al., 2016) while race and ethnicity are more prominent in the US (e.g., Younger et al., 2019). This does not mean, of course, that race does not matter in the UK, or that class does not matter in the US, but the literature suggests different inequality dynamics. The literature reviews also invite us to pay attention to another set of factors that complicate attempts to draw lessons from any given context: the different architectures of HE systems, including the philosophical

approach to HE (including considerations regarding its instrumental and intrinsic values and whether access should be dependent on performance, or universal),¹ who pays for it (taxpayer versus student), and the outcomes of prior interventions, add further nuance to the picture. Finally, the literature discussing macro-level factors naturally invites a more international perspective: as the frequently cited example of Scotland shows, the abolition of tuition fees reduces inequalities domestically, but it does not provide disadvantaged students with opportunities outside Scotland, and thus does not address their under-representation in the rest of the UK and globally (Sosu et al., 2018). Similarly, the expansion of HE reduces inequalities in the short run, but may lead to a phenomenon of diploma devaluation and “over-education” in the long run and on the international stage that may, in turn, disproportionately affect the most vulnerable (Gorard & Smith, 2006; Kromydas, 2017).

3.2 | The role of resources at the micro level

We now shift the lens to the individual and household levels and the resources that influence one's capability to benefit from HE.

3.2.1 | Financial resources

Students who lack financial resources are under-represented and disadvantaged in all phases of HE and beyond. High tuition fees exacerbate the issue (Herbaut & Geven, 2019), but earlier life experiences and learning trajectories are also key and related to economic backgrounds (Crawford et al., 2016). However, Gorard and Smith (2006) point out that “there is a danger that the widening participation debate is being hijacked by fees and finance issues at the expense of more far-reaching institutional change” (2006, p. 114). In line with recommendations, most reviews make a case for multifaceted interventions that go beyond simple financial incentives (Herbaut & Geven, 2019; Younger et al., 2019). The US example illustrates this, showing that a low-income background makes it less likely for someone to apply to HE or aid in the first place, thus excluding them from financial aid (Herbaut & Geven, 2019; Younger et al., 2019). Beyond access, students from a background with lower parental income have been shown to experience a higher drop-out rate and are less likely to enter top professions, all other things being equal (Crawford et al., 2016). In other words, HE in itself often does not level the playing field. Moreover, graduates from lower socioeconomic backgrounds tend to earn less (Gorard & Smith, 2006), possibly because they can afford less time and flexibility on their job search after graduation (Crawford et al., 2016).

3.2.2 | Sociocultural resources

The influence of sociocultural variables is less clear, but there is evidence that: (1) students who are the first generation to attend university are less likely to apply than others; and (2) children whose parents have achieved HE are more likely to enter elite universities (Younger et al., 2019). Furthermore, race, ethnicity and gender are very visible fault lines, especially in the US (Crawford et al., 2016). The mechanisms that underpin such findings, and whether they are direct or indirect (through the internalization of ideas and behaviours), are often disputed. Socioeconomic environment, beyond income

¹Discussions on the prevalence and impact of these considerations are beyond the scope of this article.

strictly speaking (based on employment, residence, race and gender) is mentioned as a key factor as it affects perceptions and aspirations and related capabilities and functionings. The mechanisms through which sociocultural resources affect career outcomes are also documented: social networks are often key to finding a job, while gender- and race-based discrimination in the job market also affect graduates (Crawford et al., 2016).

3.2.3 | Human resources

What we identify as human resources is intrinsically linked to the other domains, and partly a product of them. Past educational attainment is a case in point: in the access phase, better “quality” prior education (learning effectiveness, learning skills) increases academic preparation and thus performance (Sosu et al., 2018; Herbaut & Geven, 2019). It also sends a signal: the “evidence of being trainable” (Gorard & Smith, 2006, p. 46). Other factors, such as intrinsic motivation and aspiration, are less tangible but have been connected to financial considerations, time availability, information (Gorard & Smith, 2006; Herbaut & Geven, 2019) and social class (Crawford et al., 2016). Younger et al. (2019) mention subject choice, self-esteem, self-reported aspirations as well as emotional and aspirational barriers as possible factors in the success of access programmes. Again, the extent to which factors in the social environment are contributing to this in the form of internalized perceptions and behaviour remains a contested field of study: in the retention and performance phase, Herbaut and Geven (2019) mention that behavioural deficits of students from disadvantaged backgrounds are relevant, but the evidence is limited. Other intrinsic factors, such as negative self-identity, are suggested as being potentially relevant, but they are not part of their study. It is clear that prior education matters, but sometimes in surprising ways: Crawford et al. (2016) find that in the US, some people from worse-performing schools actually perform better in HE, possibly because they are more autonomous learners.

3.2.4 | Political resources

The role of politics in inequality (Herbaut & Geven, 2019) and institutional change (e.g. Gorard & Smith, 2006; Sosu et al., 2018) is important, but these studies pay little attention to the inclusiveness of decision-making processes. HE can be seen as a “mechanism where adults exercise their influence over the younger in order to maintain the status quo they desire” (Kromydas, 2017, p. 2). Such arguments are part of longstanding academic debates, but none in this selection has sought to document the interplay between the (potential) co-creation of education systems and inequalities. Gorard and Smith (2006) mention the diversity of university staff as a factor, but attribute their value to their function as role models.

3.3 | Overview

This brief overview of the literature suggests a number of points for researching inequalities in HE. First, a life-course approach is key. Resources become important long before HE, and do not end with access to HE: inequalities persist in retention and performance at the HE institution as well as in career outcomes. Second, the impacts of resources are not predictable or linear: they can work differently in different contexts (e.g. elite versus open universities) and in different stages throughout the course of

one's life, affecting functionings and capabilities. Third, developments and policies at the macro level are relevant to the outcomes for individuals and households as they influence agency: the freedom to make choices regarding HE.

