

**Skill and Education Effects on Earnings in 18 Countries:
The Role of National Educational Institutions**

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7246 words, all inclusive

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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 work-relevant skills 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 positional good. Under this model, education is used for selection into the organization, after which directly observable skills are determining wages. Assuming that a strongly tracked educational system makes sorting easier, it was hypothesized that strongly tracked systems lead to stronger skill effects. Support for this hypothesis is mixed.

Introduction

It is undisputable 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 a model that sees education as a positional good (Thurow 1976; Weiss 1995). Human capital theory and its sociological (functionalist) allies see education as producing skills that are directly rewarded by employers (Becker 1993; Bell 1974; Parsons and Shils 1951; Davis and Moore 1945). The positional good perspective assumes that education does not necessarily produce directly applicable skills, but is used to rank applicants on the training costs that employers have to bear.

Comparative research has argued that the strength of the impact of education is dependent on the educational institutional context (Allmendinger 1989; Müller & 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 & Müller 1998; Stiglitz 1975; Van der Velden & 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 relative position that a qualification indicates

among the suppliers of labor – two theories that are clearly different in their perception of why education matters (Weiss 1995).

This ignorance of potential differences across countries in the usefulness of theoretical explanations is unfortunate for three reasons. First, even in a situation when the education effect would be of similar strength across countries, it is by no means evident that such similar effects result from the same theoretical mechanism. There may be institutional characteristics that affect the likelihood that education is used as an indicator of skill, or whether it is mainly used for sorting individuals on trainability. Second, given that the strength of the effect of education does seem 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. Clearly, as we argue, such explanations are not satisfactory if we stick to the aggregate level by referring to educational institutions. Third, 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 we study the impact of educational qualifications and measured skill on earnings in eighteen 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 skill level of workers.

To this aim, we contextualize the importance of education and measured skill by relating their effects to two educational institutional characteristics: tracking and vocational orientation. Tracking refers to the extent to which students are placed in

separate ability-grouped tracks, at which ages this occurs, and how many different tracks are offered. The level of tracking in a country thus illustrates the extent to which education can be used to sort students according to their potential productivity and training costs. 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 productive skills more than in systems with a weak vocational component.

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 tracking 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 generally is not concerned with the different mechanisms why education pays off. Also Rosenbaum and Kayira (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 number of comparative studies have emerged on the transition from school to work (e.g. Brauns et al., 1999; Scherer, 2001; Iannelli and Raffe, 2007; Wolbers, 2007; Bernardi et al. 2004; Kogan and Unt, 2008).

Although many of these studies have interpreted their findings in support of the hypotheses of Shavit and Müller (1998), two issues remain unsolved. 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 & Müller 1998). Yet, vocational education comes out much more poorly in those systems when it comes to obtaining jobs with high occupational status in comparison with graduates from tertiary education (Bernardi et al. 2004; Wolbers 2007). With regard to the timing of employment after graduation the findings are unsettled. 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 of this hypothesis (Bernardi et al., 2004; Wolbers, 2007; Iannelli & 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 & Wolbers 2003; Wolbers 2007). Although the detailed mechanisms are often left unspecified, it is through a combination of skills and signals 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 from macro-level effects have difficulty to provide empirical evidence for micro-level effects (Iannelli and Raffe, 2007; Wolbers, 2007).

We propose that 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, it is evident from many studies that several explanations exist for the education effect, the two most important ones being the learning/human capital explanation and the sorting/positional good explanation. 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 positional good 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 that are rewarded by employers as such. 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 influence on the content of the programme. Employers thus exert their influence on 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. This 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 the vocational orientation are developed.

