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Working Papers on the Reconciliation of Work and Welfare in Europe

Cognitive skills matter.

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in international comparison**

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About the author

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Abstract

It is now a widely acknowledged fact that the low-skilled are facing important risks of labour market exclusion in modern economies. However, possessing low levels of educational qualifications leads to very different situations from one country to another, as the cross-national variation in the unemployment rates of the low-skilled attest. While conventional wisdom usually blames welfare states and the resulting rigidity of labour markets for the low employment opportunities of low-skilled workers, empirical evidence tends to contradict this predominant view.

Using microdata from the International Adult Literacy Survey that was conducted between 1994 and 1998, we examine the sources of the cross-national variation in the employment disadvantage of low-skilled workers in 14 industrialized nations. In particular, we test the validity of the conventional theories concerning the supposedly harmful effect of labour market regulation against a new and promising hypothesis on the importance of cognitive skills for the employment opportunities of the low-educated. Our findings support the latter and suggest that the employment disadvantage the low-educated experience relatively to medium-educated workers is mainly due to their deficit in the skills that have become so important for labour market success in the recent past, namely cognitive skills.

Keywords

Cognitive skills, low-educated workers, unemployment, international perspective, labour market institutions

Introduction

Since the end of the Golden Age of Capitalism, low-educated workers seem to be increasingly disadvantaged in terms of employment opportunities in modern economies. While this disadvantage was always present, its growth over the past decades has caused rising concern among scholars over the labour market situation of this group of workers and its consequences in terms of the new social risks it brings upon them (e.g. Bonoli 2007; Huber and Stephens 2006).

Conventional wisdom, mainly stemming from the well-known OECD *Jobs Study* (OECD 2004), has it, to over-simplify, that it is the rigidity of labour markets resulting from its regulation that is essentially responsible for the low employment opportunities of the low-skilled in industrialized countries. More particularly, wage regulation, the strictness of employment protection legislation and the generosity of social benefits are generally believed to be at the root of this disadvantage. While this simple and appealing theory has had much success in the recent past in policy circles, increasing empirical evidence (Bradley and Stephens 2007; Esping-Andersen 2000; Howell 2003) is adding controversy to the relevance of the previous theoretical arguments. With many European countries characterized by quite rigid labour markets faring actually better than the US in terms of employment, especially when focusing on the low-educated (Howell 2003), and analyses showing the apparent positive effect of labour market institutions such as short-term unemployment replacement rates or active labour market policies on employment (Bradley and Stephens 2007), it is time new insights on this issue emerged.

One promising idea, in our opinion, is related to recent evidence on the importance of cognitive skills for labour market outcomes (e.g. Heckman, Stixrud and Urzua 2006). As Nickell and Layard (1999) for instance interestingly suggest, inequality of cognitive skills among workers may be an important factor of the cross-national variation in inequality of earnings. And even if evidence (Blau and Kahn 2005; Devroye and Freeman 2001) shows that inequality of skills is responsible for only a modest part of the intra-country variation in earnings, the “price” that is given to these cognitive skills in the labour market, in other words the returns to these skills, seems to be significant in the explanation of this issue. Since we can reasonably assume that educational attainment is a good measure of the level of skills of workers as those with low cognitive ability are less likely to attend high levels of education and because education tends to enhance the development of those skills, the low-educated may in fact be more likely to be disadvantaged in the labour market because they possess less cognitive skills in average. Accordingly, ignoring the role of cognitive skills in workers' labour market outcomes and in particular in the employment disadvantage that the low-educated experience could clearly constitute an important mistake. However, recent evidence has shown that the average level of cognitive skills that workers with similar educational qualifications possess varies importantly across countries (Park and Kiey, 2011). Although educational attainment constitutes a strong signal to employers regarding workers' potential productivity, low-educated workers possessing in average higher levels of cognitive skills may well have more chances of employment in our modern economies.

Nothing indicates, however, that increasing the level of skills of workers with low educational qualifications would increase their employment opportunities comparatively to their more educated counterparts. Indeed, without employer demand “at reasonable earnings level, for the individuals who have improved skill levels” (Kenworthy 2008: 209), it may be difficult to conceive that the employment prospects of the low-educated may be enhanced by

a more egalitarian distribution of skills among the population. Our main interest in this paper will thus be to determine whether it is indeed the case, and whether it is skills rather than the more traditionally identified labour market characteristics and policies that play a significant role in the relative employment opportunities of the low-educated. In order to do so, we will first review the literature on the explanation of the cross-national variation in the employment disadvantage of the low-educated while stressing the importance of cognitive skills in this issue. In a second part, we will present the data and methodology used to verify empirically our hypotheses before, in a third part, presenting and interpreting our findings. Finally, we will conclude on the importance of cognitive skills relatively to the traditionally spotted labour market characteristics for the cross-national variation in the employment disadvantage of the low-educated.

Theoretical background

Labour market institutions and policies and the employment outcomes of the low-educated

As previously mentioned, most analyses of the employment disadvantage of the low-educated have focussed on labour market policies while largely ignoring the role of cognitive skills in this issue. In order to leave more space for the development of our hypotheses on the influence of cognitive skills, we will, in this part, only address the role of labour market policies and institutions on the surface while giving the appropriate references for the reader to be able to deepen the reflection. Five main policies or institutions are usually being identified in the literature as the main culprits for the employment disadvantage the low-educated experience in modern labour markets.