We can also make several observations regarding the different levels and domains in our analytical framework: (1) the role of financial resources is most represented in the evidence reviewed in these papers; (2) the role of sociocultural resources are the most difficult to disentangle, both from each other and from other resource domains and thus provides less clear evidence; (3) the human resource domain is most susceptible to influence by individual agency (e.g. aspiration or motivation), but the extent to which an individual is capable of overcoming challenges in spite of limitations in other domains is less clear; and (4) political resources or power—conceptualized as the extent an individual has control of, influence over, or voice in the design of education systems—come up sporadically in the literature, which suggests a gap in this domain.

4 | METHODS

Following the guidelines of Arksey and O'Malley (2005) for scoping studies, we adopt a broad research question and are not initially concerned with assessments of the quality, methodology or analytical frameworks of the chosen literature: the general aim of this scoping review is to identify research gaps and review the evidence based on a sample of existing literature. We explored the Web of Science database with keywords reflecting: (1) descriptors of HE or post-secondary education; (2) countries identified as LMICs; and (3) inequality, socioeconomic mobility and some typical markers of socioeconomic inequality such as class, gender or ethnicity. The search terms were based on the concepts used in the six reviews presented above. (Table A2 in the appendix presents the general group categories as well as the complete search string.) The review focuses on publications in English in the social sciences—including fields such as Economics or Education—where most debates and research on inequalities in HE feature.²

This search provided 385 results, predominantly from sociology, anthropology, economics, area studies, political studies, education and multidisciplinary studies. We present the selection process in Figure 1. The first four stages of the selection were based on a review of titles and abstracts, while the final stage was based on a full-text reading of the publications. In the third stage, we categorize the results along with their level of analysis (case studies, comparative case studies and global in scope) and their focus on either the instrumental value (function) of education to broader society, or the improvement of HE systems. The latter is marked by two distinct bodies of work on different types of online teaching methods, as related to the effective expansion of HE; and the economic barriers to participation in HE (possibly the most publicly debated barrier). The dominant discussion, which encompasses 62% of the articles, is on HE as an instrument to further LMICs in the global context. This reflects a dominant framing across a whole range of articles: in LMICs where the majority of people suffer different forms of resource deprivation, it is suggested that the primary focus should be on the functioning of the system in general and its expansion rather than on the experience of specific groups within society. The implicit assumptions seem to be that, either inequalities between groups within countries do not matter in LMICs (a point we challenged in the introduction) or that the expansion of

²This is, of course, a limitation of our study. Although we would not expect them to be a prime outlet for discussions on inequality in HE in LMICs, the issue may be touched on by Medical, Humanities, Arts, and Science, Technology, Engineering and Mathematics journals.

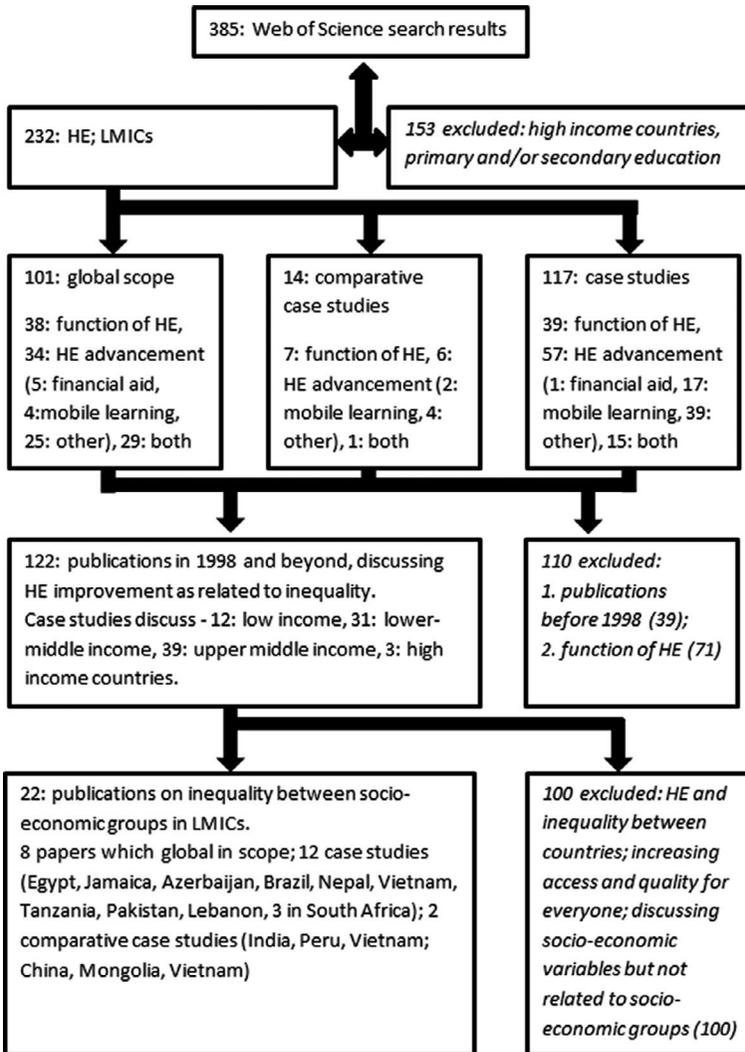


FIGURE 1 Selection criteria

HE automatically creates more equality, which we have seen is a problematic assumption based on the findings presented in HICs.

A substantial part of the literature is relatively dated, and we made the decision in the final stages of selection to take 1998 as a cut-off point to ensure consistency and comparability throughout our analysis. Under the joint forces of economic globalization and international agreements, the landscape of HE has drastically changed since 2000, in particular in terms of expansion (reach) and structure. It was the year the Bologna Declaration was signed; formally, this concerned the restructuring of HE in Europe but, in practice, many non-European countries decided to align their system to the one laid out in Bologna. Two years later, the influential Task Force on Higher Education and Society report *Higher education in developing countries: Peril and promise* argued for the provision of support for HE in LMICs, signalling a shift in the discussion beyond primary education as the principal means to promote economic growth and inclusion. HE expansion was starting to become very visible (Figure 2).

