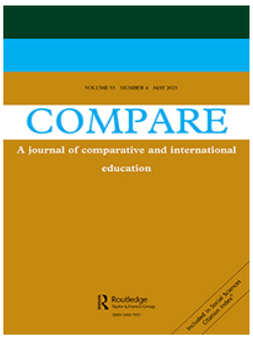

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Compare: A Journal of Comparative and International Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ccom20

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To cite this article: Janine Jongbloed & Jean-François Giret (2023) Untangling the roles of low skill and education in predicting youth NEET statuses: negative signalling effects in comparative perspective, Compare: A Journal of Comparative and International Education, 53:4, 674-692, DOI: 10.1080/03057925.2021.1951664

To link to this article: https://doi.org/10.1080/03057925.2021.1951664

COMPARE, 2023
VOL. 53, NO. 4, 674–692
https://doi.org/10.1080/03057925.2021.1951664

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Untangling the roles of low skill and education in predicting youth NEET statuses: negative signalling effects in comparative perspective

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ABSTRACT

Education determines life chances across the globe, but human capital and skill formation offer context-specific advantages in the labour market during the transition from school to work. Our study focuses specifically on the varying effects of low skill on youth 'not in employment, education or training' (NEET) statuses via educational attainments. Using Programme for the International Assessment of Adult Competencies (PIAAC) data, we estimate the extent to which country-specific relative low skill levels affect young people's probability of reporting long-term NEET statuses across contexts. We find that low skill and education have differing effects on the probabilities of reporting NEET statuses cross-nationally. We also conduct mediation analyses to examine to what extent the negative signalling effects of low education explain the impacts of skill disadvantages on NEET statuses. We find that the indirect effect of low skill through education is particularly important in countries with vocationally oriented education systems.

KEYWORDS

Youth transitions; NEET youth; negative signalling effects; vocational education and training; PIAAC

Introduction

Education acts as a stratifying force in all developed countries and a strong body of research shows that educational systems shape opportunity structures in the labour market. Educational institutional arrangements and their impact on the relationship between educational credentials and socio-economic and occupational outcomes have been the study of much research, finding that human capital and skill formation operate differently across countries and thus offer context-specific advantages in the labour market during the transition from school to work. While studies have investigated these macro-micro interrelationships, none have focused specifically on the varying effects of low skill levels on youth 'not in employment, education or training' (NEET) statuses via differing educational attainments.

NEET youth have fast become an important population sub-group in European social policy discussions. Research has explored the conceptual clarity of this social group (Maguire 2015), predictors and outcomes of NEET membership (Bruno, Marelli, and

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Signorelli 2014), and cross-national variations in group composition and characteristics (Eurofound 2012). Existing studies have highlighted the central role played by institutional arrangements, such as national education systems and labour market policies, in predicting youth unemployment and joblessness (O'Reilly et al. 2015). The absence of a diploma appears to be a handicap for young people in the job market, who more frequently report NEET statuses in the years following their exit from the education system (Furlong 2006). Particularly in countries that have experienced high educational expansion, these youth risk being excluded from the labour market regardless of their actual skills (Araki 2020). However, the exact protective role of a diploma is not yet well understood, as it is not always a sufficient condition in avoiding youth unemployment and precarity (Calero and Choi 2017). More particularly, the interrelated impacts of skill and education on NEET statuses have not been explored directly in studies of NEET youth.

The primary aim of the present study is thus to untangle the closely related effects of low skill levels and low educational attainments in predicting long-term NEET youth statuses from a comparative perspective. To do so, we use the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) data to investigate the relationship between country-specific low relative skill level and the probability of reporting NEET statuses while taking into consideration the interconnected effect of low educational attainment. Specifically, we conduct both logistic regression models and mediation models using the Karlson-Holm-Breen (KHB) method to examine to what extent low educational attainments explain the effects of low relative skills on NEET statuses – a negative signalling effect – across countries and to examine how this mediated relationship is shaped by education system characteristics.

NEET youth and institutional contexts

The term 'NEET' describes young people who are 'not in education, employment or training.' Since 2011, Eurostat defines NEET as those aged 15–34 years who are not developing their human capital in any way through employment, training, or education (Serracant 2014). However, more recent European analyses focus particularly on the population aged 20 to 34, given the fact that the vast majority of young people between the ages of 15 and 19 are still participating in some form of education and training (Eurostat 2018).

Research into youth transitions shows that national institutional differences structure differences in labour market entry patterns among youth (Raffe 2008). This is particularly important because first entry into the job market is 'a delicate phase' of youth's working life that is often determinate of later outcomes (Caroleo et al. 2018, 16). Cross-nationally, successful labour market entries are typically characterised by normatively linear and orderly activity statuses that include few or no incidents of unemployment or inactivity (Brzinsky-Fay and Solga 2016). These school-to-work transitions are framed within institutional contexts that comprise a complex mix of social policy, including education and training systems, employment regulation, social security systems, youth transition policies, and lifelong learning policies for youth (Hadjivassiliou et al. 2016). The comparative literature on the effects of educational and labour market institutions on youth transitions has shown that the effects of these policies are always conjunctural or based on a combination of types of institutions (Brzinsky-Fay 2017).

However, cross-national studies show that the effects of educational system characteristics on youth transitions are particularly important and differ strongly by country (Allmendinger 1989). Variations in these institutional characteristics are particularly important when looking at NEET youth because they play a strong role in determining how school-leavers are allocated to jobs in the labour market. Typically, educational systems are described via four main types of characteristics: stratification, standardisation, vocational orientation, and institutional linkages (Bol and van de Werfhorst 2013a). In this study, we focus on stratification and vocational orientation.