In labor markets relying on strongly tracked educational systems, however, schooling works differently. Selection takes place at an early age, and puts pupils in separate school environments for the whole curriculum. Usually several tracks are available for the same age group, and consequently access to higher education is limited (OECD 2008). Tracking in an educational system has several consequences for social stratification and social mobility. In strongly selective systems inequality of educational opportunity is generally larger (Brunello and Checchi 2007). Also, it has been hypothesized that tracking enhances the overall effect of education on labor market outcomes, although empirical support is inconclusive (Shavit & Müller 1998). We argue that more tracking does not necessarily increase the strength of the effect of education. Education is used to rank applicants in a 'labor queue' on the basis of expected training costs, whereas little is assumed by employers about the applicability of the skills new workers obtained in school (Thurow 1976). Unlike the vocational orientation of an educational system, the dimension of tracking on ability 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 ranking easier. The signalling function of schooling is further reinforced as tracked systems generally

have fewer students that are eligible for enrolment in higher education, which enhances the relative advantage of tertiary degree holders. Hence, the more educational systems allow for a transparent and clear ranking of applicants, the easier sorting is, and the more effectively schooling can be used for the selection into the organization. However, following the positional good model of education, schooling is mainly used for selection into the organization. Once workers are hired, education loses its informative power, as schooling does not produce directly applicable work-relevant skills. Therefore, after entry into the organization, employers can obtain information about workers' productivity (and offer a related wage) by directly observed skills.

Hypotheses

We test cross-national variation in the applicability of human capital and positional theories of education 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 more work-relevant skills are acquired in education, 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.

With regard to the institutional dimension of tracking, the pattern is expected to be different. Tracking 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 extensive tracking would lead to a smaller effect of skills. Recalling that tracking affects the positional goods nature of schooling, we hypothesize that stronger tracking leads to a stronger effect of measured skill on earnings. Under the positional good model, education is mainly used to rank applicants for the selection into the organization, which may imply that direct indicators of skill are highly influential on wages. Thus, the easier the educational system makes it to rank applicants on the basis of their educational career (i.e., through tracking), the more strongly direct indicators of skill should be rewarded independent of educational attainment (*hypothesis 2*).

Empirical Design

The International Adult Literacy Survey (IALS) of 1994/1998 is the best available dataset to carry out these analyses. IALS has been developed to measure literacy skills among adult populations aged 16-65 in nineteen countries, of which eighteen have all the relevant information for our purposes. Furthermore, achieved educational level and type is recorded. We operationalize educational attainment using six categories: primary education, lower secondary vocational, lower secondary general, upper secondary vocational, upper secondary general, and tertiary education.¹ Earnings are measured too, provided in the dataset in within-country quintiles. Control variables included 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 authors upon request.

our models are gender, age, and age squared. Our analytical dataset includes people between the ages of 25 and 65, with a total N=29,224 nested in 18 countries.

Literacy is defined in IALS as “using printed and written information to function in society, to achieve one’s goals and to develop one’s knowledge and potential” (Kirsch 2003: 182). It is measured using a battery of fifteen test items on prose, document, and numerical literacy, which is summarized in one variable (z-standardized across countries). Following other research we employ literacy as a valuable measurement of cognitive skills (e.g. Kerckhoff et al. 2001; Leuven et al. 2004).

We constructed two country-level indices relating to educational institutions: the level of tracking 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.²

The “Tracking 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 fourteen-year-old student, and the length of the tracked curriculum as a proportion of total length of 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.

² For Slovenia we inserted the percentage of students enrolled in upper secondary vocational education on the basis of Slovenian government files.

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 & 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 we merged the country-level information to the IALS survey data. Figure 1 shows the position of each of the 31 countries that can be scaled on both indices. The correlation between the two contextual variables is $r=0.48$ if we look at the 31 countries. However, if we only examine IALS countries the correlation goes up to $r=0.66$. Given this rather strong correlation we will examine different model specifications with regard to contextual variables, to see if we find a consistent pattern in their effects.

[Figure 1 about here]

Table 1 shows descriptive statistics of all used variables.

[Table 1 about here]

As the dependent variable is earnings in quintiles, we estimate interval regression models, 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 .