After excluding pre-1988 literature and literature that did not discuss inequalities before, during or after HE, 122 results remained. Figure A1 and Table A4 (in the online supplementary material)

Tertiary Education Gross Enrolment Ratio (UNESCO Statistics, 2020)

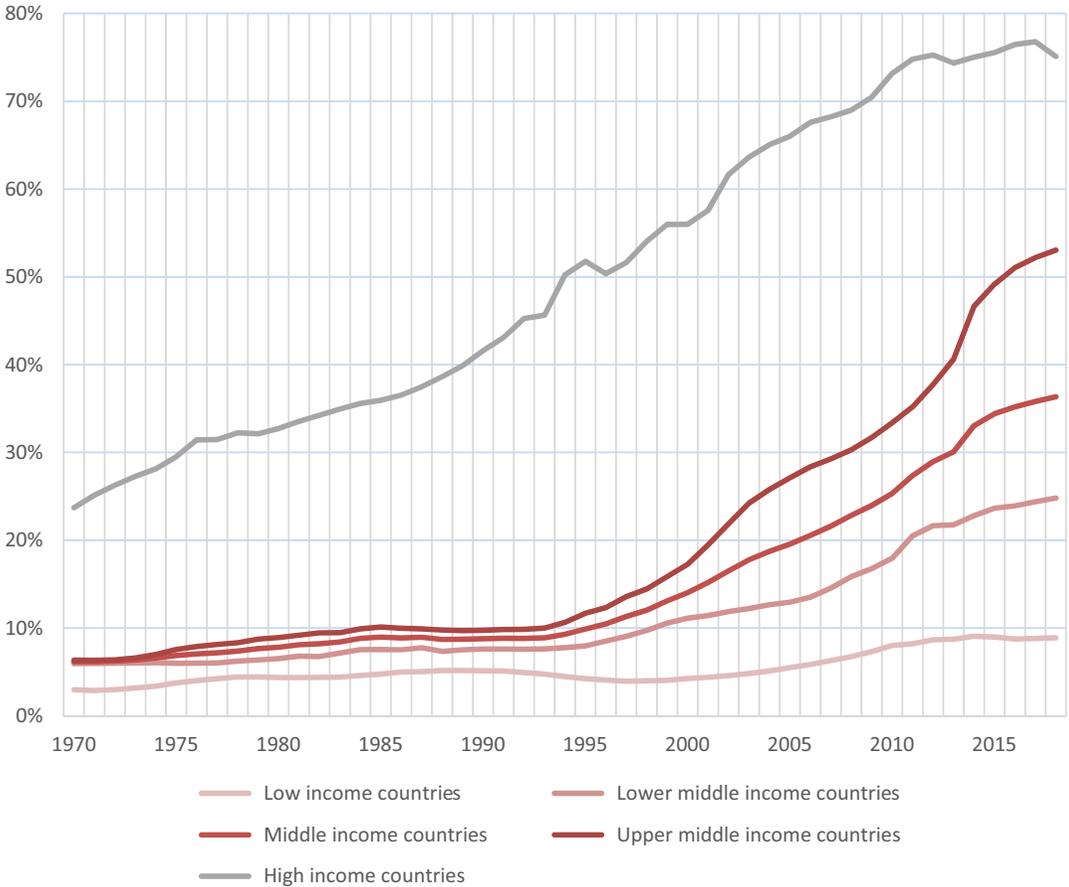


FIGURE 2 Tertiary Education Gross Enrolment Ratio (UNESCO Statistics, 2020)

provide an overview of their geographical spread. There is a clear bias in favour of middle-income, and even more so upper-middle-income, countries: only 12 papers look at contexts widely described as low income according to the categories of the World Bank and United Nations. These papers include Benin, Ethiopia (three papers), Mozambique, Nepal (one paper), Senegal, Tanzania (three papers) and Uganda.

In the final stage, the selection was based on a full-text reading of the publications. In this stage, only publications that specifically address the relationship between inequality at the national and subnational level and socioeconomic background, were included. We found that many articles discuss the role of socioeconomic factors in HE participation, such as the extent to which the social environment affects educational choices (Al-Adwan et al., 2018) or the causes of high drop-out rates among part-time students (Raturi et al., 2011). However, these issues are rarely connected to in-country inequalities, or the question of why certain resource deprivations matter for some but not for others. They do not reflect the complex role of socioeconomic background on structural factors and agency in capability development and their conversion into functionings. Addressing policy challenges based on these studies' findings is likely to result in an overall rise in enrolment and performance, but some will benefit more than others, thus exacerbating inequalities in the long run. Finally, the exclusion

criteria of earlier stages were also applied in this stage, and some articles were excluded based on their full reading.

We were left with 22 publications: eight papers that are global in scope, 12 case studies (in Azerbaijan, Brazil, Egypt, Jamaica, Lebanon, Nepal, Pakistan, South Africa (three case studies), Tanzania and Vietnam) and two comparative case studies (India, Peru, Vietnam; China, Mongolia, Vietnam). We discuss their results in the next section.

5 | INEQUALITY IN HIGHER EDUCATION: LOW- AND MIDDLE-INCOME COUNTRIES

This section discusses 22 articles on inequality in HE in LMICs, following the analytical framework presented in section 2. We start with a brief description of the structural characteristics and trends at the macro level and then discuss the findings along resource domains and summarize the findings in Table A3. Most of the literature presents cross-sectional findings, which means that it is often difficult to fully capture the life-course implications of inequalities in HE. Longitudinal data are rare and, as Sánchez and Singh (2018, p. 261) note: “while higher education has also increased rapidly in many countries in the last two decades [...] we know much less about the relevant life-cycle determinants of access, especially in developing countries.” They also argue that there is a research gap on the determinants and consequences of the type of education track chosen by students and the quality of education (understood here as test scores) imparted by different types of HE institutes. Similarly, Ilie and Rose (2016) suggest the need for more research on institutions, programmes and courses related to learning by different social groups, and how this leads to certain trajectories and career outcomes.

5.1 | Macro-level developments and structural inequality

Inequality dynamics may manifest differently in different societies, including LMICs, although LMICs also share (some) circumstances at the macro level that create structural barriers to HE related to socioeconomic background. According to Carnoy (2011), key trends in the political economy of HE shared across countries include: (1) rising returns to university education (compared to primary and secondary); (2) decreasing difference in public spending between higher and lower levels of education; and (3) increasing spending differences between mass (often public) universities and those that cater to the elites. Most of the literature we reviewed did not systematically include macro-level factors in their analysis. When they were, two categories of factors are described as related to inequalities in HE: financial and infrastructural constraints, and positioning in the global market of education—both factors crucially shape (aspiring) students' opportunities and capabilities.

