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Status Attainment of Young Workers in 21 Countries: The influence of skill formation and economic coordination on the effectiveness of educational credentials and worker skills

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Founded in 1963 by two prominent Austrians living in exile – the sociologist Paul F. Lazarsfeld and the economist Oskar Morgenstern – with the financial support from the Ford Foundation, the Austrian Federal Ministry of Education, and the City of Vienna, the Institute for Advanced Studies (IHS) is the first institution for postgraduate education and research in economics and the social sciences in Austria. The Sociological Series presents sociological research of the IHS and aims to share “work in progress” in a timely way before formal publication. As usual, authors bear full responsibility for the content of their contributions.

Das Institut für Höhere Studien (IHS) wurde im Jahr 1963 von zwei prominenten Exilösterreichern – dem Soziologen Paul F. Lazarsfeld und dem Ökonomen Oskar Morgenstern – mit Hilfe der Ford-Stiftung, des Österreichischen Bundesministeriums für Unterricht und der Stadt Wien gegründet und ist somit die erste nachuniversitäre Lehr- und Forschungsstätte für die Sozial- und Wirtschaftswissenschaften in Österreich. Die **Reihe Soziologie** bietet Einblick in die soziologische Forschungsarbeit am IHS und will interne Diskussionsbeiträge einer breiteren fachinternen Öffentlichkeit zugänglich zu machen. Die inhaltliche Verantwortung für die veröffentlichten Beiträge liegt bei den Autoren und Autorinnen.

Abstract

This paper develops a status attainment model that brings in the cross-country perspective in the status attainment process. We amend the conventional model of individual status attainment by splitting educational achievement into educational credentials and measured skills and by including information on motivation for further learning. Within a two-level path-model framework social status attainment processes at the individual- and country-level are explained by analyzing mediating and moderating variables simultaneously. Overall, family background effects on educational achievement both in terms of formal attainment levels and worker skills are strong, but socio-economic outcomes are largely determined by educational certificates while skills make a difference only to a minor extent. As the direct family effect on status attainment is small, it follows that the influence of families is mainly mediated by the acquisition of educational credentials and not by worker skills. Our results further show that individual level path dependencies vary across countries. This variation is associated with differentiation in a country's skill formation system in terms of vocational specialization and the degree of economic coordination measured via the extent of collective bargaining coordination. Vocational specialization relates to higher skills levels of young workers and higher parental effects both on worker skills and status, as well as higher effects of credentials and learning motivation on social status. Higher levels of bargaining coordination correspond to higher worker skills as well, but unlike vocational education, a higher degree of coordination is associated with lower family effects on educational outcomes and social status.

Zusammenfassung

In dieser Studie wird ein internationales Statuserwerbsmodell entwickelt, in dem der Erwerb und die Auswirkungen von Bildungsabschlüssen und Kompetenzen junger Erwerbstätiger im Ländervergleich modelliert werden. Insgesamt erklärt der erreichte Bildungsabschluss, der wesentlich von der sozialen Herkunft abhängt, in deutlich höherem Maße den beruflichen Status als die gemessenen Kompetenzen. Somit gilt das Leistungsprinzip bei der Allokation am Arbeitsmarkt nur in eingeschränktem Maße, wenn Mechanismen der sozialen Schließung den Zugang zu Positionen regulieren. Unterschiedliche Ergebnisse hängen systematisch, jedoch nicht sehr stark, von den institutionellen Rahmenbedingungen ab.

Keywords

Status attainment; educational credentials; worker skills; education systems; skill formation; labor market coordination

Schlagwörter

Statuserwerb; Bildungsabschlüsse; Zertifikate; Formation von Kompetenzen; Bildungssysteme; Arbeitsmarktregulierung und Koordinierung;

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1. Introduction

Recent research on intergenerational social mobility shows that the transmitting effects of socio-economic background differ substantially when compared across countries. While reasons for these differences often remain opaque and revert to explanations like "educational cultures", the proposed paper tries to comparatively examine these differing transmission processes using a multilevel path-analysis model that combines individual level variables with country specific institutional variables.

Since the seminal work of Blau and Duncan (1967), the path dependencies of status attainment processes are commonly recognized in the scientific community engaged in social stratification and mobility. However, this model's attractiveness stems to a certain extent from its embeddedness in specific national or cultural contexts, which in turn limits its applicability for cross-national comparison. Blau and Duncan developed their approach at a time, in which neither comparative data nor international classifications of the concepts (comparable measures of education and occupation) were available to researchers. As a result, most early empirical applications of status attainment models refer to rather homogeneous individuals in common education and occupational systems in which the status attainment processes are subject to similar contextual determinants. But especially the second half of the last century saw major and accelerating social dynamics: the changing role of women, migration and urbanization, technological developments or educational expansion – just to mention a few – significantly changed occupational structures and trajectories of social mobility between and within countries. Although these changes occurred in most (Western) countries, they differ significantly regarding timing, extent and speed, e.g. regarding women's employment rates (OECD 2002), or graduation from tertiary education (OECD 2012). Moreover, research (e.g. by Schoon 2008) suggests, that in addition to the directly observable socio-economic variables like parents educational and occupational status, latent constructs and questions concerning attitudes toward schooling and learning also play an important "mediating" role in the status attainment process. As a result of these limitations of the status attainment model, it lately seems to have become unfashionable. More recent research on social stratification in international perspective rather deploys a comparative meta-approach in which marginal effects are estimated from different data sources (e.g. Bar Haim and Shavit 2013; Hertel and Groh-Samberg 2014; Reisel 2011). Although these studies are methodologically rigorous and pay much attention to any kind of limitation in terms of comparability of results, their explanations of cross-country differences sometimes end in a blind alley since empirical evidence for these differences could not be integrated in the models.

Our contribution is twofold. First, we conceptualize educational achievement in terms of credentials obtained through formal education as well as worker skills resulting from both formal and informal learning processes, like on-the-job training. The skill measure used has

the advantage that it is assessed at the same time as the occupational information is collected and it thus reflects the "skills for which the labor market is currently rewarding workers" (Kerckhoff, Raudenbush, and Glennie 2001: 3). Moreover we include learning motivation as a main driver to acquire and maintain skills in adulthood. And second, we augment the status attainment model to bring in the comparative perspective in the status attainment process, employing a two-level path-modelling framework in which country differences in the path dependencies are modelled and regressed on institutional variables of education systems and economic coordination. Previous attempts to evaluate the explanatory power of skills compared to educational attainment in labor market outcomes have been made – like most status attainment research – for single countries only, predominantly the United States (see Kerckhoff, Raudenbush, and Glennie 2001). One exception is Van de Werfhorst (2011), who comparatively analyzes the partial effects of skills and credentials on earnings in 18 countries and whether these correspond to the institutional characteristics of their schooling systems. He finds that in strongly vocationally oriented schooling systems the credential explanation is more relevant while worker skills do not add much to the explanation of the education-job link in terms of earnings. This is because in such systems the credential is a better proxy for the productive capacities as compared to more comprehensive systems that are less vocationally specific. We add to this research by considering credentials, skills, and learning motivation as mediating variables between social origin and labor market outcomes. This allows us to assess country differences in the various status attainment paths and how these differences are moderated by contextual variables.

1.1 Social origin and schooling as a mediator

Countries with advanced economies are frequently referred to as meritocratic societies in which differences in adult status are largely attributable to merit, and only to minor extent to other factors that used to be the prevalent determinant of social status in pre-modern societies, especially social origin. We want to make two points here. First the growing importance of schooling as a mediating institution between family background and occupational outcomes, and second the mechanism through which the well-established relationship between educational and socio-economic attainment operates.