Wage regulation

First, wage regulation, positively influencing wage equality, especially at the lower end of the distribution, is argued to affect employment creation in the low-end service sector because of the difficulty to enhance productivity in these jobs (Esping-Andersen 1999: 111-114; Iversen and Wren 1998). Empirical evidence, however, is quite mixed on the subject as Esping-Andersen (2000) finds a positive and significant effect of higher minimum wages on the relative employment prospects of low-skilled workers¹ whereas Oesch (2010) doesn't find any clear significant trend between minimum wage or bargaining coverage or coordination and low-skilled unemployment across modern economies. Surprisingly, however, he finds a positive association between wage inequality and low-educated unemployment, which he attributes to the three Scandinavian countries, namely Denmark, Norway and Sweden, as well as the Netherlands, as they all have a strongly compressed wage structure and relatively low rates of low-educated unemployment. However, despite this somewhat surprising empirical evidence, we expect wage regulation to affect negatively the employment chances of the low-educated as it is believed to increase the economic burden of employers in sectors with few opportunities to increase productivity.

Employment protection legislation

It is also not clear whether employment protection legislation is harmful or not for the employment outcomes of low-educated workers. Indeed, since it reduces workers' mobility - less hiring during upswings and less firing during downturns-, and therefore the outflows of unemployment or non-employment, it is more likely to create long-term unemployment that essentially affects the weakest groups of workers, among which the low-skilled (Esping-Andersen 2000; Oesch 2010).

However, as Kahn (2005) argues, in countries where permanent employment protection is high, employers use temporary employment as a way to observe employees' productivity and therefore to get rid of the uncertainties concerning their skills before hiring them in permanent jobs. Since, as Kahn (2005) shows, it is mainly the low-skilled that are targeted by these types of contracts, employment protection, through the generation of temporary jobs, may thus not necessarily additionally disadvantage the low-skilled. However, since temporary contracts are less secure, temporary jobs may also further move this group of workers away from the labour market. Therefore, we expect a stronger permanent employment protection to lower the employment opportunities of the low-educated compared to medium-educated workers, as the former are more likely to become and stay the 'outsiders' of a labour market protecting its 'insiders', namely those with intermediate or higher education.

Passive and active labour market policies

According to the traditional view on the matter, the generosity of the welfare state may act as a disincentive to enter or return to the labour market for those with low education. Indeed, generous social benefits, whether through unemployment benefits, early retirement schemes, social assistance or sickness and disability compensation, may be more attractive than paid work to low-skilled workers since the difference between these benefits and the wage they would receive in the labour market is likely to be small (Esping-Andersen 2000; Oesch 2010). Accordingly, more generous social benefits are expected to further disadvantage the low-educated in terms of employment compared to those with intermediate education.

Yet, while these passive labour market measures are more likely to be detrimental to the employment prospects of low-educated workers, investments in active labour market policies or ALMPs, on the other hand, may help this group of workers enter or re-enter the labour market, for instance through employment services and individual case management or training programmes (Oesch 2010). Thus, countries spending more on these active policies are expected to enhance the employment chances of low-educated workers.

Payroll and consumption taxes

Finally, as Kenworthy (2008: 186-193) and Scharpf (2000) both argue, taxes, and more particularly payroll -social contributions- and consumption taxes, tend to reduce employment in low-end private services as they have impeded the development of jobs in this sector during the last decades. Indeed, as Scharpf (2000) further explains, payroll and consumption taxes can be detrimental for the development of low-end services essentially because of the economic burden they put on employers, as they may price out such services of price elastic markets. Thus, higher payroll and consumption taxes are expected to strengthen the employment disadvantage of the low-educated.

Now that we have briefly presented the usual institutional factors that are held responsible for the employment disadvantage the low-educated experience in industrialized

nations, we can focus on our main hypotheses through examining the role of skills in this issue.

The importance of cognitive skills for the employment opportunities of the low-educated

The cognitive gap and the employment disadvantage of the low-educated

As de Grip and Zwick (2004) note, jobs in modern economies are getting increasingly complex because of “the *combination* of related innovations in information technology, workplace reorganization, and the introduction of new products and services”. These combined elements, therefore, create an increase in the level of skills required for modern jobs while also altering the type of skills needed to succeed in a knowledge economy. Indeed, a whole stream of literature insists on the importance of cognitive skills in dealing with the rising complexity of jobs in modern economies (e.g. Carbonaro 2007; Murnane, Lewitt and Levy 1995). Thus, as de Grip and Zwick (2004) further argue, these new and continuously growing skill needs in the majority of occupations threaten “the labour market position of low-skilled workers who are crowded out of their traditional occupational domains”, resulting in these workers being “either locked up in poorly paid elementary jobs with flexible contracts that further weaken their labour market position or crowded out of employment entirely”.

At the present time, however, little evidence on the importance of cognitive skills for employment status is available. Yet, as several studies show (Heckman et al. 2006; McIntosh and Vignoles 2000; Pryor and Schaffer 1999), those with lower levels of cognitive skills are more likely to stand at the end of the job queue, all others being equal. In particular, when workers competing for the same jobs possess similar formal educational qualifications, regardless of the level of education, it is those with higher levels of cognitive skills that are more likely to get the job, all other things being equal. Since cognitive skills are predictive of job performance², it is thus perfectly normal that employers care about their employees possessing the right skills to be successful in a modern economy and reward them accordingly.