Vertical stratification in secondary schooling refers to the existence of hierarchal tracking and measures of stratification often examine the number of tracks and the age at which tracking occurs (Bol and van de Werfhorst 2013b). Vocational orientation usually refers to the prevalence of vocational programmes within a country. Within vocational education, students learn specific rather than general skills, and most often learn skills specific to a particular occupation or job. While vocational programmes are by nature linked to stratification (they are usually defined as another school track) and heterogenous between countries (they exist as apprenticeship, school-based, and mixed systems), they share the commonality of providing occupationally-specific skills to young people (Ryan 2001).

While vocational tracks may offer more or less advantage in terms of direct links with firms, vocational education presents secondary students with a valuable alternative to general education or dropping out. In countries with relatively developed and widespread vocational enrolment, credentials might be more closely linked with occupation-specific skills and this may give individuals with these credentials more advantages in the labour market (Araki 2020; van de Werfhorst 2011). Importantly, this may allow educational systems to 'send clear signals to employers' about young people's suitability and skills (Breen 2005, 129). Indeed, the vocational specificity of the education system has been shown in previous research to 'shape to a large extent the opportunity structure for school-leavers in Europe' (Wolbers 2007, 208).

Skill transparency and the role of education

Education can been seen as an absolute or a relative/positional good (Horowitz 2015; Araki 2020). Human capital theory argues that educational attainment acts as a proxy for the skills that employees have at their disposal to use in a particular job and thus their productivity (Becker 1964). Credentialist theories, such as that of Collins (1971), and economic theories of education as filter (Arrow 1973) or as a signal (Spence 1973), explain that in the framework of imperfect information within the job market on the skill levels of individuals, employers use the level of educational attainments as a guide to the expected skill level of the individual. Thus, credentialist theories see the role of education as signalling skill in the job market. In this signalling role, a diploma certifies a minimum level of skills that permit employers to expect a certain level of productivity (or trainability) in a given job (Spence 1973; Thurow 1972). In contrast, from the perspective of the low-educated, the theory of social closure argues that educational qualifications provide a socially-sanctioned mechanism of excluding some individuals from the labour market and thus provides benefits to those with credentials regardless of their actual skills (Murphy 1988).

A number of studies have examined the ability of educational certificates to communicate individuals' basic skills (Heisig and Solga 2014; Calero and Choi 2017). Our research extends this line of questioning on the value afforded to skills and educational credentials in the job market from the perspective of the risks of low skill and education. When looking at social closure or *negative* signalling, education plays a similar role in signalling the trainability of workers. In this case, employers make decisions based on probabilistic beliefs about potential employees based on their education, where workers with low levels are assumed to have weaker cognitive ability and lower potential productivity (Gesthuizen, Solga, and Künster 2011). The extension of this 'statistical discrimination' to the country level – when the *average* cognitive skills of low-educated workers in a country influence employers' likelihood of giving low-educated individuals a job – has been termed the negative cognitive competence selection hypothesis (Gesthuizen, Solga, and Künster 2011). This is linked to the notion of the 'skill transparency' of different educational systems, where the distribution of skills at a given level of education affects the value of this educational signal in the job market (Andersen and van de Werfhorst 2010; Heisig, Gesthuizen, and Solga 2019). The transparency of different educational systems is also affected by credential inflation and diploma devaluation in these contexts (Chevaillier and Duru-Bellat 2017).

Research questions and hypotheses

Our study attempts to untangle the relationship between skill level, educational attainments, and youth unemployment and economic inactivity in comparative context. The objective of our research is thus to focus on the direct and indirect effects of low skill and low education respectively in shaping long-term NEET youth statuses. As NEET statuses affect most often those with lower levels of education, we concentrate on the role that the certification of basic skills in secondary education plays. Therefore, we focus on the effects of low skill and low education, as well as their interrelation, on the probability of reporting NEET statuses in comparative perspective. We use the theories from the sociology and economics of education discussed earlier to address the following research questions:

(1) After controlling for low educational attainments, are young people's low country-specific relative skill levels, as measured by PIAAC's literacy assessment, significantly related with the probability of reporting long-term NEET statuses?
(2) To what degree do low educational attainments explain the effect of low relative skill levels on NEET statuses, and what proportion of the variance is left unexplained – in other words, due to a direct effect of skills themselves?
(3) How do the relative weights of these direct and indirect effects relate to the comparative stratification and vocational orientation of educational systems?

Our approach contrasts two alternative, but likely complementary (Blaug 1992), explanations for the role of low skill levels in predicting youth NEET statuses: (1) A direct effect, which assumes the connection between skills and NEET status is based solely on the skills themselves; and (2) a mediated indirect effect, which instead argues that low educational attainments partially or completely account for the relationship

between skill levels and NEET status. We hypothesise that a large part of the effect of low skill on the probability of reporting NEET statuses passes through low education and that this level of skill is signalled by the educational attainment as part of its filtering function. Due to our focus on NEET statuses, we examine a *negative* signal: that of low educational attainments reflecting low country-specific relative basic skill levels. Thus, this may also capture the stigma communicated through this negative selection in the country context (Solga 2002).