Baker and LeTendre (2005) argue that the family as an institution got weaker in the process of social reproduction. As mass schooling has become universal and compulsory and average numbers of school years increase, families have forfeited their significance in directly influencing the socio-economic position of their offspring. At the same time the school as an institution has gained significance in status assignment. While this does not imply that the process of status attainment is independent of family background, the way how families can make a difference in the process has changed. Now, more than ever before, families must take the way through the educational institutions. To secure the occupational prospects of their children they have to concentrate their resources and efforts on achievement within schooling. As a result, social reproduction has become effective at the

links between family and educational achievement, and only to a minor extent directly between families and the socio-economic outcome. Thus, and in line with previous research, we expect that the direct family effect on the socio-economic status is small and the indirect family effect through the mediating educational achievement variables is high. Likewise, we expect that the direct effects of educational achievement in terms of credentials and skills on the achieved socio-economic status (measured as ISEI) are high.

There is a large body of sociological research that details the mechanisms of inequality in educational achievement. Many of these draw on Boudon's (1974) distinction between primary and secondary social stratification effects (see review by Erikson and Jonsson 1996). Earlier research on unequal educational attainment focus on the attainment of qualifications measured as educational credentials. As data on assessed skills have become increasingly available, a growing interest in the analysis of skills and skill acquisition is observable in the past two decades. Due to the international large scale assessments of student performance conducted by the International Association for the Evaluation of Educational Achievement (IEA) and the Organization for Economic Co-operation and Development (OECD, e.g. PISA, TIMSS, PIRLS), family effects on educational outcomes are well-established both in terms of credentials and skills.

The second point we want to highlight in the intergenerational transmission of social status is the relationship between these two different measures of educational achievement: attainment levels in terms of credentials vs. (assessed) performance in terms of demonstrated knowledge and skills. Although both variables are treated as synonymous measures of educational achievement in many empirical applications,[1] the underlying concepts refer to theoretical approaches that fundamentally differ with respect to the explanations they offer for the observed education-job link. Human capital (HC) theory (Becker 1964) on the one hand poses that the skills accumulated in education and on the job make the significant difference in workers' placement. Schooling is understood as a mechanism of meritocratic selection, given free educational and occupational choice. The basic mechanism of the education-job link is that higher skills translate into higher productive capacities which are rewarded on the labor market accordingly. The credentialist view (Collins 1979) on the other hand broke with this conception and holds that it is not the superior skills of the better educated, but their ability to exclusively access higher job-ranks, benefitting from a mechanism of social closure. Although schooling and productivity are not independent in this view, the returns to educational credentials are higher than the gains in productivity associated with its attainment. This reasoning is supported by the observation that workers with the same formal qualification differ according to their skills and productive capacities, as do workers who are in the same occupation, a situation which has been termed "heterogeneous skills" (Green and McIntosh 2007). However, augmented HC models have proven to be very useful both in sociological status attainment research and in

[1] E.g. in much of the human capital literature, years of education serve as a proxy for skills, i.e. productivity.

economic research on the returns to education. We investigate whether educational credentials or skills are more relevant in the socio-economic status attainment process and how the two concepts mediate family background. In doing so, we also control for another individual characteristic that is associated with labor market success and include it in our model: learning motivation.

1.2 Country effects and skill formation as a moderator

Credentialist reasoning allows for conceptualising labour market phenomena beyond technological changes, innovations and other sorts of workplace-based changes by laying the focus on institutional structures of job assignment and labour market matching processes. in particular those of the education system itself. Moreover, it allows for the investigation of the relevance and potential impact of credential inflation, as compared to the human capital explanation of skill-based technological change in relation to institutional factors of skill formation and the system of industrial relations.

Our basic assumption is that the effectiveness of the mediating variables in the status attainment process varies across countries, depending on their institutional makeup and their skill formation system. Likewise, we expect that family background effects vary accordingly. E.g. OECD (2013c) demonstrates the variation in the socio-economic gradient that denotes student performance gaps associated with socio-economic status differences and the strength of this relationship. Depending on the institutional structure, the explanatory power of credentialist and the HC approach is expected to vary across countries and cohorts (Van de Werfhorst 2011). In strongly regulated education and occupational systems in which entitlements are tied to educational credentials, the credentialist view is expected to be more relevant than in less regulated systems, in which the human capital explanation should be of higher relevance.

National educational institutions and economic coordination are assumed to moderate country variation in the individual path dependencies. In the institutional literature, the well-established education-job linkage has been discussed along several institutional country-level characteristics, among them educational stratification and vocational enrolement at the upper secondary level (Allmendinger 1989; Bol and Van de Werfhorst 2013; Breen 2005; Kerckhoff 1995; Müller and Jacob 2008; Wolbers 2003). Country variation in these dimensions has been found to explain differences in the status attainment process. In stratified education systems students are tracked at early ages into different educational programs and tracks, resulting in early and diverse vocational specialization of a large part of the student population within initial upper secondary education. Stratified systems have been found to increase educational and socioeconomic inequality, and impede intergenerational mobility (see review by Bartlett 2009). Drawing on date from the Programme for International Student Assessment (PISA) by the OECD, Hanushek and Wößmann (2006) find that comprehensive school systems contribute to a more equitable skill attainemet of students,

while stratified systems increase educational inequality. Regarding vocational education and training, Brunello and Checchi (2007) point to counter-acting effects: while lower class students are kept away from moving on to higher education in systems with early vocational specialization ("diversion effect"), the chances of skill attainment and labor market prospects of disadvantaged students are higher in such systems ("specialization effect"). The good side of the trade-off thus is that lower class students may benefit from a relatively straightforward school-to-work-transition (Breen, 2005), which also facilitates further training opportunities and the development of adult skills beyond schooling.

Country variation in skill formation is also observable with respect to the speed and timing of educational expansion. Upper secondary education is almost saturated in many OECD countries. Related to the design of upper secondary education (general academic vs. vocational, see above), expansion and differentiation of higher education (HE) is under way. In this process, countries differ to a large extent with respect to tertiary education attainment rates. The share of young people who have achieved upper tier tertiary degrees can be used as a measure of the status quo of the higher education (HE) sector while the dynamic of the HE sector can be partly assessed by adding the share of students whose parents themselves have attained a higher education qualification.

The Varieties of Capitalism (VoC) approach argues that skill formation systems complement other economic spheres—production regimes, labor market institutions, and the system of industrial relations (Hall and Soskice 2001; Hall and Gingerich 2009). The vocational specificity of education systems is highly interrelated with the way economic activities are coordinated and with the level of social protection available (Estevez-Abe, Iversen and Soskice 2001). In the presence of generous social protection and coordination the risks of investing in specific skills are reduced since employment protection is high, wage bargaining beyond the firm level assure skill rewards and in the case of unemployment benefits mitigate income losses. Economic coordination is particularly relevant for educational and occupational attainment workers, while the socioeconomic situation of the unemployed is closely related to social protection mechanisms (Busemeyer and Jensen, 2012). Bargaining coordination indicates the extent to which employer's economic activities are influenced by collective actors. In liberal systems, coordination relies more on the competitive market mechanism while in coordinated market economies regulations set by collective actors constrain employer's behavior to a greater extent. The empirical literature suggests that higher levels of bargaining coordination are associated with higher levels of educational outcomes and higher wages. Thus we expect that bargaining coordination correlates positively to a countries average education attainment level, workers' skills, and socio-economic status. Since collective actors in the skill formation process negotiate over training schemes and (vocational) training arrangements, we further expect that family effects on educational achievement and occupational outcomes are lower in highly coordinated and regulated systems.

The remainder of the paper is as follows. The data and technical details of the modelling strategy are discussed in the next section, the results are presented in section 3, while section 4 summarizes and concludes.

2. Method

2.1 Data

Our sample consists of 20-34 year old young workers in 21 countries that took part in the first round of the Survey on Adult Skills[2] conducted by the Organization of Economic Co-Operation and Development (OECD) in 2011/12. Countries included are Austria, Belgium (Flanders), Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Slovak Republic, Spain, Sweden, United Kingdom (England and Northern Ireland), and the United States. At least 5,000 individuals aged 16 to 65 were interviewed in each country. The survey is designed to provide cross-culturally and cross-nationally valid data on education, individual skills and occupation, together with a wide range of background information, including information on parental education and attitudes towards learning. The data thus offers the opportunity to analyze skill-formation systems and their outcomes in comparative perspective. Country level data is obtained from several sources, including Eurostat, OECD, ICTWSS[3] (see below).