Moreover, those who decide to leave school before or at the end of compulsory education are more likely to be laggards in terms of cognitive skills compared to their more educated counterparts. Indeed, educational attainment is highly dependent on parental background characteristics (e.g. De Graaf, De Graaf and Kraaykamp 2000; Teachman 1987) and those coming from disadvantaged households are also less likely to live in less cognitively stimulating environments during early childhood (Berger, Paxson and Waldfogel 2000) and are more likely to attend low quality schools (Currie and Thomas 2001). Accordingly, these pupils, who are more likely to leave school at an early age, are also less likely to acquire and develop the cognitive skills that have become so important for economic success in our modern societies.

And since the development of these skills begins as early as in the preschool period and then becomes crucial for the future life chances of children as “learning begets learning” (Heckman 2000), the disadvantage the low-educated experience in terms of cognitive skills may seriously affect their employment chances in a long run perspective.

Against this background, cognitive skills may thus play an important role in inequalities of employment across educational levels and may therefore explain why low-educated workers are more likely to be found out of the labour market compared to workers with higher levels of education. Yet, depending on social and educational inequalities at the country-level, the cognitive gap, that is the cognitive disadvantage the low-educated experience relatively to

those with intermediate education, should vary across nations. Indeed, in countries where social inequalities are particularly developed, with high poverty rates, and where the quality of education is also more dependent on parental background, we should expect the cognitive gap to be higher. Given that these skills are determinant for the employment chances of workers, in countries where the low-educated are more likely to be laggards in terms of cognitive skills relatively to their more educated counterparts, the former should also be more likely to be disadvantaged in terms of employment, still relatively to the latter.

The cognitive gap, polarization of occupations, job displacement patterns and the employment disadvantage of the low-educated

However, since it seems that some modern labour markets are in fact witnessing a polarization of occupations rather than only an occupational upgrading (Autor and Dorn 2009; Oesch and Menés 2010), it is legitimate to doubt about the role cognitive skills may play in the employment disadvantage of the low-educated. Indeed, while these skills may be crucial to perform highly complex tasks, they are less likely to matter for job performance -and therefore employers- in jobs with basic repetitive tasks. And since this polarization of labour markets is partly due to the development of low-end service jobs (Oesch and Menés 2010), where skill requirements are low, an important cognitive gap may not necessarily result in a higher employment disadvantage for the low-educated. In other words, the cognitive disadvantage of the low-educated may not necessarily further keep off the former out of the labour market if there is a sufficient supply of jobs with low skill requirements, such as in low-end services.

That is, of course, unless this polarization of occupations does not reflect the fact that “middling” jobs are disappearing while high- and low-end service jobs are created (de Grip and Zwick 2004). Then, those who were occupying these mid-level jobs and who probably have intermediate education will be more likely to go down the occupational ladder and to compete with the low-educated for low-end jobs, eventually resulting in the former displacing the latter from their traditional occupations. This would thus result in a greater effect of the cognitive gap on inequality of employment opportunities between low-educated workers and those with intermediate education as employers would be more likely to favour those with higher levels of cognitive skills if both categories of workers are found to compete for the same jobs.

To summarize, first we expect the cognitive gap to positively affect the employment disadvantage of the low-educated. In other words, the more the low-educated lag behind in terms of cognitive skills, the higher the chances that they will be found out of the labour market relatively to medium-educated workers. Second, the supply of low skill jobs in the economy should improve the employment opportunities of the low-educated, even despite a high cognitive gap, and should therefore counterbalance the labour market disadvantage entailed by low relative levels of cognitive skills. However, if it appears that workers with intermediate education are competing for the same jobs as the low-educated, the supply of low skill jobs may, in the end, be ineffective for the employment opportunities of the latter. Moreover, in this case, the detrimental effect of the cognitive gap will be strengthened as employers will be more likely to hire and keep medium-educated workers possessing higher levels of cognitive skills.

Data and methods

Data description

The data we have used for our empirical analysis come from the International Adult Literacy Survey that was conducted in a total of 20 countries between 1994 and 1998. This survey was administered in order to assess the literacy skills of the adult population in an international perspective. The following countries were included in our analysis: Canada, Switzerland, Germany, the US, Ireland, the Netherlands, Sweden, New Zealand, UK, Belgium, Italy, Norway, Denmark, and finally Finland. While we could also have included Czech Republic, Hungary and Poland, we decided not to integrate these countries to our analysis for several reasons. First, we wanted to maintain a certain level of comparability across the countries of our analysis, in particular in terms of structural characteristics of the economy and technological advancement. Second, the effect of some of our independent variables at the country-level, mainly labour market policies, was driven mainly by the inclusion of the post-communist countries while the results obtained with the 14 countries were robust and were not dependent on one or several countries.

Methodology

The methodological technique that we use here is the estimated dependent variable model (Lewis and Linzer 2005), also referred to as a two-step or two-stage multilevel model, consisting in estimating the same equation in several groups and using the coefficients of one or several independent variables of interest from this equation in order to try to explain the variation across groups in these coefficients. In our case, in the first stage of our analysis, this will consist in estimating the effect of being-low-educated on the employment status at the individual level in each country, while the second step of the model will be dedicated to the explanation of the cross-national variation in this effect through the introduction of country-level variables. The main advantage of using such a model rather than a usual multilevel model lies in the number of observations required at the second level to obtain robust findings. Since we only include 14 countries in our sample, it is more reliable to use this technique as it allows an easier correction of heteroskedasticity at the second level than when using maximum likelihood estimation (Nelson 2009).