A key question that remains unanswered in the literature is the weight of the signalling effect of education in different countries, and especially in relation to the selectivity of educational systems. Not all educational systems filter skills in the same way, and more particularly basic skills, which appear to have a decisive impact in the job market (Calero, Murillo Huertas, and Raymond 2016). We predict that vocational orientation is a critical characteristic: Vocational tracks offer students an alternative to general education, allowing them to develop specific skills and improve their chances of integrating into the labour market. Conversely, young people who do not complete at least an upper secondary diploma of some sort in contexts with an extensive vocational focus may be at higher risk of long-term NEET statuses than those in general education-focused contexts. Thus, we expect that the indirect effects of skills through educational attainments will be maximised in those countries where vocational training at the secondary level plays a strong role and thus where educational sorting is more pronounced. Indeed, we hypothesise that vocationally oriented systems enhance the signalling effect of educational attainments, causing employers to more strongly prefer individuals with qualifications.

Methods

Data

PIAAC permits researchers to analyse comparative data on demographics, education, work, self-reported skill use, and standardised assessments in literacy, numeracy, and problem solving in technologically-rich environments across a large sample of adults aged 16 to 65 (OECD 2016). Notably, the value of using this dataset in comparative education research was underscored in a recent *Compare* Special Issue (Vol. 50, Issue 2; Valiente and Lee 2020). Of importance to the present study, these data can be combined with country-level education system measures and both education and skill can be measured in absolute or relative terms (Heisig, Elbers, and Solga 2020).

The PIAAC survey was designed to provide valid and reliable estimates of adult skills in these three domains, as well as to measure differences in competencies between subgroups and to determine the impact of skill levels on life chances. In this study, we use the PIAAC public use file (PUF) from the first and second rounds of data collection (2011–2012 and 2014–2015).[1] Given our focus on NEET youth, we restrict our sample to the older NEET age span (20–34 years) and to non-students, to avoid confounding the effects of age and education. Our focus on NEET youth is advantageous because problems due to the obsolescence of skills from long periods of labour market exclusion are by definition less important for young people.

The PIAAC survey includes a background questionnaire containing items pertaining to demographic characteristics, education, employment, and skill use. Skills are then measured using paper- or computer-based competency assessments. For each skill area, participants respond to only a selection of items for each test, and their final overall scores are imputed through 10 plausible values. This technique, although unreliable at the individual level, minimises measurement error at the population level (OECD 2016). Eighty-one replicate weights correcting for both country-specific sampling strategy and non-response add further complexity to the task of analysing PIAAC data. Given the complex survey design, we use both the 'repest' (Avvisati and Keslair 2014) and 'piaac-tools' (Jakubowski and Pokropek 2019) commands in Stata to obtain correct estimates and robust standard errors.

Dependent variable

The dependent variable is constructed from three questionnaire items to form a derived indicator of long-term NEET status. These items include whether the individual was employed in paid work in the last 12 months and whether they participated in any formal or non-formal education or training in the past 12 months. Those who responded negatively to all three items were categorised as NEET. This measure differs slightly from the ready-made 'NEET' variable included in the PIAAC data, which only takes into account *current* unemployment and educational participation over the past 12 months. Thus, we define our indicator as long-term NEET, as it accounts for an entire year on all three items.

Independent variables

The main independent variables of interest are literacy assessment scores and formal educational credentials. The key advantage of PIAAC data as compared to other large-scale international surveys is the standardised test results that measure skill level. Thus, it allows us to measure young people's skills directly, alongside traditional educational attainment measures. Given the strong correlation between these two proficiency assessments, we model only literacy scores in our analyses. As conceptualised by the OECD (2013), literacy skill is 'the ability to understand, evaluate, use and engage with written texts to participate in society, achieve one's goals, and develop one's knowledge and potential' (61). Literacy is central to job searching, as well as being one of the fastest growing workplace skills and foundational to the other types of skills (Green and McIntosh 2007).

In a further nuance, we construct a country-specific measure of *relative* skill level for literacy scores (Heisig, Elbers, and Solga 2020). Using the raw scores, we develop a three-quantile categorical measure for each country and for each of the 10 plausible values. Thus, each individual is categorised as 'high,' 'medium,' or 'low' skilled in relation to the distribution of assessment scores of youth within their own country. In our analyses, we compare those categorised as 'low skill' within their country with the rest of the distribution. This categorical variable allows us to identify youth most at risk to be excluded from the labour market and also allows for easier interpretation of model results, while controlling for differences in overall levels and distributions of skill levels

across countries. Moreover, these categorical variables continue to take into account the special nature of the plausible values.

PIAAC measures educational level through the International Standard Classification of Education (ISCED) in order to allow for comparison across different systems of education. We focus on the effects for those with the lowest levels of education in our analyses. Therefore, we compare three levels of education in our analyses: 1) lower secondary or less (ISCED levels 1, 2, and 3c short); 2) upper-secondary (ISCED levels 3a, 3b, and 3c long) and post-secondary non-tertiary (ISCED levels 4a, 4b, 4c); and 3) professional diplomas or tertiary professional diplomas or bachelor's and research degrees (ISCED levels 5a, 5b, 6 and above). We use the upper-secondary level as the reference group because individuals in this category are most likely to be competing in the same parts of the job market as our groups of interest, those with low skills and low education levels (Abrassart 2013)

The control variables include gender (male or female); whether or not the respondent lives with a spouse or partner (yes or no) and has at least one child (yes or no); the young person's seniority in the labour market as captured by the number of years of prior work experience (in years), whether or not the respondent participated in a vocational stream over the course of their formal schooling (yes or no), whether or not the respondent speaks one of the country's official languages as their native language (yes or no), and the highest educational attainment of at least one of the respondent's parents (lower secondary, upper secondary, or post-secondary). These control variables are included in all analyses, unless otherwise indicated.