First, LMICs have limited resources. Those are amply discussed in the academic and policy debates regarding the expansion and quality of education systems (e.g. Kara, 2018; Schofer & Meyer, 2005), and sometimes feature in publications dealing with inequalities. Müller and Haller (2012) report a lack of quality resources and infrastructure in Tanzania, while Letseka and Pitsoe (2014) mention dysfunctionality in South African public schooling, where rural and township schools are of lower quality, thus hampering the development of the “epistemological access” necessary for HE. Despite significant expansion, most LICs offer “elite access,” as opposed to the “mass” or “universal”

access offered in HICs (Ilie & Rose, 2016).³ Related to this is regional inequality, where communities are underserved due to limited HE infrastructure at the local level (but not necessarily at the national, Müller & Haller, 2012; Nawaz & Kundi, 2010; Ntshoe, 2003; Peet et al., 2015; Sánchez & Singh, 2018; Witenstein & Palmer, 2013; Bertolin & Leite, 2008). These disadvantages extend beyond the presence of HE institutions: for example, rural youth experience difficulties in accessing HE (Sánchez & Singh, 2018) due to lower parental education and wealth (Peet et al., 2015), and differentiated perceptions of and attitudes towards educational technologies used for online learning (Nawaz & Kundi, 2010). Beyond access, people in rural areas are disadvantaged in the HE resources available to them (Ntshoe, 2003) and they experience lower rates of return (6.9%) than students in urban areas (7.9%)—although there are significant regional discrepancies: 9.6% in Africa, but only 6.3% in Eastern Europe, and 4.4% in Asia (see Peet et al., 2015).

Second, the forces of international education (including aid) and globalization affect education in LMICs, but in ways that are different than in HICs (Kromydas, 2017), and affect capabilities accordingly. In Brazil in the 1990s, for instance, public resources were directed towards primary and secondary education, leaving the HE sector a free market to be served by private and for-profit institutions. While this situation is associated with high participation rates in HE, it is also clear that it did not (sufficiently) encourage equity, effectiveness, and diversity. Other studies underline how local, regional and global economic shocks have had a fundamental (but diverse) impact on the development of, and relationship between, private and public HE systems in countries including China, Mongolia and Vietnam (Postiglione, 2011). Ntshoe (2003) mentions a power-play between market and government in the context of a global competition marked by increasingly exclusive loan and funding systems and the commodification of education. Countries with higher initial levels of human capital are likely to suffer less from these effects, as the global system favours formally educated labour—the impact of these processes are thus likely to be exacerbated in LMICs.

It is useful to note that, in contrast to the suggestion made by authors working on HICs, Peet et al. (2015) looked at the Living Standard Measurement Surveys of 25 LMICs between 1985 and 2012 and “do not find that the rapid increases in education throughout developing countries have led to a decline in the returns to education. Between the pre- and the post-2000 period average returns increase by only 0.2 percentage points from 7.3% to 7.5%.” They also find that, as opposed to other claims, rates of return are not higher in these 25 countries than in HICs. Finally, political discourse in relation to inclusive policy and social stratification and the extent to which this is implemented (see Witenstein & Palmer, 2013; Mollaeva, 2018) as well as demographics, notably population growth (Ilie & Rose, 2016; Post et al., 2004; Postiglione, 2011) are key factors in the organization of HE. This is likely to be true in all types of contexts, but the history and outcomes are diverse. The identification of similar discourses could provide a valuable comparison, both between different LMICs and with HICs.

5.2 | Financial resources

Economic maldistribution is abundantly discussed in the literature: unsurprisingly, poorer students are less likely to access HE. Ilie and Rose (2016) provide an overview of inequality in HE in 35 South Asian and African countries: in only four of them (Bangladesh, Comoros, Nepal and Pakistan) do more than 5% of the poorest half of young people access HE. Moreover, in those four countries, stark

³A definition of these categories is mentioned in Ntshoe (2003, p. 382): “HE systems that enrol up to 15% of the target group should be regarded as elite systems, those that enrol between 15 and 40% as mass systems, and those that enrol more than 40% as universal systems.”

inequalities remain as better-off youth are found to be three to five times more likely to access HE. Financial resources continue to play a role in the later stages of retention and performance through different channels. The most obvious and better-documented difficulty is to earn enough money to live on while studying, which restricts students' education capabilities. Many students need to work long hours alongside their studies, which limits their focus on pursuing HE (Letseka & Pitsoe, 2014). For instance, Müller and Haller (2012) find that in Tanzania (St. Augustine University, a mid-ranking private university), 90% of active students report financial problems, and 30% have problems with paying basic living expenses. As in other contexts, difficulty paying for tuition often leads to exclusion from programmes and examinations. "Perverse" corruption mechanisms are also at play in contexts such as Vietnam, where paying bribes for enrolment or grades is reportedly widespread and influences access, retention and performance (McCornac, 2015). Financial resources also affect the level of vulnerability of certain income groups to external economic shocks, as is shown in China, Mongolia and Vietnam: poverty and vulnerability have a negative influence on the choice of attending a certain type of HE (or HE altogether), the ability to complete a programme and repay loans at a later stage, and the level of information on programmes and labour markets (Postiglione, 2011). Further, students from poor backgrounds are more likely to drop out, and more likely to attend institutions that experience a fall in quality (both in the narrow and wider sense explained earlier) during a recession.

5.3 | Sociocultural resources

The relevance of sociocultural resources is clear across the literature. In India, Peru and Vietnam, having one or more parents with (post-)secondary education is correlated with attending HE (Sánchez & Singh, 2018, p. 270). A possible underlying mechanism, besides the idea that parents' education may result in sufficient financial resources to access HE and provide a better learning environment, is the idea of epistemological access described by Letseka and Pitsoe (2014). They argue that better-educated parents have social networks that allow prospective students to know and understand the experience of university study. It must be noted that parental education seems to matter differently for boys and girls. In Tanzania, Müller and Haller (2012) find that 31% of fathers and 17% of mothers of male students have college or university education, but these figures jump to 56% and 41% for girls.

