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Education, Inequality, and Labor Market Outcomes

Patterns and Trends in Educational and Socioeconomic
Transformations

Xiaojie Xu



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Academic dissertation for the Degree of Doctor of Philosophy in Sociology at Stockholm University to be publicly defended on Friday 2 May 2025 at 10.00 in Hörsal 9, Södra huset D, Universitetsvägen 10 D.

Abstract

This dissertation contributes to a deeper understanding of how profound educational and socioeconomic transformations since the late 20th century have influenced the changing relationship between educational attainment and labor market outcomes, evolving patterns of educational inequality by social background, and trends in intergenerational income mobility.

Study I examines the role of education in explaining gender differences in intergenerational income mobility in Sweden. Drawing on register data for cohorts born between 1958 and 1979, it finds that income mobility increased and then stabilized for men, while it steadily declined for women. For both genders, reduced educational inequality contributed to increased mobility. However, for women, this effect was offset by a steady rise in educational returns among cohorts born since the late 1960s. These findings offer new insights into the role of education in driving mobility patterns within the broader context of evolving gender equality.

Study II examines changes in the education–occupation linkage in Sweden from 1960 to 2013. The rapid expansion of upper tertiary education and occupational upgrading shifted composition toward more tightly linked categories. Yet these gains were largely offset by weakening structural linkages at upper secondary vocational and lower tertiary levels, where ties to specific occupations eroded considerably. Taken together, educational expansion and occupational upgrading appear relatively balanced and have jointly contributed to a closer alignment between the educational system and the occupational structure in Sweden. This underscores the importance of re-evaluating educational policies to balance skill upgrading with appropriate labor market linkages of vocational education.

Study III analyzes changes in the college wage premium across 49 countries and 810 country-years between 1980 and 2022, using data from the Luxembourg Income Study. Since 2000, there has been a marked decline in the wage premium, beginning in Latin America and spreading to Eastern and Central Europe. In contrast, most Western developed countries saw rising premiums throughout the 2000s, followed by stabilization or decline after 2010. Macro-level factors related to supply, demand, and institutions explain much of the cross-national variation but account for only part of the within-country changes. The global flattening of the college wage premium calls for further research to better understand its implications for the relationship between educational attainment and labor market inequality.

Keywords: *social stratification, labor market outcomes, education, inequality, intergenerational mobility, comparative studies.*

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For my 18-year-old self—
driven by ideals, passion,
and an endless curiosity
about the world

Plus ça change, plus c'est la même chose.

(The more things change, the more they stay the same.)

— Jean-Baptiste Alphonse Karr, 1849

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List of studies

Study I. Explaining Gender-Specific Trends in Income Mobility: The Role of Education

Revise & Resubmit at *Social Forces*

Study II. Educational Expansion, Occupational Upgrading, and the Changing Structure of Education-Occupation Linkages in Sweden, 1960–2013

Submitted Manuscript

Study III. The College Wage Premium Around the World: Trends and Predictors

Unsubmitted Manuscript

Abstract

This dissertation contributes to a deeper understanding of how profound educational and socioeconomic transformations since the late 20th century have influenced the changing relationship between educational attainment and labor market outcomes, evolving patterns of educational inequality by social background, and trends in intergenerational income mobility.

Study I examines the role of education in explaining gender differences in intergenerational income mobility in Sweden. Drawing on register data for cohorts born between 1958 and 1979, it finds that income mobility increased and then stabilized for men, while it steadily declined for women. For both genders, reduced educational inequality contributed to increased mobility. However, for women, this effect was offset by a steady rise in educational returns among cohorts born since the late 1960s. These findings offer new insights into the role of education in driving mobility patterns within the broader context of evolving gender equality.

Study II examines changes in the education–occupation linkage in Sweden from 1960 to 2013. The rapid expansion of upper tertiary education and occupational upgrading shifted composition toward more tightly linked categories. Yet these gains were largely offset by weakening structural linkages at upper secondary vocational and lower tertiary levels, where ties to specific occupations eroded considerably. Taken together, educational expansion and occupational upgrading appear relatively balanced and have jointly contributed to a closer alignment between the educational system and the occupational structure in Sweden. This underscores the importance of re-evaluating educational policies to balance skill upgrading with appropriate labor market linkages of vocational education.

Study III analyzes changes in the college wage premium across 49 countries and 810 country-years between 1980 and 2022, using data from the Luxembourg Income Study. Since 2000, there has been a marked decline in the wage premium, beginning in Latin America and spreading to Eastern and Central Europe. In contrast, most Western developed countries saw rising premiums throughout the 2000s, followed by stabilization or decline after 2010. Macro-level factors related to supply, demand, and institutions explain much of the cross-national variation but account for only part of the within-country changes. The global flattening of the college wage premium calls for further research to better understand its implications for the relationship between educational attainment and labor market inequality.

Sammanfattning

Denna avhandling bidrar till en djupare förståelse av hur djupgående utbildningsmässiga och socioekonomiska förändringar sedan slutet av 1900-talet har påverkat det föränderliga sambandet mellan utbildningsnivå och arbetsmarknadsutfall, förändrade mönster av utbildningsjämlighet efter social bakgrund, samt trender i intergenerationell inkomstmobilitet.

Studie I undersöker utbildningens roll i att förklara könsskillnader i intergenerationell inkomstmobilitet i Sverige. Med hjälp av registerdata för kohorter födda mellan 1958 och 1979 visar studien att inkomstmobiliteten ökade och därefter stabiliserades för män, medan den stadigt minskade för kvinnor. För båda könen bidrog minskad utbildningsjämlighet till ökad mobilitet. För kvinnor motverkades dock denna effekt av en stadig ökning i utbildningens avkastning bland kohorter födda från och med slutet av 1960-talet. Dessa resultat ger nya insikter om utbildningens roll i att driva mobilitetsmönster inom ramen för en förändrad könsjämlighet.

Studie II undersöker förändringar i kopplingen mellan utbildning och yrke i Sverige från 1960 till 2013. Den snabba expansionen av högre utbildning och uppgradering av yrken ledde till en förändrad sammansättning mot mer tätt sammanlänkade kategorier. Dessa vinster motverkades dock till stor del av försvagade strukturella kopplingar på gymnasial yrkesutbildning och lägre högskolenivåer, där banden till specifika yrken eroderade avsevärt. Sammantaget framstår utbildningsexpansion och yrkesmässig uppgradering som relativt balanserade och har tillsammans bidragit till en närmare anpassning mellan utbildningssystemet och yrkesstrukturen i Sverige. Detta understryker vikten av att ompröva utbildningspolitiken för att balansera kompetensutveckling med lämpliga kopplingar till arbetsmarknaden för yrkesutbildning.

Studie III analyserar förändringar i utbildningspremien för högskoleutbildning i 49 länder och 810 land-år mellan 1980 och 2022, baserat på data från Luxembourg Income Study. Sedan år 2000 har det skett en tydlig nedgång i utbildningspremien, som började i Latinamerika och spred sig till Öst- och Centraleuropa. I kontrast såg de flesta västliga industriländer stigande premier under 2000-talet, följt av stabilisering eller nedgång efter 2010. Makrofaktorer relaterade till utbud, efterfrågan och institutioner förklarar en stor del av den internationella variationen, men förklarar endast delvis förändringarna inom länder över tid. Den globala utjämningen av utbildningspremien för högskoleutbildning kräver vidare forskning för att bättre förstå dess implikationer för sambandet mellan utbildningsnivå och inkomstjämlighet på arbetsmarknaden.