We model a random intercept variant of interval regression 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. We furthermore test whether the effects of these interaction terms change when we include interaction terms between contextual variables and educational attainment in categories.³

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

³ 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. Our results would be very similar if we had used multilevel random intercept models for continuous dependent variables using earnings quintile as the dependent variable. We are therefore confident about the robustness of our findings.

strongly correlated, and we need to see whether different model specifications lead to different effects.

[Table 1 about here]

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 cognitive 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 cognitive 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 cognitive 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. Cognitive skills have a significant effect on earnings, controlled for education; one standard deviation increase in cognitive skills leads to almost six percentage points higher earnings, for people with equal educational attainment.

Model 2 adds the two country-level variables: the Tracking 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 tracking leads to lower earnings. 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.⁴

Of more interest for our purpose are the interaction effects between these two country-level institutional variables and cognitive skills. Models 3a to 6b include these interaction effects in different ways, with the inclusion of different other interaction terms. Model 3a includes the interaction term of the Tracking index with cognitive skills. This interaction effect is small and non-significant. Thus, the impact of cognitive skills is not dependent on the level of tracking in a country. Model 3b replaces this interaction with the interaction between the Vocational Orientation Index and cognitive 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 cognitive 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 cognitive 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 Tracking index and measured skill has a significantly positive effect on earnings, unlike in model 3a. In strongly tracked systems, skills have a stronger effect on earnings than in untracked systems with a comparable vocational orientation of the upper secondary system.

⁴ It should be noted that these contextual effects are controlling for individual level variables, which function in this case as suppressor variables as the quintile earnings distribution is fixed within countries.

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 Tracking Index (model 4a) and with the Vocational Orientation Index (model 4b). Given the degrees of freedom at the country level with a sample of eighteen 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 tracking and stronger vocational orientation. The negative main effects of the education dummy's become more strongly negative with increasing tracking and vocational orientation. This finding is in line with earlier research on occupational status (Bernardi et al. 2004; Shavit & 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 tracked 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 tracking. 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 Tracking 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 degree of tracking, measured skill does not interact with the Tracking Index. Thus, there is no systematic variability in the skills effect with varying levels of tracking. This is the preferred model when it comes to analyzing the interaction between tracking and measured skill, because it includes the

interaction of tracking with educational attainment and of the vocational orientation with measured skill. The model also has a better fit compared to 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, 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 tracking with skills is significant and positive in model 6b, as it was in model 3c. Thus, this model implies that cognitive skills matter more in strongly tracked systems. However, this model does not include the interaction effect between education and tracking, 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 additional indicators of skills 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.

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.

Support for hypothesis 2 is more mixed. This hypothesis stated that, in strongly tracked systems, skills have a stronger effect on earnings than in comprehensive systems. Although some models support this hypothesis (models 3b and 6b), these models do not include the interaction effect between education and tracking. Hence, the significantly positive interaction effect seems to capture stronger effects of education rather than of cognitive skill in more strongly tracked systems.

Conclusions and Discussion

In this paper we examined the effects of education and cognitive skills (operationalized by literacy) on earnings in eighteen countries. We were particularly interested in the question whether the partial effect of cognitive skill is dependent on the vocational orientation and the degree of tracking of the schooling system. Based on human capital theory it can be assumed that education produces work-relevant skills. 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 us to hypothesize smaller effects of measured skill on earnings in countries with a strongly developed vocational sector, as productivity is adequately captured by education. We found strong support for this hypothesis. 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 theory that education is a positional good, education does not necessarily create productivity-enhancing skills, but rather sorts people on the basis of training costs (Thurow 1976; Chevalier et al. 2004). Under that model, education is mainly used for the selection of candidates into the organization, after which more directly observable indicators of skill become important to determine productivity and earnings. In countries with strongly tracked educational systems, applicants can more easily be sorted on the basis of training costs, as tracked systems inform employers about educational trajectories and reduce the number of graduates in higher education. Thus, we hypothesized that in strongly tracked systems cognitive skills were more important to determine wages than in comprehensive systems. Support for this hypothesis is mixed. In the preferred model we found no evidence for any systematic variation of the skills effect with varying levels of tracking.