Analyses

We begin by briefly examining country-level descriptive statistics on NEET rates, average skill levels, and inequalities in skill between those who report NEET statuses and the rest of the youth sample across countries. Following this, we test the relationships between these variables at the individual level using two approaches. First, we study the direct relationship between skill, education and NEET status using consecutive nested logistic regression models. Despite disagreements in the literature, the comparability of odds ratios among groups in models where the binary outcome analysed is not a proxy for an unobserved latent variable, but rather a measured binary state, is argued to be sound (Kuha and Mills 2020). These first models investigate how low education alters the relationship between low skill and NEET status using country-fixed effects and robust country-clustered standard errors to account for unobserved country-level heterogeneity, while incorporating plausible values and replicate weights.

Part two examines the indirect relationship between low skill level and NEET status in more detail. To do so, we first conduct pooled and country-specific mediation analyses (Model 3) using the Karlson-Holm-Breen (KHB) method (Kohler, Karlson, and Holm 2011). The KHB method describes the degree to which a control variable – low educational attainment – mediates or explains the relationship between low adult literacy skills and long-term NEET status. That is, it decomposes the effect of skill on NEET status into direct (unexplained), indirect (explained), and full (total) effects. This approach is particularly useful when using logistic regression models, where coefficients are rescaled between models (Kohler, Karlson, and Holm 2011). Second, we analyse the results of the

mediation models of the interrelationship between low country-specific relative skill level and low educational attainment in predicting NEET status in country-level analyses following a two-step method. In doing so, we compare the ratios of the part of the effect of relative skill levels that is explained by low educational attainment for women and men across countries with the part left unexplained. Finally, we discuss which the education system characteristics can help us to predict these differences in negative signalling effects.

Results

Country-level associations

First, we explore differences in the educational distribution of skill levels and NEET statuses within the youth country samples.[2] In Figure 1, we illustrate the descriptive country-level correlation between the NEET status cognitive gap and the NEET status educational gap. The cognitive gap is the ratio of the average literacy score of those who do not report long-term NEET status to those who do within the country. The educational gap is the ratio of the proportion of low educated youth who report long-term NEET statuses to those with medium or high education in the country. Thus, each captures a relative 'gap' or extent of disadvantage for those who are long-term NEET or those with lower levels of education within the country (Abrassart 2013).

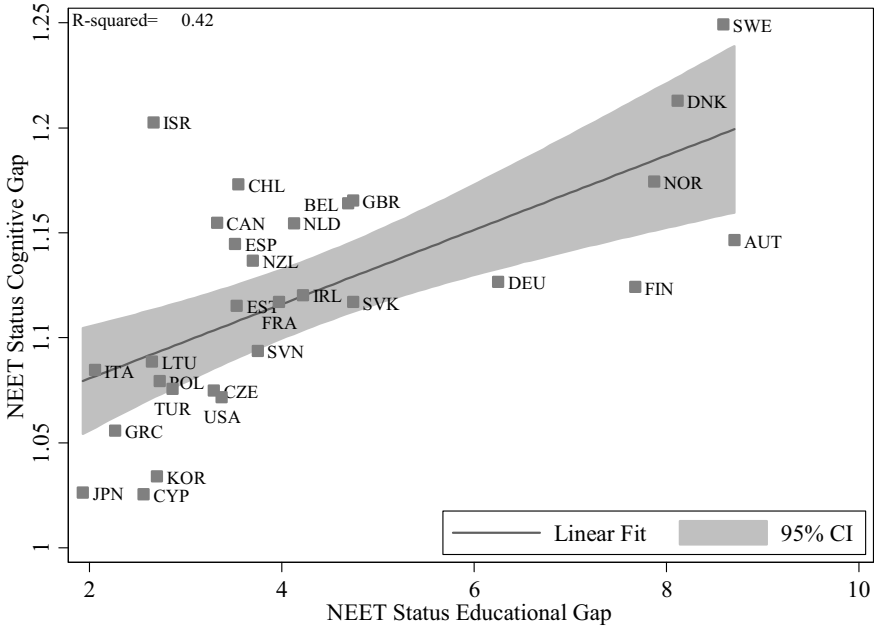

Figure 1. Descriptive country-level correlation between the NEET status cognitive gap and the NEET status educational gap.
Source: PIAAC PUF microdata.
Note: Statistics computed using plausible values and replicate weights.

We see that in all countries those who are long-term NEET have literacy scores lower than those who are not long-term NEET and that youth with low education more often report NEET statuses across contexts, but the penalties related to a lack of degrees or competences are more or less accentuated depending on the country. Indeed, this graph shows that there is a significant correlation between the two measures ($r = 0.42$; $p < 0.01$), where countries with higher cognitive gaps also show higher educational gaps. However, some countries, such as Austria, Finland, and Germany, below the regression line, seem to have long-term NEET youth who are more strongly differentiated on the basis of their level of education than their level of skills, while others, such as Israel, Chile, and Canada, above the regression line, are more differentiated by literacy skills than by education. These descriptive bivariate relationships require further examination once we begin to consider individual covariates in the next section.