Introduction

Education is a cornerstone of labor market outcomes in modern societies, shaping both the opportunities individuals can access and the unequal positions they attain. Understanding the intersection of education and labor markets is essential for designing policies that enhance individual well-being and foster national prosperity. Moreover, the emphasis on education is deeply rooted in the concept of meritocracy, which positions education as a key mechanism for leveling the playing field and promoting equality of opportunity. As a fundamental determinant of social mobility, education provides individuals from diverse socioeconomic backgrounds with access to opportunities that might otherwise be constrained by inherited privilege. Consequently, educational reforms and expansion are often viewed as crucial tools for reducing inequality and fostering mobility. By examining the evolution of education-based inequalities, this dissertation thus sheds light on how educational and labor market policies can further advance equal opportunities in the future.

This dissertation contributes to our understanding of how profound educational and socioeconomic transformations since the late 20th century have influenced the changing relationship between education, inequality, and labor markets, and their interrelations in industrialized countries. One of the most significant changes has been a global trend toward increasing participation in tertiary education since the late 20th century. In 1990, only six countries had achieved a Gross Tertiary Enrollment Ratio (GTER)¹ of 40%. By 2021, this figure had exceeded 40% globally, with high-income nations averaging around 80% (UNESCO Institute for Statistics 2024).

Simultaneously, economic and industrial shifts have reshaped labor markets, with technological progress and globalization being two dominant macroeconomic forces driving changes in labor market inequality (F. D. Blau and Kahn 2002; Katz and Autor 1999; DiPrete 2005). These forces have significantly increased the demand for high-skilled labor, closely linked to key structural changes such as occupational upgrading and job polarization, which further influence stratification processes across countries (Autor and Dorn 2013; Oesch 2013).

¹ The Gross Tertiary Enrollment Ratio represents the percentage of individuals within a specific five-year age group, succeeding secondary education, who are enrolled in tertiary-level programs (ISCED levels 5 to 8).

Moreover, the demographic composition of the labor force has evolved, with significant institutional shifts shaping educational and employment opportunities. Not only has women's educational attainment surpassed that of men, but their labor force participation has increased, along with their representation in high-skilled and leadership jobs (England 2010; Goldin 2014). Simultaneously, the growing inflow of low-skilled immigrants has altered labor supply dynamics, while institutional changes—such as skill formation systems and labor market regulations—have further conditioned how individuals navigate education and employment (Morris and Western 1999; Busemeyer 2014).

The complexities of these parallel and interwoven structural transformations make it very challenging to disentangle their independent and combined effects on labor market inequalities. While educational expansion has broadened opportunities, its interaction with technological change, globalization, demographic shifts, and institutional structures necessitates further examination to understand how these forces collectively shape patterns of social stratification and mobility across diverse contexts.

The three overarching research questions, along with their interplay, form the central focus of this doctoral thesis:

1. How has the link between educational attainment and labor market outcomes evolved over time?
2. If returns to education remain unequal, how have evolving patterns of educational attainment by social background, in turn, influenced trends in social mobility?
3. What key educational, economic, and social transformations have played a role in these changes?

The dissertation consists of three individual studies. While each study contributes to the overall research, they tackle distinct issues and are geared toward slightly different audiences. *Study I* addresses both Questions 1 and 2, focusing on education's role as a mobility strategy. Specifically, it explores whether trends in intergenerational income mobility in Sweden can be explained by changes in educational inequality and returns to education. *Study II* addresses Question 1 by moving beyond individual-level associations to examine the changing structure of the linkage between the educational system and the occupational structure in Sweden. It conceptualizes linkage strength at the level of specific educational credentials and aggregates

these into an overall measure. This approach reveals how education-occupation linkages evolve within the broader institutional framework of national skill formation systems. *Study III* expands the scope beyond Sweden, addressing Questions 1 by examining levels and trends of college wage premium worldwide. It provides the first systematic account of long-term trends in college wage premiums on a global scale.

Taken together, all these three studies try to understand Question 3 with a common focus on the role of educational expansion and occupational upgrading, while also with some additional focus. *Study I* considers the increasing gender equality in society and the economy, and brings gender into the mobility studies. *Study II* concerns how educational reforms in vocational education and training systems, within a country's general institutional framework, may restructure the education-occupation linkage. *Study III* particularly distinguishes between within-country trends and cross-national differences in the college wage premium, examining how socioeconomic and institutional factors account for these variations.

It should be noted that the studies presented in this dissertation are primarily descriptive, aiming to explore changes in the association between educational attainment and labor market outcomes at the population level, while also examining potential explanations related to structural shifts. This association reflects both causal and spurious effects of educational attainment on labor market outcomes, capturing unmeasured factors (Zhou 2019; Card 1999). The descriptive focus of these studies is situated within broader research fields such as intergenerational mobility, skill formation systems, and the college wage premium as a measure of between-group inequality, themes that will be the main focus of the literature review.

Education and labor markets: bridging sociological and economic perspectives

Research on education and labor markets shows considerable overlap between sociology and economics, though their approaches stem from distinct intellectual traditions (Sørensen and Kalleberg 1981). In economics, most empirical research on labor markets is grounded in frameworks of wage determination and labor supply. On the demand side, firms' hiring and wage-setting decisions are often explained through the marginal productivity theory, which

posits that wages reflect workers' contributions to output. On the supply side, human capital theory is the dominant framework, suggesting that individuals invest in education and training to enhance their productivity and earnings.

In contrast, sociologists often study labor market dynamics through the lens of social mobility and socioeconomic attainment, examining how structural and institutional mechanisms shape educational and occupational trajectories across social groups. While sociologists also analyze individual income and earnings, they place greater emphasis on occupational attainment, labor market segmentation, and broader social structures—such as class and gender—that influence labor market inequalities.

This dissertation seeks to integrate perspectives from both classical sociological and economic theories, adopting a multidimensional approach that combines sociological theories of social mobility, inequality, and status attainment with economic theories related to human capital, wage formation, and macroeconomic dynamics.

Why education pays off and its evolution: theoretical frameworks

Human capital theory

The mainstream labor economic theory is human capital theory, which views education as an investment in human capital that tends to increase an individual's productivity and, in turn, wages (Mincer 1974; Becker 1962). As part of the broader neoclassical economic framework, human capital theory seeks to provide a more comprehensive approach to understanding labor as a factor of production. From a macro-level perspective, investment in education leads to economic growth by creating a more skilled workforce. Countries that invest in education see improvements in labor productivity, innovation, and overall economic competitiveness (Mankiw, Romer, and Weil 1992; Hanushek and Kimko 2000).

Within the human capital framework, the evolution of wage differentials between educational groups is determined by the neoclassical framework—relative supply and demand for skilled labor in production processes. While education enhances productivity in absolute terms, wages

are determined by marginal productivity at work. When the demand for skilled labor outpaces supply, the college wage premium rises; conversely, an oversupply of skilled workers suppresses wage growth relative to unskilled labor.

