Why does education pay off? Relations between institutional context and the mechanisms by which education pays off in the labor market

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Chapter 4

How Education Became Positional. Educational Expansion and Labor Market Outcomes, 1951-2003

Abstract
The transition from education for the privileged to education for the masses has had important effects on society. Most research on educational expansion focuses either on the explanation of expansion as such or on how expansion relates to processes of over-schooling and credential inflation. However, it has not yet been fully acknowledged that expansion changed the way in which education operates in labor markets. In this chapter, we investigate how educational expansion altered the way that education functions in labor markets. During times that education was highly dispersed, with few graduates in higher education, employers looked at educational levels as being informative about employees' absolute skill level. This "human capital model" of education has been replaced by a positional model of education, whereby rewards do not primarily depend on absolute skill levels but instead on workers' relative position in the labor market. Using data from the International Social Survey Program (ISSP) from 1985 to 2008, which allows us to create cohorts of people who graduated between 1951 and 2003 for 30 countries, we find support for the claim that education has become increasingly positional.

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4.1 INTRODUCTION

In the 20th century, the role of education in society changed tremendously. Whereas education was only accessible for children born in privileged classes until the mid-century, it became an institution for the masses during the second half of the century. Research on educational expansion can be divided in two strands: literature that studies the origins (e.g., Trow 1972; Meyer et al. 1977; Boli, Ramirez, and Meyer 1985) or the outcomes of the process (e.g., Woodhall 1967; Psacharopoulos 1989; Raftery and Hout 1993; Schofer and Meyer 2005; Hannum and Buchmann 2005). Widely different perspectives have been adopted with respect to the origins of expansion, varying from functionalist claims referring to the increasing need for qualifications in complex labor markets and the appropriate matching of occupational positions to achieved qualifications (Davis and Moore 1945; Bell 1973; Goldin and Katz 2008) to views that the expansion is better explained as a "myth" because the often-presupposed positive relationship between education and economic growth is far from evident in developed economies (Meyer and Rowan 1977; Schofer and Meyer 2005; Ramirez et al. 2006).

A second strand of literature on educational expansion has related the expansion to distributional consequences on the labor market, most clearly in connection to over-schooling and the resulting credential inflation (Clogg and Shockey 1984). Existing research on the consequences of expansion has, therefore, focused on how stratified labor markets became by way of these processes. The credential inflation literature has, for example, examined the wage premium to education in an over-schooled labor market (Freeman 1976; Hartog 2000) and studied how credential inflation affects the strength of the effect of education on occupational attainment (Wolbers, De Graaf, and Ultee 2001). Other studies that focus on outcomes find that the returns to education increased with educational expansion (e.g., Goldin and Katz 2008, but see Hannum and Buchmann 2005).

By directing the research agenda towards the question of how expansion affects the *strength* of the relationship between educational attainment and labor market outcomes, the field has not sufficiently considered the possibility that expansion has completely changed the way in which education operates in labor markets. We claim that, with expansion, there has been a shift in the dominant mechanism that underlies the association between education and labor market outcomes. In societies with limited levels of educational enrollment, the human capital model of schooling, with its focus on the level of skills acquired, offers a better explanation for why education is rewarded than in societies with mass education. In these latter societies, by contrast, education has increasingly come to operate as a positional good in labor markets, in which not the absolute skill level but rather the relative position of workers, given the distribution of the educational attainment of the population, is increasingly important to earnings.

We demonstrate that with the rise of mass higher education for cohorts graduating between 1951 and 2003 in a sample of thirty countries, rewards (measured in income and occupational status) in the labor market are increasingly based on a relative measure of workers' educational level. That is, we find that education becomes more important in the determination of income and occupational status—as standard theories of stratification would hold—only if education is measured in relative

rather than absolute terms. This finding implies that, with educational expansion, the strength of the education effect has increased. Moreover, it suggests that the mechanisms underlying the effect have shifted from a human capital perspective to a positional model of education.

4.2 Educational expansion and educational differentials in labor markets

At an individual level, it is a well-known fact that education is strongly related to earnings (for reviews see Card 1999; Hout 2012), although there are significant differences in the size of the returns to education between countries and time periods. Researchers have explained such variations by referring to varying degrees of (post-)industrialization and technology, assuming stronger effects of education with increasing processes of (post-) industrialization and technological development because the demand for and price of skilled work increased (Bell 1973; Fernandez 2001; Goldin and Katz 2008). The role of technology and economic modernization in increasing the demand for skilled labor, thereby strengthening the association between education and earnings, has been questioned from several angles.

Economists, for example, argue that the increase in the returns to education are primarily found in the 1980s and the 2000s, not in the 1990s, as these are the periods when technology developed rapidly (e.g., Card and DiNardo 2002; Lemieux 2006). Goldin and Katz (2008) analyze the growing educational payoff in the United States by studying the differences between supply and demand in a race between education and technology. Their main argument is that the wage premium to education increased from the 1980s onwards because the demand for skills exceeded the supply of highly educated workers. When technological change moves faster than educational expansion, the returns to education increase. Although there is skepticism as to why the effect of education has increased with the expansion of education (e.g., Berg 1970; Collins 1979), the finding that the returns to education increased is less contested.

An important stream of research has thus addressed the relationship between educational expansion and how strongly educational attainment is related to labor market outcomes. A central finding in these studies is that the effect of education on labor market outcomes has increased with educational expansion (e.g., Goldin and Katz 2008). However, this field has hardly addressed the more fundamental question whether a new model of education has emerged in labor markets, in which education is seen as a positional good rather than as an absolute indicator of skills. Did the increasing number of highly educated workers change the way in which employers reward education? To shed light on this question, we focus on two dominant models of schooling in the economic and sociological literature: education as human capital and education as a positional good. Although both theories are discussed independently, it is important to mention that our argument is not that one of the two models fully explains the educational payoff in the labor market. Both models can operate simultaneously; however, our main focus is whether one of the two models becomes increasingly important with educational expansion (not necessarily at the expense of the other).

4.2.1 Human capital and industrialization processes

A common explanation of why education is rewarded, and why individuals invest in schooling, is that education provides students with productivity enhancing skills that are rewarded by employers (Kerckhoff, Raudenbusch, and Glennie 2001; Brand and Xie 2010). Neoclassical economic theory can be seen as the main advocate of this idea in arguing that each person will receive the full returns for their marginal product (their skills) in the labor market, where labor demands and labor supplies are matched (Becker 1964). Education is an important form of human capital accumulation: more education implies more skills and thus entails higher wages.[1] There are several studies that use less-strict definitions of human capital and that argue, for example, that human capital accumulation is not solely an individual process (Tomaskovic-Devey, Thomas, and Johnson 2005) or that there are different types of human capital, and it is thus "multifaceted" (Acemoglu and Autor 2012). However, the general assumption that underlies all of the variants of human capital theory is that individuals with equal skills should be rewarded equally. When entering the labor market, education is therefore expected to generate an absolute return: each person with the same amount of skill should receive the same wage. Absolute skill levels (typically assessed by years of education in the human capital model) are rewarded, and individuals decide their personal investment in a certain number of years of schooling on the basis of the wage it will yield.

