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Youth employment decline and the structural change of skill

Michael Tåhlin and Johan Westerman

Swedish Institute for Social Research (SOFI), Stockholm University, Stockholm, Sweden

ABSTRACT
Labor market prospects for youth have deteriorated significantly in many OECD countries over recent decades. While the extent and consequences of falling youth employment are commonly studied, attempts at understanding its causes have been much more limited. The present paper attempts to fill this explanatory gap. We suggest that the secular decline in youth employment can be accounted for by the structural change of skill. This process of structural change has two interrelated components: (a) one part where skill supply (individual educational attainment) and skill demand (educational requirements of jobs) grow together in what can be called matched upgrading and (b) another part where excess skill supply leads to mismatch and crowding-out. These components of skill growth have commonly been treated separately and incompletely in the literature. We build on both of them in developing our account of why the labor market for youth has weakened. Using data on 10 European countries from the EU Labor Force Surveys over the period 1998 to 2015, we estimate associations between the structural change of skill and youth employment decline. The main conclusion is that both matched skill upgrading and overeducation are strongly and negatively linked to young people's employment chances.

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KEYWORDS Youth employment; skill upgrading; overeducation

Introduction

Over recent decades, it has become increasingly hard for young people to gain a foothold on the labor market (e.g. Blanchflower and Freeman 2000; Blossfeld *et al.* 2008; Christopoulou 2013). The extent and consequences of this secular weakening of youth employment prospects have commonly

CONTACT Michael Tåhlin michael.tahlin@sofi.su.se Swedish Institute for Social Research (SOFI), Stockholm University, SE-106 91 Stockholm, Sweden

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been studied, yet, attempts at understanding its causes have been much more limited (Banerji *et al.* 2015). Previous research on the labor market for youth has tended to focus on institutional factors explaining cross-sectional differences between countries (see e.g. Breen 2005). Although this research has provided many valuable contributions, our purpose in this paper is different: we aim at accounting for *change* in the youth labor market, and more specifically for youth employment decline in recent decades.

We suggest that the secular decline in youth employment to a significant extent can be accounted for by the structural change of skill. The essence of our story is that a falling share of available low-skill jobs explains declining youth employment, because jobs with low skill requirements are important for young individuals who need them to enter the labor market. The availability of low-skill jobs has been reduced over time as a consequence of two interrelated structural shifts: (a) one part where skill supply (individual educational attainment) and skill demand (educational requirements of jobs) grow together in what can be called matched upgrading and (b) another part where excess skill supply leads to mismatch and overeducation. We decompose structural skill change into matched and mismatch components by applying a micro-level measurement model designed by Duncan and Hoffman (1981) to macro-level data. On the basis of labor force survey data (EU-LFS) from ten northwestern European countries for the period 1998–2015, we then examine the empirical links between the structural change of skill and youth employment decline and find support for our proposed account.

Although the decline of youth employment has been described in previous research, we begin our analysis by providing a recapitulation of the change that has taken place. The evolution of youth employment in the ten examined countries is displayed in Figure 1(a,b) (for men and women, respectively). We define youth as age 25–29 (to allow for education to be completed) and compare young men and women with mid-age (40–49) men (to control for changes in general labor demand). The figures show how the youth-adult employment gaps thus defined have evolved from the earliest timepoints covered by OECD's labor force statistics through 2015 (see OECD 2017) in each of the countries considered.

The overall picture for men (Figure 1(a)) is a widening employment gap between young and mid-age individuals, but there is also significant cross-national variation in this regard. Eight of the ten countries display an upward trend in the gap from 2000 and onwards. For women (Figure 1