Gender is a key theme across the literature. Across their 35-country sample, Ilie and Rose (2016) find that young men are, on average, more likely to gain access to HE than young women. Furthermore, Sánchez and Singh (2018) find that in earlier cohorts in their case studies (1950s and 1960s), men were always more likely to enrol in HE. Currently, in India, this gender gap has widened, while in Vietnam and Peru, it has reversed: women are now over-represented in HE. Intra-household decisions also matter and Sánchez and Singh (2018) find that, in India, parental and children's aspirations expressed at the age of 12 are important determinants for access, and often show gender biases that negatively affect girls. In Nepal, Witenstein and Palmer (2013) argue that education decisions are usually made by parents or husbands. As a result, women are strongly under-represented in HE as well as in faculty. Nepalese girls and women are further affected by labour expectations resulting from a reproduction of cultural gender norms inside the HE institutional settings; marriage as a key reason for drop-out; and regional inequality, which affects women more strongly than men. Gender norms are also mentioned by Mollaeva (2018), who reviews the role of environmentally and culturally informed stereotypes that prescribe personal qualities, normative patterns of behaviour and opinions in Azerbaijan. The author argues that such stereotypes are internalized by the individual, confirming the connection between

the sociocultural and human resource domains. These stereotypes influence women beyond access, through factors such as perceptions in labour markets, which affect the rates of return for women, or the relevance of “hidden” curricula—the “hidden” referring to the (unintentional) transmission of gendered attitudes through learning and social behaviour. Müller and Haller (2012) cite research demonstrating that women are disadvantaged in terms of performance because they typically combine their studies with more domestic responsibilities than men. In terms of career outcomes, Nilsson (2019) finds that women experience longer school-to-work transitions and are paid less when finding a job. He suggests that they suffer, among other things, from gendered labour-market characteristics and male-dominated professional networks. This finding is in line with some findings in HICs, however it appears paradoxical when put in perspective with studies such as Peet et al. (2015), who find that returns to education in most LMICs are higher for women than for men (8.6% increase in earnings per year of schooling, compared to 7.1% for men).

Race and ethnicity are found to be entrenched in societies in diverse and complex ways. They are not much discussed, with the notable exception of South Africa. Ntshoe (2003) shows that South African HE institutes are still divided along racial lines. Quality (a term that is not defined) and finance issues are rampant at what are called “historically black universities” that have traditionally presented an entry point to HE for disadvantaged groups. Equal representation in HE at the national level must be understood carefully in that context if the quality of education is suffering in institutions primarily attended by a specific group. In Brazil, the expansion of (private) HE has come along with a higher increase in participation of black populations (193% as opposed to 115% for white populations), but has not resulted in equal participation rates (Bertolin & Leite, 2008). Witenstein and Palmer (2013) further find that in Nepal the effects of gender are stronger for women in marginalized ethnic or caste groups.

5.4 | Human resources

Human resources are characteristics attached to individuals, which develop over the course of lived experience.⁴ Ilie and Rose (2016) argue that inequality in access to HE mostly stems from heterogeneous primary and secondary education levels. Similarly, Sánchez and Singh (2018) find that test performance in mathematics and vocabulary at the age of 12 is an important predictor for accessing HE. Letseka and Pitsoe (2014) add that the extent to which secondary education prepares for learning is also key. Access to suitable primary and education is notoriously predicated on socioeconomic opportunities, but also on disabilities. HE institutions are found to be rarely fully physically accessible to persons living with disabilities, when not simply refusing students because of their disability. Students living with disabilities who do enrol in HE rarely receive appropriate course materials and curricula. Moreover, with strong linkages to the sociocultural domain, attitudes towards physical disabilities among faculty and staff, and students with and without disabilities, are a major barrier to full participation and inclusion (Lord & Stein, 2018). This clearly illustrates how individual resources interact with institutional-level constraints and ultimately shape opportunities and capabilities.

Distance and online learning is regularly described as a way to expand access and allow students in diverse situations and from diverse backgrounds to access HE, and eventually provide

⁴The debate on what should be considered intrinsic to the individual and may or may not evolve over time is, of course, important, for example in discussions on factors like aspiration, willingness, perception and culture in the use of educational technologies (e.g. Al-Adwan et al., 2018; Nawaz & Kundi, 2010; Tarhini et al., 2017), but it is not within the scope of this review.

better opportunities in the labour market, e.g. by allowing flexible learning hours to working students (Letseka & Pitsoe, 2014). A cautious approach seems necessary, however. For example, in South Africa, Queiros and de Villiers (2016) argue that low (digital) literacy and inferior schooling are important barriers for students to access online learning opportunities, as well as for successful participation.

Less tangible personal characteristics, such as perceptions of technology—and the ways in which these vary according to gender or geographical locations—are found by Nawaz and Kundi (2010) to be instrumental for understanding whether educational technologies diminish or, on the contrary, further accentuate inequalities. Similarly, Tarhini et al. (2017) find a strong connection between elements of “culture,” namely a favourable view of individualism (as opposed to collectivism), and intent to start using online learning. The linkage between such dispositions and other factors is not clear, but their relevance is broadly recognized in the literature, and it echoes the idea of capabilities and their conversion into functionings as a complex product of intersecting factors. For example, Beladi et al. (2016) built a model to assess the impact of public policies, based on the assumption that individual education choices in resource-scarce environments are not only embedded in “actual” rates of return, but also affected by factors such as creditworthiness (in addition to parental education and the number of siblings in a household). In the retention and performance phases, Queiros and de Villiers (2016) explain that disadvantaged South African students have specific needs created by factors such as prior access to technology and self-efficacy in online learning. In that setting, the most novel or best technology may not provide the best solutions. Handa and Gordon (1999) reflect on how part-time students in Jamaica also have specific needs: they are often older and already engaged in the labour market and have family responsibilities, and therefore have different motivations and greater time constraints. Combined with their often lower educational background, this results in extremely high drop-out rates of 32% when entering normal university programmes. Human resources continue to matter after graduation. For instance, Nilsson (2019) explains that beliefs about present and future possibilities are instrumental in the school-to-work transition.