Sociological theories of modernization are strongly connected to this skill-based interpretation of education. Instead of social origin, educational attainment increasingly determines who advances (Breen and Jonsson 2005), as jobs in technologically advanced industries demand productivity enhancing skills that are taught in schools. It is evident from the modernization theorists, and more fundamentally from functionalism as a theoretical paradigm, that the reason that education is increasingly rewarded is its *function* for the production processes in modern economies (Bell 1973; Blau and Duncan 1967; Morris and Western 1999; Treiman 1970). Hence, although rarely made explicit in the literature, there is a strong affinity between modernization theory and the human capital model of education (Barone and Van de Werfhorst 2011). Education is rewarded, and increasingly so, because of the skills that are taught in schools and the demand for those skills.

Following this approach, it may be expected that this increasing trend particularly concerns the effect of the *absolute* level of schooling (*hypothesis 1*). The absolute level of schooling can be assessed, as is common practice among scholars in the human capital tradition, by the number of years of education (e.g., Mincer 1974; Goldin and Katz 2008; see Card 1999 for a discussion).

4.2.2 The positional model of education in the post-industrial society

The positional model of education, in contrast, stresses the relativity of educational attainment (Thurow 1975; Hirsch 1977). Not so much the worker's absolute skill level determines his or her earnings but rather his or her relative position among the suppliers of labor. According to Thurow (1975), a hiring process is defined by two

1. Work experience is also key in the process of human capital accumulation (Schultz 1961; Mincer 1974). Although we recognize the importance of work experience, we are predominantly interested in the educational payoff at labor market entry. By controlling for work experience in our statistical models, we estimate the returns to education net of the skills that are gained through experience.

queues: the labor queue and the job queue. In the labor queue, employees are sorted according to their signaled characteristics (with education being the most important feature), while the job queue is a virtual line where jobs are sorted according to the training costs that employers make to prepare their workers. Employers will always try to hire those employees who are at the front of the labor queue, whereas employees will always aim to obtain the highest-ranked occupation in the job queue. The educational payoff in the labor market, in this model, depends on the educational composition of the other job seekers. Given the distributional variations in education that differ between time and place, the value of a particular level of education is strongly context-dependent.

Thurow (1975) furthermore questions the assumption of neoclassical economics that the individuals who sell their labor are skilled to do a job, and it is thus the absolute skill level which is rewarded. He argues that skills are of relatively little importance in the selection process: education is more a sorting machine than a skill provider (Weiss 1995), and educational degrees do not necessarily reflect actual skill levels but are used by employers as signals (Arrow 1973; Spence 1973; Stiglitz 1975). Thurow argues that education is unimportant for productivity enhancing skills, as "most cognitive job skills, general or specific, are acquired either formally or informally through on-the-job training after a worker finds an entry job and the associated promotion ladder" (1975: 78). The productivity of workers is not connected to the human capital of the workers themselves but rather to the jobs they hold. When productivity does not reside in individuals, the absolute value of education is limited. Instead, workers with the highest available level of education are chosen for more complex jobs requiring more training, as employers aim to minimize their future training costs. In that sense, the positional model of education attaches more importance to the demand side than human capital theory, as job opportunities are solely created by employers when there is a demand for that specific type of work (Goldthorpe 2009). The positional model of education argues that individuals are constantly in competition to obtain the best paid jobs, with an upward pressure in the educational system whereby individuals attempt to become as highly educated as possible.

The positional model of education seems better able to explain trends in "mismatching" between educational attainment and demanded skill levels than the human capital model. A process has taken place whereby individuals invest in a level of education even if that level is unnecessary for their future work (Freeman 1974; Clogg and Shockey 1984; Van der Ploeg 1994). This trend towards over-schooling has led to credential inflation (Berg 1970; Collins 1979) and subsequently to the displacement of less-qualified workers (Wolbers et al. 2001). Highly educated workers take jobs at their own level but also below that, and workers with intermediate levels of education are increasingly competing for low-skilled jobs. The result of this process is that many people work below a job level that matches their education; moreover, the less-qualified workers are displaced. Because educational expansion has further homogenized the composition of the less-skilled workers (e.g., in terms of learning ability), employers are increasingly demanding higher levels of education even for jobs that do not require much education (Olneck and Kim 1989; Gesthuizen, Solga, and Kunster 2010).

Like the human capital model, the positional model also assumes that education is increasingly important for labor market careers. However, contrary to the modernization

thesis and its underlying human capital model, the positional model assumes that it is particularly the *relative* position of educational qualifications that have become increasingly important in societies with significant educational expansion (*hypothesis 2*).

The positional model of education, in which employers increasingly reward the relative position of educational attainment, is compatible with the neo-institutional perspective that views the quest for educational expansion as a myth unsubstantiated by empirical evidence (Meyer 1977; Schofer and Meyer 2005; Ramirez et al. 2006). According to this model, employers increasingly believe in the beneficial outcomes of education. They are active agents in a society in which the demand for education is seen as pivotal for economic growth, even if the empirical evidence of a relationship between education and growth is unclear. This assumption will lead them to increasingly select workers on the basis of their educational qualifications, especially in their relative rather than absolute form.

4.2.3 Changes in the labor market

Although one of the most striking changes in the last century was the rise of mass education, it was not the only significant change. In the previous sections, we focused exclusively on educational expansion, and thus variation in the supply side of the labor market, as a predictor of changes in the returns on relative or absolute skills. On the demand side of the labor market, several processes may have influenced the mechanism by which education yields high returns on investment. First, the actual demand for labor should be taken into account. When the supply outpaces the demand, the relative value of education is likely to be higher than in times of an undersupply of labor. Even when the labor queue, and thus the educational composition of the job seekers, remains stable, changes in the job queue can influence the relative educational payoff.

Second, technological changes are likely to influence the mechanism by which education yields a high return on investment. In the skill-biased technological change framework, exogenous technological changes cause an increasing demand for highly skilled workers (Goldin and Katz 2008). However, technological changes not only increase the demand for higher skills but also decrease the demand for static skills. When new technologies evolve, individuals are more likely to be selected on the basis of their trainability than their actual skill levels; hence, employers reward more on the basis of workers' relative position (Van de Werfhorst 2011a).

