Social Science Research 40 (2011) 1078–1090

Contents lists available at ScienceDirect

Social Science Research

journal homepage: www.elsevier.com/locate/ssresearch

Skill and education effects on earnings in 18 Countries: The role of national educational institutions

Herman G. van de Werfhorst

Department of Sociology, University of Amsterdam, Oudezijds Achterburgwal 185, 1012 DK Amsterdam, The Netherlands

ARTICLE INFO

Article history:
Received 19 April 2010
Available online 22 March 2011

Keywords:
Education
Labor market
Stratification
Institutions
Comparative research

ABSTRACT

This study investigates whether the mechanisms why education is rewarded vary across countries. Do educational institutions affect the likelihood that support for a particular mechanism is found? Combining IALS survey data and OECD statistics on educational institutions, it was shown that the effect of measured skill on earnings – controlled for educational attainment – is lower in countries where educational institutions produce skills relevant for work through the vocational system. This indicates that the human capital perspective on education works particularly well in vocationally oriented educational systems, as the skills generated in education are strongly overlapping with the skills that are rewarded. An alternative mechanism sees education as a means for social closure through credentialization. Under the credentialization model, education is not primarily rewarded for the productivity-enhancing skills it entails, but rather for reasons unrelated to productivity. Following this theory education is used for selection into the organization, after which directly observable skills are determining wages. Assuming that a strongly differentiated educational system creates boundaries between social groups, it is hypothesized that strongly differentiated systems lead to stronger measured skill effects. We do not find support for this hypothesis.

1. Introduction

It is undisputed that educational attainment has a profound influence on individual labor market prospects. The higher educated earn more, have higher occupational ranks, have better employment contracts, and have a higher probability to be employed than persons with lower levels of qualification. It is also evident that there are several different mechanisms at play that explain this effect (Hannan et al., 1990; Rosenbaum et al., 1990). A well-known distinction is between human capital theory and credentialism theory (Bills, 2003; Brown, 1995; Hage et al., 1988; Weiss, 1995). Human capital theory and its sociological (functionalist) allies see education as producing skills that are rewarded by employers (Becker, 1993; Bell, 1974; Parsons and Shils, 1951; Davis and Moore, 1945). Credentialism theory, by contrast, assumes that education is used for selection into organizations for reasons other than the productivity that is associated to it (Bills, 1988). Although various perspectives exist on credentialism, one central element of the theory holds that education is used as a means for social closure. By institutionalization processes regarding the educational structure and access to occupations, elites are able to limit the supply of workers, and to restrict access to persons from preferred social backgrounds (Brown, 1995; Bills, 2005; Collins, 1979; Meyer, 1977). Credentialism processes typically involve inequalities that are not resulting from differences in productivity between workers.

E-mail address: h.g.vandewerfhorst@uva.nl

0049-089X/$ - see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.ssresearch.2011.03.004

Comparative research has argued that the strength of the impact of education is dependent on the educational institutional context (Allmendinger, 1989; Müller and Gangl, 2003; Harmon et al., 2001). In educational systems that are vocationally specific and are more strongly tracked, stronger effects of education are found on labor market outcomes (Shavit and Müller, 1998; Stiglitz, 1975; Van der Velden and Wolbers, 2003; Wolbers, 2007). Yet, comparative research has ignored the possibility that countries do not only differ with regard to the *strength* of the effect of schooling, but also with regard to the *mechanism why* education affects labor market outcomes. Comparative research has explained variation in the education effect usually by a mixture of arguments relating to the skills obtained in education and the credentials by which people can get access to well-paying jobs – two theories that are clearly different in their perception of why education matters.

This ignorance of potential differences across countries in the usefulness of theoretical explanations is unfortunate for two reasons. First, given that the strength of the effect of education seems to vary across countries, more insight into the mechanisms on why education affects labor market outcomes is needed to understand this cross-national variation. We need to open up a black box why in one country the effect of education is stronger than in the other. Such explanations are not satisfactory if we stick to the aggregate level by referring to educational institutions, as is thus far the case. We need to integrate institutional perspectives with theories on individual behavior. Second, given that a good explanation of a phenomenon indicates under which conditions the explanation holds true (Popper, 1972), we further develop existing theories by formulating institutional conditions under which these theories are more likely to be supported.

In this paper I study the impact of educational qualifications and measured skill on earnings in 18 countries. Looking at partial effects of skill and education separately, we are able to analyze in which institutional context measured skill provides more additional gains in terms of earnings, and in which institutional context education itself is sufficiently informative about the productivity of workers.

To this aim, I contextualize the importance of education and measured skill by relating their effects to two educational institutional characteristics: external differentiation and vocational orientation. External differentiation refers to the extent to which students are sorted in separate ability-grouped schools, at which ages this occurs, and how many different school types are offered. The creation of a diversified set of school types has a long history in externally differentiated systems. It took shape at the end of the 19th and early 20th century, when post-primary vocational schools were developed in response to changing demands in the economy. Such schools came into existence alongside the already prevalent classical academic types of education. Based on the credentialization theory's arguments that educational systems have been created in order to legitimize and emphasize social differences, such credentalization can be considered most developed in systems where the structure and individual placements are known to everyone involved, and where systems structurate selection in separate school types for multiple years. This is much less evident in internally differentiating countries such as the United States.

In systems with strong educational differentiation it is likely that education functions as a credential that is (partly) unrelated to productive capacities/skills of the holders of qualifications. This would imply that reward of skills measured independently from education becomes more relevant in strongly differentiated systems, given that the market forces employers in a strongly credentialized society still to reward productivity of workers. The vocational orientation refers to the extent to which work-relevant skills are obtained in schooling. In systems that incorporate a strong vocational training component, it is likely that employers use education as an indicator of productivity-enhancing skills more than in systems with a weak vocational component.

2. The education effect in comparative research: from strengths to mechanisms

Existing comparative research on the effect of education on the labor market has focused predominantly on its strength. The seminal volume by Shavit and Müller (1998) on the from-school-to-work transition shows that the strength of the education effect depends on the differentiation and vocational orientation of the schooling system (cf. Allmendinger, 1989; Müller and Gangl, 2003). When these aspects of educational systems are more strongly developed, employers are better informed about applicants on the basis of their qualification. However, this research is generally not concerned with the different mechanisms why education pays off. Also Rosenbaum and Kariya (1989, 1991; Rosenbaum et al., 1990), who show that school grades are of greater importance in Japan than in the United States, largely leave undiscussed *why* grades are important. Following these landmark publications a substantial amount of comparative studies have emerged on the transition from school to work (e.g. Andersen and Van de Werfhorst, 2010; Brauns et al., 1999; Scherer, 2001; Iannelli and Raffe, 2007; Wolbers, 2007; Kogan and Unit, 2008). Many of these studies have interpreted their findings in support of the hypotheses of Shavit and Müller (1998); stronger effects of education are found in countries with a more strongly vocationally oriented educational system.

Yet, two issues remain unresolved. First, it depends on the labor market outcome under study and on the educational categories compared whether the effect of education gets stronger with an increasing vocational orientation of the schooling system. Vocational education comes out pretty strongly in vocationally oriented educational systems when it comes to the chance to avoid unskilled work, in comparison to persons with general qualifications (Shavit and Müller, 1998). Yet, vocational education comes out much more poorly in those same systems when it comes to obtaining jobs with high occupational status in comparison with graduates from tertiary education (Wolbers, 2007; Andersen and Van de Werfhorst, 2010). With regard to the timing of employment after graduation the findings are inconclusive. Some studies conclude that vocational systems smoothen the transition from school to work (Breen, 2005; Van der Velden and Wolbers, 2003), whereas

others find no support for this hypothesis (Wolbers, 2007; Iannelli and Raffe, 2007). It is, in other words, not straightforward to make general claims about stronger education effects with an increasing vocational orientation of the system.