Assessing the direct effects of skills

To address our first research question, we examine the direct relationship between low country-specific relative skill level and NEET status across all (pooled) countries. Model 0a, illustrated in Table 1, shows that, compared to the reference group, individuals with low levels of skill have a higher probability of reporting a NEET status, with about twice the odds. Model 1 incorporates the effects of educational attainment, and in this model the odds ratio of low skill diminishes to two-thirds of its original size. The odds ratio measuring low educational attainment is highly significant and almost twice as large as that of low skill level.

In Model 2, controls for parental education, previous work experience, vocational stream, non-native speaker status, living with a partner, gender, and having a child, as well as an interaction between gender and child, are added. Their effects are in the expected directions; however, several findings stand out. Those who were in a vocational stream during their education are *more* likely to report long-term NEET statuses. Both men and women living with a partner are more likely to report NEET statuses, but men

Table 1. Odds ratios of reporting NEET status by low relative literacy skill level.

	Model 0_a	Model 0_b	Model 1	Model 2
Low literacy level[a]	2.056***(.146)		1.371*** (.096)	1.088***(.127)
Less than secondary[b]		2.709***(.184)	2.500***(.164)	2.210***(.252)
Post-secondary or tertiary[b]		0.419***(.030)	0.451***(.032)	0.427***(.033)
Low parental education[c]				1.423***(.134)
Previous work experience[d]				.746***(.007)
Vocational stream				1.100***(.081)
Non-native speaker				.954***(.109)
Lives with partner				1.598***(.153)
Woman				1.124***(.112)
Has at least one child				.788***(.155)
Woman with child (interaction)				9.206***(1.79)
Intercept	.040 (.003)	.048 (.004)	.042 (.004)	.006 (.001)

$N = 43{,}967$; *$p < .05$, **$p < .01$, ***$p < .001$; Country fixed effects included but not shown (available upon request); Robust country-clustered standard errors in parentheses.

aReference group: Category including the highest two-thirds of the youth skill distribution within the country.

bReference group: Upper secondary school diploma or post-secondary non-tertiary education.

cReference group: High parental education (upper secondary or tertiary education).

dReference group: No previous work experience.

with a child are less likely to report NEET statuses, while women with a child are much more likely to report long-term NEET statuses (the odds are nine times greater). While not surprising, the magnitude of this result is striking.

These controls further weaken the influence of literacy score on the probability of reporting NEET status (by about a quarter of the size of the odds ratio). However, skill level still has a clear influence, with the odds ratio remaining highly statistically significant. Low educational credentials also continue to have a significant impact on the likelihood of being long-term NEET, with only a moderate decrease in the size of the odds ratio. Notably, when we compare the R^2 across nested linear probability models (not shown), the overall predictive power of the model is greatly enhanced when education is added to the models, to about four times its size in models using only skill level to predict NEET statuses.

These results are similar across countries (see Figure 2). The direction of the effects remains consistent, although the magnitude and significance change substantially. Direct effects of low relative skill are largest in Norway, Canada, Denmark, and Israel, while they are small in the USA, Turkey, France, and Poland. Direct effects of low educational attainment are largest in Turkey, the Czech Republic, Finland, and Austria, while they are

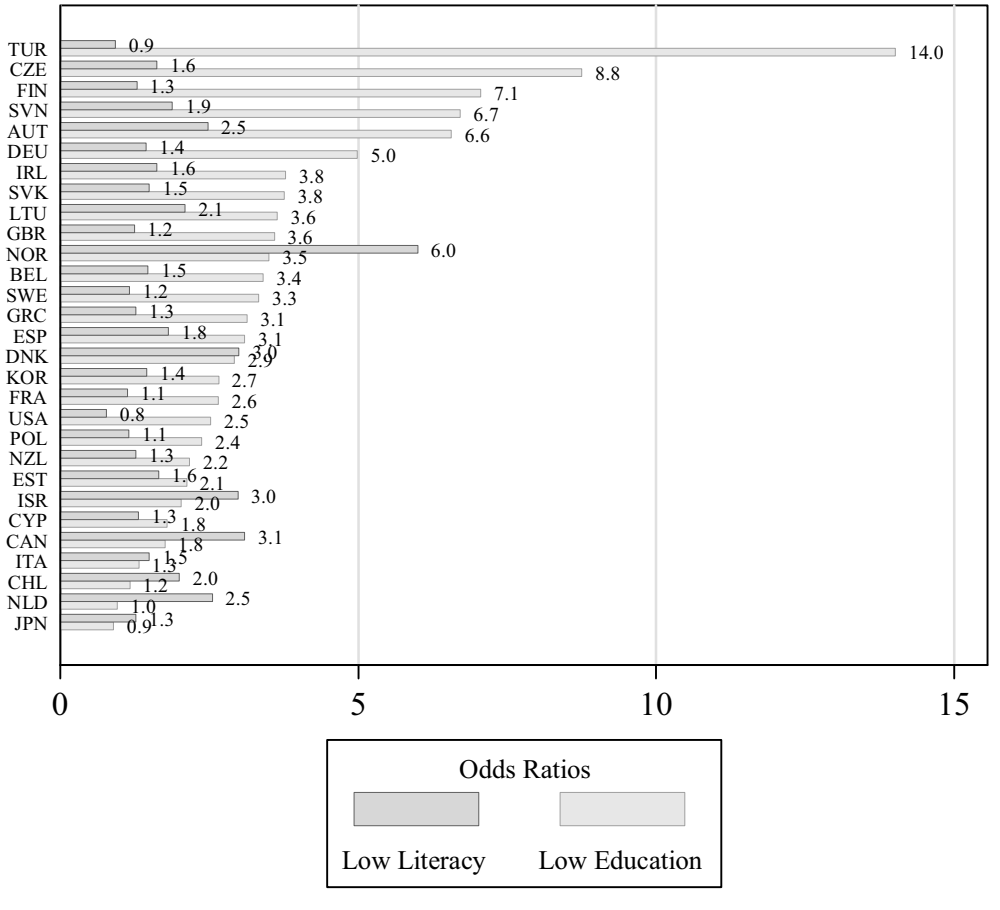

Figure 2. Low literacy and low education effects as odds ratios from Model 2.