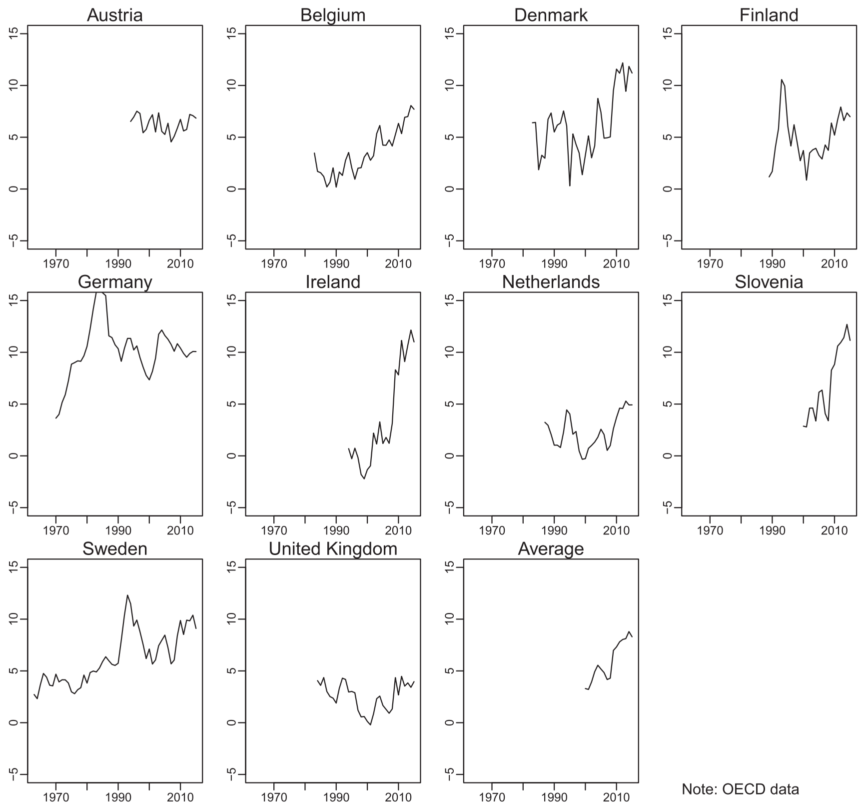

Figure 1a. Male youth employment gap (vs. mid-age males) (%).

(b)), the trend is much less visible than for men since the gender gap in employment is still closing in several countries, thus compensating for widening gaps between young women and mid-age men. Still, we expect that young women face similar opportunities and constraints as do young men with regard to changes in the structure of skill supply and demand, to be revealed in the more analytic empirical models estimated below.

The paper is organized as follows. We begin by formulating our suggested causal account of how aggregate skill change affects labor market prospects for youth. We then briefly review previous explanations of youth employment variation. The methods section describes data, measures and analytic strategy. We then turn to estimating associations between structural skill change and the evolution of youth employment, separately for women and men. A discussion section concludes.