The race between education and technology

Based on the neoclassical framework of supply and demand, what should we expect under educational expansion? The dominant explanation for changes in the college wage premium is the so-called “race between education and technology” (Goldin and Katz 2008; Tinbergen 1974; Katz and Murphy 1992). This framework is often modeled using a Constant Elasticity of Substitution (CES) production function, which describes how different factors of production (e.g., labor and capital) can be substituted for one another in the production process. Rooted in human capital theory, the central mechanism is that new technologies are often initially complex, giving individuals with higher education and greater innate ability a comparative advantage in adopting and adapting to them. As a result, employers tend to hire and promote those who can integrate these technologies more effectively, reinforcing wage disparities based on education and skill. Technological change, in this view, is skill-biased—making highly educated and more skilled individuals more productive, while rendering others increasingly redundant.

Overall, this framework posits that educational expansion increases the supply of skilled labor, while skill-biased technological change (SBTC) raises the demand for such workers; the college wage premium thus fluctuates depending on the relative pace of these forces. According to this canonical supply–demand model, the rising college wage premium in the United States is primarily attributed to the demand for college-educated workers outpacing their relative supply since the 1980s (Autor, Goldin, and Katz 2020; Goldin and Katz 2008; Katz and Murphy 1992). More specifically, it is linked to the computer-based technological revolution (e.g., Levy and Murnane 1992; Autor, Katz, and Krueger 1998; Krueger 1993; Acemoglu 1998).

However, some economists have criticized this framework, arguing that the role of SBTC in driving the college wage premium (though more so for overall wage inequality) has been overstated. First, if SBTC were the primary driver of rising skill demand, one would expect the pace of technological change to have accelerated in the 1980s, when the college premium surged. Yet, evidence suggests that key technological advances—such as the growth of IT,

internet diffusion, and productivity gains—accelerated more markedly in the 1990s (Card and DiNardo 2002). Second, influential studies such as Katz and Murphy (1992) and Goldin and Katz (2008) estimate demand shifts by netting out the effects of relative supply, attributing the residual changes in the wage structure to SBTC. Yet, this residual approach may overlook other forces, including the role of international trade in increasing wage gaps between skilled and unskilled workers (e.g., Wood 1995; Freeman 1995). Moreover, as strong labor market institutions tend to benefit low-skilled workers, the rising college wage premium may also reflect the weakening of unions and labor protections during this period (Card and DiNardo 2002; DiNardo, Fortin, and Lemieux 1996; Lee 1999).

Given these limitations, some studies have refined the SBTC framework to pose more targeted questions: What specific functions does technology perform in reshaping labor demand? And to what extent does human capital mediate or amplify these effects in the labor market?

Task-biased technological change

A widely cited extension of the SBTC framework is offered by Autor, Levy, and Murnane (2003), often referred to as task-biased technological change. Unlike models that rely on aggregate measures of skill demand, task-based approaches highlight how sectoral and occupational variation can be obscured in macro-level analyses. These models challenge the assumption that technological change uniformly affects workers along the skill distribution. Instead, they offer a more nuanced interpretation: wages depend not only on absolute skill levels but also on how those skills align with the nature of job tasks and the evolution of technology.

As routine tasks become increasingly automated, middle-skill jobs have declined—driving job polarization and task downgrading. As a result, an increasing number of individuals are crowded into lower-skilled positions, limiting the returns to their education. In contrast, as technological change advances, workers with advanced degrees—whose skills are well complemented by technology, who are doing nonroutine complex, analytical, and interactive tasks—tend to command substantially higher wage premiums (Autor and Handel 2013). More intriguingly, technological progress cannot easily replace low-skilled service jobs that require physical dexterity, flexible interpersonal interaction, and close physical proximity (Autor and Dorn 2013). Correspondingly, wages in these jobs have even seen a rebound during the technological change (Acemoglu and Autor 2012). Building on this framework, scholars expect

earnings gaps to evolve differently across levels of education—an expectation that is assumed to explain the empirical observations in the contemporary U.S. labor market (Valletta 2018; Acemoglu and Autor 2012). This framework aligns well with trends in rising job polarization and non-linear income shifts in the United States (Autor, Katz, and Kearney 2008; Goos, Manning, and Salomons 2009), but is more limited in its applicability to other countries (Berglund et al. 2020; Hoftijzer and Gortazar 2018; Oesch and Piccitto 2019; Oesch and Rodríguez Menés 2011).

In sum, task-biased technological change emphasizes that the impact of education on wages depends not only on individuals' skill levels but also on how those skills align with the specific tasks required in different jobs. In doing so, it resonates with longstanding sociological theories of education and labor markets by bringing jobs and occupations into focus.

In sociological accounts, education is often understood as a means of navigating a relatively fixed structure of inequality. Within this framework, changes in the supply of education across skill levels do not alter the income distribution, contrary to the predictions of human capital theory (Thurow 1975).² The next section turns to core economic and sociological theories that offer deeper insight into the interplay between educational attainment and labor market outcomes, beyond the assumptions of human capital theory.

Signaling and screening

The first set of criticisms of human capital theory that sociologists often refer to actually emerged within economics itself, through the development of signaling and screening theories (Spence 1973; Arrow 1973). Human capital theory posits that education enhances individuals' skills and, in turn, their marginal productivity at work, leading firms to offer higher wages in compensation. However, signaling and screening theories challenge this assumption by arguing that education does not necessarily increase productivity but instead serves as a filter in situations where employers lack information about a worker's true capabilities. Specifically, Arrow, drawing on insights from sociologists such as Berg (1970), wrote:

² In human capital theory, changes in educational attainment are assumed to directly influence an individual's productivity—via the accumulation of skills and experience—which in turn shapes the distribution of earnings. As a result, most theoretical and empirical work by economists in the early to mid-20th century focused primarily on the supply side of the labor market, often assuming a fixed demand schedule. However, this perspective is at odds with empirical evidence. As Thurow and Lucas (1972) showed, income distribution remained remarkably stable after World War II, despite substantial changes in the distribution of education.

Higher education, in this model, contributes in no way to superior economic performance; it increases neither cognition nor socialization. Instead, higher education serves as a screening device, in that it sorts out individuals of differing abilities, thereby conveying information to the purchasers of labor (Arrow 1973, 194).

Similarly, signaling theory regards education as a signal to employers about a worker's underlying attributes, such as their ability to learn, work hard, or conform to workplace demands. According to Spence's signaling model, higher levels of education indicate these qualities, which leads employers to offer higher wages, even if the education itself does not directly enhance the worker's ability to perform tasks.

How will educational returns evolve under expansion from the perspectives of signaling and screening? Generally, it is hypothesized that educational expansion either dilutes the signaling value of education or intensifies employer screening processes. Also viewing education as a screening device, Hirsch (1976) conceptualized education as a positional good and outlined a series of assumptions regarding educational expansion. He suggests that there is a relative dimension of educational qualifications function within a competitive framework. As Hirsch (1976, 50) explains,

Thus, the utility of expenditure on a given level of education as a means of access to the most sought-after jobs will decline as more people attain that level of education. The value to me of my education depends not only on how much I have but also on how much the man ahead of me in the job line has.