2.2 Individual level variables

The path-model at the individual level consists of one independent variable, three mediating variables, and one dependent variable. The dependent variable is measured by the International Socio-economic Index of Occupational Status (ISEI, Ganzeboom et al. 2010) scores, which are assigned to the occupational information of the current job. PIAAC provides job information according to the 2008 International Standard Classification of Occupations (ISCO-08) at the 2-digit level (sub-major groups). For Canada, Estonia, and Finland, only the major groups at the 1-digit level are available. The mediating variables are educational attainment measured in years, the readiness to learn scale,[4] and adult skills

[2] The survey is also known under the acronym PIAAC (Programme for the International Assessment of Adult Competencies).

[3] Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 countries between 1960 and 2012.

[4] The readiness to learn scale was derived from the following six items: a) When I hear or read about new ideas, I try to relate them to real life situations to which they might apply, b) I like learning new things, c) When I come across something new, I try to relate it to what I already know, d) I like to get to the bottom of difficult things, e) I like to figure out how different ideas fit together, and f) If I don't understand something, I look for additional information to make it clearer. On a scale of 1 (“Not at all”) to 5 (“To a very high extent”), respondents were asked to what extent these statements apply to them. Although the derived scale of the index has between-country differences, it is fairly reliable (OECD 2013a).

measured by proficiency in numeracy.[5] Instead of observed proficiency scores, the PIAAC design of the cognitive assessment provides ten plausible values (PVs). The associated imputation variance is accounted for by our estimation procedure (see Appendix 1).

The independent variable is the level of parental education, which is measured on a three point scale: (1) neither parent has upper secondary education, (2) at least one parent has upper secondary education, and (3) at least one parent has tertiary education.[6] As individual level controls we use sex, and a dummy variable indicating if both parents were born in a foreign country. The sample is restricted to 20-34 year old subjects who were in paid work, not in formal education at the time of the survey and for whom occupational information of their job is available. This applies to 23,502 subjects in the data, of which 22,305 cases have complete data. However, since not all variables are included in all models, the sample changes accordingly. The data is weighted by sampling weights (final full sample weight incorporated by the PIAAC) to account for selection probabilities.

2.3 Country-cohort level variables

The higher level consists of country-age cohort combinations, where the 20-34 year olds are assigned to three five year age cohorts. The following country-cohort level variables are analyzed with respect to their direct effects on the individual level outcomes (dependent and mediating variables) and their moderator effects on individual level paths:

1. Vocational enrolment measured as the share of students in upper secondary education that follow vocational tracks is used to indicate system differentiation. The indicator is built from the average of the five years when the cohort members turned 20 years of age. The data sources are various volumes of OECDs Education at a Glance, which provides data for 1998 to 2012.
2. Bargaining Coordination[7] was drawn from the ICTWSS Database (Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 countries between 1960 and 2012, see Visser 2013). Data refer to the average of the five years when the cohort members turned 20 years of age.

[5] We conducted the analysis for literacy as well and obtained similar results.

[6] While this variable indeed is on an ordinal scale, we assume a continuous scale for reasons of simplicity and parsimony. Checks based on a dummy variable approach justify this assumption because the estimated coefficient of tertiary parental education is about double the coefficient of parental upper secondary education on various outcomes, suggesting that the two intervals are roughly equal.

[7] The scale distinguishes five levels of coordination: 5 = economy-wide bargaining, based on a) enforceable agreements between the central organizations of unions and employers affecting the economy or entire private sector, or on b) government imposition of a wage schedule, freeze or ceiling; 4 = mixed industry and economy-wide bargaining: a) central organizations negotiate non-enforceable central agreements (guidelines) and/or b) key union and employers' associations set pattern for the entire economy; 3 = industry bargaining with no or irregular pattern setting, limited involvement of central organizations and limited freedoms for company bargaining; 2 = mixed industry- and firm level bargaining, with weak enforceability of industry agreements; 1 = none of these, fragmented bargaining, mostly at company level.

3. Economic wealth (per capita GDP in PPP, OECD), average 2012-2013, country constant.
4. Share of 25-34 year olds with tertiary education (ISCED 5A/6, OECD 2014). Data refer to 2012; Belgium (Fl.): estimate from the PIAAC data, country constant.
5. Share of students with HE background (Percentage of 20-34 year olds in tertiary education whose parents have tertiary education, OECD PIAAC 2011/12), country constant.
6. Dummies for cohorts 25-29 and 30-34.

2.4 Two-level modelling strategy

On the individual level, the effect of parental education on status attainment is modelled directly and through the three mediating variables educational attainment level (measured in years of formal education), worker skills (in terms of numeracy), and learning motivation. As family effects on social reproduction are contingent on other institutional processes, we aim to explain how the path dependencies at the individual level are moderated by country level variables. To do so, we estimate two-level structural equation models (two-level SEM) using the software package Mplus (Muthén and Muthén 2014). On the individual level, the dependent variable is regressed on the independent variable parental education and on the three mediators, numeracy, years of education and readiness to learn (see Figure 1). The mediators are regressed on parental education as well, and numeracy and readiness to learn are regressed on years of education. Covariates of the mediators and the outcome are sex and parental immigration background.

On the between part of the model, the modelling strategy is twofold. In a first step, a full path model is specified that allows only the intercepts of the DV and the mediators to vary across the 63 country-cohort combinations, while slopes of the individual level paths are fixed. The random intercepts are regressed on all the country-cohort level variables. In a second step, random slopes models are specified for each individual level path dependency separately. In these models, the random path coefficient is regressed on the country level predictors. While in the first step the country level variables are specified to have direct effects on the random intercepts of the outcome and the mediators, in the second step the moderating effects on country variation in the path dependencies at the individual level are modelled.

This two-step modelling strategy is pursued because two-level SEM incorporating random slopes and cross-level interactions are complex models that require many parameters to estimate, and we only have 63 observations at the country-cohort level (21 cohorts times three age-groups).

Formally, we can express the separate random slopes models as follows. The individual level model can be written as

$$y_i \sim \mathrm{N}(\beta_{0j} + \beta_{1jk} S_{ik} + X_i \beta, \sigma_y^2),\ \text{for i = 1,…,n and k = 1,…,K random slopes,}$$

Where β_{0j} is the random intercept, β_{1jk} is the random slope parameter of slope S_{ik}, X_i is the vector of individual level covariates with the associated vector of coefficients β and σ_y the standard deviation estimated from the data. The dependent variable y_i ither the mediating variable years of education (k = 1), numeracy (random slope k = 2,5), readiness to learn (k = 3,6), or the outcome variable socio-economic status (k = 4,7,8,9). In the country level model, the random intercepts and the random slopes (for simplicity we omit the subscript k) are assigned a probability distribution with variation in the random coefficients (with means, standard deviations and a between group correlation parameter ρ estimated from the data

$$\begin{pmatrix} \beta_{0j} \\ \beta_{1j} \end{pmatrix} \sim \mathrm{N}\left(\begin{pmatrix} \gamma_{00} + U_j \gamma_0 \\ \gamma_{10} + U_j \gamma_1 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\beta_0} & \rho \sigma_{\beta_0} \sigma_{\beta_1} \\ \rho \sigma_{\beta_0} \sigma_{\beta_1} & \sigma^2_{\beta_1} \end{pmatrix} \right) \text{ for j = 1,…,J country-cohort-combinations,}$$

Where U_j is the vector of the country-cohort-level predictors, γ_0 is the associated vector of direct effects (on the random intercepts), and γ_1 the vector of moderating effects of these predictors (on the random slopes). The models are estimated by the robust maximum likelihood estimator implemented in Mplus.