small in Japan, Switzerland, the Netherlands, and Italy. This may be related to differing characteristics of educational systems among these countries, which may offer different labour market opportunities after precocious exits from education. We will further explore the differences between these two effects in the next section.

Assessing the indirect effects of skills

The results above demonstrate that the direct relationship between skill level and NEET status weakens when educational attainment is included in the model. Because education and literacy proficiency scores are significantly correlated ($r = .41$, $p < .001$), disentangling these relationships is not an easy task. Here, we examine the extent to which educational attainment mediates the relationship between literacy skill level and the probability of reporting long-term NEET status using KHB mediation models. First, we show pooled, cross-country findings, and then individual country models. We conclude our analysis with an examination of how national educational system characteristics correlate to the mediating power of educational attainments in predicting NEET status.

Table 2 presents the results of our KHB model. The total effect is an additive measure of both the direct effect of skill on NEET status, net of all controls, and the indirect effect functioning through low educational attainment. We see that low education significantly mediates the relationship between low skill levels and the probability of reporting NEET status. Indeed, the indirect effect of educational attainment is almost as large as the direct effect of low literacy skill on the probability of reporting long-term NEET status. The robust significance of the result suggests that a major part of the role that literacy skill plays in predicting NEET statuses is due to this negative signalling effect.

Next, we highlight some key differences in the individual country results of KHB decomposition Model 3. In all countries except Chile, Korea, and Japan, low educational attainments significantly mediate the relationship between low skill level and the probability of reporting NEET status. The indirect effect is largest relative to the total effect in Germany, France, the United Kingdom, and Finland. Opposing this, the indirect effect is very small relative to the direct effect in Israel, Canada, Belgium, and Norway. The confounding ratio, or the ratio of the total effect of low skill on NEET status to its direct effect, shows that the direct effect represents

Table 2. Pooled estimation of the indirect relationship between skill and NEET status as mediated by low educational level.

		Model 3
Low skill level[a]	Total effect	.443***(.124)
	Direct effect	.265** (.120)
	Indirect effect	.178***(.021)

*p < .05, **p < .01, ***p < .001; Robust standard errors in parentheses; All controls included.
aReference group: Category including the highest two-thirds of the youth skill distribution within the country.
bThe total effect is the sum of the direct and indirect effects of skill level.
cThe direct effect can also be described as the part of the overall effect of skill that is *unexplained* by educational attainment.
dThe indirect effect can also be described as the part of the overall effect of skill that is *explained* by educational attainment.

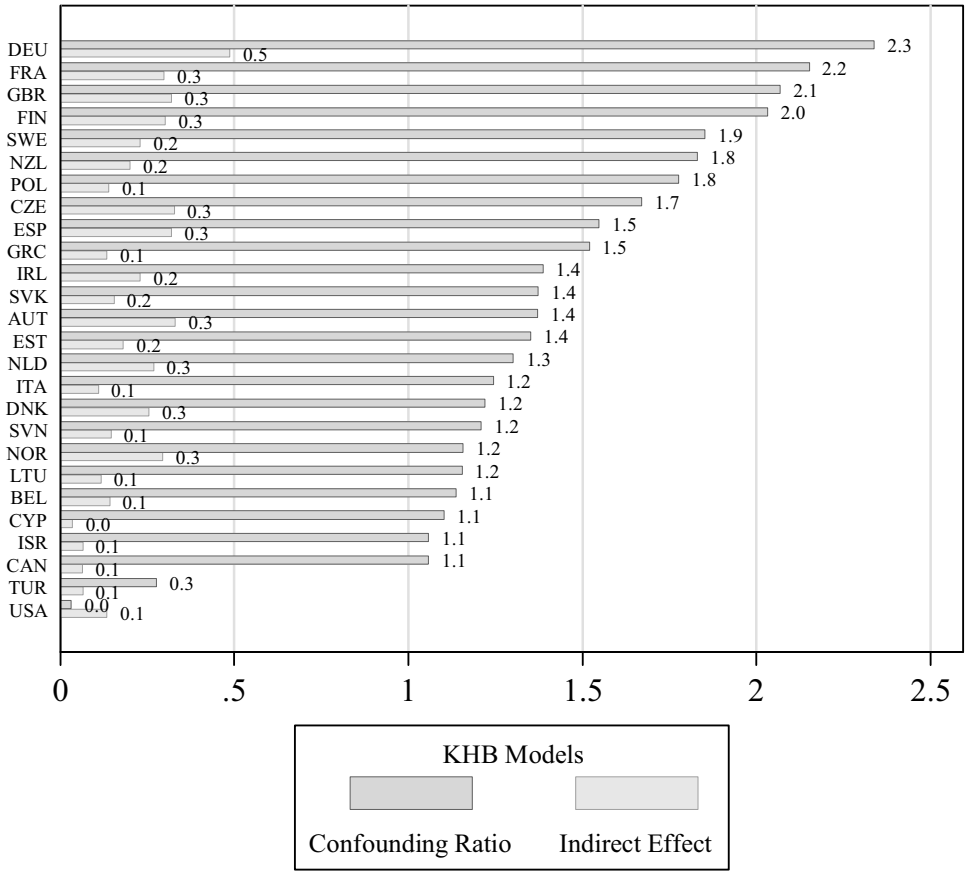

Figure 3. Country results of the indirect relationship between skill and NEET status as mediated by low educational level from Model 3.