Similarly, the transition to post-industrialism caused a change in the occupational structure, with industrial jobs being replaced by service jobs. It is especially in these types of jobs that the rewarding of employees takes place more on the basis of trainability instead of the skills acquired in education (Beduwé and Planas 2003). Due to the generic (less vocational) character of service-sector employment, individuals are increasingly rewarded for their level of trainability. In the secondary sector, the connection between education and skills is more obvious and therefore employers are expected to select on the basis of a worker's absolute educational position. This connection between education and skills is less apparent for service jobs in the tertiary sector, where employers are more likely to reward workers on the basis of their relative educational position.

4.3 Methods

Our main empirical task is to compare the absolute level of education (following the human capital model) with the positional good model of education based on workers' relative educational position. More specifically, we are interested in whether, with increasing levels of educational expansion, the impact of either an absolute measurement of education or a relative measurement of education on labor market returns increases. If the effect of an *absolute* measure on labor market returns increases as education expands, this finding supports the human capital model of education (hypothesis 1). If, however, the effect of a *relative* measure of education on labor market returns increases with educational expansion, this finding supports the positional model of education (hypothesis 2).

We test both hypotheses with multilevel random intercepts models, whereby individuals are nested in synthetic country-specific graduation cohorts with fixed effects on the country level. To estimate the two-level models with fixed country effects, we use data from the International Social Survey Programme (ISSP) from 1985 to 2008 and harmonize the variables used in these surveys.[2] A total of 30 countries[3] provided the data for our analyses. The models are based on a cohort design, as individuals are nested in synthetic bi-annual graduation cohorts (the cohort in which individuals are assumed to have left formal education, calculated by using information on the birth year and the years spent in formal education). The first bi-annual graduation cohort in our sample is from 1951 and the final is from 2003 for a total of 27 cohorts.[4] Only employees between the ages of 25 and 65 are included in the sample.

4.3.1 Absolute and relative level of education

Before we describe our statistical design, we first explain how we operationalized the theorized distinction between absolute and relative educational positions. For the absolute measure, the amount of years one has spent in formal education is used, which is a standard measure in human capital studies. We use years of education instead of the level of educational attainment, as it is more comparable across respondents from the same graduation cohorts but different survey years. Additionally, the classification of distinct educational levels changes over time in the data that we use (ISSP), unlike years of education. As a result, only those countries and survey years were used in which years of schooling was asked as a separate survey question. Our absolute measure is independent of the years of education of other school-leavers in the same cohort and

2. In the harmonization, we had to recode several variables because they differed across survey years. Respondents' employment relation is described in more detail in the later years. The main recoding took place concerning income. For each country and survey combination, all categorical income data is recoded into group means. A final step that we took was to delete duplicate observations. As some countries use the same sample of respondents for two consecutive ISSP waves, the respondents with the same respondent number, country of residence and gender are eliminated from our final dataset.

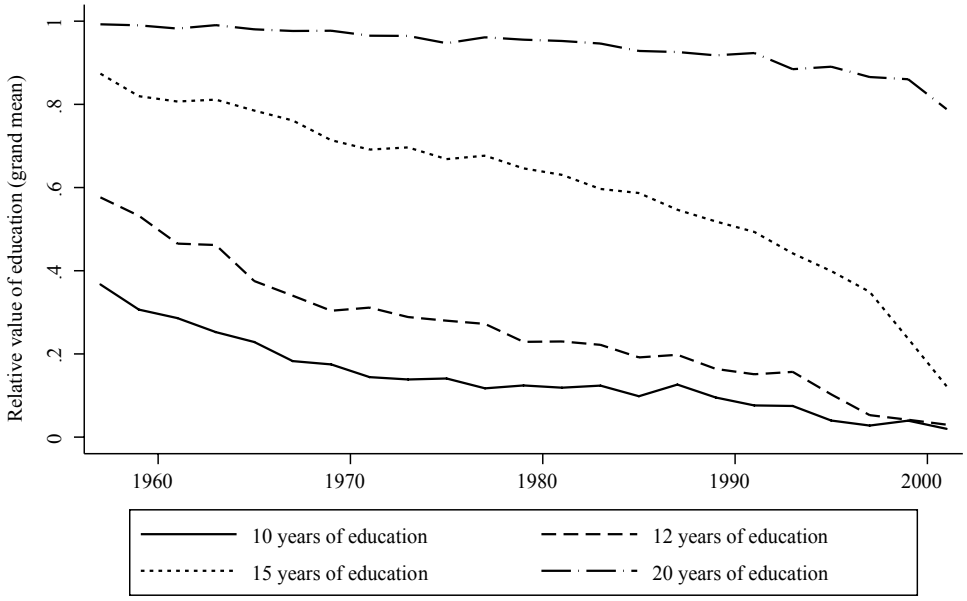
3. We are more interested in a trend over time than a comparison between countries. Although we acknowledge that there are potentially important differences between the countries, we take a first step by studying a trend over time. The 30 studied countries are all industrialized Western countries. A list of all of the countries, as well as their mean scores on all macro variables, can be found in Appendix G.

4. In our design, a school-leaver is expected to compete for a job mainly with those who leave education within these two-year time frames. While the strongest competition is between those who have just entered the labor market, individuals who are already in the labor market compete, as well.

thus remains constant across time and context.[5]

To obtain the relative measure of education, we recode the years of schooling into a proportional score (percentile position, ranging from 0 to 1) for each country-cohort combination. Individuals are ranked according to the number of years they spent in education relative to the years spent by the individuals in the same cohort and country. By converting the years of schooling into a ranked variable, we measure the position of one worker relative to others in the same graduation cohort, as has been done in previous studies (Sørensen 1977; Ultee 1980; Olneck and Kim 1989). The relative measure depends on context and time, as an individual's rank depends on the years of education of other workers who left formal education in the same cohort. This difference between the absolute and the relative measure of education can be exemplified by showing how the relative value of education changes over time. In Figure 4.1 we plotted the average proportional score (i.e. the relative value of education) for those individuals with 10, 12, 15, and 20 years of education. While 10 years of education was relatively a lot in the 1950s and 1960s (4th decile), the value decreased drastically over time. The figure thereby clearly shows how the absolute and relative measure are different.

FIGURE 4.1: THE RELATIVE VALUE OF YEARS OF EDUCATION OVER TIME



Source: ISSP 1985-2008

5. This assertion does not imply that years of education gives the same returns across countries and years: educational systems differ across countries, which could lead to different predictive powers of years of education (see Bol and Van de Werfhorst 2011b). However, this fact is not a problem for our design because we only compare the absolute measure with the relative measure. If there is a measurement error, there is no reason to expect it to be larger for the absolute and the relative measure.