First stage of analysis

Dependent variable

Throughout this paper, our dependent variable is measured through the working/not working distinction, rather than the employed/unemployed dichotomy, in order to include all individuals out of the labour market and not only those who are actively looking for work. Indeed, unemployment rates, because they only account for workers looking for a job actively, miss an important part of the non-working population, especially in the case of low-educated workers who are more likely to experience long-term unemployment and may therefore be more likely to become discouraged workers. In order to avoid the danger of including workers who have retired at the legal age and students who haven't completed their education yet in our sample, we decided to only keep the prime working age respondents, namely those whose age is comprised between 26 and 55.

The main issue related to using the working/not working distinction pertains to the inclusion of home makers in the not working category. Indeed, assuming that home makers are mostly married women, and since it has been shown that the low employment rates of married women are culturally and politically determined (Daly 2000; Oesch 2010), the effect of education on employment status may be biased by this category of the population. However, as Michaud and Tatsiramos (2005) show, the labour market participation of married women in Europe seems to depend mainly on education. Moreover, since we control for gender at the micro-level, there should be no reason to doubt about the reliability of our estimations. Yet, since being a home maker is also related to having young children at home, this issue could remain problematic for the estimation of the effect of our independent variable on employment status. Unfortunately, the IALS data set does not provide information on the presence of young children at home. However, people out of the labour market were asked why they were not looking for work during the last weeks preceding the interview. Using this information, we excluded those having answered that they were not looking for work because of child care duties. Since our coefficients were virtually the same whether we made this specification or not, we can thus affirm that this issue will not bias our estimations.

Independent variable

Our main independent variable in the first stage of our analysis was measured through the educational attainment of respondents, coded in three categories: below upper secondary education (ISCED 0-2), intermediate education (ISCED 3) and tertiary education (ISCED 5-7)³. The reference category of this variable will be below upper secondary education so that the coefficient of the intermediate education category can reflect the employment disadvantage the low-educated experience relatively to the former.

However, two of these countries, namely UK and Germany presented severe issues concerning the variable indicating educational attainment. Indeed, as Gesthuizen, Solga and Künster (2011) have observed, the proportion of low-educated workers in these countries was clearly higher in the IALS sample than in OECD reports. Basing ourselves on the number of years of schooling that was reported by respondents and depending on the length of compulsory schooling, we recoded the variable of educational attainment following almost the same procedure as the one of Gesthuizen et al. (2011)⁴. Accordingly, depending on cohorts, workers with lower secondary education (ISCED 2) who declared that they had more years of schooling than the nationally possible years of compulsory schooling were thus “upgraded” in the ISCED 3 category⁵. First-generation immigrants were excluded from this recoding because we argue that they are more likely to have already completed their education in their home country.

Control variables

In order to obtain unbiased coefficient for the influence of education on the probability to be in or out of the labour market and to account for compositional effects, we had to control for other important determining factors for this labour market outcome. These encompass age (which is mainly a proxy for labour market experience), immigrant status (only the first generation, i.e. those workers that were born outside the country of interview), gender, parental background, which was measured through mother's education coded in three categories, ISCED 0-2, ISCED 3 and ISCED 5-7, and finally a variable indicating the size of the community that was defined as either urban or rural. Unfortunately, it was impossible for

us to control for other important determinants such as ethnicity, which was only available for some countries. Moreover, when including this variable in the model for the US, results were virtually identical and the variables identifying Black, Asian or Hispanic minority were not significant. Finally, measures of non-cognitive skills or behavioural traits were not available. However, in this last case, education and parental background certainly account for part of their effect on employment status.

The model at the first stage

The model at the first stage therefore is:

$$(1) W_{ij} = \alpha_{ij} + E_{2ij}\beta_{1ij} + E_{1ij}\beta_{2ij} + F_{ij}\beta_{3ij} + A_{1ij}\beta_{4ij} + A_{2ij}\beta_{5ij} + I_{ij}\beta_{6ij} + M_{1ij}\beta_{7ij} + M_{2ij}\beta_{8ij} + U_{ij}\beta_{9ij} + \epsilon_{ij}$$

where i stands for individuals and j for country. W is our binary dependent variable (working/not working), E_1 and E_2 stands for, respectively, intermediate education (ISCED 3) and high education (ISCED 5-7), F for female, A_1 and A_2 for the age in categories (respectively 36-45 and 46-55 with the reference category being 26-35), I for immigrant status, M_1 and M_2 for mother's education in categories and finally U for urban community.

Accordingly, we first estimated, in each country included in our analysis, the effect of education on employment status (working/not working), while controlling for the other covariates described earlier. Average marginal effects (AME) were used to estimate the effect of our independent variables on the employment status, since the comparison of coefficients across groups can easily be biased when using logit regressions (Mood, 2010). By using AME, our coefficients will reflect the effect of our independent variables on the dependent variable in terms of the change on the probability of being employed at the time of survey. In this first step, only the sampling weights were used in our regressions because of a problem of redundancy with the replicate weights. However, our standard errors are reliable as robust standard errors were calculated with the help of the sandwich estimator (also known as the Hubert/White estimator).

Second stage of analysis

Dependent variable

At the second stage of our analysis, the coefficients of our main independent variable at the individual level estimated in each country, namely the AME of an intermediate level of education relatively to a low level of education on the employment probability, becomes now our dependent variable.