a smaller part of the overall literacy effect in Germany, Austria, the Czech Republic, Great Britain, France, and Finland (see Figure 3).

As we discussed earlier, the direct effects of low relative skill play a more important role in Norway, Canada, and Israel, while the indirect effects are large in Germany, Finland, the United Kingdom, and France. While the direct effects of low educational attainment on NEET status were significant in the USA and Turkey, they do not operate as a mediating variable between low skill and NEET status (indeed they seem to function in opposition to one another). The direct effects of educational attainment were large in Austria, Denmark, Germany, and the Netherlands, and we see that they also play a significant role *indirectly* in mediating the effect of low skill on long-term NEET status.

As discussed in the introduction, this may be due to the widespread options for secondary-level vocational training available in these countries. Indeed, as demonstrated in Figure 4, the confounding ratio measuring the size of the indirect effect, seen here as an indicator of the negative signalling role of education, is significantly positively correlated with an index of the size of vocational enrolment within

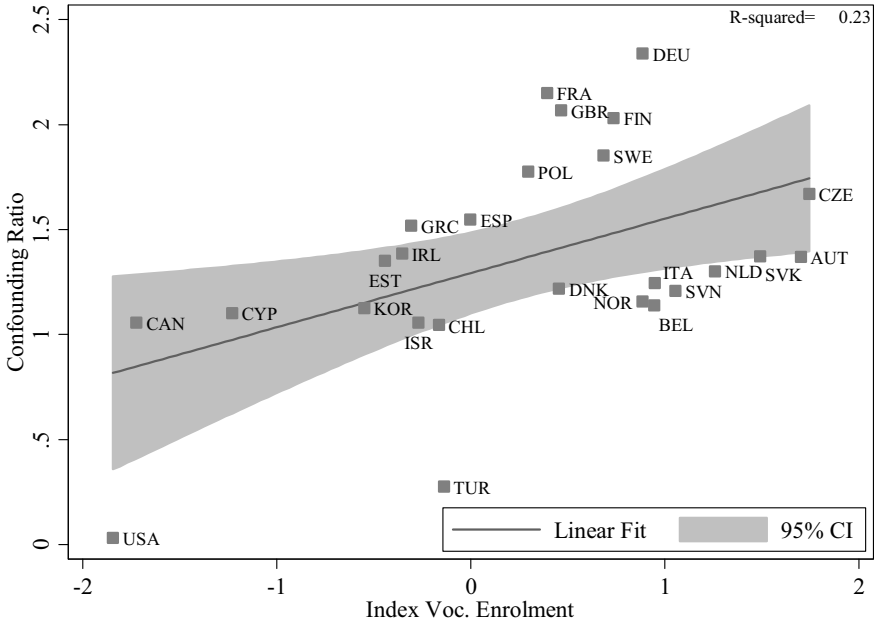

Figure 4. Country-level correlation between the confounding ratio and the vocational enrolment index.
Source: PIAAC PUF microdata.
Note: Statistics computed using plausible values and replicate weights. The vocational enrolment index is adapted from Bol and van de Werfhorst (2013b)

countries ($r = 0.23$; $p < 0.01$). Those countries with higher vocational enrolment show larger *indirect* effects of low skill as mediated by educational attainments. This is particularly the case for Germany, but also for Finland, Sweden, Great Britain, and France.

This provides evidence for the selection effects of vocational education: Low skill affects NEET statuses via lower educational attainments within these countries, while it affects NEET statuses directly in other contexts (such as Canada and Israel, for example). Other country-level indicators of educational system characteristics are not significantly related to these measures. For example, educational stratification – as measured by the number of tracks and selection age – and institutional linkages – as measured by the ratio of firm-based versus school-based vocational programmes – are not related to the strength of the indirect effects. Nor is the size of the long-term NEET group as a proportion of youth: Indeed, the significant relationship between the mediation effect and vocational enrolment becomes stronger when the proportion of NEET youth is controlled.

As we discussed earlier, vocational tracks offer an alternative route to secondary school completion for students and improve labour market entry outcomes. However, this means that those who do not manage to finish send a strong negative signal to employers. Youth without any secondary diploma may suffer an even more pronounced disadvantage when attempting to integrate into the labour market in these contexts. We see evidence for this in the fact that low education explains a larger proportion of the

effect of low skill on long-term NEET statuses where levels of vocational orientation and participation are higher.

Discussion

We hypothesised that individuals with low country-specific relative levels of skills would be more likely to report long-term NEET statuses regardless of their educational attainments, although we predicted that low relative skills may contribute even more strongly through low education in a negative signalling effect (Solga 2002). Additionally, we suggested that this mediated relationship is likely in turn shaped by the institutional sorting that occurs within countries, with indirect effects likely maximised in those countries where vocational training at the secondary level plays a strong role. We found strong support for these assertions.