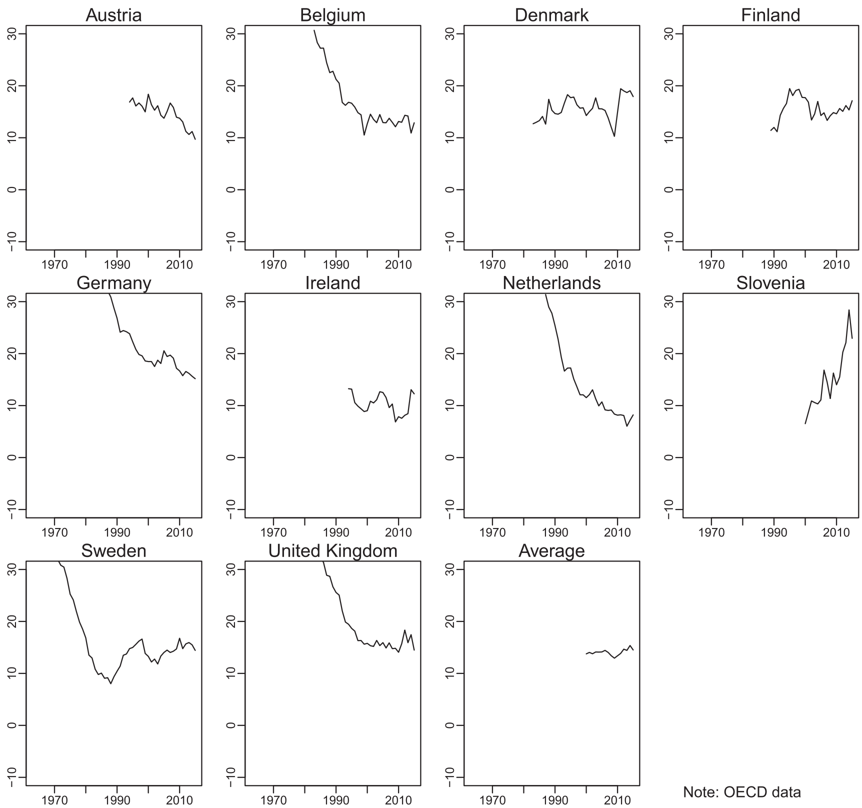

Figure 1b. Female youth employment gap (vs. mid-age males) (%).

Youth employment decline and the structural change of skill: story outline and hypotheses

The skill structure of labor markets has a supply side and a demand side, where supply consists of individuals' human capital (education and experience) and demand consists of jobs' human capital requirements. Experience, aside from education, is a key determinant of productive capacity (Mincer 1974). Indeed, historically, on-the-job learning rather than formal schooling has been the main source of skill formation (see e.g. Mincer 1958). Requirements of education and experience are positively correlated: jobs requiring relatively large amounts of education, as revealed by entry requirements, tend to require relatively large amounts of experience, as revealed by both entry requirements and experience-wage gradients (see e.g. Goldthorpe and McKnight 2004; Tåhlin 2007). Since young people are relatively inexperienced, they are (given education) hence less competitive in high-skill jobs than in low-skill jobs.

While availability of low-skill jobs is thus especially important for youth, the young can nonetheless be at a disadvantage also in the competition for low-skill jobs. Experience is not only constituted of advanced skills such as technical mastery of specialized tasks, typically required and developed in complex (high-skill) jobs. Experience may also be constituted by more basic skills, such as regularly showing up on time in good shape for performing everyday work tasks and then diligently taking care of them. Basic skills are non-cognitive in character, and are required and developed in all jobs, regardless of complexity.

Basic skills are more reliably indicated by experience than by (post-compulsory) education. Completing additional education of course indicates the possession of some basic skills, yet, documented work experience is typically the best signal of an individual's ability to accurately perform work also in a new job (see e.g. Holzer 1996). Since basic skills are tied to experience, the young are less competitive than mid-age workers not only – and especially – in high-skill jobs but also – although by a slimmer margin – in low-skill jobs.

The arguments above can be summarized in two fundamental assumptions: (a) experience is more highly valued (by employers) in high-skill than in low-skill jobs; (b) experience is more highly valued (by employers) than (post-compulsory) education in low-skill jobs. In order to test these two assumptions, demand-side data about what employers want are crucial. The Swedish Establishment Survey (APU) 2000 contains information collected on the demand side. Employers/managers at a nationally representative sample of workplaces were asked about their hiring criteria for jobs at different skill levels. Specifically, they were asked to grade how important education (other than basic) and work experience (organization internal or external) were for their hiring decisions of, respectively, higher white-collar and blue-collar workers, on a scale ranging from 0 (not at all important), 1 (somewhat important), to 2 (very important). We used data from this survey for organizations employing both types of workers ($N =$ 864), and computed within-organization differences in hiring criteria for higher white-collar and blue-collar workers. Results provided strong support for both assumptions.[1]

The assumptions and their implications for youth skill deficits in low-skill and high-skill jobs are visualized in Figure 2. It is evident from the figure that the skill gap (comparative disadvantage) for youth is largest in high-skill jobs. In these jobs, young people are at a disadvantage both