Independent variables

The country-level variables⁶ that were then included in our model to explain the cross-national variation in this disadvantage encompass:

- earnings inequality, that we measured through the ratio of the 5th decile to the 1st decile of earnings among the population and averaged over a three-year period⁷;
- employment protection, that was measured through the index of permanent employment protection legislation and averaged over a three-year period ($t-2$, $t-1$, t);
- social benefits generosity, measured through the index of decommodification built by Scruggs and Allan (2006);

- spending on two particular categories of ALMPs⁸, public employment service and administration, and training, expressed in % of GDP, divided by unemployment rates and averaged over a three-year period;
- revenues of payroll (social contributions) and consumption taxes, expressed in % of GDP and averaged over a three-year period;
- the ratio of average literacy scores⁹ of those with intermediate education to the average literacy scores of the low-educated¹⁰, measuring the cognitive gap between these two groups;
- a variable for the supply of low skill jobs measured through the employment share of low-end services -defined as ISIC 6 only as ISIC 9 also encompasses medium to high skill jobs- in the whole economy.
- and finally a job displacement index, measured through the inverse of the relative difference between the skill demand of jobs of those with intermediate education and jobs of low-educated workers¹¹.

The models at the second stage

The models at the second stage can be written as

$$(2) \beta_{1j} = \Phi_{0j} + \Phi_{kj} V_{kj} + \varepsilon_j$$

$$(3) \beta_{1j} = \Phi_{0j} + \Phi_{1j} V_{1j} + \dots + \Phi_{kj} V_{kj} + \varepsilon_j$$

where (2) is the equation for the bivariate model (one variable at a time) and (3) is the equation for the multivariate models. As already explained before, the coefficient β_{1j} measuring the estimated effect of intermediate education relatively to low education on employment chances at the individual level in each country becomes now our new dependent variable. Again, j stands for the 14 countries included in the analysis, and finally V_k for the aforementioned country-level independent variables.

Feasible generalized least squares were used here with the `edvreg` command on Stata (Lewis and Linzer 2005). Since our dependent variable at the second level is a coefficient and is therefore estimated with error, this procedure allows us to account for the variation across countries in the degree of imprecision with which our dependent variable is estimated. Finally, robust standard errors were obtained with the Efron estimator.

Endogeneity issues

Since literacy skills were measured at the same time of the interview, people out of the labour market for already a long period could have lost part of these skills, while those working are more likely to enhance these skills. This thus makes the causal relationship between skills and employment status less straightforward and therefore could cause problems of endogeneity as a result of this reverse causality, especially knowing that some respondents declared having been unemployed or looking for work for more than 40 years. But the strength of the effect of the length of unemployment on cognitive skills is probably limited as Pryor and Schaffer (1999) argue, as is the strength of the effect of age¹² and experience on the same skills (Gesthuizen et al. 2011).

Moreover, when observing the mean literacy scores of those out of the labour market in each country (figure 1), it doesn't seem at all that those who have declared not having worked for 10 or more years possess less skills than other more “recent” unemployed. Therefore, the risk that the length of the spells of unemployment may negatively affect functional literacy is very low and we can consider our analysis as reliable.