4.3.2 Random intercept models

By using two-level random intercepts models, we investigate the specific pattern by which the effects of the relative and absolute measures change with educational expansion. Because both measures are strongly correlated (R=0.86), we are not able to estimate both effects in the same model, as doing so might lead to inefficient estimates. Therefore, we run separate models with either the absolute measure (Equation 4.1) or the relative measure (Equation 4.2) as our main independent variable. For this chapter, we are more interested in cross-temporal than cross-national variation; therefore, we control for all country variations by adding fixed effects for countries. In both multi-level random intercept models, individuals (*i*) are nested in country-specific graduation cohorts (*j*). The general models are defined by the following equations:

$$Y_{ij} = \alpha + \beta_1 X_{1ij} + \beta_2 X_{3j} + \beta_3 X_{1ij} * X_{3j} + \sum_{k=k-1} \beta_x D_k + \beta_x A_{ij} + \beta_x B_j + u_j + \varepsilon_{ij} \quad \textbf{(4.1)}$$

$$Y_{ij} = \alpha' + \beta'_1 X_{2ij} + \beta'_2 X_{3j} + \beta'_3 X_{2ij} * X_{3jk} + \sum_{k=k-1} \beta_x D_k + \beta_x A_{ij} + \beta_x B_j + u_j + \varepsilon_{ij} \quad \textbf{(4.2)}$$

where Y_{ij} is the dependent variable in use (either income or occupational status), X_1 is a vector of years of education, X_2 is the relative level of education, X_3 is educational expansion, A is a set of individual-level control variables, B is a set of graduation-cohort-level control variables, β_x estimates the fixed effects for countries by adding dummies D_k (dummies D for country k), u_j is the error term at the country-specific graduation-cohort level, and ε_{ij} is the individual-level error term. Most important in these models are the cross-level interactions (β_3 and β'_3), as they signal how the effect of the absolute and relative measures (β_1 and β'_1) change with educational expansion.

4.4 Data

We test our hypotheses with harmonized data from all waves (1985-2008) of the ISSP. The ISSP is an annual cross-national collaboration of surveys, and it collects nationally representative data on social-scientific issues. Although there are numerous rotating modules, a fixed set of background variables was gathered in each survey between 1985 and 2008. These variables are used in the current study, and it is therefore possible to harmonize all waves of the ISSP. Because of the large number of ISSP waves, we are able to analyze a large number of observations (N=110,252 when income is the dependent variable and N=77,664 when occupational status is the dependent variable). The difference in sample size between the two dependent variables arises from the absence of detailed occupational information (and hence occupational status) for a number of country-survey combinations in the ISSP.

4.4.1 Dependent variables

We estimate the effects of the absolute and relative educational measures on two different dependent variables: income and occupational status.

Income

The ISSP income variable is measured differently across countries but also between survey years within countries. In some countries, it is measured on an interval scale, while other countries only provide income categories.[6] We therefore need to standardize the measure to make it comparable across countries (*k*) and survey years (*l*). Following Checchi, Visser, and Van de Werfhorst (2010), we take the logarithm of the relative distance of each individual income observation to the country and survey year specific median:

$$\text{income}_{ijk} = \ln\left(\frac{incomeISSP_{ilk}}{median_{lk}}\right) \qquad \textbf{(4.3)}$$

On the new variable, "income," zero is interpreted as being equal to the median income, and each negative and positive distance is mirrored. If an individual earns six times the median wage, he or she is equally distant from zero on the positive axes as someone who earns one sixth of the median is on the negative axes.

A shortcoming of this variable is that it measures personal income rather than earnings. Personal income is not exactly the same as earnings, the variable that we are theoretically interested in. However, the data are often used as earnings data (e.g., Blau and Kahn 1992; Kelley and Evans 1993), and the correlation between actual earnings and personal income is expected to be high, especially because we only studied employees. To make sure that our results are not an artifact of the use of relative income as dependent variable, we also estimated our models with the European Union Community Statistics on Income and Living Conditions (EU-SILC) of 2009. The EU-SILC data is a cross-sectional dataset for which all European Union countries deliver a large random sample of their population.[7] Most importantly, this dataset contains a continuous measure of gross personal earnings, and therefore allows us to replicate the analyses done with the ISSP data. The results of our analyses with the EU-SILC data of 2009 are highly comparable to the results we find with the data from the ISSP[8] (see Appendix F). We can thus be more confident that the results we will present in the following sections is not merely caused by the way income is measured in the ISSP.

Occupational status

We also test our hypotheses by using occupational status as a dependent variable. Occupational status is measured with the International Socio-Economic Index (ISEI) (Ganzeboom, De Graaf, and Treiman 1992). We tested the extent to which the absolute or relative level of education gives more access to high status occupations as education

6. For all countries and survey years where income was coded according to categories, each category is recoded to its class middle.

7. For a more detailed description of the EU-SILC data, visit epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu_silc, last accessed July 9, 2012.

8. A difference between both results is that with the EU-SILC data we find that the effect of years of education on earnings decreases with educational expansion. This finding is in line with earlier studies that show that an increase in supply decreases educational returns (e.g., Teuling and Rens 2008). However, this findings is not in conflict with our main claim that education increasingly became positional.

expands. ISEI reflects the status of the occupation and is therefore used to determine whether the positional good or human capital mechanism is a better explanation for one's place in the occupational structure.

Although income should yield a good indication of how the role of education changed with educational expansion, occupational status is used to verify our findings. As mentioned, in the ISSP, income is measured differently across different countries and survey years, therefore it is a test of validity to see whether our findings hold when we use ISEI, a dependent variable that is highly comparable between countries and survey years, as a dependent variable. Furthermore, ISEI is a dependent variable that a broader indication of social advantage in the labor market. ISEI is measured on a scale from 16 (lowest socio-economic status) to 90 (highest socio-economic status).

4.4.2 Independent variables

Individual level

Our main independent variables, the absolute and relative measure of education, have already been described. At the individual level, we control for gender, marital status and work experience. Gender is coded 1 for females; marital status is a dummy variable that is coded 1 for married, and 0 for other marital statuses. Work experience is an important control because we use a design where individuals are grouped according to their synthetic graduation cohort, and as a consequence, the amount of work experience differs across the observations for each group. To control for income or occupational-status differentials that arise out of differences in experience, we add work experience, which is constructed by taking the number of years since an individual exited formal education. Finally, we add the squared term of work experience, as it is well-known from labor economics that the effect of experience on income is non-linear.