The countries in our sample are not a random sample of a population of countries, resulting in a violation of the central assumptions underlying the multilevel modelling framework. Some countries are similar cases with respect to their institutional contexts, while others may represent “unique cases”. An alternative modelling approach would be to simply estimate the path coefficients of interest at the individual level separately for each country in a first step and regress these estimates on country level predictors in a second step. While such a two-step regression approach could make sense in our case because the number of observations is high within countries and the number of countries is low (Achen, 2005 recommends two step modelling in that case), we restrain from such an approach for two main reasons: first, separate country analysis may overstate the variability in the individual level estimates across countries, e.g. because of differences in the sample sizes in countries and unequal variation within and between countries (see Gelman and Hill 2007: 253-254). And second, multilevel modelling incorporates unequal uncertainty of country level effects by decomposing the observed (co-)variance into a within and between country part. Moreover, the specification of random slopes allows for estimating inter-individual variation in response to a countries social gradient (see Cleasby, Nakagawa and Schielzeth 2015).

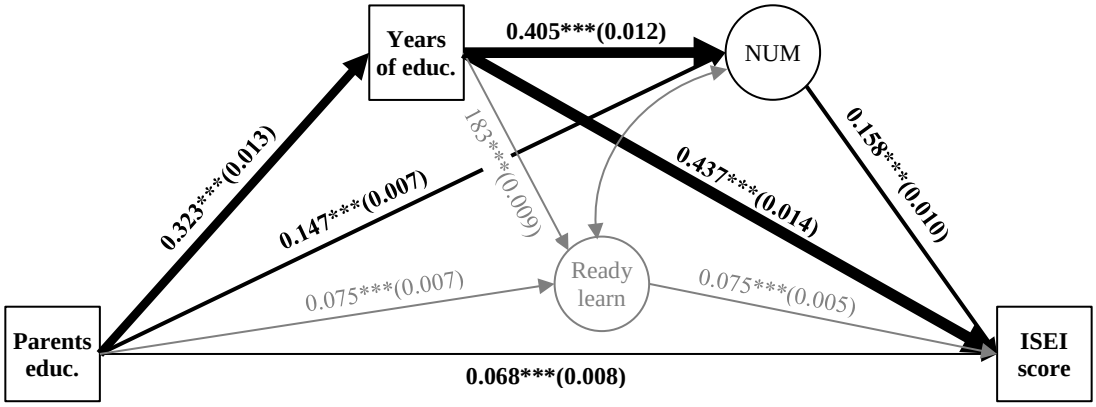
3. Results

In this section, we first discuss the results of the individual level mediation analysis, which is followed by presenting the estimated contextual effects obtained from moderation analysis.

3.1 Mediation analysis

Compared to previous research on status attainment, our main contribution here is a more comprehensive conception about the mediator of educational achievement, in which educational attainment levels (i.e. credentials) are complemented by adult skills and readiness to learn. This conception enables us to assess the extent to which each variable contributes to the status attainment process. To begin with, the results are in line with our expectation that the family influence mainly operates indirectly through educational institutions (standardized effects are included in Figure 1, and in Table 1, and indirect effects are presented in Appendix A1). While the standardized total effect from parental education to socio-economic status is estimated to 0.263, the direct component amounts to only 0.068. The main part of the parental effect works through years of education (0.141). The indirect effects through numeracy (0.023) and through readiness to learn (0.006) are rather small and even lower than the direct parental effect. The family effects on the two main components of educational achievement differ greatly, with the impact on years of education being more than double the impact on numeracy (0.323 vs. 0.147). Given the higher indirect parental effect through years of education, the effect of the latter on the ISEI score is clearly higher (0.514) than the effect of numeracy (0.158), which is about the size of the indirect parental effect through years of education. This means that on average across all country-cohort combinations, the credential clearly has a larger effect than merit in the status attainment process, meaning that the credentialist explanation of the education-job link seems to be more relevant than the human capital view of meritocratic selection. While numeracy is largely affected by ones' educational attainment level, numeracy itself accounts only for a small share of the total effect of years of education on socio-economic status (0.064 of a total of 0.514). Learning motivation is influenced by educational credentials to some extent (0.183), but is only moderately influenced by parental education and its impact on the ISEI score is limited as well (0.075). Given the fact that skills vary considerably within qualification groups, i.e. skills of workers with the same educational attainment level are heterogeneous (see Levels, van der Velden, and Allen 2014), this result suggests that the credential obtained is more relevant in status attainment than the human capital in terms of the measured worker skills.

Figure 1: Individual status attainment model estimates, standardized path coefficients (n=22,305)



Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria; *** p<.001, ** p<.01, * p<.05, + p<.1.
For indirect and total effects see Appendix A.

There is substantial country variation in the path coefficients of parental education, as depicted in Figure 2. Countries differ more with regards to the average parental effect on the credential attained, and less with regards to the skill assessed. In the Nordic countries the parental effects are the lowest. This result is in line with conventional wisdom that education systems in these countries provide educational opportunities relatively independent of social origin. The former soviet central European countries Czech Republic, Slovak Republic and Poland cluster on the other end of the distribution, along with Italy and the United States. In these countries, the gross parental education effect on both educational achievement variables is estimated to be larger than in most other countries of our sample. In general, parental effects act in the same direction across countries and achievement variables, in the sense that if the parental effect on the credential is low or high, likewise its effect on the skill tends to be low or high. One notable exception to this is Japan, where the credential is strongly related to social origin, but not the distribution of skills. While social origin determines credential attainment to a great extent, the Japanese education system is doing relatively well in equipping all workers including those from low-educated backgrounds with high skills, because among all participating countries average numeracy (and literacy) proficiency is highest in Japan, and the proportions of young adults performing at low levels are the smallest. In Italy, the United States and the United Kingdom, high levels of However, high levels of social inequalities in skill attainment corresponds to low average numeracy levels and relatively large shares of low-performers. However, this pattern is not true for the Czech Republic and the Slovak Republic, where a restricted intergenerational mobility is associated with high proficiency levels (OECD 2013d)

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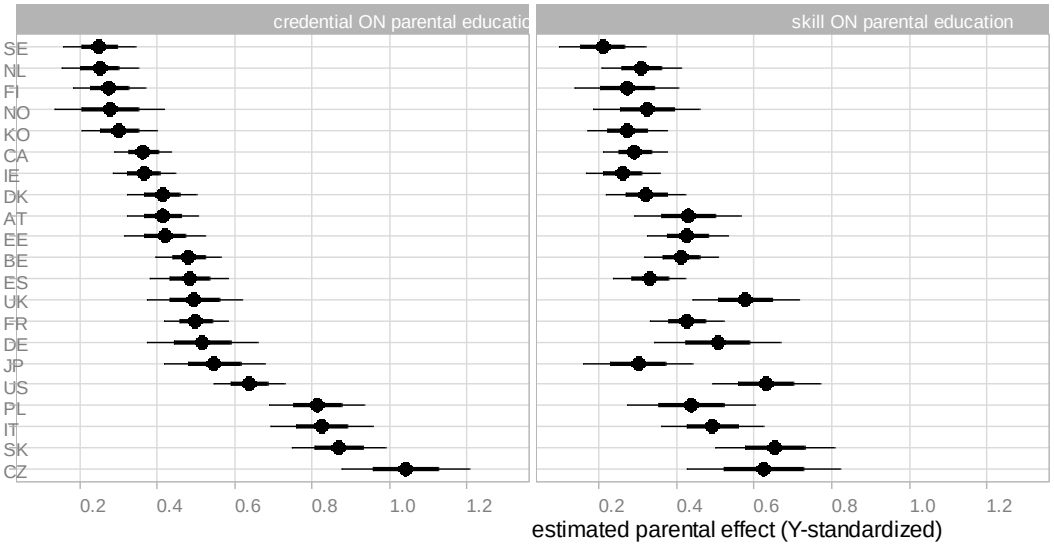
Table 1: Contextual effects of country level variables (standardized estimates from two-level structural equation model with random intercepts)