Therefore, where educational expansion overcrowds superior positions as a whole, rather than the effect will be to push competition by hitherto qualified applicants down the hierarchy of jobs. In these processes, employers intensify the screening process. They may increasingly require college degrees for positions that do not inherently demand higher education, using them as a proxy for presumed ability rather than job-specific training. Overall, Hirsch's framework underscores how credential inflation and positional competition contribute to labor market distortions. Rather than ensuring a better alignment between skills and jobs, educational expansion can heighten job competition, erode the value of credentials, and lead to increasingly selective employer screening processes.

In summary, both theories emphasize the supply side and operate under the assumption of a relatively stable occupational or job distribution. However, they do not explicitly account for shifts in labor demand and how that would affect educational returns.

Job competition theory

Thurow's job competition model also challenges the human capital perspective, but unlike signaling and screening theories, it brings both demand and supply into the center. He argues that wages do not attach to workers themselves but rather to jobs, and that education merely helps individuals compete for job slots rather than directly enhancing productivity (Thurow 1975). In this model, an individual's income is shaped by two factors: their position in the labor queue and the distribution of job opportunities in the economy. Employers prioritize hiring workers perceived as having the lowest training costs for high-level jobs, while workers seek the best available positions based on their ranking in the queue.

Once a worker reaches the top of the queue and secures a job, their wage is predetermined by the job's productivity characteristics rather than their individual skills. Here, education functions as a screening mechanism, helping employers estimate training costs rather than signaling actual productivity. From a supply-side perspective, competition for desirable jobs drives individuals to pursue higher education to improve their labor market ranking. However, productivity is primarily developed through on-the-job training, reinforcing the idea that wages are shaped by job structures rather than individual ability or educational attainment. As such, differences in wages are shaped more by patterns of job assignment and access to training than by inherent productivity differences between college- and high school-educated workers.

But how do educational returns change during expansion? As the number of college-educated workers increases, Thurow and Lucas (1972, 34) explain:

According to a job competition model, the most preferred group (college laborers) would have experienced an equalization of income within their group, a rise in incomes relative to other groups, but a fall in incomes relative to the national average. As the most preferred group expanded, it would filter down the job distribution into lower-paying jobs. This would lead to a fall in wages relative to the national average. As it moved into a denser portion of the national job (income) distribution, it would, however, experience

within-group equalization of income. By taking what had previously been the best high school jobs, college incomes would rise relative to high school incomes.

To summarize, job competition models assume that educational returns relative to less-educated groups can increase during educational expansion, but may decline in absolute terms when measured against the national average. At its core, this framework suggests that observed wage differentials reflect differences in job allocation and training opportunities rather than changes in the relative productivity of college- versus high school-educated workers.

Sociologists largely agree with Thurow's job competition theory on the key point that the structure of inequality is shaped by the distribution of rewards attached to jobs, rather than by individuals themselves (Sørensen and Kalleberg 1981). Similarly, vacancy competition theory, developed by Sørensen (1977), shares this line of critique. It also emphasizes structural constraints—namely, a predetermined structure of inequality—that shapes labor market outcomes independently of changes in personal characteristics. In this view, individuals do not shape outcomes solely through their attributes; rather, labor market attainments reflect the availability of job slots, with personal characteristics (such as ability, education, and experience) influencing only access to those slots.

Credentialism

The above-mentioned economic theories are among the most frequently cited by sociologists when studying the relationship between education and labor market outcomes, and how this relationship changes over time. Although these theories align in many respects with sociological perspectives—as well summarized by Goldthorpe (2014)—they consistently emphasize productivity as central, along with its subsequent link to earnings. As Goldthorpe notes (2014, 273), “what is at issue is not whether, but how, education relates to productivity.”

Sociologists examine the value of education in the labor market by considering its structural and cultural functions. One influential perspective, credentialism, argues that education functions less as a direct enhancer of workplace productivity—its technical role—and more as a social and cultural screening mechanism (Bourdieu 1984; Collins 1979). From this perspective, those who receive the greatest returns are not necessarily the most productive workers in terms of generating highly valued goods and services (Berg 1970). Instead, educational credentials regulate access to high-status occupations and reinforce existing social

hierarchies by legitimizing cultural capital as a basis for economic rewards. In other words, most educational credentials carry limited intrinsic value; they primarily serve as formal indicators that grant access to certain opportunities, without guaranteeing their actual worth when those opportunities are pursued (Collins 2002).

Building on these concepts, credential inflation refers to what occurs as education expands: the educational requirements for jobs increase as more people attain advanced degrees. As Collins explicitly states (1979, IX):

Educational degrees function as a type of currency of social respectability, exchanged for access to jobs. Like any currency, they undergo inflation—losing value as the supply increases. When educational attainment rises autonomously, yet the number of middle-class jobs remains limited, the result is a diminishing return on higher education. Credential inflation is self-perpetuating: from the perspective of individual degree-seekers, the rational response to its declining value is to pursue even more education.

At its core, the rising credential requirements reflect a self-reinforcing process driven by status competition rather than technological necessity. As more individuals attain a given level of education, its ability to confer social distinction and secure access to elite occupations diminishes. This triggers a continual pursuit of higher credentials, as education functions less as a response to job requirements and more as a form of cultural capital that must be accumulated to maintain one's position and avoid downward mobility.

In short, as more individuals attain a given level of education, its value as a marker of distinction and access to elite occupations declines. This, however, gives rise to a central puzzle: if educational credentials yield diminishing returns, why do people continue to invest in them? As Collins (1979, 10) provocatively asks,

Why is it that this overall stratification structure exists in which increasing numbers of people have sought increasing amounts of education, even if their relative stratification positions on the whole have not changed?

Drawing on Weberian insights, Collins argues that educational degrees have replaced aristocratic “proofs of ancestry” as modern instruments of social closure. Diplomas function as

symbolic currencies that regulate access to prestigious occupations, reinforce status boundaries, and preserve class advantage. In this view, credential inflation is not a response to rising skill demands, but rather a self-perpetuating outcome of status competition embedded in bureaucratic societies.

Overall, credentialism offers an insightful lens for understanding the potential decoupling of education and occupational outcomes in terms of absolute gains, while relative gains remain persistently structured.

Assessing theoretical perspectives: insights and challenges

These theoretical perspectives are not mutually exclusive; rather, they offer complementary lenses for understanding the complex and evolving relationship between education and labor market outcomes. Relying on a single framework risk oversimplifying the shifting dynamics of occupational structures and wage determination. As Hout (2012) notes, concerns about credential inflation and overeducation gained prominence in the 1970s, when scholars such as Collins (1979), Hirsch (1976), and Berg (1970) were writing in a context of declining college wage premiums and growing signs of overqualification. At the time, sociological critiques focused on the role of occupational structure and the positional nature of educational credentials. However, as wage gaps by education widened in subsequent decades, scholarly attention shifted toward frameworks emphasizing the causal impact of education—particularly human capital theory and supply–demand models—as central explanations for rising inequality. These shifts underscore the importance of situating theories within their historical contexts and recognizing how empirical trends shape theoretical relevance.