Contextual level

Our main interest is how educational expansion influences the strength of the effects of the absolute and relative measure of education on our two dependent variables. We therefore add an indicator of educational expansion at the country-cohort level, measured by using the number of students enrolled in tertiary education as a percentage of the total enrollment. Following Schofer and Meyer (2005), we use data on enrollment in higher education from the Cross National Time-series Data Archive (CNTDA) by Banks (2008). The enrollment data in the CNTDA is based on UNESCO statistical yearbooks and has the advantage of including data from the 19th century for some countries. In our design, we only use the tertiary enrollment data from 1951 until 2003.

As argued, the strength of the relative measure of education might be dependent on changes to the demand side of the labor market. We therefore control for three other contextual variables, all of which have an observation for each country-cohort combination. First, we control for changes in demand for labor. Ideally, one would use (youth) unemployment rates as a measure. For most countries, however, these data are only available from 1970 onwards. As a proxy, we take the two-year difference in GDP

per capita[9] (Banks 2008, supplemented by data from the World Bank).[10] Economic growth is strongly related to variations in demand, as in times of high economic prosperity, the demand for employees is often higher.

Second, we control for technological developments. Because not all countries invest equally in technological change, there is some variation that needs to be controlled for if we wish to show that it is actually educational expansion and not the technological development that influences the effects of the relative measure of education. Technological development is measured by the number of patents per million persons that is applied for in that year (WIPO Statistics Database).[11] Finally, we control for sectoral changes: how did the labor market actually change during the era of educational expansion? To address this question, we add the amount of employees in the secondary sector as a percentage of total employment, based on data from the CNTDA (Banks 2008) and the World Bank.[12]

If we wish to use these variables as controls, it is important to add all cross-level interaction terms between these macro-level variables on the one hand and the relative and the absolute educational measures on the other hand. Descriptive statistics for all variables can be found in Table 4.1. In Table 4.2, the mean scores of all macro variables over time are shown.

TABLE 4.1: DESCRIPTIVE STATISTICS

Variables	Observations	Mean	S.D.	Min.	Max.
Individual level data					
Income	110,252	-0.05	0.63	-7.05	3.82
ISEI	77,644	45.71	16.59	16	90
Gender (female=1)	110,252	0.49	0.50	0	1
Marital status (married=1)	110,252	0.68	0.47	0	1
Experience	110,252	26.07	10.83	0	57
Experience squared	110,252	796.80	590.00	0	3,249
Years of education	110,252	12.84	3.58	1	35
Relative educational position	110,252	0.42	0.31	0	1
Graduation cohort level data					
% tertiary enrollment	644	0.09	0.06	0	0.29
Growth in GDP per capita	644	0.14	0.17	-1.85	0.58
Number of patents per million persons	644	0.81	0.75	0.01	3.95
% employed in secondary sector	644	33.13	7.15	17	53.9

NOTE. – The descriptive statistics for all variables except ISEI are based on the sample that is used when income is the dependent variable.

9. To standardize the difference in growth in GDP per capita and make the measure comparable across countries, we applied the following formula: *Growth = log(GPD per capita/GDP per capita[n-2])*. By taking the log of the ratio, a negative and positive deviation from the previous GDP level are equal.

10. The data are retrieved from their online database: data.worldbank.org, last accessed February 8, 2011.

11. Using World Bank and UNESCO data, the World Intellectual Property Organization (WIPO) collects historical data on patents: www.wipo.int/ipstats/en, last accessed February 24, 2011.

12. The data are retrieved from their online database: data.worldbank.org, last accessed February 5, 2011.

Table 4.2: Mean scores of cohort data for all countries

Year	% Tertiary enrollment	Growth in GDP per capita	Number of patents per million persons	% employed in secondary sector
1951	0.024	0.097	0.895	0.357
1953	0.027	0.084	0.979	0.366
1955	0.028	0.105	0.730	0.325
1957	0.029	0.098	0.760	0.334
1959	0.034	0.123	0.857	0.344
1961	0.039	0.132	0.879	0.347
1963	0.044	0.112	0.920	0.349
1965	0.052	0.171	0.992	0.354
1967	0.058	0.158	1.052	0.359
1969	0.065	0.159	1.079	0.359
1971	0.075	0.312	1.040	0.357
1973	0.082	0.304	1.040	0.360
1975	0.084	0.272	0.942	0.354
1977	0.084	0.160	0.923	0.350
1979	0.085	0.267	0.867	0.354
1981	0.096	0.135	0.684	0.338
1983	0.102	-0.056	0.680	0.325
1985	0.110	-0.003	0.637	0.319
1987	0.122	0.397	0.728	0.312
1989	0.136	0.137	0.775	0.307
1991	0.146	0.077	0.618	0.301
1993	0.151	0.027	0.547	0.301
1995	0.155	0.212	0.563	0.296
1997	0.161	-0.002	0.611	0.286
1999	0.172	0.003	0.611	0.276
2001	0.188	0.020	0.388	0.259
2003	0.206	0.266	0.393	0.251

NOTE. – These averages are calculated by giving equal weight to each country-cohort observation. All percentages are coded to proportions. The data above is used in the analyses.

4.5 Results

Did the expansion of education influence the way in which employers reward education in the labor market? We investigate this question by using two-level random intercepts models (individuals nested in country-cohort combinations) where we fix cross national differences by adding country dummies because we are primarily interested in how educational expansion influenced the returns to an absolute and relative measure over time. As argued earlier, due to collinearity between the relative and absolute measure of education, we are forced to estimate two series of models[13] for each of the dependent variables: in Tables 4.3 (income) and 4.5 (ISEI), the absolute measure (years of education) is the main independent variable, and the relative measure of education (proportional rank on years of education) is the main independent variable in Tables 4.4 (income) and 4.6 (ISEI).

13. However, if we ignore the issue of multicollinearity and use both the relative and absolute measure of education, our conclusions are supported to an even greater degree in one model. The interaction effect of the absolute measure and educational expansion is negative, while the interaction term between the relative measure and educational expansion remains positive.

4.5.1 Results for income

In the first model of Table 4.3, we find that years of education has a strong, significant, effect on income, as expected. For each year of education, the relative income increases by 6% (exp[0.060]=1.062).

In the following models, we add educational expansion and the interaction between educational expansion and years of education (Model 2). Educational expansion has a negative coefficient as main effect, which is the effect of educational expansion when years of education are equal to zero. We find no significant interaction effect between educational expansion and years of education, indicating that with educational expansion, the absolute level of education neither lost nor gained importance; its effect on income stayed more or less equal. In Model 3, we add several control variables.