5.5 | Political resources

Similar to the literature on HICs, most discussions on the role of politics and representation do not cover participation in decisions on the HE education system or delivery. The study by Lord and Stein (2018) is the only one that explicitly mentions the relevance of including under-represented groups in HE reform, in the context of inclusive HE for people with disabilities. Ntshoe (2003), discussing the political economy of HE in South Africa, argues in favour of active redistribution of goods and resources to empower groups that are historically marginalized as key to a fair access to HE. However, he does not discuss the necessary changes in decision-making power.

6 | DISCUSSION AND CONCLUSION

While there are many differences between countries and regions, our review of the literature on LMICs reveals dynamics of inequalities that bear similarities with those observed in HICs and synthesized in other literature reviews. The resource deprivations that (re)produce inequality are complex, changing and non-linear; they are strongly influenced by developments in the global arena, the (sub-)national politico-historical context, but also by previous human capital development and choices made at the individual and community levels. However, the diversity in responses to social development, global

movements and markets underlines the need to keep the specific social and politico-historical context in mind.

6.1 | Reflections on the analytical framework

Our study introduces a framework that helps consider these specificities. It approaches the issue of inequality from the perspective of individual well-being resulting from increased capabilities and their conversion into functionings, but also provides room for connecting these dynamics with meso- and macro-level dynamics that create structural barriers for socioeconomic groups, creating space for regional, national and international perspectives. In addition, by considering “being educated” or “studying” as functionings, we are able to propose a more nuanced assessment of inequalities that recognizes the mitigating or enabling effects of choices and actions on outcomes. The framework identifies and focuses on different resource domains (financial, sociocultural, human and political) linked to agency and capability, thereby delineating clear areas for policy action. It also stresses the inter-connectedness of those areas that invite a reconsideration of oversimplified “solutions”—which historically have been context-blind and finance-focused. In light of the present study, the framework can be enriched further, particularly in terms of providing conceptual tools to explore the connections between the resource domains, describe the articulation between macro and micro levels, and accommodate the inter-connectedness of education systems, within and between countries.

6.2 | Policy highlights

Without repeating our earlier analysis, the following six findings appear particularly important for policy-makers and constitute key lessons to consider when designing interventions.

1. Financial resources come out as the most discussed and most visible of our four domains. While it is tempting to address inequalities primarily with financial aid and interventions, the literature on LMICs, like that on HICs, suggests that it is important to complement financial resources with other human and sociocultural resources.
2. Inequality should be seen as a dynamic process evolving throughout the life course.
3. The complex entanglement of micro- and macro-level factors and resources that shape education outcomes means that policy design and assessment should be considered in light of the specific politico-historical context, including an assessment of interlinkages between resource domains (in line with a capabilities framework).
4. The relevance of sociocultural perspectives and behaviours on issues such as race, ethnicity and gender are pointed out in many studies, but their nature and effects are very diverse throughout regions and countries in both HICs and LMICs. Importing policies from other contexts should thus come after a proper assessment of the relevant contextual determinants of inequalities. A prime example of this is institutional stratification which creates disadvantages along racial lines in South Africa—even when enrolment figures point to a fairer situation, HE outcomes remain unequal.
5. In the human resource domain, early educational attainment is a prominent factor in all settings. In LMICs, the often limited infrastructure for primary and secondary education suggests that students may have less agency: they are not totally able to choose to further develop capabilities, by choosing to become better educated. The development of human resources becomes more dependent on the structural environment, and less on characteristics like motivation and aspiration.

6. There are significant knowledge gaps in the study of inequality in HE in LMICs, which should be explicitly recognized and addressed.

6.3 | Knowledge gaps

Our findings highlight that, although much attention is paid to the role of socioeconomic resources and their role throughout HE, and to inequality among countries based on knowledge inequalities, very few studies look at the role of socioeconomic grouping in the (re)production of inequalities through HE, suggesting scholars' preference to study HE expansion over equity. The lack of research on the differentiated effects of resource availability to specific individuals and groups, and the origins of this differentiation, prevents a more thorough understanding of inequality dynamics in HE participation and outcomes at the (sub-)national level—an understanding that is key to addressing these inequalities and approaching issues of human development. Four gaps appear particularly salient in the reviewed literature:

First, the most obvious, and in our eyes pressing, is the study of people's and students' involvement in the decisions affecting (the design of, and access to) HE systems. Our "political resources" domain is insufficiently studied. Recent developments suggest an essential part of the puzzle is missed, as illustrated by the renewed "decolonizing the university" movement that has spiralled in and beyond South Africa.

Second, and connected to our first point, the literature we reviewed pays limited attention to the philosophical and value choices that underpin the design and administration of HE systems. A different choice of keywords may have helped identify more relevant literature in this field, but nevertheless, it is striking to observe that key education "ideologies" are barely discussed. There is an element of choice in offering universal or elite education, and whether to base access on performance or offer HE to anyone. For instance, the implementation of heavily tracked systems from an early age affects access to HE. Similarly, the choice to support and develop adult education, informal education, and non-linear education trajectories did not emerge in our review of the literature. Such research would be very timely: the COVID-19 pandemic has shaken up the perception of what mainstream education means and urges us to reimagine education systems (UNESCO, 2020).

Third, the linkages between resource domains also appear insufficiently studied. This includes the extent to which the development of aspirations and motivation is a product of the social environment. The lack of clarity regarding the interaction between the sociocultural and human resource domains affect our understanding of agency in HE trajectories and HE-related socioeconomic mobility.

Fourth, there is limited reflection on the relationship between structural factors at the macro level and how these affect the comparability of contexts.