Mediator/outcome:	Years of Educ. (YoE)	Numeracy (Num)	Ready to Learn (RtL)	ISEI Score
Within level				
Male	-0.152***(0.013)	0.136***(0.009)	0.057***(0.009)	-0.080***(0.011)
Foreign-born Parents	0.028 (0.030)	-0.204***(0.016)	-0.014 (0.012)	-0.035***(0.007)
Parents Education	0.323***(0.013)	0.147***(0.007)	0.075***(0.007)	0.068***(0.008)
Years of Education		0.405***(0.012)	0.183***(0.009)	0.437***(0.014)
Numeracy				0.158***(0.010)
Ready to Learn				0.075***(0.005)
Between Country Level				
Vocational Enrolement	-0.270* (0.119)	0.445***(0.073)	0.125 (0.089)	0.003 (0.072)
Bargaining Coordination	0.131 (0.095)	0.350***(0.082)	-0.606***(0.123)	-0.022 (0.070)
GDP per capita	0.192* (0.086)	-0.096 (0.087)	0.850***(0.113)	0.193* (0.087)
% ISCED 5A/6 (25-34)	0.291** (0.088)	0.119 (0.072)	-0.211* (0.103)	-0.020 (0.068)
% Students w. HE parents	-0.393***(0.109)	0.321***(0.067)	-0.549***(0.110)	-0.080 (0.072)
Aged 25-29	0.502***(0.110)	0.528***(0.089)	0.168 (0.106)	0.735***(0.094)
Aged 30-34	0.621***(0.109)	0.619***(0.081)	0.135 (0.108)	0.985***(0.090)
Intercept				
Dependent Variable	12.352***(1.229)	18.764***(2.052)	8.462***(0.920)	6.854***(0.844)
Variance Explained (R2)				
Within	0.129***(0.010)	0.263***(0.008)	0.048***(0.004)	0.346***(0.015)
Between	0.546***(0.075)	0.823***(0.047)	0.475***(0.089)	0.807***(0.049)

Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria, Eurostat, OECD, Visser (2013); *** p<.001, ** p<.01, * p<.05, $^{+}$ p<.1.

Figure 2: Country variation in parental education effects on educational achievement



Country estimates of educational attainment (credential) and numeracy (skill) regressed on parental education with error bars (thick: +/-1 standard error, thin: +/-1.96 standard errors).
Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria.

3.2 Moderation analysis

In moderation analysis, the estimated random effects on the individual level are regressed on the country level predictors through cross-level interactions. To begin with, we briefly present descriptive associations among our country-cohort level variables. Vocational enrolment and bargaining coordination are positively correlated across the 63 country-cohort combinations (0.30), meaning that in countries with a more differentiated education system economic coordination on average is higher. There is a small negative association between vocational enrolment and the share of HE graduates among the 25-34 year old (r=-0.18), and with the share of students with HE parents (r=-0.06). This supports the “diversion effect” of vocational education only to some extent. The share of HE graduates among the 25-34 year old and the share of students with HE parents are positively correlated but to a moderate extent (r=0.26). As the positive correlation between students’ HE background and the share of HE graduates among the 55-64 year old is considerably stronger (r=0.60), a high value of the student background variable indicates that the HE sector was relatively large several decades while HE expansion since then was below average.

Table 2: Contextual moderation effects of country level variables (estimates from nine separate random slopes models)

	S1: YoE ON PE	S2: Num ON PE	S3: RtL ON PE	S4: ISEI ON PE
Random slope ON				
Vocational Enrolement	0.000 (0.027)	0.581** (0.212)	0.013* (0.006)	0.324** (0.111)
Bargaining Coordination	-0.148** (0.055)	-3.086***(0.535)	-0.043** (0.013)	-0.721** (0.220)
GDP per capita	0.009 (0.060)	1.938** (0.595)	0.002 (0.011)	-0.192 (0.273)
% ISCED 5A/6 (25-34)	-0.261***(0.068)	-3.559***(0.754)	0.006 (0.016)	-0.993** (0.335)
% Students w. HE parents	-0.194** (0.057)	-1.002* (0.464)	-0.019* (0.009)	-0.827***(0.223)
Aged 25-29	0.446***(0.123)	2.255 (1.444)	0.040 (0.031)	4.317***(0.577)
Aged 30-34	0.461***(0.116)	0.656 (1.211)	0.032 (0.030)	4.007***(0.620)
Intercepts				
Random Slope	3.131***(0.378)	33.654***(3.725)	0.306** (0.089)	13.911***(1.991)
Dependent Variable	12.967***(0.647)	225.557***(6.415)	2.670***(0.174)	35.988***(2.359)
Residual Correlation				
Random Slope x Dep.Var.	-0.009 (0.030)	-6.147^{+} (3.438)	-0.004 (0.003)	-1.196 (0.765)

	S5: Num ON YoE	S6: RtL ON YoE	S7: ISEI ON YoE	S8: ISEI ON Num	S9: ISEI ON RtL
Random slope ON					
Vocational Enrolement	0.068 (0.083)	0.003^{+} (0.002)	0.209***(0.038)	0.004^{+} (0.002)	0.169* (0.083)
Bargaining Coordination	-0.634** (0.200)	-0.010***(0.002)	-0.051 (0.091)	-0.003 (0.004)	-0.081 (0.163)
GDP per capita	0.581** (0.181)	0.003 (0.003)	0.180^{+} (0.097)	0.003 (0.004)	-0.135 (0.172)
% ISCED 5A/6 (25-34)	-1.127***(0.256)	-0.003 (0.004)	-0.021 (0.112)	-0.015* (0.006)	-0.369 (0.228)
% Students w. HE parents	0.358* (0.170)	-0.002 (0.002)	0.138 (0.088)	0.000 (0.004)	0.332* (0.165)
Aged 25-29	-0.125 (0.522)	0.004 (0.008)	1.108***(0.233)	0.077***(0.011)	1.114* (0.460)
Aged 30-34	-0.230 (0.539)	-0.002 (0.007)	0.931***(0.212)	0.076***(0.013)	1.451** (0.468)
Intercepts					
Random Slope	9.218***(1.364)	0.100***(0.019)	1.820** (0.688)	0.141***(0.027)	2.662* (1.189)
Dependent Variable	101.385***(21.602)	1.338***(0.365)	12.623 (8.995)	39.407***(3.030)	22.211***(2.796)
Residual Correlation					
Random Slope x Dep.Var.	-21.145***(4.803)	-0.002 (0.001)	-3.254** (0.982)	0.015 (0.014)	0.389 (0.441)

Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria, Eurostat, OECD, Visser (2013) ; *** p<.001, ** p<.01, * p<.05, $^{+}$ p<.1.

Bargaining coordination is moderately positively associated with the share of students with HE background (0.13) and negatively correlated with the share of young upper-tier graduates in a country (-0.24). Economic wealth mainly serves as a control variable. It is strongly positively correlated to an early expansion of the HE sector, (r=0.44) and to bargaining coordination (r=0.40), and only to a minor extent to the status quo of HE expansion, i.e. the share of young people with tertiary degrees (r=0.13). Vocational enrolment and per capita GDP are almost unrelated across the 21 countries, showing a small negative correlation coefficient of 0.10.