TABLE 4.3: RANDOM INTERCEPT MODELS FOR *ABSOLUTE* EDUCATIONAL POSITION WITH INCOME AS DEPENDENT VARIABLE

	Model 0	Model 1	Model 2	Model 3
Individual level				
Country dummies	*yes*	*yes*	*yes*	*yes*
Years of education		0.060***	0.059***	0.050***
		(0.001)	(0.001)	(0.004)
Country-graduation cohort				
% Tertiary enrollment			-0.467***	-0.462**
			(0.179)	(0.191)
Growth in GDP per capita				-0.110**
				(0.044)
Number of patents per million persons				0.100***
				(0.014)
% employed in secondary sector				-0.375**
				(0.153)
Cross-level interactions				
% Tertiary enrollment * Years of education			0.010	0.017
			(0.011)	(0.012)
Growth in GDP * Years of education				0.006*
				(0.003)
Patents * Years of education				-0.007***
				(0.001)
% secondary sector * Years of education				0.042***
				(0.011)
Constant	-0.093***	-1.038***	-0.980***	-0.922***
	(0.015)	(0.020)	(0.026)	(0.058)
σ^2u (graduation cohort)	0.004***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
σ^2e	0.383***	0.308***	0.308***	0.308***
	(0.001)	(0.001)	(0.001)	(0.001)
ICC (graduation cohort)	0.011	0.010	0.010	0.010
-2LL	207,902	183,878	183,864	183,776
N (graduation cohort)	644	644	644	644
N (individuals)	110,255	110,255	110,255	110,255

NOTE. – Standard errors in brackets. These results in Model 1, 2 and 3 are controlled for gender, marital status, experience, and experience squared.

* p<0.10, ** p<0.05, *** p<0.01

Economic growth has a negative main effect and a positive interaction effect. In times of greater economic prosperity, the average income is lower while education pays off more in the labor market. The number of patent applications has a positive main effect and a negative interaction term. As the number of patent applications increases, the effect of years of education on income decreases. The main effect of secondary sector strength is negative, indicating that when there is a strong secondary sector, the average income is lower. We also find a significant interaction term between the percentage of employees in the secondary sector and the absolute level of education: the effect of years of education on income is stronger when there is a stronger secondary sector. This finding confirms our expectation that the absolute level of education is especially important for jobs in the secondary sector. Most important is that the effect of the absolute level of education, measured in years of schooling, does not significantly change as education expands.

The results of the multilevel regressions with the relative educational measure as the main independent variable are shown in Table 4.4. In the first model, we find a strong positive effect of the relative educational position on income. In contrast to years of education, the relative measure has a significant and positive interaction with educational expansion. As education expands, the effect of the relative educational position on income increases. One might think that this finding might result from a growing effect of higher education in comparison to lower education, as found in earlier studies (Olneck 1979; Olneck and Kim 1989). However, when we specify two variables of years of education (years of lower education and years of higher education) and estimate the cross-level interactions, the findings remain the same: there is no significant interaction effect for years of education, while educational expansion interacts positively with the relative measure of education.

In the third model, we add the control variables. The main effects of economic growth and patents, as well as their cross-level interactions with the relative educational level, are the same as we found in Table 4.3. Economic growth has a negative main and a positive interaction effect, both significant. The number of patents interacts negatively with the relative educational level, while we expected this interaction to be positive because in times of technological change, employers are primarily interested in employees who are easily trainable. Most important is that our main finding from Model 2 is persistent: controlling for all graduation cohort-level variables, the interaction term between relative educational position and educational expansion remains positive and significant. With educational expansion, the effect of the relative educational position on income increases.

4.5.2 Results for ISEI

It is interesting to determine whether our findings are consistent when we use a different dependent variable, namely ISEI. Again, we show two tables, one with the absolute and one with the relative measure of education as main independent variable.

Table 4.5 shows the results for the absolute level of education. In the first model, we see that for each year of education, individual scores on the ISEI scale increase by 2.5, a strong positive effect. However, we are more interested in the results from Model 2, where we add tertiary enrollment and its interaction with years of education. In line with the findings from Table 4.3, we observe that the main effect of educational

TABLE 4.4: RANDOM INTERCEPT MODELS FOR *RELATIVE* EDUCATIONAL POSITION WITH INCOME AS DEPENDENT VARIABLE

	Model 0	Model 1	Model 2	Model 3
Individual level				
Country dummies	*yes*	*yes*	*yes*	*yes*
Relative educational position		0.590***	0.550***	0.585***
		(0.005)	(0.011)	(0.040)
Country-graduation cohort				
% Tertiary enrollment			1.168***	1.343***
			(0.104)	(0.111)
Growth in GDP per capita				-0.053**
				(0.023)
Number of patents per million persons				0.022**
				(0.009)
% employed in secondary sector				0.209***
				(0.091)
Cross-level interactions				
% Tertiary enrollment * Relative education			0.481***	0.297**
			(0.108)	(0.124)
Growth in GDP * Relative education				0.096***
				(0.033)
Patents * Relative education				-0.079***
				(0.008)
% secondary sector * Relative education				0.115
				(0.103)
Constant	-0.093***	-0.345***	-0.547***	-0.639***
	(0.015)	(0.019)	(0.024)	(0.038)
σ^2u (graduation cohort)	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
σ^2e	0.383***	0.308***	0.307***	0.307***
	(0.001)	(0.001)	(0.001)	(0.001)
ICC (graduation cohort)	0.011	0.013	0.012	0.012
-2LL	207,902	183,758	183,542	183,406
N (graduation cohort)	644	644	644	644
N (individuals)	110,255	110,255	110,255	110,255

NOTE. – Standard errors in brackets. These results in Model 1, 2 and 3 are controlled for gender, marital status, experience, and experience squared.

* p<0.10, ** p<0.05, *** p<0.01

expansion is negative and that there is no significant interaction term. Based on these results, we would conclude that the effect of absolute educational position on occupational status does not change with educational expansion.

However, when we add control variables in Model 3, the effect size of the interaction term increases and becomes significant, indicating a small increase in the payoff of years of education with an increase in tertiary education enrollment. The control variables and their interactions with years of education are comparable to the findings in Table 4.3, although we do not find any significant effects of economic growth. According to our findings, the effect of education on occupational status does not change with changing economic conditions.