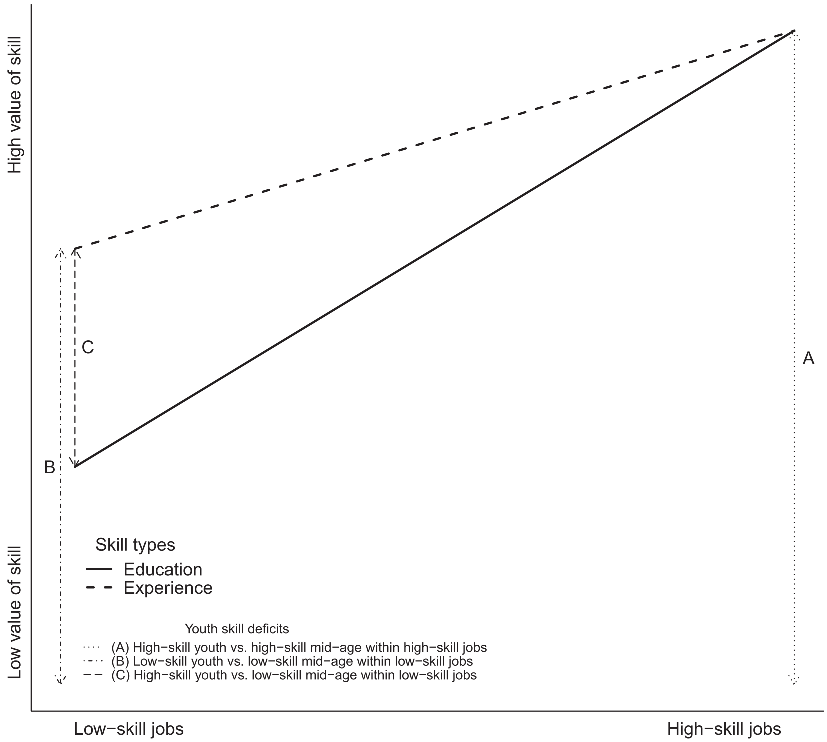

Figure 2. Skill deflicits of high/low skilled youth vs. high/low skilled mid-aged within high/low–skill jobs.

in terms of advanced and basic skills. In low-skill jobs the gap is smaller and is mainly constituted by a lack of (documented) basic skills, making these jobs easier to attain and hold for the young; thus the paramount importance of their availability. Given assumption (b), however, even youths with superior post-compulsory education are at a disadvantage relative to more experienced workers in the competition for low-skill jobs; thus the importance of minimizing this competition.

After this brief outline of the micro-foundations of our argument, we now turn to the structural (macro-level) factors that have changed the conditions of the competition visualized in Figure 2.

Skill upgrading

The skill structure of jobs tends to be upgraded over time due to technological progress in a wide sense; this development is often referred to as skill-biased technical change (see e.g. Acemoglu 2002). Rising skill demand in the labor market has been an integral part of technological development for at least the past half-century (see e.g. Katz and Margo 2014). Human capital theory (Becker 1964) was formulated on the basis of modeling the positive impact of skills on productivity, raising economic growth at the aggregate (macro) level and earnings at the individual (micro) level; see Mincer (1984) for an overview of such micro–macro links.

A link between long-run skill upgrading and declining youth employment has previously been suggested by Ryan (2001). While acknowledging that the rise in demand for educated workers should by itself be helpful to youth, since the young tend to be relatively well (or at least more) educated, Ryan argued that the parallel rise in demand for experienced workers would counteract and potentially exceed the education effect, to the disadvantage of the young. He thus formulated the 'double skill-bias' hypothesis: technological change in recent decades has tended to diminish the chances of labor market success not only for the less educated but also for the less experienced, i.e. youth.

Ryan's (2001) account was updated and extended by Christopoulou and Ryan (2009) and Christopoulou (2013). In these studies, technical change is measured indirectly with national yearly expenditures on research and development and ICT (Information and Communications Technologies) capital services. They find mixed empirical evidence concerning the negative impact of rising skill demand thus indicated on youth employment prospects but struggle to separate their demand measure from a simple global trend. Few studies have examined the impact of skill upgrading on youth employment prospects using more direct measures of skill demand. A rare example is Gangl (2002) who examines labor market attainment among recent school-leavers in 12 European countries 1988–1997; he finds, i.a., that upgrading of the occupational structure increases unemployment for the low-educated young but not for other youth.

In sum, there are good theoretical reasons to expect an association between skill upgrading and waning youth employment prospects via rising experience requirements, but empirical analyses of this issue have so far been very limited.