6.4 | A capabilities-informed HE agenda: Recommendations

Realizing a capabilities-informed inclusive HE agenda requires an increased focus on inequalities in research and policy (going beyond expansion). This includes carefully thinking about the desired outcomes and processes of HE, and revising policy strategies and assessment tools accordingly, so that they reflect the complexity of inequalities. A focus on inequalities measured as enrolment or the use of financial aid is insufficient as it fails to reflect education capabilities. Following our analytical framework, policies and assessments need to consider both micro and macro levels, both structural factors and agency, as well as a timeframe that spans the life course. This will mean collecting additional evidence that goes beyond

expansion, recognizing not only heterogeneity of outcomes for populations between countries, but also within countries. This includes substantial primary data collection but also co-ordination and documentation of data sources and initiatives already in place, at the national and cross-country level. Policy-makers have a role to play in this ecosystem of knowledge production. Reformulating policy aims to focus more on inequality from a capabilities perspective implies asking different questions and making assessments that consider the actual learning incentives and outcomes provided by resource distribution.

Finally, the “mainstreaming” of inequality issues in both academia and policy should be done cautiously, avoiding blank statements and vague definitions that merely pay lip service to a concept that has become fashionable again. It is also urgent. The challenges to sustain and promote HE in LMICs are huge—but so are the opportunities for rethinking fairer HE systems.

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APPENDIX

TABLE A1 Inequality in HE in high-income countries

Access	Financial resources	Sociocultural resources	Human resources	Political resources
	Economic disadvantage	Parental education	Educational attainment	
	Crawford et al., 2016	Crawford et al., 2016	Crawford et al., 2016	
	Sosu et al., 2018	Type of parental employment	Herbaut & Geven, 2019	
	Herbaut & Geven, 2019	Crawford et al., 2016	Gorard & Smith, 2006	
	Younger et al., 2019	Kromydas, 2017	Sosu et al., 2018	
	Gorard & Smith, 2006	Educational attainment in the family	Motivation / aspiration	
		Younger et al., 2019	<i>(created by the self, and the social environment)</i>	
		Access to information	Gorard & Smith, 2006	
		Herbaut & Geven, 2019	Crawford et al., 2016	
		Gorard & Smith, 2006	Herbaut & Geven, 2019	
		Gender	Innate ability	
		Crawford et al., 2016	Crawford et al., 2016	
		Ethnicity or race	Behavioural deficits that influence decision-making	
		Crawford et al., 2016	<i>(created by the social environment)</i>	
		Younger et al., 2019	Herbaut & Geven, 2019	
		Family environment that encourages abilities and traits		
		Kromydas, 2017		
		Parental familiarity with the university system		
		Crawford et al., 2016		
		Parental motivation and support		
		Crawford et al., 2016		
		Discriminatory practices		
		Herbaut & Geven, 2019		

(Continues)

TABLE A1 (Continued)

	Financial resources	Sociocultural resources	Human resources	Political resources
Retention and performance	Economic disadvantage Crawford et al., 2016 Herbaut & Geven, 2019 Gorard & Smith, 2006 Younger et al., 2019	<i>Interaction of factors that can be difficult to measure or predict (such as family circumstance)</i> Crawford et al., 2016 Discrimination Educational attainment in the family Herbaut & Geven, 2019	Educational attainment Crawford et al., 2016 <i>Behavioural deficits that influence decision-making (created by the social environment)</i> Herbaut & Geven, 2019 <i>Negative self-identity (created by the social environment)</i> Herbaut & Geven, 2019	Co-creation of knowledge Kromydas, 2017 Influence on systemic decisions Kromydas, 2017
Career outcomes	Economic disadvantage Crawford et al., 2016 Gorard & Smith, 2006	Family background/social class Crawford et al., 2016 Gender Crawford et al., 2016 Gorard & Smith, 2006 Networks for job market Crawford et al., 2016 <i>Family networks and soft skills (e.g. self-confidence)</i> Crawford et al., 2016 Cultural capital Crawford et al., 2016	Educational attainment Crawford et al., 2016 Age Gorard & Smith, 2006 <i>Non-cognitive skills like confidence and self-esteem (created by the social environment)</i> Crawford et al., 2016	

Italics: Variables are suggested but not supported by evidence

Where literature relates human resources explicitly to the social environment, this is indicated in the table

TABLE A2 Web of Science search

Markers of HE	Markers of LMIC literature	Markers of inequality
higher education; university; post-secondary education	Low- and middle- income countries; LMIC; developing countries	socio economic status; socio economic differences; family background; family environment; social environment; social class; gender; non-traditional; under-represented; regional inequality; minority; occupation; first generation; ethnicity; culture; inequality; socio economic mobility; intergenerational mobility.

SEARCH STRING: ((((((TI=("higher education" OR "university" OR "post-secondary education" AND "low and middle income countries" OR "LMIC" OR "developing countries"))) AND (TS=("socio economic status" OR "socio economic `differences" OR "family background" OR "family environment" OR "social environment" OR "social class" OR "gender" OR "non-traditional" OR "under represented" OR "regional inequality" OR "minority" OR "occupation" OR "first generation" OR "ethnicity" OR "culture" OR "inequality" OR "socio economic mobility" OR "intergenerational mobility" AND "low and middle income countries" OR "LMIC" OR "developing countries"))) AND (SU=("Biomedical Social Sciences" OR "Business & Economics" OR "Cultural Studies" OR "Development Studies" OR "Education & Educational Research" OR "Ethnic Studies" OR "Family Studies" OR "Government & Law" OR "Social Issues" OR "Social Sciences Other Topics" OR "Sociology" OR "Urban Studies" OR "Womens Studies"))) OR (WC=Political Science" OR "Anthropology" OR "Area Studies" OR "Behavioral Sciences" OR "Psychology, Social" OR "Ethnic Studies" OR "Family Studies" OR "Social Issues" OR "Multidisciplinary Sciences" OR "Social Sciences, Biomedical" OR "Social Sciences, Interdisciplinary" OR "Sociology" OR "Cultural Studies" OR "Urban Studies" OR "Economics" OR "Womens Studies" OR "Education & Educational Research" OR "Education, Scientific Disciplines)))))) AND LANGUAGE:(English)

Refined by: TOPIC: ("higher education" OR "university" OR "post-secondary education") AND TOPIC:("developing countries" OR "low and middle income countries" OR "LMIC")

TABLE A3 Summary of the literature: Inequality in HE in low- and lower-middle-income countries