In Table 4.6, we show the multilevel regressions with relative educational position as the main independent variable. In the first model, we find that the

Table 4.5: Random intercept models for *absolute* educational position with ISEI as dependent variable

	Model 0	Model 1	Model 2	Model 3
Individual level				
Country dummies	*yes*	*yes*	*yes*	*yes*
Years of education		2.539***	2.543***	1.953***
		(0.017)	(0.035)	(0.121)
Country-graduation cohort				
% Tertiary enrollment			-35.185***	-39.943***
			(5.359)	(5.738)
Growth in GDP per capita				1.120
				(1.262)
Number of patents per million persons				3.991***
				(0.400)
% employed in secondary sector				-24.594***
				(4.431)
Cross-level interactions				
% Tertiary enrollment * Years of education			0.177	0.870*
			(0.325)	(0.469)
Growth in GDP * Years of education				-0.112
				(0.088)
Patents * Years of education				-0.249***
				(0.025)
% secondary sector * Years of education				2.271***
				(0.317)
Constant	48.763***	13.055***	18.761***	24.029***
	(0.852)	(0.557)	(0.795)	(1.731)
σ^2u (graduation cohort)	15.764***	2.070***	1.918***	1.671***
	(0.602)	(0.137)	(0.126)	(0.117)
σ^2e	255.102***	195.748***	195.462***	195.203***
	(0.650)	(0.499)	(0.498)	(0.498)
ICC (graduation cohort)	0.056	0.010	0.009	0.008
-2LL	652,108	630,806	630,672	630,524
N (graduation cohort)	625	625	625	625
N (individuals)	77,664	77,664	77,664	77,664

NOTE. – Standard errors in brackets. These results in Model 1, 2 and 3 are controlled for gender, marital status, experience, and experience squared.

* p<0.10, ** p<0.05, *** p<0.01

relative educational position has a strong and significant effect on ISEI. The individuals with the highest educational position scored 25.4 points higher on the ISEI scale than those in the lowest percentile.

In Model 2, we add the main effect of tertiary enrollment and its interaction with the relative educational measure. In line with the findings in Table 4.4, we find that the expansion of tertiary education has a significant main and interaction effect. Again, we find that with educational expansion, the effect of the relative educational position increases, this time on occupational status. Relative education has a stronger effect on occupational status when there are higher levels of educational expansion.

This finding persists when we add all of the control variables. The effects of the control variables differ from the models that utilized income as the dependent variable. In Model 3, we find no significant effect of economic growth, while we do

find that relative education pays off more when the secondary sector is strong. The main finding is, however, that the effect of the relative educational position on ISEI increases when education expands.

The results with ISEI as a dependent variable differ somewhat from income. While we found no significant interaction effect between years of education and educational expansion on income, we do find some evidence that the effect of years of education on ISEI increases when education expands. However, this finding only emerges after we add control variables; the results of the model without controls are congruent with our findings with income as the dependent variable. The positive interaction between relative educational position and educational expansion is persistent in all models, just as when we use income as the dependent variable.

TABLE 4.6: RANDOM INTERCEPT MODELS FOR *RELATIVE* EDUCATIONAL POSITION WITH ISEI AS DEPENDENT VARIABLE

	Model 0	Model 1	Model 2	Model 3
Individual level				
Country dummies	*yes*	*yes*	*yes*	*yes*
Relative educational position		25.353***	23.784***	24.306***
		(0.165)	(0.342)	(1.215)
Country-graduation cohort				
% Tertiary enrollment			26.813***	32.558***
			(3.343)	(3.547)
Growth in GDP per capita				0.347
				(0.672)
Number of patents per million persons				1.228***
				(0.283)
% employed in secondary sector				3.917
				(2.777)
Cross-level interactions				
% Tertiary enrollment * Relative education			17.515***	13.341***
			(3.189)	(3.722)
Growth in GDP * Relative education				0.177
				(0.940)
Patents * Relative education				-2.719***
				(0.246)
% secondary sector * Relative education				6.721**
				(3.100)
Constant	48.763***	44.072***	38.727***	35.616***
	(0.852)	(0.572)	(0.785)	(1.177)
σ^2u (graduation cohort)	15.764***	3.773***	3.672***	3.558***
	(0.602)	(0.199)	(0.187)	(0.183)
σ^2e	255.102***	193.929***	193.583***	193.254***
	(0.650)	(0.495)	(0.494)	(0.493)
ICC (graduation cohort)	0.056	0.018	0.018	0.017
-2LL	652,108	630,302	630,150	630,006
N (graduation cohort)	625	625	625	625
N (individuals)	77,664	77,664	77,664	77,664

NOTE. – Standard errors in brackets. These results in Model 1, 2 and 3 are controlled for gender, marital status, experience, and experience squared.

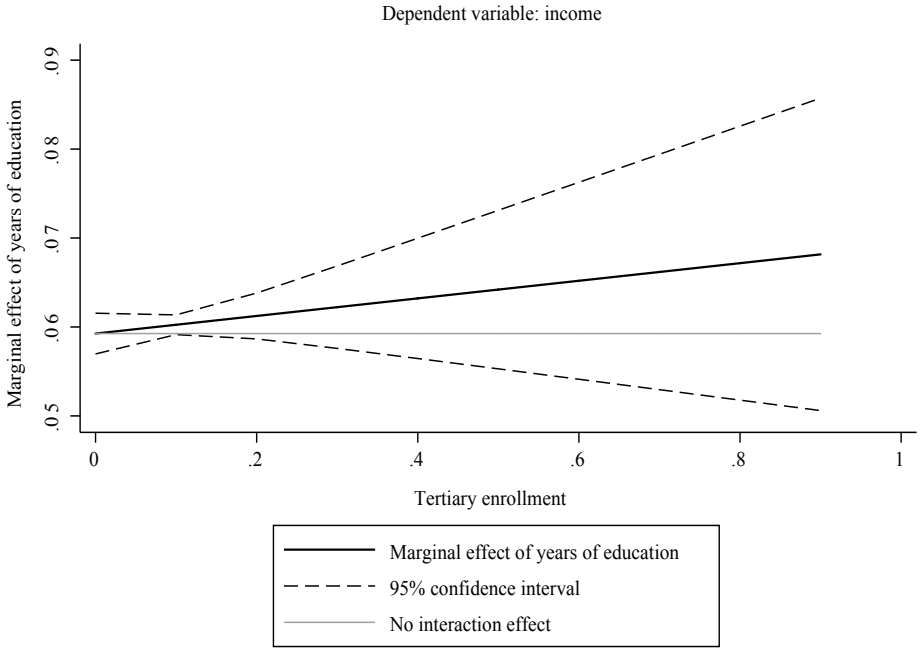
* p<0.10, ** p<0.05, *** p<0.01

4.5.3 Summary of results

With the three-level random intercept models (Tables 4.3-4.6), we investigated whether the effect of an absolute and a relative measure of education changed with educational expansion. We showed that the returns to the absolute level of education remained equal, while the returns to the relative level of education increased with educational expansion. This pattern was more apparent for income than for occupational status, where in one of the models, we did find a slight increase of the effect of absolute education with educational expansion.

In general, however, our results point to a growing importance of relative positional educational levels compared to absolute educational level when education expands. This trend is most clearly observed by plotting the marginal effects of years of education on income (Figure 4.2) and the marginal effects of relative educational position on income (Figure 4.3).