This dissertation, as noted earlier, focuses on the profound educational and socioeconomic transformations that have unfolded since the 1980s—a period marked by dramatic shifts in both the supply of and demand for highly educated and skilled labor. These changes suggest an interplay between mechanisms: multiple processes can operate simultaneously across labor market segments, with different outcomes depending on which mechanisms are dominant in each context. Yet, none of these theoretical perspectives clearly predicts the evolution of college wage returns or the association between education and occupation, which are the central focus of the three studies in this dissertation. Here, I summarize two limitations from both sides—human capital theory and the relative value of education.

First, human capital theory and related assumptions often rely on circular reasoning: they infer that higher wages validate education's contribution to productivity without independently verifying whether education itself enhances productivity. This limits our ability to assess whether wage differentials between higher- and lower-educated workers reflect true productivity gaps or are shaped by institutional, social, or market forces. In human capital and skill-biased technological change (SBTC) frameworks, college graduates in non-graduate jobs are viewed as mismatched or underutilized. In contrast, other theories see this as a structural outcome of educational expansion outpacing the growth of high-status positions. While all perspectives may observe similar patterns—such as falling wage premiums or job downgrading—they offer quite different interpretations.

Second, while some theories emphasize the crowding effect of expanding higher education on weakening the labor market value of credentials, they often lack clear assumptions about what happens if there are non-linear shifts on the demand side, as suggested by SBTC. Scholars who apply Thurow's job competition model often focus on how education enables individuals to move up the labor queue, but overlook the distribution of jobs—that is, the job queue. In fact, the key takeaway from job competition analysis is that government policies aimed at effectively altering market incomes should not rely exclusively on supply-side interventions targeting individual characteristics, but should also address labor demand and the broader structure of job opportunities (Thurow and Lucas 1972). Without considering changes in job structures, these models cannot fully explain why returns to education might continue to rise, particularly in terms of absolute gains and access to top-tier positions.

It is likely that education's positional value becomes more pronounced when the occupational structure is relatively static. If the supply of educated workers increases without a corresponding rise in high-status or high-wage jobs, education functions more as a sorting device than a productivity-enhancing investment. Accordingly, when labor market outcomes are measured in terms of occupational class—typically more rigid than income—educational returns may decline, as some sociological studies have found (cf. Shavit and Park 2016). By contrast, since the 1990s, growing academic, policy, and public attention has focused on income inequality across industrialized countries. Sociologists, therefore, should consider how occupational and economic outcomes interact in the labor market, and how education mediates these dynamics to better understand the structure of inequality in labor markets. When job structures are in flux—due to occupational upgrading, technological transformation, or other

structural forces that consistently drive differential changes in labor market positions—educational returns may reflect genuine skill-based productivity differences.

The institutional context of labor market returns to education

Different institutional settings shape how educational qualifications translate into labor market positions and influence the wage and earnings returns associated with those positions (Van De Werfhorst 2011; Busemeyer 2014). It is important to recognize that a country's institutional setting is shaped by a complex interplay of factors, as acknowledged in various theoretical frameworks. This complexity makes it challenging to draw simplistic conclusions based solely on a few institutional traits. More importantly, institutions are not static; they evolve through dynamic political processes and historical contingencies from a political economy perspective (Hall and Thelen 2008; Busemeyer and Trampusch 2011a; Thelen 2004), as well as through market forces such as technological change and globalization from an economic perspective (F. D. Blau and Kahn 2002; Katz and Autor 1999).

Recognizing these complexities, a more comprehensive approach is needed to examine how labor market outcomes across different educational groups evolve over time in response to institutional factors. While various theoretical approaches and conceptual frameworks have analyzed institutional effects, the precise mechanisms shaping these effects often remain unspecified.

This dissertation addresses this gap by focusing on two key institutional dimensions. First, *Study II* examines the vocational specificity of educational systems—or more broadly, skill formation systems—which determines how directly education translates into specific occupations. Second, *Study III* analyzes labor market institutions, which regulate employment conditions and wage-setting mechanisms, influencing the levels and trends of the college wage premium. By centering on these two institutional factors and their interactions with broader structural changes, this study aims to provide a more nuanced understanding of how institutional structures shape the relationship between educational attainment and labor market outcomes.

Skill formation systems

Sociological and political research highlights that the formation of skills is shaped less by individual decisions and more by institutional structures and historical trajectories within specific political economies. It also emphasizes that human capital is diverse in form and unevenly distributed across countries, with significant implications for economic performance and social cohesion.

The development of skill formation in educational systems is shaped by dynamic political processes and historical contingencies, with critical junctures redefining institutional structures and stakeholder negotiations (Busemeyer and Trampusch 2011a). While these systems have deep historical roots, their stability depends on continued political support, reflecting a balance between path dependency and the potential for transformative change.

Busemeyer and Trampusch (2011b) identify three pivotal turning points in the development of skill formation systems. The first occurred during the late 19th and early 20th centuries, when industrialization and democratization reshaped the relationship between businesses and labor, influencing the formation of national labor markets. The second turning point took place in the 1960s and 1970s, as the postwar economic boom ended, leading to the emergence of neo-corporatist labor market structures and the start of economic globalization. The third and most recent transformation is characterized by deepening global economic and political integration, the rise of a knowledge- and service-based economy, and major labor market changes, including deregulation, the decentralization of industrial relations, and shifting skill demands.

Despite these insights, research on the third critical juncture remains incomplete. In particular, little is known about how the increasing availability of highly educated workers interacts with occupational upgrading within institutional frameworks to shape education-occupation linkages, particularly in the context of evolving labor market structures and shifting skill demands.

Labor market institutions

The labor economics perspective on institutional factors remains within the broader human capital framework but views institutions as intermediaries that shape how supply and demand forces influence wage structures (F. D. Blau and Kahn 1996; Freeman and Katz 1995). By influencing wage-setting mechanisms, institutions often produce wage structures that diverge from those predicted by a purely competitive market. Collective bargaining, wage regulations,

and minimum wage laws introduce rigidities that prevent wages from fully aligning with productivity levels. For example, unionized workers may earn above their marginal productivity due to bargaining power, while minimum wages can prevent low-skilled workers from being paid strictly in line with their productivity.

However, focusing solely on wage-setting institutions may overlook how institutional flexibility to market forces can increase wage inequality between groups, especially in the European contexts. In particular, segmented labor markets—or processes of dualization—and their changes play a crucial role. For instance, Doeringer and Piore (1971) emphasized that segmented labor markets, rather than just supply and demand, are central to understanding labor market dynamics, especially in relation to inequality and job allocation. As continued sociological research has shown, the rise of non-standard employment relations, such as part-time and temporary contracts, is significantly associated with increasing wage inequality (Kristal and Cohen 2015, 2017; DiPrete et al. 2006; Kalleberg 2011).

Educational inequality and social mobility

The status attainment perspective

Given education's pivotal role in shaping labor market outcomes, it serves as a primary mechanism through which families transmit socioeconomic advantages across generations. That is why educational policies often target inequality in educational attainment to promote social mobility.

The status attainment paradigm, once dominant in stratification research (P. M. Blau and Duncan 1967; Sewell, Haller, and Portes 1969; Featherman and Hauser 1978), remains a key theoretical framework for understanding how individuals achieve different levels of socioeconomic status. This perspective focuses on the interplay between family background, educational attainment, and personal aspirations in shaping life trajectories. A central question within this framework is the extent to which educational and occupational mobility is driven by meritocratic factors (such as individual ability and effort) versus ascriptive factors (such as parental socioeconomic status).