A second unresolved issue concerns the analytical level at which the effects of educational systems are manifested. Often hypotheses are formulated about the effect of institutional characteristics – such as the vocational orientation of the system – on labor market outcomes of all school leavers in a country (Breen, 2005; Van der Velden and Wolbers, 2003; Wolbers, 2007). Although the detailed mechanisms are often left unspecified, it is through a combination of skills and credentials why *individual graduates* from vocational programmes in those countries are assumed to have a smooth transition from school to work. However, the few studies that have been able to disentangle micro-level effects of an individual's school type from macro-level effects of the vocational orientation of the system, have difficulty to provide empirical evidence for micro-level effects (Iannelli and Raffe, 2007; Wolbers, 2007).

Progress in the field can be made by investigating in more detail the different theoretical explanations for the education effect in comparative perspective. To this aim, it is important to theorize at the level of *individual actors within their institutional context* instead of theorizing at the level of institutions. At the individual level, many studies have shown that several explanations exist for the education effect, the two most important ones being related to learning/human capital and to credentialization. However, the viability of microlevel explanations may depend on the institutional context. Under certain institutional conditions, actors may behave more in line with the behavioral assumptions underlying a particular theory explaining the education effect than under other institutional conditions. This may be true for both the human capital/learning theory and the credentialism perspective of education.

The higher probability to avoid unskilled work with vocational qualifications in systems with strongly developed vocational training systems (Shavit and Müller, 1998) is plausibly related to the *skills* that are acquired in those systems, and the related employer-sponsored pathways to employment. In vocationally oriented systems students often take a substantial portion of their vocational programme in apprenticeships where work and school are combined. This can be in a dual (work/school) trajectory, but also in a school-based trajectory when, for example, apprenticeships take the duration of one full-time year as part of a longer programme. An important element of vocational schools in countries with a strongly vocationalized schooling system is that employers have an influence on the content of the programme. Employers thus directly influence the skills that education produces. In vocational programmes under such institutional conditions – in comparison to, for instance, vocational tracks in American high schools, or most programmes in American community colleges – more job-relevant skills are acquired that are directly applicable in the workplace.

Furthermore, not only in vocational programmes there is a clearer match between the skills achieved in education and the skills needed in work. Vocationally oriented educational systems result from a history of two-tier education since the 19th century (vocational versus general). This means that the general types of education were historically oriented towards non-manual work, a match that we still see today.

These patterns should then lead to a type of selection that is in line with the behavioral assumptions of human capital theory, with its clear focus on the selection on and reward of skills that people learn while in school that are directly applicable on the labor market. Thus, human capital theory offers a better explanation for the education effect the more strongly institutions such as vocational education are developed.

Externally differentiated educational systems, however, plausibly have a different impact on how education is used on the labor market. Systems of educational sorting have been argued to be caused by processes of social exclusion, where elites are creating educational systems in which their children will take an advantaged position. Marshall (1950) has, for instance, argued that a 'divided' educational system (in separate school types) emphasizes social distance by promoting intra-class similarity and inter-class differences. Turner (1960) interprets strong educational differentiation as exemplary of a 'sponsored mobility regime' (sponsored by the elites, that is) in which educational inequality is strong. A number of studies have indeed shown that external differentiation is related to higher levels of social inequality in educational achievement and attainment (Brunello and Checchi, 2007; Marks, 2005; Van de Werfhorst and Mijs, 2010). In more strongly differentiated systems, social origin affects educational choices that are directly associated to the amount of learning that takes place, which furthermore have a direct bearing on the eligibility to higher education. We extend this line of reasoning, by examining how differentiation is related to the linkage of educational qualifications to labor market outcomes. To the extent that educational differentiation is indeed aimed at setting boundaries between social groups to enhance the position of the elites, it is likely that such processes of social exclusion puts people at a position in the educational distribution which is not solely driven by their academic achievement. Indeed, research has shown that around one third of total educational inequality by social class background is related to choice processes that have nothing to do with the existing class variations in demonstrated ability (Erikson et al., 2005; Jackson et al., 2007). A plausible implication of these educational processes for labor market reward is that additional indicators of skill (on top of educational attainment) get more relevant. Schooling systems classify students into separate school types, often in separate organizations. Such differentiation enhances the credentialization patterns that are held to be rewarding educational qualifications for reasons other than the productivity related to it. Unlike the vocational orientation of an educational system, the dimension of differentiation does not automatically imply that more work-relevant skills are acquired. But it does provide more detailed information about the educational trajectory of applicants, which makes the exclusion of outsiders easier. The credentializing function of schooling is further reinforced as strongly differentiated systems generally have fewer students that are eligible for enrollment in higher education, which enhances the relative advantage of tertiary degree holders. Hence, the more strongly educational systems have been created to set boundaries between social groups, the more effectively schooling can be used for selection into the organization on the basis

of credentials partly unrelated to productive capacities. However, once workers are hired, education loses its informative power, as students take a position in the educational structure for reasons other than their ability. Therefore, after entry into the organization, employers need to obtain information about workers' productivity (and offer a related wage) by directly observed skills (cf. Thurow, 1976).

A few earlier studies have contextualized theories on the relationship between education and the economy. Such a contextualization takes the form of finding conditions under which average educational attainment or achievement in a country affects economic growth rates, assuming that such a relationship supports human capital theory (Fuller and Rubinson, 1992; Rubinson and Browne, 1994; Ramirez et al., 2006; Hage et al., 1988). Studies using macro-level data show that "when schooling is organized and chartered to produce human-capital development, schooling is more likely to result in economic growth" (Ramirez et al., 2006, p. 22). For example, Hage et al. (1988) argue that the French and American educational systems became more strongly geared towards the production of skills relevant for the economy over the 20th century, so that the relationship between educational expansion and economic growth became stronger. They conclude that "human capital theory works better when the state attempts to design curricula to meet economic (and possibly political) needs and when it guarantees the quality of the output" (Hage et al., 1988, p. 836). Similarly, Ramirez et al. (2006) conclude that the relationship between educational achievement and economic growth is mainly found in the bottom third of the development distribution. By contrast, at more advanced stages of economic development, gains in educational achievement and attainment lead to much weaker advances in economic growth, suggesting that the functioning of education becomes more strongly based on credentialization processes. This is said to reflect the stratifying and legitimizing function that education achieves independent of its direct relevance for the economy (Meyer, 1977; Collins, 1979).

In addition to these studies, our study contextualizes theories on education and labor by looking at educational institutional characteristics of countries, rather than economic development. Such an institutional approach helps us to investigate variations across developed countries in how education is related to the labor market. Moreover, unlike previous studies, our analyses include both individual and macrolevel data, which is essential for studying individual behavior in the context of macrolevel institutions.

3. Hypotheses

Cross-national variation in the applicability of human capital and credentialism theories is tested by examining the partial effect of productivity-enhancing skills on earnings, controlled for educational attainment.