Crowding out

A second important structural change affecting the competition visualized in Figure 2 is educational expansion; this has been a pervasive feature of economic and social development for many decades, not only as a response to rising skill demand in the labor market but also for other reasons. Long-run skill upgrading need therefore not imply a chronic shortage of highly educated individuals to fill the newly created high-skill jobs. The converse shortage – of high-skill jobs relative to skill supply – can appear either through a general fall in labor demand, typically in economic downturns, or in periods when educational expansion exceeds the growth of high-skill jobs. In recent decades, such excess skill supply (overeducation) has been more common than skill deficits in many Western countries, with crowding-out of the low-educated as a consequence (see e.g. Teulings and Koopmanschap 1989; van Ours and Ridder 1995; Åberg 2003; Gesthuizen and Wolbers 2010; Abrassart 2015).

For crowding-out to occur, jobs with relatively fixed requirements are a necessary feature, as in the job competition model of Thurow (1975). In this model employers rank job candidates by their apparent suitability (or trainability) for successful task completion and then hire workers in that order. Education is typically seen as a general indicator of productive capacity and hence determines each individual's place in the line of job applicants. We argue, however, that crowding-out related to skill-based job competition is consequential not only for different educational categories but also for different age groups, i.e. employers rank applicants also in terms of experience as an indicator of productive capacity. We are not aware of any previous comparative studies of crowding-out effects in the labor market that have thoroughly considered this possibility.

Hypotheses

Consider again employers' hiring and lay-off decisions as visualized in Figure 2 above. The structural change of skill affects the employment prospects of youth via two routes: (1) Skill upgrading hurts youth by reducing the proportion jobs that are especially important for the young, i.e. jobs with low skill requirements; this is a compositional shift from low-skill to high-skill jobs, running from left to right along the horizontal axis in the figure. (2) Skill mismatch exacerbates the decline in opportunities for youth by intensifying skill-based competition in low-skill jobs; this is a shift within the category of low-skill jobs, running upward along the vertical axis in the figure.[2] These two routes are the basis for two hypotheses to be empirically tested in the present paper:

(1) Matched skill upgrading is associated with a fall in youth employment
(2) Rising skill mismatch (esp. overeducation) is associated with a fall in youth employment

As far as we know, these hypotheses have not previously been analyzed – theoretically or empirically – in a joint framework. As discussed above, empirical testing of the two hypotheses one by one has also been very limited in earlier research.

Alternative explanations of youth employment variation

Two institutional factors, tied to cross-national – as distinct from temporal – variation in youth employment patterns, have figured prominently in sociological research on youth employment: school-to-work linkages and employment protection legislation (EPL) (see e.g. Breen 2005). In a temporal perspective, school-to-work linkages have been quite stable; in contrast, significant shifts in EPL have occurred and could potentially have affected trends in youth employment. Due to a widespread belief that strict EPL raises hurdles for labor market entrants (such as youth), many countries in recent years have tended to become more permissive regarding the use of temporary contracts. Thus far, however, shifts in employment protection rules do not seem to have affected youth unemployment (Gebel and Giesecke 2016).

Other political interventions that potentially could improve youth employment prospects include lowered minimum wages, supposedly helping youth by making it cheaper for employers to hire inexperienced workers. Neumark and Wascher (2014) show that increased hiring of young workers induced by wage reductions has primarily taken place in countries with relatively weak employment protection, such as the United States. Active labor market programs (ALMP) in various forms have also been implemented in some countries in order to improve skill matching between job-seekers and employers. The bulk of research on this topic consists of specific program evaluations and points to a positive, albeit limited and mixed, impact of ALMP on youth employment (see Kluve *et al.* 2017). The aggregate impact of national ALMP expenditures on overall youth employment is, however, a less studied topic.

Three common stories in the economic literature on youth employment are economic stagnation, job polarization, and immigration. According to the first story, a (supposed) long-term decrease in general labor demand might especially have disfavored marginal groups such as youth (e.g. Blanchflower and Freeman 2000). Second, a (supposed) long-run fall in the mid-skill job share of all employment relative to high-skill and low-skill jobs ('job polarization'; Goos and Manning 2007; Autor 2010) might have compelled mid-age, mid-educated workers to downgrade in the job structure, thereby increasingly competing with youth for low-skill jobs (e.g. Smith 2011). Third, growing immigration into many western countries in recent decades might have affected youth employment negatively via intensified job competition at labor market entry points (e.g. Smith 2012). The polarization and immigration scenarios are also important elements in sociological research on the growing labor market problems for young workers during the present era of globalization (see e.g. Blossfeld *et al.* 2008; de Lange *et al.* 2014).