The process of urbanization, the growth of bureaucratic institutions, and the spread of universalistic values are expected to weaken the role of ascriptive factors in status attainment.

More specifically, the industrialism and modernization thesis posits that as societies become more industrialized, parental status exerts less influence on educational attainment, while educational attainment plays a greater role in determining occupational status (Treiman 1970; P. M. Blau and Duncan 1967). This perspective suggests that industrialization fosters a shift from ascriptive to achievement-based social stratification, where individual merit and education become more central to social mobility (Hout and DiPrete 2006).

From an economic standpoint, family investments in children's human capital play a crucial role in shaping educational and labor market outcomes. Becker and Tomes (1986) developed a foundational model emphasizing how parents allocate time, financial resources, and educational opportunities to enhance their children's skills, earning potential, and overall social mobility. This framework suggests that higher-income families can invest more heavily in their children's education, thereby reinforcing intergenerational inequalities. Subsequent research has expanded on this model, highlighting mechanisms such as credit constraints, differential access to quality schooling, and early childhood investments as key drivers of educational disparities (Solon 2004)

Educational expansion and shifting patterns of educational inequality

Whether or not educational inequality diminishes over time has long been a critical topic in stratification research. The dominant view of research is that the effect of social origin on educational attainment has decreased for cohorts born in the first half of the 20th century in most European nations but not in the US (Barone and Ruggera 2018; Mare 1993; Breen et al. 2010, 2009; Breen and Jonsson 2005). One of the major causes is that several educational reforms were implemented in the post-war era to reduce the economic barriers to educational participation, such as an extension of mandatory education and the elimination or reduction of tuition fees (Barone and Ruggera 2018). In Sweden, following the development of the welfare state, the equalization of living conditions, decreased income inequality, and increased economic security for the lower classes have all contributed to the decline in educational inequality (Erikson 1996).

Still, the process of education equalization seems to have stalled among later birth cohorts in Sweden and many other European countries, especially when it comes to reducing social inequality in tertiary degree attainment (Barone and Ruggera 2018; Breen and Müller 2020; Jonsson and Erikson 2007; Shavit, Arum, and Gamoran 2007). Considering the dramatic

expansion of higher education in the late 20th century, this indicates that educational expansion does not necessarily reduce social inequalities in educational attainment. One classical hypothesis is that educational inequality would be maximally maintained at a given level of education unless the demand for that level of education had been “saturated” among the privileged group (Raftery and Hout 1993). In Sweden, persistent inequality during the expansion of higher education is due to the fact that middle-class students with average grades but high educational expectations have mostly taken advantage of new educational opportunities (Jonsson and Erikson 2007).

Educational inequality also persists through qualitative differences in educational choices (Lucas 2001; Hällsten 2010). Some scholars view the expansion as a diversion process by which students from higher-status backgrounds preserve and even expand their advantages in elite programs, whereas those from lower-status backgrounds are more likely to enroll in second-tier and less selective institutions (Iannelli, Gamoran, and Paterson 2011; Thomsen 2015). This diversion effect would be more pronounced in countries with a differentiated tertiary educational system, where the second tier of tertiary education consists of vocational or semi-professional training (Shavit, Arum, and Gamoran 2007). In some countries, there are also differentiated academic and vocational tracks at the upper secondary level, where students from disadvantaged families are more concentrated in the vocational tracks. Besides, a three-cycle higher education system has created transition periods following the bachelor’s degree. However, less is known about the expansion and stratification of postgraduate education (Posselt and Grodsky 2017). In sum, patterns of inequality are likely to vary within tertiary education groups, which underscores the importance of disaggregating the tertiary level in studies of intergenerational mobility.

These ongoing dynamics of educational inequality, combined with trends in educational returns, are the focus of Study I, which analyzes the role of education in shaping intergenerational mobility trends. Following the status attainment tradition, a number of studies have examined the evolution of educational inequality by socioeconomic background over time—particularly during periods of educational expansion. While there is extensive sociological research on the role of education in driving social class mobility (Breen and Müller 2020; Breen and Jonsson 2005), less is known about its role in driving mobility trends in terms of income ranks. This study adopts a simplified three-way Origin–Education–Destination (OED) framework to

address more recent concerns about trends in intergenerational income mobility. That said, the role of family background in educational attainment has been a central focus in economics.

The rise of women in education and work: trends and implications

In a few decades, all Western countries have seen a major and ongoing gender convergence in terms of labor market participation rates, occupations, paid hours of work, earnings, and the division of labor (Blau, Brummund, and Liu 2013; England 2010; Goldin 2014; Neramo 1996; Sloane, Hurst, and Black 2021). In particular, women's economic role has undergone a transformative shift—from being secondary workers contributing out of family financial necessity to employment becoming a central aspect of their identity and social status (Goldin 2006).

Despite these dramatic changes, the role of gender is still not placed at the center of income mobility studies. Traditionally, income mobility research focused on men and commonly used male heads' income as the measure. This was attributed to low employment rates among women and the absence of reliable measures for their labor earnings. However, over time, as women's labor supply and participation have risen, their actual income reflects more of their general earnings potential (Ahrsjö, Karadakic, and Rasmussen 2023) and accounts for a growing proportion of household income (Beller 2009; Hansen 2010).

Given these changes in labor market behavior, the implications of rising educational attainment for income mobility are expected to differ between women and men. However, existing research has yet to situate the education–mobility link within the broader context of increasing gender equality in society and the economy. *Study I* specifically addresses this gap. Meanwhile, by focusing on gender differences in the extent of occupational upgrading, *Study II* offers a complementary perspective on the rising labor market status of highly educated women

Contextualizing the studies: Sweden and cross-national perspectives

The Swedish context

Studies I and II are situated in the Swedish context. Sweden is often viewed as a distinctive case internationally due to its comprehensive welfare state and strong commitment to egalitarianism. These features make it a particularly compelling context for examining how

education, gender, inequality, and labor market dynamics interact. This study focuses on the period since the late 20th century, when there were both differences and similarities in educational and socioeconomic transformations.

There were significant parallel changes in educational attainment and occupational upgrading, as seen in other industrialized countries. A government-led expansion of upper tertiary education took place in the 1990s for economic reasons—namely, to combat the economic crisis, restructure the labor market, and address youth unemployment (Börjesson and Dalberg 2021). At that time, both traditional universities and regional university colleges experienced increased enrollment (Björklund et al. 2004). The government’s ambitious goal was that 50% of a birth cohort should enroll in tertiary education (Ministry of Education 2001). High-skilled and high-paying occupations have expanded most rapidly, middle-skilled occupations in routine manufacturing and clerical sectors have shrunk, and growth at the lower end of the occupational spectrum has been limited (Berglund et al. 2020; Hoftijzer and Gortazar 2018; Oesch and Piccitto 2019; Oesch and Rodríguez Menés 2011; Tåhlin 2019).