To recall, in strongly vocationally oriented educational systems, such as in Germany, the Netherlands, and Switzerland, the human capital model of education is expected to be more appropriate than in weakly vocationally oriented systems, such as, in our study, in the United States, New Zealand and Scandinavian countries. Given that there is a closer match between skills acquired in education and the skills needed on the workplace, additional indicators of skill are expected to have a relatively weak influence on earnings in strongly vocationalized educational systems (*hypothesis 1*). In systems with a less evident linkage between labor market demands and the kinds of skills taught in schools, education is less indicative of the level of productivity, and additional indicators of skill can be expected to be relatively influential. Some research evidence substantiates this hypothesis. Measured skills have a weak partial effect on earnings in Germany (strong vocational orientation) and a strong partial effect in the United States (weak vocational orientation; OECD, 2000, p. 78).

With regard to the institutional dimension of external differentiation, the pattern is expected to be different. Differentiation itself has no direct bearing on the relevance for work of the skills learnt in schools. Certainly when we control for the vocational orientation of the system and its impact on the effect of measured skills, therefore, it is unlikely that external differentiation would lead to a smaller effect of skills. Recalling that differentiation affects the credentializing processes related to schooling, I hypothesize that stronger differentiation leads to a stronger effect of measured skill on earnings. Under the credentialism model, education is mainly used to identify applicants for the selection into the organization. Once workers are hired, employers cannot refrain from rewarding productivity in a competitive economy. Ths may imply that direct indicators of skill are highly influential on wages. Thus, the more clearly the educational system creates boundaries between social groups by way of between-school tracking institutions, the more strongly direct indicators of skill should be rewarded independent of educational attainment (*hypothesis 2*).

4. Empirical design

The International Adult Literacy Survey (IALS) of 1994/1998 is the best available dataset to test our hypotheses. IALS has been developed to measure skills relevant for work among adult populations aged 16–65 in 19 countries, of which 18 have all the relevant information for our purposes. Furthermore, achieved educational level and type is recorded. Educational attainment is operationalized using six categories: primary education, lower secondary vocational, lower secondary general, upper secondary vocational, upper secondary general, and tertiary education.[1] Earnings are provided in the dataset in

[1] Educational attainment is measured in years in full-time education and in ISCED categories supplemented with information on track (general or vocational). Given the cross-national nature of our study we use the categorized educational attainment variable. Analyses using years of education instead yielded similar results as the ones presented here. These findings are available from the author upon request.

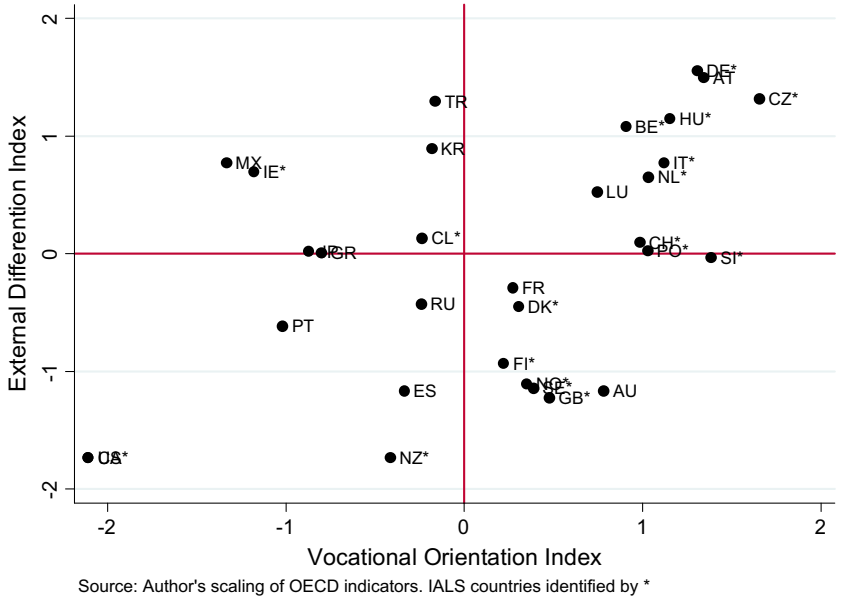


Fig. 1. Standardized external differentiation and vocational orientation indices for 31 countries. Source: Scaling based on OECD indicators. Country abbreviations: AT Austria; AU Australia; BE Belgium; CA Canada; CH Switzerland; CL Chile; CZ Czech Republic; DE Germany; DK Denmark; ES Spain; FI Finland; FR France; GB Great Britain; GR Greece; HU Hungary; IE Ireland; IT Italy; JP Japan; KR Korea; LU Luxembourg; MX Mexico; NL Netherlands; NO Norway; NZ New Zealand; PO Poland; PT Portugal; RU Russian Federation; SE Sweden; SI Slovenia; TR Turkey; US United States. Source: Scaling based on OECD indicators. Country abbreviations: AT Austria; AU Australia; BE Belgium; CA Canada; CH Switzerland; CL Chile; CZ Czech Republic; DE Germany; DK Denmark; ES Spain; FI Finland; FR France; GB Great Britain; GR Greece; HU Hungary; IE Ireland; IT Italy; JP Japan; KR Korea; LU Luxembourg; MX Mexico; NL Netherlands; NO Norway; NZ New Zealand; PO Poland; PT Portugal; RU Russian Federation; SE Sweden; SI Slovenia; TR Turkey; US United States.

within-country quintiles. Control variables included in our models are gender, age, and age squared. The analytical dataset includes people between the ages of 25 and 65, with a total $N = 29{,}224$ nested in 18 countries.

Skills are measured in IALS by three different elements of literacy: prose, document, and numerical literacy. As done in earlier studies, and substantiated by a factor analysis, we summarized these in one variable (z-standardized across countries) indicating productivity-enhancing human capital.[2] It can be seen as a general measure of cognitive skills relevant for a broad range of life outcomes, including work (e.g. Kerckhoff et al., 2001; Kirsch, 2003; Leuven et al., 2004).

I constructed two country-level indices relating to educational institutions: the level of differentiation in the system, and the vocational orientation of the system. A common problem in comparative research of individual and country-level data is that countries are ranked based on their more or less coincidental appearance in the microlevel (survey) dataset. We avoid this problem by first gathering information on the used indicators on a maximum number of countries, independent of their inclusion in the IALS survey, relying on OECD statistics, and define a country's relative position on the scales for external differentiation and vocational orientation based on the full country-level dataset.[3]

The "External Differentiation Index" is created by a factor analysis using information on three variables, ranked to a proportional score before the factor analysis was carried out: the age of first selection (reverse coded), the number of tracks available to a typical 14-year-old student, and the length of the tracked curriculum as a proportion of total length of primary and secondary education (OECD, 1993, 2005). The resulting scale accounted for 82% of the variance in the dataset with $N = 34$ countries, with an Eigenvalue of 2.45. The scale was z-standardized to mean = 0 and standard deviation = 1, again for the 34 countries. I am aware of the fact that our index only classifies countries on the basis of external differentiation (in separate school types), and not on the basis of internal differentiation (streams/tracks within schools). Although internal differention is known to be related to inequality as well (Lucas, 1999, 2001; Gamoran and Mare, 1989), the (formal) institutionalization of differentiating students is arguably more strongly developed in countries with externally differentiated systems. Furthermore, it is hard to classify countries on the basis of internal differentiation, as national-level statistics are not available.

The "Vocational Orientation Index" is based on one single indicator: the percentage of students within upper secondary education enrolled in a vocational track (OECD, 1998). Upper secondary vocational enrollment is a common indicator of the vocational orientation of a country, and is available for a large number of countries (e.g. Shavit and Müller, 1998). The Vocational Orientation Index was also z-standardized for 40 countries of the extended country-level dataset.