	Financial	Sociocultural	Human	Political
ACCESS	<p>Economic disadvantage Ilie & Rose, 2016; Sánchez & Singh, 2018; McCornac, 2015; Ntshoe, 2003; Postiglione, 2011</p>	<p>Gender Ilie & Rose, 2016; Sánchez & Singh, 2018; Müller & Haller, 2012; Witenstein & Palmer, 2013; Mollaeva, 2018</p> <p>Race Ntshoe, 2003; Bertolin & Leite, 2008</p> <p>Caste/ethnicity Witenstein & Palmer, 2013</p> <p>Parental education Sánchez & Singh, 2018; Müller & Haller, 2012</p> <p>Intra-household decisions, birth order and aspirations Sánchez & Singh, 2018</p> <p>Religious affiliation Müller & Haller, 2012</p>	<p>Previous educational attainment Sánchez & Singh, 2018; Queiros & de Villiers, 2016; Letseka & Pitsoe, 2014; Ilie & Rose, 2016</p> <p>Perceptions and attitudes towards educational technologies (caused by gender or place of residence) Nawaz & Kundi, 2010</p> <p>Risk aversion (influenced by the social environment) Beladi et al., 2016</p> <p>Culture (measured at the individual level) Tarhimi et al., 2017</p> <p>Physical disability Lord & Stein, 2018</p>	<p>Decision-making power Lord & Stein, 2018</p>

(Continues)

TABLE A3 (Continued)

	Financial	Sociocultural	Human	Political
RETENTION AND PERFORMANCE	Economic disadvantage Queiros & de Villiers, 2016; Letseka & Pitsoe, 2014; McCormac, 2015; Müller & Haller, 2012; Postiglione, 2011	Gender Müller & Haller, 2012; Mollaeva, 2018 Race Ntshoe, 2003	Previous educational attainment Ntshoe, 2003 Technological capability Queiros & de Villiers, 2016 Perceptions on and thus attitudes towards educational technologies, caused by gender or place of residence Nawaz & Kundi, 2010 Culture (measured at the individual level) Tarhimi et al., 2017 Epistemological access (created by the social environment) Letseka & Pitsoe, 2014	
CAREER OUTCOMES	Economic disadvantage Postiglione, 2011	Social networks Nilsson, 2019 Gender Islam & Amin, 2016 Peet et al., 2015 Nilsson, 2019 Mollaeva, 2018	Beliefs about present and future possibilities (created by social environment) Nilsson, 2019	

Italics: Variables are suggested but not supported by evidence (this occurs once in the LMIC contexts, but was found more often in studies on HICs, see Table A4)
 Where literature relates human resources explicitly to the social environment, this is indicated in the table.

TABLE A4 Geographical distribution of case studies

World Bank ranking	Low income	Lower-middle income	Upper-middle income	High income
Countries included	Ethiopia (3) Benin Senegal Uganda (2) Tanzania (3) Mozambique Nepal	Ghana (2) Pakistan (5) Nigeria (3) Tunisia (2) Cambodia Vietnam (7) Indonesia Kenya (3) India (3) Peru Egypt Mongolia Cabo Verde	Iran (4) Turkey (2) Jordan (2) Iraq Malaysia (4) Argentina Algeria Brazil (2) Thailand (3) Colombia (2) China (7) Namibia South Africa (4) Azerbaijan Peru Mexico Lebanon	Saudi Arabia Taiwan Germany
Total	12	31	39	3

Case studies included in the final phase of selection. Totals do not reflect total number of publications as some are comparative studies.

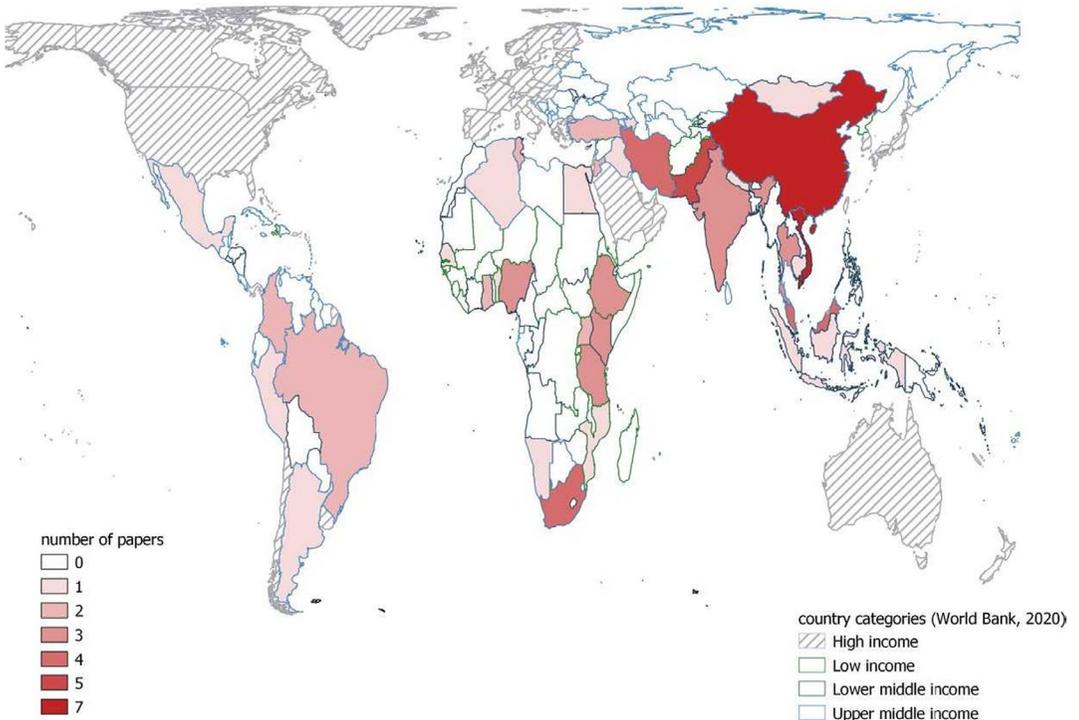


FIGURE A1 Geographical Distribution of 122 Results (Details in Table A4)