Country variation in education system differentiation is estimated to have the following moderating effects (Table 2). Higher levels of vocational enrolment, i.e. more differentiated upper secondary educational systems at the time young people enter the labor market, are strongly positively associated with the parental effect on numeracy skills (random slope S2) and on socio-economic status (S4). While the parental effect on the attained educational credential is unrelated to the level of vocational education in our sample of country-cohort (S1), the effect of the years of education attained is higher in country-cohorts with a strong vocational sector at the upper secondary level (S7). Parental effects on learning motivation as well as the effect of learning motivation on social status (S3, S9) are higher in systems in which the vocational sector at upper secondary education is comparatively larger than in other systems. Thus in comprehensive schooling systems there seems to be a weaker relationship both between family background and the skills of young adults as well as between the educational achievement variables and the social status of young adults. This finding supports prior research that found that comprehensive systems contribute to equal opportunities in the education and the status attainment process (Hanushek and Wößmann 2006; Wößmann and Schütz 2006). The diversion effect of vocational education can be seen in its negative effect on the average years of education achieved in a country (Table 1). However, its positive effect on the average numeracy level is stronger than the negative effect on the education credential attainment.[8] While young adults in differentiated systems on average leave the education system earlier and with comparatively lower credentials, our findings suggest that they achieve higher skill levels in numeracy (and literacy) at the same time. Thus the results from our specification support the finding published by the OECD (2013d) that differentiated systems with substantial vocational education and training sectors are conducive to the average numeracy level. Our results further suggest that the link between learning motivation and socio-economic outcomes is stronger in differentiated systems, while the average ISEI score and the average learning motivation seems to be independent of system differentiation. Overall, our sample suggests that there is a pronounced positive specialization effect of vocational education with respect to worker skills. With respect to status attainment, this strong positive effect tends to compensate the diversion effect of vocational education, although social status is mainly determined by the educational credential attained.

[8] This finding also holds for literacy skills.

Country variation in bargaining coordination is positively related to country-cohort levels in numeracy and negatively related to the readiness to learn, but seems to be independent of the average years of education and the socio-economic status attained. However, our analysis reveals moderating effects that counteract the moderating effect of vocational specialization. Higher levels of coordination comprehensively mitigate the parental effect on all variables in our status attainment model, and reduce the effect of educational credentials on numeracy levels and motivation at the same time. However, the effectiveness of both educational achievement variables and motivation on socioeconomic status attainment is independent of bargaining coordination in our model. Thus a higher degree of economic coordination that involves various actors at different levels weakens family as an institution in the status attainment process, both in its direct effect and its indirect effect through educational achievement. The attainment pathway through educational certificates, however, which has a strong direct impact on the ISEI score and through which family background operates the most, is only moderately influenced by country variation in coordination.

The two indicators of the HE sector, the share of 25-34 year old who has attained upper-tier tertiary education and the share of students whose parents themselves possess tertiary education, show interesting moderating relationships with country variation in the parental effects. Holding constant all other higher level variables, higher levels of the HE indicator variables translate—independent of each other—into a weaker link between family background and educational outcomes both in terms of credentials and skills as well as occupational status. While there is no significant positive effect of the status quo of HE expansion (as indicated by a countries share of young people who hold a tertiary qualification) on average numeracy scores at the country level (Table 1), higher shares of young graduates in a country translate into a weaker link between education and numeracy (random slope S5) and between socioeconomic status and numeracy (S8). In countries where the share of students with HE parents is higher, the average level of educational credentials is lower whereas the average numeracy level is higher compared to countries with a more balanced student population (Table 1). In these countries, the average level of motivation is lower and at the same time socio-economic status depends more on motivation than in countries where HE expansion has occurred more recently. These results point to a mechanism of social closure of the HE sector as a means of reproduction of the tertiary educated that is at work in such systems. On the other hand, higher shares of students with HE parents go with higher educational mobility, in particular with downward educational mobility, across the systems in our sample.[9] Of course, one must bear in mind that the used indicator cannot take into account differentiation and diversification of the HE sector and may thus conceal both downward socio-economic mobility and persistence of social reproduction. Students' parents may have not achieved sustainable upward mobility, since in an era of rapid HE expansion the gain in credentials was not reflected in increased social and economic capital (cf. Fuchs and Sixt 2009). The succeeding generation is much likely to

[9] At the country level, the share of students with HE parents is strongly correlated with downward mobility (r = 0.66).

enter tertiary education but chose, due to the lack of economic and durable cultural capital, rather short-cycle or first cycle programs only or enrolls rather at universities of applied sciences than at universities. This results in closure of the more prestigious programs at the same time and thus persistent social reproduction (there is ample evidence on social reproduction both in attendance and along lines of differentiation of HE. e.g. European Commission/EACEA/Eurydice 2015; Eurostudent 2015).

Per capita GDP is included primarily as a country level control variable. With the exception of learning motivation, which is strongly positively correlated with a country's wealth, this variable has only a weak positive relationship with credentials and socio-economic status and no direct relationship to numeracy (Table 1). The skill related path seems to be also affected by a country's wealth as indicated by moderation analysis: Higher levels of per capita GDP increase the parental effect on numeracy and literacy, as well as the effectiveness of the educational credentials on worker skills. However, since the average numeracy level in the observed countries is independent of GDP and the effectiveness of worker skills on socio-economic status is independent of a country's wealth as well, the human capital explanation is not more relevant in these systems than the credential explanation.

4. Summary and discussion

This paper seeks to explain country variation in the status attainment by modelling cross level interactions between the individual level path dependencies and country level indicators of skill formation systems. The analysis shows that family background effects on educational outcomes in terms of formal qualifications and worker skills as well as education effects on social status vary across countries and that this cross-country variation is systematically associated with differences in the institutional fabric. As expected and in line with prior research parental education background has a strong positive effect on educational achievement both in terms of attainment levels (years of education) and adult skills (proxied by the PIAAC numeracy/literacy scores). With regards to socio-economic status attainment, however, the path model confirms that schooling institutions dominate the attainment process, whereas the direct effect of parental education has become rather small. Looking at the specificity of the educational variables as mediators between parental background and status attainment, our results suggest that educational credentials have a much greater impact on job status than adults' proficiency levels in numeracy and literacy. This is in support of the credentialist rather than the human capital view on the education-job link, because the explanation of schooling as a mechanism of meritocratic selection is rather limited. Indeed, the formal level of education obtained correlates to merit in terms of skills measured by PIAAC, but the socio-economic status of the current job is largely determined by the educational certificate while skills make up for only minor differences in the outcome.

As the direct family effect on status attainment is small, it follows that the influence of families works primarily indirect, i.e. through the acquisition of educational credentials.

Our results further show that country variation in the individual level path dependencies is substantial. Some of these cross-country differences can be explained by institutional variables. A higher degree of differentiation of the education system in terms of vocational specialization is associated to higher direct family effects on worker skills and socioeconomic attainment, and higher effects of educational outcomes and learning motivation on social status. Moreover, system differentiation is strongly positively related to a countries skill level. We thus find evidence of a positive specialization effect of vocational education that is related to higher family background effects on educational achievement and an increased effect of educational achievement on job placement. In contrast to the moderating effect of vocational education, higher levels of economic coordination mitigate the parental effect on educational credentials, worker skills, and socio-economic status attainment. Like higher levels of vocational education, higher levels of coordination are conducive to the skill levels of young workers in a country. Because vocational specialization and bargaining coordination are positively correlated, the latter counteracts the former with respect to the social transmission of family background in the status attainment process in many countries. In countries where prevalent vocational education at the upper secondary level is associated with a low degree of economic coordination (e.g. CZ, SK, and PL in our sample), however, family effects in the status attainment process are high.

It is surprising that the relationship between the socio-economic status and the basic skills assessed by PIAAC is rather weak. While the skill measure refers to the year of the survey and thus offers information about the current distribution of skills among the workforce, the educational certificate was often earned up to twenty years ago. It is not only that skills are heterogeneous among holders of the same qualifications (and jobs), but that they are inferior in determining the occupational placement, as compared to the rather large effect of the educational attainment level. Against the backdrop of human capital theory, our findings point to a serious mismatch between actual skills and jobs and that learning and skill acquisition beyond initial education are not adequately recognized in the process of allocating skills to jobs. One might object that the skills measured by PIAAC do not fully represent the spectrum of knowledge, skills and (vocational) competences associated with an education certificate, and neither do they allow for a skill-based measure of the match between demand and supply. However, pedagogical research on vocational education shows that basic skills and the development of more practical technical and professional skills are closely related, and thus serve as a good proxy for professional skill development; the more so as basic skills are a prerequisite for further learning and vocational specialization.[10]

[10] Examples from Germany and Switzerland, e.g. for the vocational domains business and engineering, can be found in Winther and Prenzel (2014).