Only after these z-standardizations have been carried out, the country-level information was merged to the IALS survey data. Fig. 1 shows the position of each of the 31 countries that can be scaled on both indices. The correlation between the two

[2] There is only one factor with an Eigenvalue larger than 1, which accounts for 88% of the variance. A factor analysis imposing three dimensions gave weak loadings on two factors. If three separate scales were constructed for prose literacy, document literacy and numerical literacy, we get very high correlations between these scales (all >0.91). I therefore maintain the one-dimensional operationalization of skills.

[3] For Slovenia I inserted the percentage of students enrolled in upper secondary vocational education on the basis of Slovenian government files.

Table 1
Descriptive statistics.

	Mean	St. dev.	Min.	Max.
Gender (male = 1)	0.52	0.50	0	1
Age	41.30	10.21	25	65
Education				
Primary level	0.08	0.27	0	1
Lower secondary vocational	0.09	0.28	0	1
Lower secondary general	0.17	0.37	0	1
Upper secondary vocational	0.18	0.38	0	1
Upper secondary general	0.18	0.39	0	1
Tertiary	0.30	0.46	0	1
Income quintile	3.15	1.37	1	5
Measured skills	0.20	0.92	−4.02	2.84
External Differentiation Index	−0.27	1.01	−1.73	1.55
Vocational Orientation Index	0.41	0.88	−2.11	1.66

contextual variables is $r = 0.48$ for the 31 countries. However, if we only examine IALS countries the correlation goes up to $r = 0.66$. Given this rather strong correlation I will examine different model specifications with regard to contextual variables, to see if a consistent pattern in their effects is found.

Table 1 shows descriptive statistics of all used variables.

As the dependent variable is earnings in quintiles, interval regression models are estimated, which are suited to deal with ordered dependent variables with interval bands (Stewart, 1983). Interval regression considers an unobserved continuous variable. All that is known to the researcher is within which range of possible values on the continuous unobserved variable the earnings fall. For instance, for persons in the second earnings quintile we know that their earnings fall within the 20th and 40th percentile of the earnings distribution. Interval regression uses information about the density function and the cumulative distribution of the unobserved continuous variable, and leads to consistent estimates using maximum likelihood (Stewart, 1983). The resulting estimates can be interpreted as OLS estimates on a percentiled distribution. Thus, a regression coefficient indicates how many percentage points percentiled earnings increase with a unit increase in X.

A random intercept variant of interval regression is modelled that includes error terms at the individual and country level, using maximum likelihood estimation (programme xtintreg in Stata 10). Our hypotheses are tested by including cross-level interaction effects between measured skill and the two country-level indices. I furthermore test whether the effects of these interaction terms change when interaction terms between contextual variables and educational attainment in categories are included.[4]

5. Empirical results

Estimates of several random intercept multilevel interval regression models are displayed in Table 2. All models include two error terms, one at the level of countries, and one at the level of individuals within countries, and further include fixed effects of individual and country-level variables. Inspection of the estimates of all models is preferred, rather than just the fit statistics. The two country-level variables are rather strongly correlated, and we need to see whether different model specifications lead to different effects.

Model 1 only includes individual level variables as fixed effects. This model shows that men earn on average 18 percentage points more than women of the same age, and equal educational attainment and measured skills. Age has the usual curvilinear effect on earnings, with a decreasing slope when age progresses. Education has a strong effect on earnings, even after controlling for measured skills. All coefficients are negative, indicating that all educational groups earn less than people with a tertiary degree, even if they have the same level of measured skills. Interestingly, school leavers from the lower secondary vocational programmes earn slightly more than workers with general educational qualifications at the same level of schooling. Measured skills have a significant effect on earnings, controlled for education; one standard deviation increase in skills leads to almost 6 percentage points higher earnings, for people with equal educational attainment.

Model 2 adds the two country-level variables: the External Differentiation Index and the Vocational Orientation Index. This model shows that people in countries with strongly vocationally oriented schooling systems earn on average slightly more than people in weakly vocationally oriented systems. Controlled for the vocational orientation of educational systems, it appears that external educational differentiation leads to lower earnings. Given the within-country fixed quintile distribution these main effects of institutions must be caused by compositional differences between countries with regard to the

[4] Interval regression models can not be specified as random slope models in the statistical packages available today. Estimation of the likelihood function is based on adaptive Gauss Hermite quadrature. Checks for the adequacy of the number of integration points were carried out. The results would be very similar if multilevel random intercept models would have been used for continuous dependent variables using earnings quintile as the dependent variable. I am therefore confident about the robustness of our findings.

Table 2
Random intercept multilevel interval regression analysis on earnings quintile.

Model	1	2	3a	3b	3c	4a	4b	5a	5b	6a	6b
Individual level variables											
Gender (male = 1, female = 0)	17.77***	17.77***	17.77***	17.79***	17.79***	17.81***	17.81***	17.81***	17.81***	17.83***	17.81***
	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]	[0.269]
Age	2.842***	2.842***	2.842***	2.832***	2.840***	2.867***	2.849***	2.858***	2.835***	2.857***	2.841***
	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]	[0.108]
Age squared	−0.0300***	−0.0300***	−0.0300***	−0.0300***	−0.0301***	−0.0303***	−0.0301***	−0.0303***	−0.0300***	−0.0303***	−0.0301***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Education (relative to tertiary degree)											
Primary level	−19.38***	−19.36***	−19.37***	−19.16***	−18.92***	−19.70***	−19.51***	−20.06***	−18.75***	−19.62***	−18.52***
	[0.638]	[0.638]	[0.639]	[0.639]	[0.645]	[0.643]	[0.650]	[0.650]	[0.665]	[0.656]	[0.673]
Lower secondary vocational	−12.10***	−12.09***	−12.09***	−12.17***	−12.15***	−12.25***	−10.12***	−12.44***	−9.766***	−12.50***	−9.888***
	[0.586]	[0.586]	[0.586]	[0.586]	[0.586]	[0.593]	[0.776]	[0.595]	[0.778]	[0.595]	[0.780]
Lower secondary general	−15.08***	−15.08***	−15.07***	−15.11***	−15.17***	−15.66***	−14.73***	−15.85***	−14.30***	−15.93***	−14.36***
	[0.457]	[0.457]	[0.457]	[0.457]	[0.458]	[0.488]	[0.500]	[0.490]	[0.506]	[0.491]	[0.506]
Upper secondary vocational	−8.333***	−8.332***	−8.331***	−8.314***	−8.335***	−8.590***	−7.643***	−8.688***	−7.399***	−8.692***	−7.431***
	[0.430]	[0.430]	[0.431]	[0.430]	[0.430]	[0.439]	[0.564]	[0.439]	[0.566]	[0.439]	[0.566]
Upper secondary general	−8.764***	−8.761***	−8.759***	−8.703***	−8.754***	−8.628***	−9.014***	−8.655***	−8.744***	−8.670***	−8.783***
	[0.411]	[0.411]	[0.411]	[0.411]	[0.411]	[0.448]	[0.427]	[0.448]	[0.430]	[0.448]	[0.430]
Measured skills	5.785***	5.781***	5.777***	5.956***	6.228***	5.773***	5.753***	5.521***	6.070***	5.965***	6.305***
	[0.192]	[0.192]	[0.201]	[0.196]	[0.221]	[0.192]	[0.192]	[0.204]	[0.201]	[0.223]	[0.226]
Educational institutional variables											
External Differentiation Index		−5.137***	−5.134***	−5.046***	−5.158***	−4.409**	−4.912***	−3.862**	−4.843***	−3.885**	−4.953***
		[1.731]	[1.731]	[1.722]	[1.740]	[1.752]	[1.723]	[1.738]	[1.696]	[1.747]	[1.709]
Vocational Orientation Index		4.264**	4.264**	4.271**	4.270**	4.167**	4.278**	4.132**	4.975***	4.139**	4.982***
		[1.917]	[1.917]	[1.907]	[1.927]	[1.927]	[1.922]	[1.904]	[1.896]	[1.914]	[1.911]
Cross−level interactions											
Measured skills × External Differentiation Index			−0.0112		0.525***			−0.690***		**−0.162**	0.442**
			[0.162]		[0.195]			[0.188]		**[0.217]**	[0.198]
Measured skills × Vocational Orientation Index				−0.658***	−0.944***				−1.041***	−0.926***	**−1.293*** **
				[0.159]	[0.192]				[0.193]	[0.192]	**[0.224]**
Education × External Differentiation Index											
Primary level						−3.202***		−4.293***		−4.338***	
						[0.637]		[0.703]		[0.702]	
Lower secondary vocational						−1.651***		−2.221***		−2.208***	
						[0.495]		[0.518]		[0.518]	
Lower secondary general						−1.293***		−1.892***		−1.846***	
						[0.427]		[0.457]		[0.457]	
Upper secondary vocational						−1.007**		−1.341***		−1.333***	
						[0.463]		[0.472]		[0.471]	
Upper secondary general						0.386		0.130		0.0807	
						[0.404]		[0.410]		[0.410]	
Education × Vocational Orientation Index											
Primary level							0.607		−1.299**		−1.420**
							[0.555]		[0.658]		[0.660]
Lower secondary vocational							−2.817***		−3.824***		−3.637***
							[0.751]		[0.773]		[0.778]
Lower secondary general							−0.962*		−2.114***		−2.101***