There are several important institutional settings in Sweden that make the studies in this thesis particularly interesting. First, in terms of gender focus in Study I, Sweden’s extensive welfare policies—such as dual-earner policies that reduce women’s labor market barriers—have long positioned it as a forerunner in promoting gender equality in both society and the economy. Women’s labor force participation rates have historically been higher in Sweden than in other developed countries, both overall and across all educational levels (Boertien and Bouchet-Valat 2022; OECD 2023). Women surpassed men in tertiary education as early as the 1970s (Börjesson and Dalberg 2021). However, due to considerable public employment in the large welfare sector, Sweden—like other Nordic countries—has long faced what’s known as the welfare paradox: developed welfare states often boost women’s labor force participation but reinforce occupational segregation by concentrating women in lower-status, female-dominated roles in the welfare sector. Moreover, highly educated women in professional and managerial roles often face notable wage disadvantages when employed in the public sector (Mandel 2012). Recent research, however, provides growing evidence of declining gender segregation in Sweden (Halldén and Stenberg 2023; Barth, Reisel, and Misje Østbakken 2024), with current levels now broadly comparable to those in other EU countries (European Commission 2019). Together, these developments underscore the need for sustained research into gendered earnings patterns.

Second, the Swedish labor market features a high degree of coordination compared to other developed countries (Siaroff 1999). Corporatism and unionization have historically been strong, although they declined significantly after peaking in the late 20th century (Jahn 2016; Korpi and Tåhlin 2011; OECD 2019). These institutional features influence the linkage between education and occupation (Busemeyer 2014; Busemeyer and Trampusch 2011b). In educational systems, corporatist groups—such as trade unions and employers' associations—are often consulted to ensure that educational programs align with labor market needs and maintain a connection between the education and employment sectors. These groups participate in curriculum design, funding decisions, and policy-making processes, ensuring that higher education institutions remain responsive to societal and economic demands (Nybom 2012; Rhoades 1983).

Third, the Swedish education system features a standardized national curriculum, minimal tracking, and state-run, school-based VET (Erikson and Jonsson 1998; Olofsson and Thunqvist 2018). In particular, as the focus of Study II, Sweden's VET system is characterized by strong state involvement and significant influence from social partners, but relatively little firm-based vocational training (Busemeyer and Trampusch 2011). From an international perspective, Sweden's modern vocational education and training (VET) system is widely recognized for pioneering the school-based model, which is considered a core element of the Nordic welfare model. Its educational system prioritizes general, transferable skills over firm-specific training. This approach reflects the country's welfare state model, which seeks to enhance labor market mobility and adaptability (Busemeyer 2014; Esping-Andersen 1990; Korpi et al. 2003). This approach aligns with Sweden's longstanding tradition of social democratic governance and its commitment to educational equality (Busemeyer 2015). Even within the Nordic region, Sweden has been at the forefront of efforts to establish parity of esteem between general and vocational education, notably through the development of a unified upper secondary school system (Olofsson and Thunqvist 2018).

The global context

Over the past decades, countries worldwide have undergone a series of common macroeconomic shifts, profoundly reshaping labor markets and income distribution. *Study III* focuses on trends since 1980, a period characterized by rapid technological advancements and expanding international trade.

A key driver of labor market transformations during this period was skill-biased technological change (SBTC)—a shift in labor demand favoring highly-skilled over less-skilled workers—primarily driven by the rise of computerization and digital technologies (Acemoglu 2002). As automation and digitalization advanced, demand for routine, low-skill jobs declined, while workers with higher education and specialized skills benefited disproportionately.

At the same time, global trade integration accelerated, as economies became increasingly interconnected through trade liberalization, outsourcing, and multinational production networks. This shift intensified competition, particularly in high-income countries, where industries faced growing pressure from lower-wage economies. As a result, wage polarization widened, and income inequality continued to rise (Alderson & Nielsen 2002; Kollmeyer 2009). A common consequence of these macroeconomic shifts is rising income inequality around the world since the late 20th century (Dabla-Norris et al. 2015; Piketty and Saez 2014; OECD 2011; Gottschalk and Smeeding 1997).

Despite these shared macroeconomic shocks, labor market responses have varied significantly across countries, shaped by institutional structures and policy choices. The contrasting experiences of the United States and Europe illustrate this divergence. In the U.S., labor markets adjusted through stagnant real wages, widening income inequality and increased college wage premium. In contrast, many European countries experienced increasing real wages, and relatively stable wage structures (F. D. Blau and Kahn 2002; Atkinson 2003; Alderson and Nielsen 2002; Kollmeyer 2009). However, such a unified explanation might overlook other dimensions in labor market inequality. DiPrete et al. (2006) argue that European labor market institutions have evolved in response to economic pressures, political negotiations, and employer demands for flexibility, particularly through the expanded use of temporary labor contracts and reductions in employment protections. Consequently, unlike in the U.S., where rising wage inequality has been the dominant trend, institutional changes in Europe have primarily affected job security rather than wages, resulting in a rise in insecure employment, particularly among low-skilled workers (DiPrete et al. 2006; Maurin and Postel-Vinay 2005). Therefore, Study III will especially consider institutional changes in both wage-setting institutions and nonstandard employment to account for variations across and within countries.

Methodology

Data

As Studies I and II focus on the Swedish context, various sources of Swedish register data (1960–2022) are used. By leveraging the advantages of register data over survey data, these studies capture long-term and robust patterns in education, occupation, and economic outcomes across cohorts over the past decades.

For Study III, data from the Luxembourg Income Study (1980–2022) are used to expand the analysis globally, incorporating countries at varying levels of development. This broader scope allows for cross-country comparisons and highlights how education affects labor market outcomes over time in diverse economic contexts, capturing variations beyond the developed-world experience.

Measures of labor market outcomes

Since different measures capture distinct aspects of inequality, they can be seen as complementary. The measurement of labor market outcomes varies across the three studies, addressing both theoretical and methodological concerns regarding different dimensions of labor market outcomes. *Study I* uses adult children's earnings rank (including self-employment income and earnings-related benefits), focusing on how education influences relative labor market positions within cohorts in a broad sense. *Study III* also uses labor earnings, focusing on annual wages transformed into log points as a common relative measure across a wide range of countries. Therefore, Studies I and II may help us better inform the widespread concerns about increasing income inequality. Meanwhile, *Study II* employs occupational categories—both major and minor groups—to offer a social dimension that emphasizes occupational status beyond economic outcomes. More specifically, as mentioned in the literature section, occupations are an important link between education and earnings. Understanding how educational credentials influence individuals' access to occupations would also inform our understanding of the shifting economic returns to education.

The educational measures vary across studies to provide a more comprehensive understanding of this dimension. When exploring the economic returns to education, *Study III* categorizes individuals simply as college graduates versus non-college graduates. This is because college

attainment serves as a key indicator of high-skilled labor globally, and this categorization helps harmonize differences in educational systems across countries. However, this broad differentiation could mask significant disparities within both groups. Understanding whether the economic value of different types of educational credentials has evolved differently is crucial in itself. To address this, *Study II* differentiates between upper secondary vocational and upper secondary general education, as well as between short tertiary, bachelor's, and postgraduate levels. Both *Studies I* and *III* measure educational attainment at an aggregated level, which may obscure important variations across different fields of study within educational levels (Kirkeboen, Leuven, and Mogstad 2016; Quadlin, Cohen, and VanHeuvelen 2021). To uncover this heterogeneity at the horizontal level, *Study II* uses educational credentials—a combination of educational levels and two-digit fields of study—to provide a more detailed analysis.