In our empirical analyses, we will account for these alternative explanations as far as possible within the scope of our analytic focus. We will thus examine the impact of institutional and contextual change in various forms: labor market policy shifts, economic stagnation, job polarization and rising immigration. At least the latter two are also partly reflective of globalization. In contrast, stable institutional factors (such as school-to-work-linkages) while important to control since they account for cross-sectional differences between countries, would appear to be unlikely contributors to explanations of changing youth employment prospects.

Methods

Data

The European Labour Force Surveys (EU-LFS) are a collection of nationally representative surveys with standardized indicators of, *inter alia*, employment, education and occupation; see Eurostat (2016). Data extend back to 1983 for some countries, but missing occupational information makes it difficult to achieve a sufficient country sample before 1998. The covered time period should be viewed as a recent-time excerpt from the long-term development described in the introduction. Ten countries in northwestern Europe are selected: Austria, Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Slovenia, Sweden, and the United Kingdom. The analytical sample includes 177 country-year units of observation from 1998 to 2015 (Germany, Ireland and the UK lack data for 1998). The number of respondents varies from around 15,000 (Denmark 2004) to 484,000 (Germany 2015) with a median of 92,000 and a mean of 120,000. Altogether, the selected data include information on 21 million respondents.

Analytic strategy

The EU-LFS data have a three-level hierarchical structure: individuals nested in countries and years, thus forming a set of time-series cross-sectional (TSCS) data. The associations between the youth-adult employment gap and the structural parameters are the effects of interest. One way to capture this kind of effect is to estimate a two-step multi-level regression i.e. to treat individual level coefficients predicting a difference between two groups as dependent variable in a regression at the country-year level (Bryan and Jenkins 2015; a recent example using this method is Gebel and Giesecke 2016). We have a similar yet slightly different approach. Instead of running regressions, two proportions are computed: one employment rate for each group (youth and mid-aged). Then, at the country-year level ($N = 177$; see above), the mid-age employment rate is included as a covariate in a regression of youth employment. The coefficients of matched skill upgrading and skill mismatch in this regression model capture directly the interaction effects between skill structure and young age, while the coefficient of the mid-age employment rate (supposedly) captures the impact of general labor demand.

We estimate all models separately by sex. Given our theoretical model, it is also of interest to separate the experience gap from the total skill gap (including both education and experience). This is done by weighting young and mid-aged individuals with respect to their distribution over educational levels (primary, secondary, tertiary) such that the weighted distribution of education is equal across the two age groups. This procedure is similar to holding education constant in a regression at the individual level. The main benefit of our approach compared to a two-step regression is that we do not need to choose an education category as reference, i.e. the controlled estimates used as outcome in the regression models apply to all individuals in each age group.

We account for stable country-level confounders (such as educational systems related to varying school-to-work linkages) by including dummy (indicator) variables for countries and years, i.e. a fixed effects (FE) approach. A model including FE allows us to come closer to a causal interpretation of our estimates (compared to a cross-sectional model), since it controls not only stable confounders but also global trends and shocks (such as the financial crisis in 2008). The inclusion of yearly fixed effects also controls for the break in the time-series of the skill structure indicators in 2011 (due to a shift from ISCO-88 to ISCO-08).

The FE approach still assumes that unobserved interaction effects between the institutional set-up and unobserved time-varying covariates are unrelated to the focal associations, which makes it crucial to select approximately similar countries in terms of institutions and general macro-economic conditions. Therefore, countries in eastern and southern Europe are excluded, the former being recent democracies and late economic developers, the latter having institutional structures that imply special circumstances concerning youth labor market participation. One country at the northwestern border of eastern Europe is included in our analysis, Slovenia, whose institutions and macro-economic conditions resemble western more than eastern Europe (Saar *et al.* 2008). Additionally, five countries in northwestern Europe are excluded from our comparison: Iceland and Luxembourg (due to their small populations), France (due to its hybrid institutional structure with significant southern European features; see e.g. Chevalier 2016), and Norway and Switzerland (due to their exceptional economic traits leading to very high levels of general labor demand).