Table 2 (*continued*)

Model	1	2	3a	3b	3c	4a	4b	5a	5b	6a	6b
							[0.522]		[0.564]		[0.564]
Upper secondary vocational							−1.098*		−1.728***		−1.704***
							[0.581]		[0.592]		[0.592]
Upper secondary general							0.769*		0.233		0.241
							[0.419]		[0.431]		[0.430]
Constant	−12.56***	−14.79***	−14.79***	−14.54***	−14.66***	−14.92***	−14.84***	−14.58***	−14.71***	−14.46***	−14.82***
	[2.870]	[2.840]	[2.841]	[2.835]	[2.845]	[2.845]	[2.836]	[2.834]	[2.818]	[2.839]	[2.826]
σ_u (Country level)	7.483***	6.080***	6.078***	6.048***	6.110***	6.109***	6.050***	6.036***	5.951***	6.069***	5.998***
	[1.257]	[1.026]	[1.026]	[1.021]	[1.032]	[1.031]	[1.022]	[1.020]	[1.006]	[1.025]	[1.014]
σ_e (Individual level)	22.12***	22.12***	22.12***	22.11***	22.11***	22.10***	22.11***	22.10***	22.10***	22.09***	22.09***
	[0.0498]	[0.0498]	[0.0498]	[0.0495]	[0.0496]	[0.0502]	[0.0502]	[0.0501]	[0.0500]	[0.0499]	[0.0500]
[-2LL]	93254	93248	93248	93230	93222	93200	93216	93186	93188	93162	93182
Test against model		1	2	2	3b	2	2	4a	4b	5a	5b
Df		2	1	1	1	5	5	1	1	1	1
Chi-squared		6	0	18	8	48	32	14	28	24	6
Significance		0.050	1	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.014
Standard errors in brackets											

Source: International Adult Literacy Survey, combined with OECD indicators, own calculations.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

individual level variables. At the bottom of the table it can be seen that the fit of model 2 improves on model 1, although the chi-square test borders significance.

Of more interest for our purpose are the interaction effects between these two country-level institutional variables and skills. Models 3a–6b include these interaction effects in different ways, with the inclusion of different other interaction terms. Model 3a includes the interaction term of the differentiation index with measured skills. This interaction effect is small and non-significant. Thus, the impact of skills is not dependent on the level of differentiation in a country. Model 3b replaces this interaction with the interaction between the Vocational Orientation Index and skills. This interaction effect is negative, sizeable, and significant. The model shows that the effect of measured skill gets smaller in countries with an extensive vocational system. The main effect of measured skills ($b = 5.9$), referring to the skill effect in countries with an average vocational orientation of the system, is reduced by 0.66 for one standard deviation increase in the Vocational Orientation Index. Across the range of values on the Index (roughly -2 to $+2$) the effect of skill is estimated to vary between around 7.2 and 4.6. Thus, in systems where the educational system produces more work-relevant skills, additional indicators of skill matter less for earnings. Model 3c adds both interaction terms, and shows that the interaction term between the vocational orientation of the system and measured skill is still negative and statistically significant, and even stronger than in model 3b. Interestingly, the interaction term between the External Differentiation Index and measured skill has a significantly positive effect on earnings, unlike in model 3a. In strongly differentiated systems, skills have a stronger effect on earnings than in undifferentiated systems with a comparable vocational orientation of the upper secondary system.

Models 4a and 4b remove the interaction between the two institutional variables and measured skill, and replaces this interaction with the interaction of categorized educational attainment with the differentiation index (model 4a) and with the Vocational Orientation Index (model 4b). Given the degrees of freedom at the country level with a sample of 18 countries, it is undesirable to include both these interactions in one model. The general message resulting from models 4a and 4b is that the effect of educational attainment gets stronger with stronger differentiation and stronger vocational orientation. The negative main effects of the education dummy's become more strongly negative with increasing differentiation and vocational orientation. This finding is in line with earlier research on occupational status (Andersen and Van de Werfhorst, 2010; Shavit and Müller, 1998; Wolbers, 2007). Not surprisingly, then, models 4a and 4b have a better fit than model 2.

Models 5a and 5b add the interactions between measured skill and the institutional variables, one by one. Controlled for variation in the effect of education across institutional settings, it appears that the effect of measured skills gets weaker in strongly differentiated systems (model 5a). However, this model does not include the interaction between skill and the vocational orientation, so it is possible that this interaction captures the vocational orientation more than external differentiation. Model 5b shows, as previously, that the effect of skill gets smaller in strongly vocationally oriented systems.

Models 6a and 6b add both interactions with measured skill at the same time, in addition to interactions of educational attainment with the External Differentiation Index (model 6a) and Vocational Orientation Index (model 6b). The results of model 6a show that, once we include the varying effect of education by the level of differentiation, measured skill does not interact any longer with the differentiation index. Thus, there is no systematic variability in the skills effect with varying levels of external differentiation. This is the preferred model when it comes to analyzing the interaction between educational differentiation and measured skill (the bolded coefficients), because it includes the interaction of differentiation with educational attainment and of the vocational orientation with measured skill. The model also has a better fit than model 5a, which in turn has a better fit than model 4a.

Model 6b is the preferred model to investigate the interaction effect between measured skill and the vocational orientation of the system (the bolded coefficients), also because of the inclusion of other potentially relevant interaction terms. It corroborates findings of the other models; the interaction effect is negative. Thus, in more strongly vocationally specific educational systems, skills have a stronger effect on earnings than in weakly vocationally oriented systems. Noteworthy is that the interaction effect of external differentiation with skills is significant and positive in model 6b, as it was in model 3c. Thus, this model implies that measured skills matter more in strongly tracked systems. However, this model does not include the interaction effect between education and external differentiation, due to the limited number of available degrees of freedom.[5]

Summing up, we find clear support for the first hypothesis, which stated that skills have a smaller effect on earnings in strongly vocationalized systems. The educational system produces work-relevant skills, so the rewarded skills overlap strongly with educational attainment. This means that additional indicators of skill on top of education matter less for earnings. Support for this hypothesis is reassuringly independent of the model specification. The learning/human capital model of schooling finds therefore more strongly support in institutional settings where the educational system produces work-relevant skills than in settings where the schooling system produces less evidently skills demanded by employers.