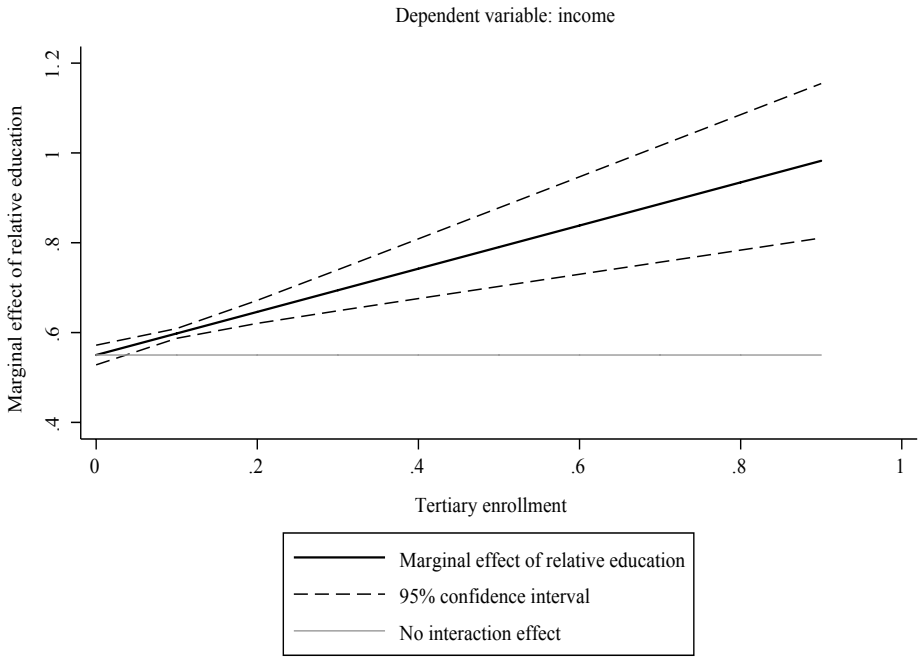
Figure 4.2: Marginal effect of years of education as education expands



Source: Model 2, Table 4.3

The two graphs summarize the main finding of our research: as education expands, the relative educational measure becomes more important, while the effect of the absolute measure remains equal. These results give support for our second hypothesis, whereas we reject our hypothesis 1.

FIGURE 4.3: MARGINAL EFFECT OF RELATIVE EDUCATION AS EDUCATION EXPANDS



Source: Model 2, Table 4.4

4.6 CONCLUSION

During the 20th century, education shifted from being the exclusive domain of those from higher social strata to becoming a mass institution. The explanations for why education expands differ; some argue that educational expansion is a function of a growing complexity in society, while others argue that it is merely a myth kept alive by social actors. Studies that focus on the individual level outcomes of educational expansion primarily look at changes in the strength of the relation between education and rewards. An important gap remains: how does educational expansion alter the mechanism by which education pays off? In this chapter, we studied how educational expansion has influenced the way in which employers reward education for either its absolute or relative value. Two contradicting hypotheses were formulated. While hypothesis 1 predicted an increase in returns to the absolute level of education with educational expansion, hypothesis 2 anticipated a positive influence of educational expansion on the returns to the relative educational position.

Our first hypothesis was based on functionalism and modernization theory in suggesting that educational expansion is functional and follows demand. Modernization theory argues that this increase in the demand for better-educated individuals leads to a stronger effect of absolute educational level on labor market rewards. According to these theories, we would expect that with educational expansion, a worker's returns on the *absolute* educational level would increase. The contrasting hypothesis argues the opposite: educational expansion leads to an increase in returns on a worker's

relative educational position. Several theories argue that educational expansion does not follow demand. If this is the case, a process of displacement will take place. With an oversupply of educated individuals (especially better-educated individuals), employers will find it increasingly difficult to reward employees for their absolute level of education and will rely more on an individual's relative educational position.

We tested both hypotheses by using synthetic cohort data from 1951 to 2003 for 30 countries. When the percentage of students enrolled in higher education increased, the effect of relative educational position on income became stronger, while the effect of the absolute level of education on income remained stable. With these results, we confirmed the second hypothesis: employers reward more on the basis of a relative educational position as education expands. Our findings point to a systematic movement towards education becoming increasingly positional at the expense of the human capital model that prevailed for most of the past half-century.

For employers, the actual level of education became less relevant, while its relative position gained importance. Displacement explains these findings by arguing that educational expansion leads to an intensified competition for fewer jobs among the skilled workforce. An oversupply of better-educated workers leads to mismatching, where the link between the education and the job diminishes. Employers, according to the positional model of schooling, increasingly recruit on the basis of the relative position of workers' education. They are less inclined to recruit on the basis of a specific set of skills desired for a particular vacancy, as a skill-based perspective on education, such as the human capital model, would hold. Labor market returns are, then, better explained—and increasingly so—by a relative measure of education rather than by an absolute indicator of skill levels.

Nevertheless, governments heavily promote educational expansion, and especially of higher education, as they perceive it to be the means to economic prosperity. The recent EU 2020 strategy document, a policy guideline for all European Union countries, describes the goal of increasing "the share of the population aged 30-34 having completed tertiary education from 31% to at least 40% in 2020" because "better educational levels help employability and progress in increasing the employment rate helps to reduce poverty" (EU 2010: 9). A comparable stand is taken by the U.S. Secretary of Education, who stated that it is necessary "to invest in our economic future and enable our kids to compete in today's global environment. America's students and workers need a higher level of education and training" (Duncan 2009).

Our results question this presupposed relationship between educational expansion and economic growth. While the leading idea is that expansion creates a larger human capital stock and therefore greater economic growth, the results of this study show that selection takes place less on the basis of absolute levels of education and thus human capital. With the societies' increase of human capital, its importance as a selection criterion for employers decreases. From our data, we cannot conclude that educational expansion did not lead to a growth in human capital, as we unfortunately do not have data on actual skills. We can, however, argue that the common mechanism by which education is expected to yield high returns on investment differs systematically across settings with different levels of educational expansion. To view educational expansion as something that has only positive outcomes is one-dimensional. This approach neglects the fact that changing educational distributions lead to a significant change in recruitment behavior.

An important task that remains is to explain country variation in the difference between the effect sizes of a relative measure and an absolute measure of education on income as a cross-section. In this chapter, we focused on a trend over time and ignored country differences. While we acknowledge potential cross-national differences, they fall outside the scope of this chapter. Future research must examine potential country differences in the strength of either the positional or the absolute model of education and connect them to structural-institutional indicators.

Educational expansion had tremendous effects on the economy and society at large. While most studies focus on the changes in the strength of the education effect, we showed that the expansion of education also changed the mechanism by which education pays off. As education has expanded, it has become increasingly positional.