Research Ethics

This study uses secondary analysis of anonymized individual data collected by the OECD Survey of Adult Skills (PIAAC). As outlined in the PIAAC Technical Standards and Guidelines Section 2 on Ethics Standards, all survey participants gave their informed consent prior to their participation in the research and national survey institutes had to take adequate steps to protect participants' confidentiality (http://www.oecd.org/site/piaac/PIAAC-NPM%282014_06%29PIAAC_Technical_Standards_and_Guidelines.pdf).

References

Achen, Christopher H. 2005. "Two-step hierarchical estimation: beyond regression analysis." *Political Analysis* 13: 447–456.

Allmendinger, Jutta. 1989. "Educational systems and labor market outcomes." *European Sociological Review* 5(3): 231–250.

Baker, David P. and Gerald K. LeTendre. 2005. *National Differences, Global Similarities.World Culture and the Future of Schooling*. Stanford: Stanford University Press.

Bar Haim, Eyal and Yossi Shavit. 2013. "Expansion and inequality of educational opportunity: A comparative study." *Research in Social Stratification and Mobility* 31: 22-31.

Bartlett, Will. 2009. "The Effectiveness of Vocational Education in Promoting Equity and Occupational Mobility Amongst Young People." *Economic Annals* LIV(180): 7-39.

Becker, Gary S. 1964. *Human Capital*. New York: Columbia University Press.

Blau, Peter M. and Otis Dudley Duncan. 1967. *The American Occupational Structure*. New York: John Wiley & Sons.

Bol, This and Herman G. Van de Werfhorst. 2013. "Educational Systems and the Trade-Off between Labor Market Allocation and Equality of Educational Opportunity." *Comparative Education Review,* 57(2): 285-308.

Boudon, Raymond. 1974. *Education, Opportunity, and Social Inequality*. New York: Wiley.

Brown, Timothy A. 2006. *Confirmatory Factor Analysis for Applied Research*. New York: The Guilford Press.

Breen, Richard. 2005. “Explaining Cross-national Variation in Youth Unemployment.” *European Sociological Review* 21(2): 125-134.

Brunello, Giorgio and Daniele Checchi. 2007. Does school tracking affect equality of opportunity? New international evidence. *Economic Policy*, 52: 781–861.

Busemeyer, Marius and Carsten Jensen. 2012. “The impact of economic coordination and educational institutions on individual-level preferences for academic and vocational education.” *Socio-Economic Review* 10: 525-547.

Cleasby, Ian R., Shinichi Nakagawa and Holger Schielzeth. 2015. “Quantifying the predictability of behaviour: statistical approaches for the study of between-individual variation in the within-individual variance.” *Methods in Ecology and Evolution* 6(1): 27-37.

Collins, Randall. 1979. *The credential society: An historical sociology of education and stratification*. New York: Academic Press.

Estevez-Abe, Margarita, Torben Iversen, and David Soskice. 2001. “Social Protection and the Formation of Skills: A Reinterpretation of the Welfare State.” Pp. 145-183 in *Varieties of Capitalism: The Challenges Facing Contemporary Political Economies*, edited by P. Hall and D. Soskice. Oxford: Oxford University Press.

Erikson, Robert and Jan O. Jonsson. 1996. “Explaining class inequality in education: The Swedish test case.” Pp. 1-63 in *Can Education Be Equalized? The Swedish Case in Comparative Perspective*, edited by R. Erikson and J.O. Jonsson. Boulder: Westview Press.

European Commission/EACEA/Eurydice. 2015. *The European Higher Education Area in 2015: Bologna Process Implementation Report.* Luxembourg: Publications Office of the European Union.

Eurostudent. 2015. *Social and Economic Conditions of Student Life in Europe. Synopsis of indicators. Eurostudent V 2012-2015.* Bielefeld, DE: Bertelsmann.

Fuchs, Marek and Michaela Sixt. 2009. “On the sustainability of educational improvements. Social heredity transmission of educational success over multiple generations.” Pp. 111-122 in *Expected and Unexpected Consequences of the Educational Expansion in Europe and USA – Theoretical approaches and empirical findings in comparative perspective*, edited by A. Becker and A. Hadjar. Bern, Stuttgart, Vienna: Haupt.

Ganzeboom, Harry B.G. and Donald J. Treiman. 2010. “International Stratification and Mobility File: Conversion Tools.” Retrieved February 17, 2015 (http://www.harryganzeboom.nl/ismf/index.htm).

Gelman, Andrew and Jennifer Hill. 2007. *Data analysis using regression and multilevel/hierarchical models*. Cambridge/New York: Cambridge University Press.

GESIS – Leibniz-Institut für Sozialwissenschaften. 2014. *Programme for the International Assessment of Adult Competencies (PIAAC), Germany – Reduzierte Version*. GESIS Datenarchiv, Köln. ZA5845 Datenfile Version 1.0.0, doi: 10.4232/1.11865.

Green, Francis and Steven McIntosh. 2007. “Is there a genuine under-utilization of skills amongst the over-qualified?” *Applied Economics* 39(4): 427-439.

Hall, Peter A. and Daniel W. Gingerich. 2009. “Varieties of capitalism and institutional complementarities in the political economy.” *British Journal of Political Science* 39(3): 449-482.

Hall, Peter A. and David Soskice. 2001. *Varieties of Capitalism. The Institutional Foundations of Comparative Advantage.* Oxford: Oxford University Press.

Hanushek, Eric A. and Ludger Wößmann. 2006. “Does educational tracking affect performance and inequality? Differences-indifferences evidence across countries.” *Economic Journal* 116: C63-C76.

Hertel, Florian R. and Olaf Groh-Samberg. 2014. “Class Mobility across three generations in the U.S. and Germany.” *Research in Social Stratification and Mobility* 35: 35-52.

Kerckhoff, Alan C. 1995. “Institutional Arrangements and Stratification Processes in Industrial Societies.” *Annual Review of Sociology* 21: 323-347.

Kerckhoff, Alan C., Stephen W. Raudenbush, and Elizabeth Glennie. 2001. “Education, Cognitive Skill, and Labor Force Outcomes.” *Sociology of Education* 74: 1-24.

Levels, Mark, Rolf van der Velden and Jim Allen. 2014. „Educational mismatches and skills: new empirical tests of old hypotheses.” *Oxford Economic Papers* 66: 959–982.

Müller, Walter and Marita Jacob. 2008. Qualifications and the Returns to Training Across the Life Course. In K. U. Mayer and H. Solga (Eds.), *Skill Formation: Interdisciplinary and Cross-National Perspectives*, pp. 126-172. Cambridge University Press.

Muthén, L.K., and B.O. Muthén. 2014. *Mplus User's Guide. Sixth Edition*. Los Angeles: Muthén & Muthén.

OECD. 2002. *OECD Employment Outlook*. Paris: OECD Publishing.

OECD. 2012. *Education at a Glance 2012*. Paris: OECD Publishing.

OECD. 2013a. *Technical Report of the Survey of Adult Skills (PIAAC)*. Paris: OECD Publishing.

OECD. 2013b. *PISA 2012 Results. Vol 4, What Makes a School Successful?* Paris: OECD Publishing.

OECD. 2013c. *PISA 2012 Results. Vol 2, Excellence Through Equity: Giving Every Student the Chance to Succeed*. Paris: OECD Publishing.

OECD. 2013d. *Skills Outlook: first results from the OECD Survey of Adult skills*. Paris: OECD Publishing.

Reisel, Liza. 2011. "Two Paths to Inequality in Educational Outcomes: Family Background and Educational Selection in the United States and Norway." *Sociology of Education* 84(4): 261-280.