Support for hypothesis 2 is more mixed. This hypothesis stated that skills have a stronger effect on earnings in strongly differentiated systems than in comprehensive or internally differentiating systems. Although some models support this

[5] In a supplementary analysis we also included the effect of technological advancement, operationalized as Research and Development expenditure as a percentage of GDP, and its interaction with cognitive skills. According to the meritocratization thesis it may be argued that skills get more important in technologically advanced societies (Bell, 1974), and if technological advancement is correlated with educational institutions our findings may be biased. Inclusion of these effects does not alter our conclusions regarding the interaction effects of the educational institutional variables with cognitive skills. Because including R&D expenditure would imply that even more degrees of freedom are used at the country level, we decided to exclude its main effect and interaction effect. Similarly, we also controlled for a potential confounding effect of labor market coordination. This analysis revealed that the consistently negative interaction effect of measured skill by vocational orientation is not driven by country variations in labor market coordination.

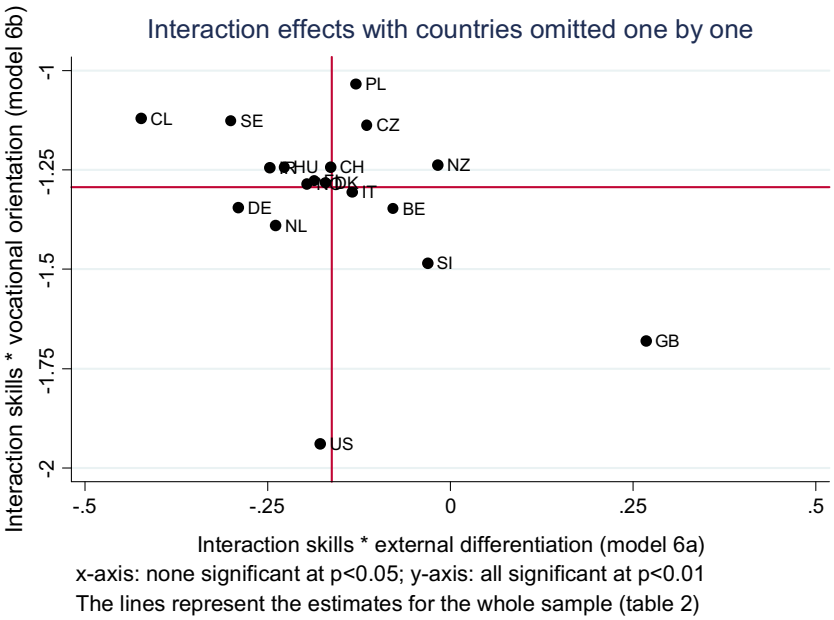


Fig. 2. Robustness checks of interaction effects.

hypothesis (models 3b and 6b), these models do not include the interaction effect between education and external educational differentiation. Hence, the significantly positive interaction effect seems to capture stronger effects of education rather than of skills in more strongly differentiated systems.

5.1. Are there countries that drive the results?

In order to check for the robustness of our findings concerning the interaction terms of models 6a and 6b, an additional analysis was performed that omits each country one by one from these models. Fig. 2 shows the results of this analysis. Regarding the interaction term between skills and the External Differentiation Index (model 6a, the horizontal axis in Fig. 2), we see that it varies between −0.4 and +0.3 (against −0.2 for the whole sample), depending on whether Chili or Great Britain is omitted. However, none of the interaction effects are significant, similar to our findings on the whole sample.

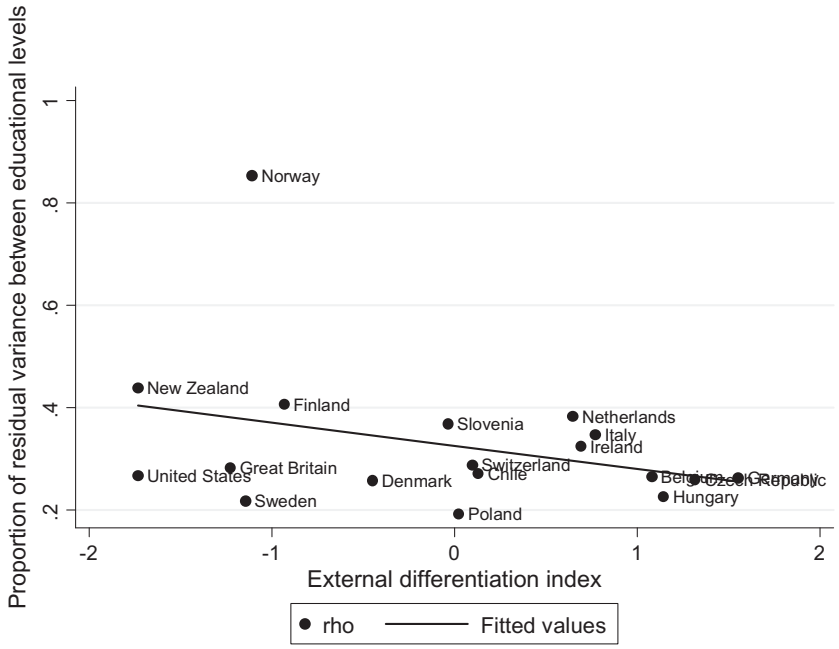
With regard to the interaction between skills and the Vocational Orientation Index (model 6b, the vertical axis in Fig. 2), the interaction term varies between −1.0 and −1.9 (against −1.3 for the whole sample), depending on whether we omit Poland or the United States. Although the magnitude of these effects thus varies to some extent, all of the interaction effects are negative and statistically significant, just as they were in the analysis on the whole sample.

On the whole, it seems justified to conclude that omitting countries has little implications on the substantial conclusions we drew on the whole sample of countries. There is no single country that has such an impact on the findings that it distorts our interpretations of the data. External differentiation does not positively affect the relevance of measured skills on earnings (which rejects hypothesis 2), and vocational orientation reduces the impact of measured skills on earnings (which supports hypothesis 1).

5.2. Why does differentiation not affect the impact of skills?

As shown above, there is no consistent variation in the effect of skills on earnings across different levels of external differentiation. Based on the credentialization theory it was expected that external differentiation affected the impact of skills positively, as tracking institutions have been created, at least in part, to select students on the basis of other characteristics than just academic ability. However, an alternative argument can be set up stressing that tracking *weakens* the effect of skills. Following a similar argument as with regard to the vocational orientation, tracking institutions may increase the congruence of educational attainment and ability, in which case educational attainment gives sufficient and reliable information to employers with regard to the expected productivity. Importantly, such a process would be critical to the credentialist view on education that selection is based on non-productive capacities, as learning abilities form the core 'productive capacities' on which efficient sorting may be achieved. The two counteracting interaction effects (based on credentialism and human capital theories) could lead to the non-significant interaction effect that we find.