The primary focus—changes in the relationship between educational attainment and labor market outcomes at the population level—captures period effects along with age and cohort differences. For instance, imbalances between educational credentials and occupations are often influenced by demand-side processes tied to shifts in industrial structure and broader macroeconomic mechanisms. These variations over time are likely to produce both age and cohort effects. Measurement choices in each study are grounded in both practical and theoretical frameworks.

Study I examines cohort effects on equality of mobility opportunities. It uses the average annual gross earnings between ages 35 to 40 to represent long-term, stable earnings ranks for children, thereby partly controlling for age and period effects. *Study II* focuses on period effects, but also compares young workers with all workers, initially capturing age effects. *Study III* primarily examines period effects, while adjusting for age patterns when calculating the average return on tertiary education by controlling for years of work experience, though cohort effects are disregarded.

Ethical considerations

All studies in this dissertation deal with personal data with a strict commitment to ethical guidelines. In the case of Swedish registers used in Study I and Study II, data is pseudonymized using randomly assigned serial numbers created by Statistics Sweden to avoid linking data to individual identities. Published data must be aggregated according to well-established

protocols to ensure that no data points are small enough to reveal personal information. Researchers are also required to sign legal agreements, acknowledging that any misuse or breach of data privacy may result in legal consequences under Swedish law. The project has received ethical approval from the Swedish Ethical Review Authority (Etikprövningsmyndigheten), reference number (Dnr): 2019-02761.

In the case of large-scale survey data used in Study III, the Luxembourg Income Study (LIS) provides secure access through a web-based job submission interface, ensuring users cannot view, examine, or print individual records at the person or household level. Collectively, these measures ensure that data management practices meet the highest standards of security and ethical integrity.

Summary of the studies

Study I

Rising income inequality has aroused widespread concern about potential decreases in intergenerational income mobility. Intriguingly, recent research reveals that income mobility remains stable among men while declining among women, but the reasons for these disparities are unclear. *Study I* aims to understand this puzzle, especially in terms of role of education in understanding these gender differences.

Using Swedish register data for cohorts born between 1958 and 1979, I measure children's earnings as the average annual gross earnings between ages 35 and 40, and transform these into within-cohort earnings ranks. The results first confirm gender-specific trends: intergenerational income mobility increased and then stabilized for men, while steadily decreasing for women. Decomposition analyses of mobility trends show that reduced educational inequality increased mobility for both genders. Yet for women, this was offset by rising direct income associations net of education across cohorts and a steady increase in educational returns concentrated among younger cohorts.

These gendered patterns suggest that neither the skill-biased technological change nor the credential inflation hypothesis alone can fully explain the gender differences in educational returns observed here, especially for cohorts born in the 1970s. Instead, this study suggests that

the interplay between skill-biased technological change and evolving gender dynamics has likely enabled highly educated women to climb further up the earnings ladder in recent decades. These findings suggest that analyzing gender-specific mobility trends within the broader context of rising gender equality in society and the economy offers new insights into the role of education in shaping mobility patterns.

Study II

Study II draws on the rise of the service and knowledge economy to examine changes in the education-occupation linkage within skill formation systems. Comparative research has shown that education-occupation linkages tend to be weaker in school-based vocational education and training systems that emphasize general rather than occupation-specific skills, as in the case of Sweden. Yet the evolution of these linkages amid labor market changes within national skill formation systems remains insufficiently understood.

Drawing on Swedish register data from 1960 to 2013, the findings reveal a sharp increase in the overall strength of the linkage between educational credentials and occupational placements, peaking around 1990, followed by a notable decline. The rapid expansion of upper tertiary education and occupational upgrading has shifted the educational and occupational composition toward more tightly linked categories. However, these compositional shifts were largely offset by weakening structural linkages at the upper secondary vocational and lower tertiary levels, where ties to specific occupations have loosened considerably. In contrast, despite substantial educational expansion, the decline in linkage at the upper tertiary level was relatively modest and later rebounded. These general trends hold across gender and age groups, with women benefiting more from occupational upgrading and showing stronger, more consistent overall linkages since 1990.

Taken together, educational expansion and occupational upgrading appear relatively balanced and have jointly contributed to a closer alignment between the educational system and the occupational structure in Sweden. This underscores the importance of re-evaluating educational policies to balance skill upgrading with appropriate labor market linkages of vocational education.

Study III

Over recent decades, college education has expanded dramatically worldwide. The college

wage premium—the wage gap between college and non-college graduates—varies across countries and over time. Understanding its evolution is critical for addressing global inequalities and informing effective educational and labor market policies. Yet, comparative research on the long-term evolution of the college wage premium remains limited—particularly beyond developed Western countries.

Using the world’s largest harmonized income microdata from the Luxembourg Income Study (2025), this paper examines cross-national variation in college wage premiums over recent decades. By applying standardized statistical methods to 810 country-year observations across 49 countries from 1980 to 2022, it provides the first systematic account of long-term trends in college wage premiums on a global scale. The study first shows that the highest average college wage premiums are observed in South Africa and Latin America, followed by certain Asian countries, while Anglophone and European regions exhibit lower premiums. Since 2000, developing countries have experienced a significant decline in the college wage premium, beginning in Latin America and spreading to Eastern and Central Europe. In contrast, most Western developed countries saw increases throughout the 2000s but, since 2010, have experienced either stabilization or declines.

I also assess how macro-level factors account for these variations. Macro-level factors related to supply, demand, and institutions explain much of the cross-national variation but account for only part of the within-country changes. In particular, trends in the college wage premium within countries are more closely related to the share of high-skilled occupations and part-time jobs. These findings underscore how rising college attainment interacts with structural and institutional factors to shape the evolution of the college wage premium. The global flattening of the college wage premium calls for further research to better understand its implications for the relationship between educational attainment and labor market inequality.

Limitations and directions for future research

While this study examines how macro-level trends shape the relationship between educational attainment and labor market outcomes, it does not establish a definitive causal link due to the complexities of labor markets, institutional structures, and policy influences. Future research could address these limitations by employing finer-grained data and advanced modeling

techniques to more precisely capture institutional variations, policy changes, and their impact on labor market dynamics, wage structures, and patterns of social mobility.

Moreover, a more comprehensive understanding of evolving labor market processes will require considering additional socioeconomic trends. In particular, two major shifts in labor supply composition—demographic aging and increased immigration—have significantly influenced how education translates into employment and earnings. Examining these factors alongside macroeconomic transformations would provide deeper insights into the interplay between education, institutional change, and broader economic forces shaping labor market inequalities.

Future research could further disentangle the causal and non-causal components of the relationship between educational attainment and labor market outcomes at the micro level. For instance, changes in the wage premium for college graduates may not solely reflect the true returns to education but also increasing selectivity, as students with lower cognitive skills are now more likely to attend college—assuming cognitive skills confound the relationship between education and earnings. In other cases, the observed association may stem from a rising demand for unobserved abilities that influence both schooling and wages but are not necessarily developed through formal education, while the causal effect of schooling itself remains unchanged (Taber 2001). Advancing this line of inquiry requires estimating more comprehensive models that account for temporal and cross-national variations in the extent and impact of unmeasured factors, which remains crucial for deepening our understanding of education’s role in labor market dynamics.

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