Our results show that both relative low skill level and low educational attainments significantly increase the probability of reporting long-term NEET statuses, with highly statistically significant odds ratios across models. In the KHB models, we saw that low educational attainments mediate the relationship between low literacy skill levels and the probability of reporting long-term NEET statuses. Indeed, the indirect effect of low relative literacy skill level through educational attainment is almost as large as its direct effect.

Across countries, the direct effects of low relative skill play a much more important role in some countries such as Canada and Israel, while the indirect effects are the driving force in countries such as Germany and France. We suggested that this might be due to the highly utilised vocational tracks that exist in these countries, which have been theorised to intensify the signalling effect of educational attainments (Araki 2020; van de Werfhorst 2011). In preliminary descriptive statistics, NEET youth appeared to be more strongly selected via their low educational attainments in these contexts. When we correlated our individual-level model results with country-level macro variables, we found that measures capturing the mediating effect of educational attainments had a positive correlation with the size of vocational enrolment within countries. Thus, as expected, those countries with higher vocational enrolment showed larger *indirect* effects of low skill. This provides evidence for the importance of negative signalling effects.

The present study has both the advantage and limitation of exploring our key variables and relationships in a number of discrete analyses. Future studies would benefit from the use of multilevel models to examine these relationships including individual and macro-level variables in the same models, while following best practice concerning the plausible values and replicate weights in the PIAAC data. An exploration of the impact of demand-side factors captured in relevant labour market indicators, such as employment protection legislation (EPL) and public expenditure on active labour market policies (ALMP), would allow for a better understanding of the complex interactions of macro-level labour market institutional characteristics, particularly for young workers.

Indeed, a limitation of our research is that, from the perspective of signalling theory, demand-side factors could also influence the role of signals in the labour market (Wang and Weiss 1998). In countries where temporary employment contracts for youth are more widespread, the filtering role of educational credentials may be less important because employers are able to directly evaluate young people's skills when they are hired

on temporary contracts. The signalling effect of education should then be weaker when there is more temporary employment. However, this theoretical argument assumes that employers do in reality use these first temporary jobs for the purpose of observing youths' skill value with the intent of hiring them on permanent contracts (i.e. the integration hypothesis). Gebel (2010) shows that this integration hypothesis for temporary employment is observed more strongly in the UK, for example, than in Germany. More recently, Barbieri et al. (2019) report that this is not the case in Italy, where reforms have increased the 'entrapment risk' of temporary employment in the early stages of youth's careers.

In preliminary exploratory analyses, we considered the effects of EPL in our second-step regression models, but our results did not show any significant associations. However, as highlighted above, we are not able to test the complex interactions of macro-level labour market institutional characteristics using our current methods. Thus, in both the current study and the research literature to date, the role of the demand side of the labour market in determining the strength of signalling effects is still unclear. This remains an important and fruitful area for further research.

It is also important to note potential reverse causation in the relationship between low skill and NEET status. Although we noted earlier that problems of skill obsolescence due to labour market exclusion are reduced when looking at youth, there may still be some effect of NEET status on skill level. Future studies analysing these negative signalling effects from the perspective of research in lifelong learning policies targeting youth, particularly from a longitudinal perspective, will allow for a better understanding of these issues (Parreira do Amaral, Kovacheva, and Rambla 2019).

Furthermore, to better understand the relationships delineated in this study it will also be necessary to unearth the effects of horizontal differentiation at each level of education discussed. As Müller and Shavit (1998) argue, the value of credentials may matter more in terms of their position in the hierarchy of credentials or the specific skills they represent, depending on the context. Finally, this study examined 'NEET' as an all-encompassing category, which limits our interpretation. In the future, it is also important to attempt to predict membership in specific sub-categories that fall under the broader NEET label (Serracant 2014).

Conclusion

In conclusion, our study contrasted two competing explanations for the role of low adult skill in predicting long-term NEET statuses. Together our findings suggest while country-specific relative low skill levels directly influence the probability of reporting long-term NEET status, they also affect NEET statuses through a powerful indirect pathway through low educational credentials. Indeed, overall, we found that the indirect effect of low literacy skill functioning through low educational attainment is as important as the direct effect of low skill itself.

The size of this effect differed widely between countries and correlated significantly with the country-level institutional characteristic of vocational orientation: Low educational attainments almost completely explained the effect of a young person's low level of skills on their long-term NEET status in countries where participation in vocational tracks is widespread. This clearly shows that not all educational systems filter low country-specific relative skill levels in the same way and that low educational attainments

act as a particularly strong negative signal of low country-specific relative basic skill levels in vocationally oriented contexts.

Thus, we conclude that negative signalling theories provide a good explanation for the effects of low relative literacy skill when predicting long-term NEET statuses cross-nationally, and a very good explanation in contexts where there is extensive vocational education at the secondary level. This study provides further evidence of the extent to which education acts as a stratifying force and differentially shapes labour market opportunity structures cross-nationally.

Notes

1. The sample includes 33 countries and regions in total, but we exclude data from Australia, Indonesia, Russia, and Singapore due to a lack of PUF data. To maintain comparable sample sizes, we weighted back the original data for Canada to a random sample of 25%.
2. Please contact the authors for a table of descriptive statistics on all key variables.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the French National Research Agency [Grant Number ANR-15-ORAR-0005-01].

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