If it is true that differentiation promotes efficient sorting, one would expect that a relatively large share of the variance in skills is found between educational levels, and a relatively small fraction of the total variance is to be found within educational levels. We examined this issue by regressing the skills indicator on parents' education for each country separately, after which we take the residual of that regression equation. The variance of that residual is then partitioned in a between



Source: IALS. Residuals of measured skills regressed on parents' education

Fig. 3. Residual variance in skills: proportion of between-educational-level variance of total unexplained variance within countries (after controlling for parents' education).

educational level component, and a within-educational level component, again for each country separately (cf. Vandenberge (2006) for a similar methodology). The resulting intraclass correlation indicates the proportion of the residual variance that is found between educational levels. This should thus be higher in more strongly tracked systems, according to the alternative theory. Fig. 3 shows that this is not the case. We do not find a greater between-educational-level variance component in countries that have a more rigid differentiating structure. Hence, we do not find evidence in favor of the alternative, human capital explanation of what is happening during selection.

6. Conclusions and discussion

In this paper I examined the effects of education and measured skills on earnings in 18 countries. The study was particularly interested in the question whether the partial effect of skill is dependent on the vocational orientation and the degree of external differentiation of the schooling system. Based on human capital theory it can be assumed that education produces those skills that employers are willing to reward. In educational systems that produce work-relevant skills in the vocational sector, it is more likely that this model is appropriate to explain the effect of schooling on earnings than in educational systems that have a much less well developed vocational education and training system. This led me to hypothesize smaller effects of measured skill on earnings in countries with a strongly developed vocational sector, as information on productivity is adequately captured by education in such systems. Strong support for this hypothesis was found. In countries with a strongly vocationally oriented schooling system, educational qualifications provide a lot of information about the skills that students acquired. Additional indicators of skill provide comparatively little additional information about a worker's productivity. By contrast, if an educational system is less vocationally specific, there is much more uncertainty among employers about the skills that can be expected from workers with a particular educational qualification. Hence, additional indicators of skill are then more important for determining earnings.

Based on the credentialism theory, however, education is institutionalized to set boundaries between social groups that are not defined by differences in productivity. Under such a model of education, it is likely that employers use educational qualifications mostly for the selection into organizations (Thurow, 1976). When it comes to rewarding workers, employers need additional indicators of skill, so that more productive people are rewarded more (within the groups defined by their credential).[6] In countries with strongly differentiated educational systems the institutionalization of social differences through education is most clearly manifested. Thus, it was hypothesized that in strongly externally differentiated systems skills were more important to determine wages than in less differentiated systems. No support for this hypothesis is found. In the preferred model no evidence was found for any systematic variation of the skills effect with varying levels of differentiation. Although it is possible that non-productive elements of schooling determine labor market outcomes, we have not gained additional insight regarding national-level conditions under which such credentialism processes take place. This is an important finding, as it pro-

[6] Employers in a competitive market economy will reward productivity, even if they use education partly for social exclusionary purposes.

vides little evidence that inefficiencies in educational selection are more strongly prevalent in strongly differentiating institutions. Whereas credentialists, together with scholars working on educational tracking, argue that educational institutions have been institutionalized with the aim to emphasize social distances between groups, no evidence is found that in countries where such differentiations are most manifest, non-productive forms of selection and reward are more common. Possibly the institutionalization of educational differentiation did not primarily take place in order to create possibilities of selection on non-productive capacities among elites, as credentialism theory would have it.

Our results demonstrate that the cross-national variation in the role of schooling on labor markets is not limited to its strength, but is also prevalent with regard to the mechanism underlying the effect. Thus, support for a theory to explain the universally strong effect of education on earnings depends on the institutional context within which employers and employees function. In some contexts human capital theory offers a more appropriate explanation for the effect of education than in other contexts. With regard to the credentialism theory of education we have not found evidence for this.

A *conditional* support for theoretical mechanisms is important for two separate fields. First, a broad field has compared different theories and comes to different conclusions regarding the explanatory power of different explanatory mechanisms (e.g. Bills, 2003; Hage et al., 1988; Chevalier et al., 2004; Groot and Oosterbeek, 1994; Jaeger and Page, 1996; Layard and Psacharopoulos, 1974; Weiss, 1995). These 'mechanism contest studies', however useful, would benefit greatly from contextualizing their findings and see whether their differing conclusions may be related to the country under study. For example, support for the human capital model of schooling demonstrated for the Netherlands (e.g. Groot and Oosterbeek, 1994) may be due to the fact that a country is examined with a strongly vocationalized educational system. Research on the United States may be more supportive for the screening model of schooling precisely because the American system is more generic in character (e.g. Jaeger and Page, 1996; Weiss, 1995; Fuller and Rubinson, 1992).

Another field that would benefit from adopting an approach of conditional support for mechanisms depending on national educational institutions is the comparative stratification literature. Within this field the main focus has been on variations across countries in terms of the strength of the effect of schooling, not on the mechanisms. However, findings of this field are rather mixed. More would be gained if the comparative field became more explicit about the theoretical mechanisms underlying effects of education in different institutional settings. Whereas comparative stratification researchers have mostly theorized at the level of institutions, it is important to include individual agency within institutional contexts. This way we can be more specific about the explanation why particular educational categories benefit relative to which other categories in terms of which labor market outcome.

Although the degree of differentiation and vocational orientation were measured extensively for the countries under study, we have not been able to fully capture all elements of sorting in which educational systems may vary. In particular, we have not differentiated in the quality of the educational institution, which is plausibly a more important factor in a system where external differentiation and vocational orientation at the secondary level are modest. If there is an upward push towards tertiary education in systems with low differentiation, it is likely that different kinds of variations within the tertiary sector are evolving that discriminate between tertiary degree holders. In the United States, for example, there is a large difference between community colleges and research universities in terms of the quality of students and the boundaries they set between social groups. If such variations are more systematically found in systems with much expansion of the tertiary system, it may be that measuring these more fine-grained differences within tertiary education would lead to a weaker partial effect of measured skills in those systems. With cross-national data it is not possible to examine this, because it is usually unknown at which institution people are educated. Yet, further research could examine this more carefully, perhaps for fewer countries.

Acknowledgments

This research has been supported by a personal VIDI grant of the Netherlands' Organization for Scientific Research (NWO), grant number 452.07.002. Earlier versions of this paper have been presented at the Sociology Seminars at Nuffield College, University of Oxford, University of Tilburg, and at the 2009 summer meeting of ISA-Research Committee 28 on Social Stratification and Mobility, Yale University.

References

Allmendinger, Jutta, 1989. Educational systems and labor market outcomes. European Sociological Review 5, 231–250.
Andersen, Robert, Van de Werfhorst, Herman G., 2010. Education and occupational status in 14 countries: the role of educational institutions and labour market co-ordination. British Journal of Sociology 61 (2), 336–355.
Becker, Gary S., 1993. Human Capital: A Theoretical and Empirical Analysis, With Special Reference to Education. Chicago University Press, Chicago.
Bell, Daniel, 1974. The Coming of Post-Industrial Society: A Venture in Social Forecasting. Heinemann Educational, London.
Bills, David B., 1988. Educational credentials and promotions: does schooling do more than get you in the door? Sociology of Education 61, 52–60.
Bills, David B., 2003. Credentials, signals, and screens: explaining the relationship between schooling and job assignment. Review of Educational Research 73, 441–469.
Bills, David B., 2005. Participation in work-related education: variations in skill enhancement among workers, employers, and occupational closure. Research in Social Stratification and Mobility 23, 67–102.
Brauns, H., Steinmann, S., Kieffer, A., Marry, C., 1999. Does education matter? France and Germany in comparative perspective. European Sociological Review 15, 61–90.
Breen, Richard, 2005. Explaining cross-national variation in youth unemployment: market and institutional factors. European Sociological Review 21, 125–134.