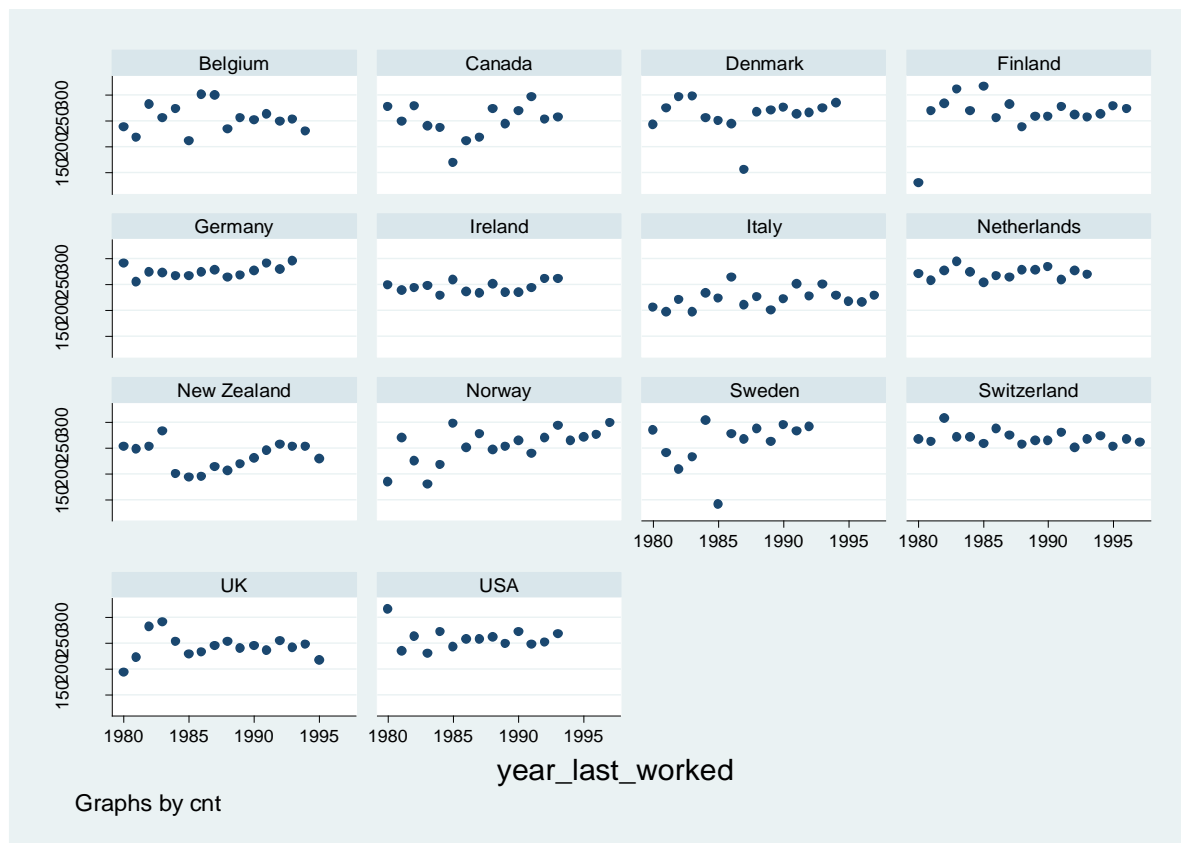


Figure 1: Non-employment duration and average literacy scores

Source: LALS 1994-1996-1998

Findings

As we have previously explained, the first step of our model consists in estimating the relative employment disadvantage of the low-educated in each country while controlling for other important factors of labour market participation. As we can observe in Table 1, even after controlling for all these determinants, the relative disadvantage of the low-educated in terms of employment varies importantly across countries. More interestingly, the ranking of countries in terms of the employment disadvantage of the low-educated does not seem to follow any known welfare or labour market regime classification. In particular, while we could have expected flexible labour markets such as in Anglo-Saxon countries to lead to better relative employment opportunities for the low-educated, here, this group of workers

experience their highest disadvantage in Canada and the US while in traditionally more rigid labour markets such as Germany, Finland or Sweden, this employment disadvantage is either low or medium.

	<i>Year of survey</i>	<i>n</i>	<i>AME for ISCED 3 (with controls)</i>	<i>Standard errors</i>
Germany	1994	1056	0.03	0.0423
Switzerland	1994 and 1998	2545	0.06	0.0359
Finland	1998	1791	0.06	0.0267
Netherlands	1994	1894	0.08	0.0247
UK	1996	3794	0.09	0.0340
New Zealand	1996	1838	0.10	0.0282
Sweden	1994	1553	0.10	0.0268
Belgium	1996	1096	0.11	0.0356
Denmark	1998	1943	0.11	0.0245
Norway	1998	2081	0.12	0.0298
Italy	1998	1981	0.15	0.0266
Ireland	1994	1294	0.15	0.0318
USA	1994	1691	0.17	0.0406
Canada	1994	2272	0.23	0.0505

Table 1: The relative employment disadvantage of the low-educated across countries

Note: Average Marginal Effects (AME) were estimated for those with intermediate education (ISCED 3) with the low-educated (ISCED 0-2) as reference category. Controls included gender, age, parental background, immigrant status and the size of the community. These coefficients must be interpreted as the percent point change in the probability of being employed for those with intermediate education relatively to the low-educated. Observations are in ascending order of the inequality of employment opportunities across both these groups.

Source: LALS 1994-1996-1998

Now that we have obtained our dependent variable for the country-level analysis, we can examine the puzzling cross-national variation in the relative employment disadvantage of the low-educated, first by verifying each of our hypotheses separately before, in a second part, testing the validity of the skill hypotheses against the more traditional hypotheses linked to labour market institutions and policies. We would like to remind the reader that, because of the small number of countries in the second stage of our analysis, the findings we present should be interpreted with caution.

As we can observe in Table 2, only employment protection, job displacement and the cognitive gap seem to significantly affect the relative employment disadvantage of the low-educated -although the first two are only significant at the 10% level. More particularly, a one standard deviation positive change in the cognitive gap would increase the employment disadvantage of the low-educated relatively to those with intermediate education by almost 3 percentage points, which would clearly be a non-negligible variation for the dependent variable whose standard deviation is equivalent to 5 percentage points.

	<i>Bivariate models</i>	<i>Adjusted R²</i>	<i>N</i>
<u>Labour market institutions and policies</u>			
Earnings inequality	.019	.10	14
Permanent employment protection	-.0195†	.12	14
Social benefits generosity	-.0128	.01	14
ALMPs: pes and administration	-.0102	.	14
ALMPs: training	-.0066	.	14
Payroll and consumption taxes	-.0121	.	14
<u>Skills</u>			
Cognitive gap	.0285**	.34	14
Employment share of low-end services	.0101	.	14
Job displacement	.0273†	.35	14

Table 2: Determinants of the relative employment disadvantage of the low-educated in modern economies: bivariate models with standardized independent variables

Notes: The adjusted R² was not provided when it was negative, meaning that the impact of the independent variable included in our model most likely is trivial.

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Source: LALS 1994-1996-1998

Concerning permanent employment protection, it seems to reduce the relative employment disadvantage of the low-educated in accordance to the theory that a stricter permanent employment legislation will encourage employers to create temporary jobs to screen employees and that these temporary contracts will essentially be targeted at low-skilled workers. Moreover, our findings concerning this variable seem to be consistent with the results of Esping-Andersen (2000). However, this relationship is most likely spurious as employment protection is strongly and positively correlated to the cognitive gap. We will see later how the effect of this variable on our dependent variable varies once we include the cognitive gap simultaneously in the model.