As discussed above, we also assess several alternative explanations of changing youth employment by controlling for a set of time-varying variables. These include GDP per capita (US$ PPPs) and average hours worked per person in the working age population (as indicators of general labor demand), ALMP (expenditures as share of GDP divided by the labor force size adjusted number of program participants), employment protection legislation (regular and temporary) and the immigrant share of employment (as computed from the EULFS-data). All control variables were downloaded from the OECD statistics web page (except as otherwise stated).

A common statistical problem when estimating regression models with TSCS data is serial correlation, violating the assumption of independent observations. As a solution, the regression equation can be transformed by taking serial correlation of the first order (one time-point back) into account while still keeping the first observation; this is known as the Prais-Winsten transformation (see e.g. Wooldridge 2008). Other common problems are error disturbances, and heteroscedasticity in the regression residuals due to variation in the preciseness of the estimates across county-year samples. Beck and Katz (1995) recommend using panel-corrected standard errors as a solution to these problems. Thus, in estimating the regression models below, we consistently apply Prais-Winsten transformations (with a country-specific autocorrelation structure) and use panel-corrected standard errors.

Outcome variables: measuring labor market participation

Our measure of labor market participation is the employment rate, i.e. the employed share of the population in a given age group. Two alternative measures are the unemployment rate and the NEET ('Not in Education, Employment or Training') rate. The unemployment rate is problematic since it is (usually) expressed as a proportion of the labor force; both non-employed students and non-employed not actively looking for a job are thus excluded. The NEET measure is also less than ideal for our purposes, since it equates education and employment as activities without taking into account that schooling may be a second-best option in the face of weak employment chances. We therefore see the employment rate as the best activity measure among youth. To minimize the problem of how to classify students, we define youth as age 25–29, thus setting the lower age limit above the modal point of schooling completion, including tertiary education.

Explanatory variables: measuring change in the skill structure via the ORU model

As outlined above, the skill structure of labor markets has a supply side and a demand side. Supply consists of individuals' human capital, typically indicated by education and experience, while demand consists of jobs' human capital requirements. Skill demand can thus be measured by requirements of education and experience at the job level. Data on experience requirements are not available in the large-scale, cross-national and temporal context that we need here, but due to the association with educational requirements (see above) indicators of the latter (see further below) can be used as proxies.

According to our theoretical outline, it is important to estimate the separate employment effects of skill upgrading and mismatch in a joint model. Duncan and Hoffman (1981) decompose attained education (in years) into three parts: (a) education required in the worker's current job, (b) education attained by the worker that exceeds current job requirements, and (c) education required by the current job that exceeds what the worker has attained. This model (known as ORU: Over-Required-Under) thus allows estimation of separate payoffs to education dependent on the nature of the job match.

Table 1. Combinations of education and occupation by three levels of skill.

Occupation	Education: Low (ISCED 0–2)	Education: Medium (ISCED 3–4)	Education: High (ISCED 5–8)
Low (ISCO 5,6,8,9)	Low-skill jobs held by Low-skill workers (LL) (.08)	Low-skill jobs held by Mid-skill workers (ML) (.19)	Low-skill jobs held by High-skill workers (HL) (.03)
Medium (ISCO 3,4,7)	Mid-skill jobs held by Low-skill workers (LM) (.04)	Mid-skill jobs held by Mid-skill workers (MM) (.24)	Mid-skill jobs held by High-skill workers (HM) (.11)
High (ISCO 1,2)	High-skill jobs held by Low-skill workers (LH) (.01)	High-skill jobs held by Mid-skill workers (MH) (.06)	High-skill jobs held by High-skill workers (HH) (.23)

Note: numbers indicate the average proportions across the 177 country-years.