Brown, David K., 1995. Degrees of Control. A Sociology of Educational Expansion and Occupational Credentialism. Teachers College Press, New York.
Brunello, Giorgio, Checchi, Daniele, 2007. Does school tracking affect equality of opportunity? New international evidence. Economic Policy 22, 781–861.
Chevalier, Arnaud, Colm, Harmon, Ian, Walker, Yu, Zhu, 2004. Does education raise productivity, or just reflect it? The Economic Journal 114, 499–517.
Collins, Randall, 1979. The Credential Society: An Historical Sociology of Education and Stratification. Academic Press, New York.
Davis, Kingsley, Moore, Wilbert E., 1945. Some principles of stratification. American Sociological Review 10, 242–249.
Erikson, Robert, Goldthorpe, John H., Jackson, Michelle, Meir, Yaish, Cox, D.R., 2005. On class differentials in educational attainment. Proceedings of the National Academy of Sciences 102, 9730–9733.
Fuller, Bruce, Richard, Rubinson (Eds.), 1992. The Political Construction of Education: The State, School Expansion, and Economic Change. Praeger Publishers, New York.
Gamoran, Adam, Mare, Robert D., 1989. Secondary school tracking and educational inequality: compensation, reinforcement, or neutrality? American Journal of Sociology 94, 1146–1183.
Groot, Wim, Oosterbeek, Hessel, 1994. Earnings effects of different components of schooling; human capital versus screening. The Review of Economics and Statistics 76, 317–321.
Hage, Jerald, Garnier, Maurice A., Bruce, Fuller, 1988. The active state, investment in human capital, and economic growth: France 1825–1975. American Sociological Review 53, 824–837.
Hannan, Michael T., Klaus, Schomann, Hans-Peter, Blossfeld, 1990. Sex and sector differences in the dynamics of wage growth in the Federal Republic of Germany. American Sociological Review 55, 694–713.
Harmon, Colm, Ian, Walker, Westergård-Nielsen, Niels C., 2001. Education and Earnings in Europe: A Cross Country Analysis of the Returns to Education. Elgar, Cheltenham.
Iannelli, Cristina, Raffe, David, 2007. Vocational upper-secondary education and the transition from school. European Sociological Review 23, 49–63.
Jackson, Michelle, Robert, Erikson, Goldthorpe, John H., Meir, Yaish, 2007. Primary and secondary effects in class differentials in educational attainment: the transition to a-level courses in England and Wales. Acta Sociologica 50, 211–229.
Jaeger, David A., Page, Marianne E., 1996. Degrees matter: new evidence on sheepskin effects in the returns to education. The Review of Economics and Statistics 78, 733–740.
Kerckhoff, Alan C., Raudenbush, Stephen, Glennie, E., 2001. Education, cognitive skill, and labor force outcomes. Sociology of Education 74, 1–24.
Kirsch, Irwin S., 2003. Measuring literacy in IALS: a construct-centered approach. International Journal of Educational Research 39, 181–190.
Kogan, Irena, Unt, Marge, 2008. The role of vocational specificity of educational credentials for labour market entry in Estonia and Slovenia. International Sociology 23, 389–416.
Layard, Richard, Psacharopoulos, George, 1974. The screening hypothesis and the returns to education. The Journal of Political Economy 82, 985–998.
Leuven, Edwin, Hessel, Oosterbeek, Hans, Van Ophem, 2004. Explaining international differences in male skill wage differentials by differences in demand and supply of skill. The Economic Journal 114, 466–486.
Lucas, Samuel R., 1999. Tracking Inequality. Stratification and Mobility in American High Schools. Teachers College Press, New York.
Lucas, Samuel R., 2001. Effectively maintained inequality: education transitions, track mobility, and social background effects. American Journal of Sociology 106, 1642–1690.
Marks, Gary N., 2005. Cross-national differences and accounting for social class inequalities in education. International Sociology 20, 483–505.
Marshall, T.H., 1950. Citizenship and Social Class. Cambridge University Press, Cambridge.
Meyer, John W., 1977. The Effects of Education as an Institution. American Journal of Sociology 83, 55–77.
Müller, Walter, Gangl, Markus (Eds.), 2003. Transitions from Education to Work in Europe – The Integration of Youth into EU Labour Markets. Oxford University Press, Oxford.
OECD, 1993. Education in OECD Countries – A Compendium of Statistical Information. Paris, Organisation for Economic Cooperation and Development.
OECD, 1998. "Education at a Glance OECD Indicators 1998." Paris, Organization for Economic Cooperation and Development.
OECD, 2000. Literacy in the Information Age. Final Report of the International Adult Literacy Survey. Paris, Organisation for Economic Cooperation and Development.
OECD, 2005. OECD Factbook 2005. Paris, Organisation for Economic Cooperation and Development.
Parsons, Talcott, Shils, Edward A. (Eds.), 1951. Toward a General Theory of Action. Harvard University Press, Cambridge, Mass.
Popper, Karl R., 1972. Objective Knowledge. An Evolutionary Approach. Oxford University Press, Oxford.
Ramirez, Francisco O., Xiaowei, Luo, Evan, Schofer, Meyer, John W., 2006. Student achievement and national economic growth. American Journal of Education, 113.
Rosenbaum, James E., Kariya, Takehiko, 1989. From high school to work: market and institutional mechanisms in Japan. American Journal of Sociology 94, 1334–1365.
Rosenbaum, James E., Kariya, Takehiko, 1991. Do school achievements affect the early jobs of high school graduates in the United States and Japan? Sociology of Education 64, 78–95.
Rosenbaum, James E., Takehiko, Kariya, Rick, Settersten, Tony, Maier, 1990. Market and network theories of the transition from high school to work: their application to industrialized societies. Annual Review of Sociology 16, 263–299.
Rubinson, Richard, Browne, Irene, 1994. Education and the economy. In: Smelser, N., Swedberg, R. (Eds.), The Handbook of Economic Sociology. Princeton University Press, Princeton, NJ, pp. 581–599.
Scherer, Stefani, 2001. Early career patterns: a comparison of Great Britain and West Germany. European Sociological Review 17, 119–144.
Shavit, Yossi, Müller, Walter (Eds.), 1998. From School to Work. A Comparative Study of Educational Qualifications and Occupational Destinations. Clarendon Press, Oxford.
Stewart, M.B., 1983. On least squares estimation when the dependent variable is grouped. Review of Economic Studies 50, 737–753.
Stiglitz, Joseph E., 1975. The theory of "Screening," education, and the distribution of income. The American Economic Review 65, 283–300.
Thurow, Lester, 1976. Generating Inequality. Basic Books, New York.
Turner, Ralph H., 1960. Sponsored and contest mobility and the school system. American Sociological Review 25, 855–867.
Van de Werfhorst, Herman G., Mijs, Jonathan J.B., 2010. Achievement inequality and the institutional structure of educational systems: a comparative perspective. Annual Review of Sociology 36, 407–428.
Van der Velden, Rolf K.W., Wolbers, Maarten H.J., 2003. The integration of young people into the labour market: the role of training systems and labour market regulation. In: Walter, Müller, Markus, Gangl (Eds.), Transitions from Education to Work in Europe. The Integration of Youth into EU Labour Markets. Oxford University Press, Oxford, pp. 186–211.
Vandenberge, Vincent, 2006. Achievement effectiveness and equity: the role of tracking, grade repetition and inter-school segregation. Applied Economics Letters 13, 685–693.
Weiss, Andrew, 1995. Human capital vs. signalling explanations of wages. Journal of Economic Perspectives 9, 133–154.
Wolbers, Maarten H.J., 2007. Patterns of labour market entry. A comparative perspective on school-to-work transitions in 11 European countries. Acta Sociologica 50, 189–210.