Finally, job displacement seems to be detrimental for the employment opportunities of the low-educated in accordance to our hypothesis. However, since this last variable is probably also dependent on the supply of low-skill jobs and on the cognitive gap, it is too early to draw conclusions regarding its effect on the relative employment disadvantage of the low-educated.

In order to be sure that the effect of the cognitive gap on the employment disadvantage of the low-educated is not confounded with other factors, or similarly, that the impact of labour market institutions and policies or is not due to inequality of skills, we now use multivariate models to disentangle the effect of these characteristics at the national level.

In Table 3 we can observe the results of our new regressions (only the models that were significant were kept for the analysis). Compared to the bivariate models, several changes are notable. First of all, the effect of the cognitive gap is now greater in three of the five models while its impact seems to be reduced by the variables included in model 1 and 5. However, in all models, it remains statistically significant and relatively strong. More particularly, in the best model that we could obtain in terms of explained variance (model 6), the cognitive gap

has the strongest effect on the employment disadvantage of the low-educated while the other two covariates have a rather similar and lower impact on our dependent variable. All in all, the multivariate analysis tends to confirm the robustness of the effect of the cognitive gap on the employment disadvantage of the low-educated and its predominance over our other hypotheses and over our labour market institutions and policies variables more particularly.

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>
Cognitive gap	.0278*	.0465**	.0430**	.0301**	.0208**	.0342*
Permanent employment protection	-.0013					
Social benefits generosity		.0212*				
ALMPs: training			.0200†			.0155†
Employment share of low-end services				-.0031	.0014	
Job displacement					.0213*	.0178*
Adjusted R²	.28	.40	.45	.29	.50	.61
N	14	14	14	14	14	14

Table 3: Determinants of the relative employment disadvantage of the low-educated in modern economies: multivariate models with standardized independent variables

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Source: LALS 1994-1996-1998

Furthermore, several variables measuring labour market policies now have a significant impact once we account for the cognitive gap and their effect on the dependent variable is now positive while it was negative in the bivariate model. This is the case for social benefits generosity and spending on training ALMPs, although the latter is only significant at the 10% level. While the fact that the generosity of social benefits affects positively the relative employment disadvantage of the low-educated is in accordance with our theoretical expectations, the positive effect spending on training ALMPs has on this same disadvantage actually contradicts what we would have expected.

It is possible to find two reasons why the employment prospects of the low-educated should be less enhanced than those of their more educated counterparts by ALMPs. First, the latter seem to be more successful in getting out of non-employment with the help of these policies than the former (Gaure, Røed and Westlie 2008; Martin and Grubb 2001). Second, the participation rates to ALMPs are generally higher for those with intermediate education than for low-educated workers (Amoroso and Witte 1998; Crépon, Ferracci and Fougère 2007). Therefore, both arguments support our evidence that training policies profit essentially to those with intermediate or higher education rather than the low-educated, who, sadly, need these policies the most. This finding is also in accordance to the argument of Heckman (2006), suggesting that investments in the human capital of individuals is essentially a matter of timing as it may yield higher returns the younger they are. Indeed, it seems that it is the cognitive skills of individuals, whose development is crucial during the earliest periods of life,

which predominates over ALMPs whose success for the employment outcomes of the unemployed is probably also dependent on the level of general skills they possess.

Then, it seems that the negative impact the strictness of permanent employment legislation has on the relative employment disadvantage of the low-educated is mainly explained by the fact that countries with high employment protection are also characterized by a low cognitive gap between the low-educated and those with intermediate education (model 1). This finding therefore confirms that the negative relationship we found between this variable and the employment disadvantage of the low-educated in the bivariate model was indeed spurious.

In model 4, we controlled for the employment share of low-end private services in the whole economy. Compared to the bivariate model, the cognitive gap has now a slightly stronger influence on the employment disadvantage of the low-educated. Therefore, and since the cognitive gap and this last variable are positively correlated, it seems that the development of low-end services helps compensate for the skill deficit of the low-educated in the labour market, although only lightly. Indeed, for instance, had Canada or the US had a lower supply of private low skill jobs such as in Scandinavian countries at that time, the low-educated would be even more disadvantaged by their skill deficit in the former countries.

However, and as we have explained in our theoretical framework, if there are important job displacement patterns in the labour market with those with intermediate education crowding out the low-educated of their traditional occupations, the development of low-end services may not necessarily counterbalance the negative effect of the cognitive gap on the employment disadvantage of the latter. And according to model 5, this hypothesis indeed seems to be verified as controlling for job displacement clearly reduces the effect of the cognitive gap on our dependent variable -by approximately 31%- and suppresses the compensating effect of the share of low-end service jobs in the economy. Indeed, taking again the US and Canada as examples, had these countries had less job displacement issues, such as in Sweden or Finland, and with their level of development of private low-skill jobs, the skill deficit the low-educated experienced relatively to those with intermediate education in these North American countries would clearly have resulted in a lower employment disadvantage for the former category of workers.

Conclusion and discussion

As we have seen in this paper, it seems that the employment disadvantage that the low-educated experience relatively to those with intermediate education is mainly due to the differences in cognitive skills between these two groups of workers. Even after accounting for labour market characteristics and policies, this effect remains significant and strong. However, as we have also shown, the effect of a strong cognitive gap between the low-educated and those with intermediate education can be slightly mitigated by the development of low-end service jobs but can in turn be compounded by strong job displacement patterns.