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, and the same holds for the positional good theory of education.

Such 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 human capital and positional good theories (e.g. Bills 2003; Chevalier et al. 2004; Groot & Oosterbeek 1994; Jaeger &

Page 1996; Layard & 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 & Oosterbeek 1994) may be due to the fact that they study a country with a strongly vocationalized educational system. Research on the United States may be more supportive for the positional good model of schooling precisely because the American system is more generic in character (e.g. Jaeger & Page 1996; Weiss 1995).

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. 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 we have measured the degree of tracking and vocational orientation extensively for the countries under study, we have not been able to fully capture all elements of sorting and signalling 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 indicator of skills and talents in a system where selection and vocational orientation at the secondary level is modest. If there is an upward push towards tertiary education in systems with low tracking, 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 Ivy League research universities in terms of the quality of students and the skills they learn. 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-sectional 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.

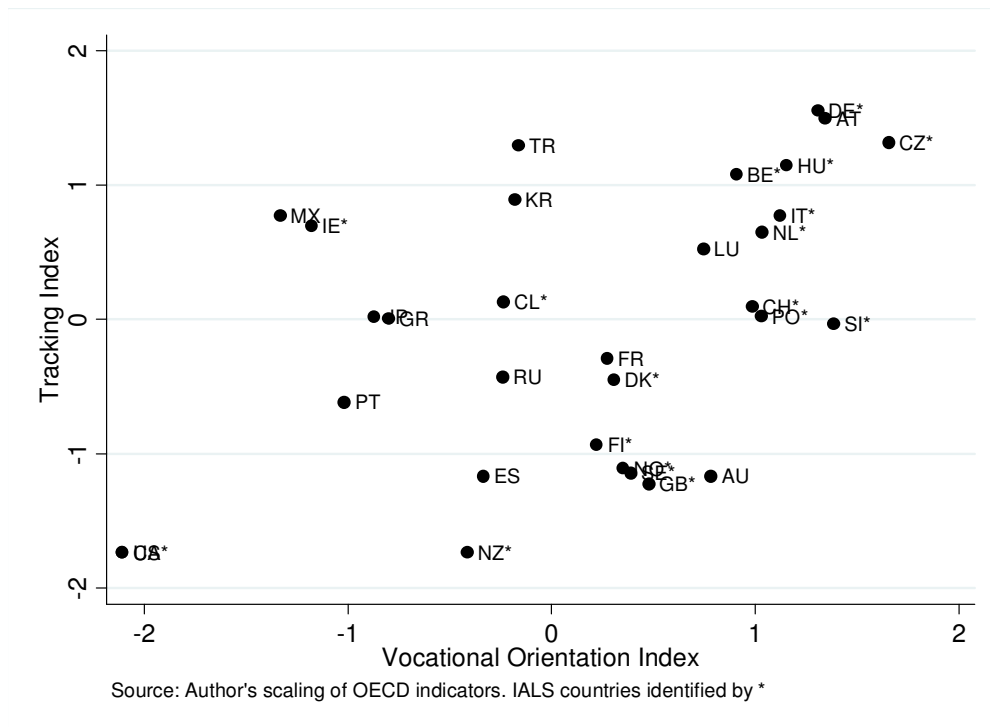
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Figure 1 Standardized Tracking and Vocational Orientation Indices for 31 Countries



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

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
Cognitive skills	0.20	0.92	-4.02	2.84
Tracking Index	-0.27	1.01	-1.73	1.55
Vocational Orientation Index	0.41	0.88	-2.11	1.66

Table 2 Random intercept multilevel interval regression analysis on earnings quintile

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

Upper secondary vocational							[0.427]	[0.457]	[0.457]		
							-1.007**	-1.341***	-1.333***		
Upper secondary general							[0.463]	[0.472]	[0.471]		
							0.386	0.130	0.0807		
							[0.404]	[0.410]	[0.410]		
Education x 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***	
								[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

*** p<0.01, ** p<0.05, * p<0.1

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