Schoon, Ingrid. 2008. "A Transgenerational Model of Status Attainment: the Potential Mediating Role of School Motivation and Education." *National Institute Economic Review* 205: 72-82.

Visser, Jelle. 2013. *Data Base on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960-2011 (ICTWSS)*. Amsterdam Institute for Advanced Labour Studies AIAS, University of Amsterdam. Retrieved November 17, 2015 (http://www.uva-aias.net/uploaded_files/regular/ICTWSScodebook40.pdf).

Van de Werfhorst, Herman G. 2011. "Skill and Education Effects on Earnings in 18 Countries: The Role of National Educational Institutions." *Social Science Research* 40:1078–90.

Winther, Esther and Manfred Prenzel. 2014. *Perspektiven der empirischen Berufsbildungsforschung. Kompetenz und Professionalisierung (Prospects of Empirical Research in VET. Skill and Professionalization)*. Sonderheft 22 der Zeitschrift für Erziehungswissenschaft, Wiesbaden, DE: Springer VS.

Wolbers, Maarten H. J. 2003. “Job Mismatches and their Labour-Market Effects among School-Leavers in Europe.” *European Sociological Review* 19(3): 249-266.

Wößmann, Ludger and Gabriela Schütz. 2006. *Efficiency and Equity in European Education and Training Systems*. Analytical Report prepared for the European Commission. Retrieved November 17, 2015 (http://www.eenee.de/de/dms/EENEE/Analytical_Reports/EENEE_AR1.pdf).

Appendices

Appendix A: Indirect individual level effects (standardized estimates)

Path:	PE to Num	PE to RtL	PE to ISEI	YoE to ISEI
Within level				
via years of educ.	0.131*** (0.007)	0.059*** (0.004)	0.141*** (0.008)	
via numeracy:			0.023*** (0.002)	0.064*** (0.005)
via readiness to learn:			0.006*** (0.001)	0.014*** (0.001)
via YoE & num:			0.021*** (0.002)	
via YoE & Rtl:			0.004*** (0.000)	
Total indirect effect	0.131*** (0.007)	0.059*** (0.004)	0.195*** (0.009)	0.077*** (0.005)
Direct effect	0.147*** (0.007)	0.075*** (0.007)	0.068*** (0.008)	0.437*** (0.014)
Total effect	**0.278*** (0.010)**	**0.135*** (0.008)**	**0.263*** (0.012)**	**0.514*** (0.014)**

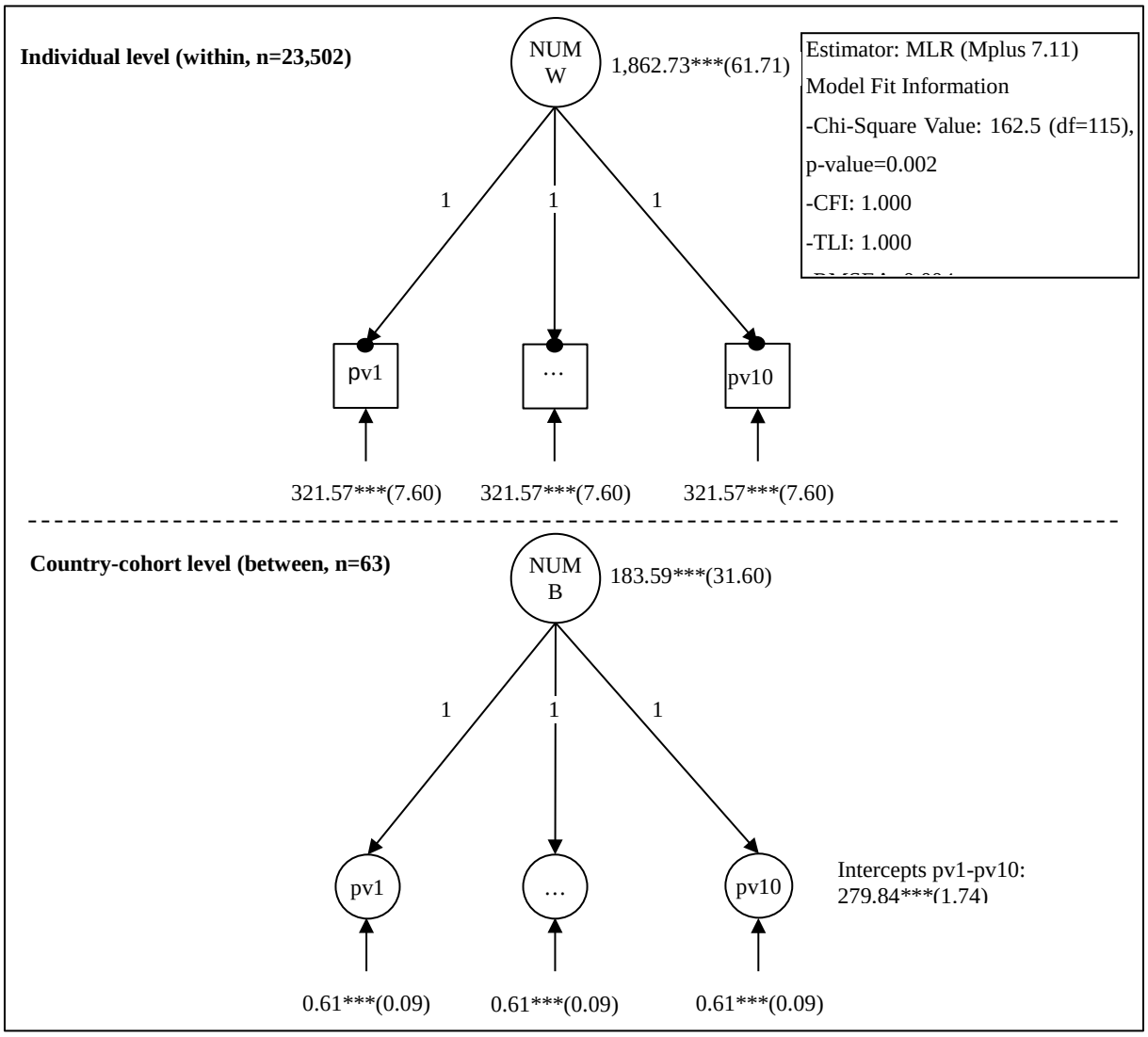
Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria; *** p<.001, ** p<.01, * p<.05, $^{+}$ p<.1.

Appendix B: The measurement of skills in PIAAC

Instead of observed proficiency scores, the PIAAC design of the cognitive assessment provides ten plausible values (PVs) which are imputed from a posterior distribution using IRT scaling. This implies that our estimation must account for the imputation variance in addition to the sampling error component. To do so, we model individual skills as a latent construct using all ten PVs within a Confirmatory Factor Analysis (CFA) framework (Brown 2006), to account for the uncertainty associated with this multiple imputation technique. Since each one of the ten PVs is equally likely representing the unobserved true numeracy score, they are constrained to load equally on the latent factor, having the same error variances, as well as the same intercepts at the country level.

Figure A1 is a graphical representation of the two-level CFA measurement model, including the estimated results. Note that each of the ten plausible values of the numeracy score is constraint to load equally on the unobserved latent skills variable, have equal errors and intercepts. The model fit based on CFI/TLI, RMSEA and SRMR is very good, although the chi-square test suggests rejecting the model. However, since chi-square is sensitive to large sample sizes, the model is indeed acceptable. Compared to the chi-square value of the baseline model (522,608.0), the model achieves a huge reduction and thus the differences between the estimated (co-)variance matrix and the empirical one are negligible.

Figure B1: Measurement of the latent variable numeracy (multilevel-CFA model)



Source: OECD PIAAC 2011/12, GESIS 2014, Statistik Austria; *** p<.001, ** p<.01, * p<.05, $^{+}$ p<.1.
Factor loadings and residual variances are constraint to be equal on each level, as well as the intercepts of the indicator variables.

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