Yet, all in all, our results seem to support the importance of a strategy focusing on equalizing opportunities through the reduction of inequalities in the development of cognitive skills. In order to do so, governments should already target disadvantaged children in the preschool period through the implementation of a set of family policies that aims at increasing the well-being of these children and their future life chances (Esping-Andersen 2009). Moreover, since cognitive skills also seem to play a determinant role in educational attainment (Heckman et al. 2006), investing in those skills may also constitute a good way to

weaken the link between parental background and educational attainment. However, governments wishing to improve the employment situation of the low-educated should not forget the prevention of skill mismatches in the labour market and should thus avoid the development of heavy job displacement patterns through, for instance, a more adequate and strong articulation between educational systems and labour markets.

However, strategies of investment in the human capital of individuals realized as early as possible in their life miss important at-risk populations such as first-generation immigrants who have, for most of them, already completed their education once they arrive in a host country. Since in some countries, first-generation immigrants constitute an important share of the low-skilled population, such strategies focussed on the reduction of inequalities in skills will most likely not be successful in order to help these workers increase their employment opportunities. In this case, other solutions must be found in order to reduce the employment disadvantage of the low-educated in modern economies. Adult education may for instance be an interesting alternative to contribute to the improvement of the labour market situation of low-educated workers.

¹ Although the explained variance of the model is very low.

² See Farkas et al. (1997) for a review of the literature.

³ It is important to note that in IALS, the classification was ISCED 76, not ISCED 97.

⁴ We would like to thank Ralf Künster for providing us with the SPSS code to perform this recoding.

⁵ In order to check for the robustness of our results despite this recoding, we excluded both these countries of our analysis. Since we obtained the same results, we are confident that our findings are robust.

⁶ See the annex for descriptive statistics of these variables

⁷ However, because information was not available for some countries for the years when the survey was conducted, we had to use more recent data of the year closest to the period of the survey. The results concerning this indicator should therefore be interpreted with care.

⁸ Instead of using spending on ALMPs as our indicator, we prefer to disaggregate this measure as many studies now show that it clearly makes no sense using it as a whole since the categories that comprise it assess very different policies (e.g. Bonoli 2010; Vlandas 2011). Therefore, we use two categories that, according to us, better represent the potential benefits of those policies for the low-educated, namely training and public employment service and administration.

⁹ Throughout our analysis, we use a measure of what Pryor and Schaffer (1999) call functional literacy and that regroup the three types of literacy measured in IALS, namely prose, document and quantitative literacy. In order to do so, we simply average the 15 plausible values of the different literacy scores.

¹⁰ Average literacy scores were calculated while excluding immigrants to avoid the potential language bias as well as to focus on the effect of the national educational system. Anyway, the correlation between the cognitive gap while excluding first generation immigrants and the cognitive gap measured for the whole population is 0.91.

¹¹ The inverse of the relative difference was taken in order to obtain higher values when the skill demand of jobs of those with intermediate education was closer to the skill demand of jobs occupied by low-educated workers, that is, when the former group of workers is more likely to displace the latter. The skill demand of jobs was measured through principal component analysis on a series of questions on the frequency of use of literacy skills at work.

¹² Moreover, since we control for age in our analysis, this should solve part of the potential bias.

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Appendix

Country	Earnings inequality (D5/D1)	Index of permanent employment protection	Spending in AILMS: PES & administration as % of GDP, divided by unemployment rates	Spending in AILMS: adult training as a % of GDP, divided by unemployment rates	Social benefits generosity index	Payroll and consumption taxes as a % of GDP	Cognitive gap	Employment share of ISIC 6 sector in the economy	Job displacement index
Belgium	1.41	1.68	2.34	1.98	32.81	25.72	1.13	18.65	0.08
Canada	2.00	1.25	2.26	3.10	25.00	14.47	1.21	25.32	0.07
Denmark	1.47	1.63	2.33	14.68	35.09	17.26	1.11	18.9	-0.19
Finland	1.40	2.35	1.64	5.79	32.23	27.33	1.14	15.5	-0.48
Germany	1.97	2.63	3.03	7.78	29.11	24.57	1.04	18.55	-0.78
Ireland	2.06	1.60	2.44	2.53	21.65	18.66	1.21	19.42	-0.04
Italy	1.65	1.77	0.98	2.54	23.68	24.82	1.27	19.08	0.03
Netherlands	1.56	3.08	8.78	4.69	34.24	28.75	1.13	19.95	-0.35
New Zealand	1.55	1.35	2.17	6.22	23.93	12.10	1.17	26.35	-0.68
Norway	1.39	2.25	4.86	13.38	40.99	25.10	1.07	17.57	0.46
Sweden	1.35	2.88	4.34	12.33	41.99	25.27	1.08	14.84	-0.40
Switzerland	1.50	1.16	1.49	0.96	27.51	12.05	1.14	23.46	-0.33
UK	1.85	0.95	2.58	2.80	19.92	17.90	1.18	22.81	0.00
USA	2.07	0.17	0.93	1.34	19.24	13.67	1.35	22.21	0.10
Mean	1.66	1.77	2.87	5.72	29.10	20.55	1.16	20.19	-0.18
Standard deviation	0.27	0.80	2.03	4.64	7.57	5.99	0.08	3.42	0.34

Descriptive Statistics

Source: the cognitive gap and the job displacement index from IALS 1994-1996-1998, the social benefits generosity from Scruggs and Allan (2006), and all other indicators from the OECD online-database <http://stats.oecd.org>

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