We apply the ORU model to aggregate data on occupation and education at the country-by-year level. Skill demand is indicated by ISCO (International Standard Classification of Occupations) categories of the jobs held by individual workers. Similarly, on the basis of individual education (ISCED categories; International Standard Classification of Education), a measure of skill supply is constructed. Three skill levels of both education and occupation are distinguished: high, medium and low (for level definitions, see below and Table 1).

ISCO

> allows all jobs in the world to be classified into 436 unit groups … aggregated into 130 minor groups, 43 sub-major groups and 10 major groups, based on their similarity in terms of the skill level and skill specialization required for the jobs. (ILO 2012: 1)

Here, we use the major groups (indicated by ISCO's first digit, excluding military occupations) and collapse these into three levels of skill requirements: high-skill jobs (ISCO major group 1 = managers and 2 = professionals), mid-skill jobs (ISCO major group 3 = associate professionals, 4 = clerical workers and 7 = craft workers) and low-skill jobs (ISCO major group 5 = sales and service workers, 6 = agricultural workers, 8 = factory workers and 9 = workers in elementary occupations).

Data from two international surveys, the *European Social Survey* (ESS) and the *Programme for International Assessment of Adult Competences* (PIAAC; see also endnote 1), provide strong validation of the link between major occupational groups in ISCO and job-level skill requirements. Both ESS (wave 2 in 2004 and wave 5 in 2010) and PIAAC (data collected in 2008–2016) ask explicitly about job-level educational requirements, with self-reports by individual workers. The correlation between the survey respondents' occupation (ISCO first digit categories, grouped into three levels of skill requirements as just described) and the educational requirements (years beyond compulsory school) in their job amounts to $R = 0.50$ in ESS and $R = 0.56$ in PIAAC (for our selection of countries). On average, the requirements among workers in our ISCO-based high-skill job category are 5.2 years in ESS and 5.3 years in PIAAC; in our mid-skill job category 2.7 years in ESS and 2.5 years in PIAAC; and in our low-skill job category 1.2 years in ESS and 0.6 years in PIAAC.

ISCED 'classifies educational programmes into seven broad ordinal levels (0 to 6), which … reflect the degree of complexity of the content of an educational programme … from very elementary to more complex learning experiences' (Schneider and Kogan 2008 : 17). The seven levels are the following: 0 = pre-primary education, 1 = primary, 2 = lower secondary, 3 = upper secondary, 4 = post-secondary non-tertiary, 5 = first stage tertiary, and 6 = second stage tertiary education. A common grouping of these seven levels is to distinguish three major educational stages: 0–2, 3–4 and 5–6, reflecting primary, secondary and tertiary schooling, respectively. We follow this convention here.

Although the three stages clearly correspond to different amounts of schooling as indicated by years of education, there is no generally agreed upon conversion rate between stages and years, not least because such rates tend to differ both across time and between countries. Still, good indications are available as proxies. For example, according to average expert ratings used in the PIAAC survey for the group of countries we examine, primary education (ISCED 0–2) is on average 8.0 years long, while secondary education (ISCED 3–4) adds an average of 3.9 years and tertiary education (ISCED 5–6) adds a further 3.4 years on average. A typical person with a completed secondary education would thus have around 12 years of schooling while someone with an average tertiary degree would have about 15 years of education.

The match between skill supply and demand is measured by cross-classifying educational (ISCED) and occupational (ISCO) levels; all observed worker-job matches (individuals with jobs) are sorted into this 9-cell (3 by 3) matrix. For each country-year, the nine proportions sum to unity.

The proportions in Table 1 are computed from data on women and men (combined), age 30–39. We select this age group for computing the independent variables in order to limit endogeneity issues, i.e. conflation of determinants and outcomes in the regression models (based on data for youth and mid-aged). Three match measures are constructed on the basis of the proportions in each education-occupation (ISCED by ISCO) cell, as follows.

$$\text{Matched education} = \text{LL}*0 + \text{MM}*0.5 + \text{HH}*1$$

$$\text{Overeducation} = \text{ML}*0.5 + \text{HM}*0.5 + \text{HL}*1$$

$$\text{Undereducation} = \text{LM}*0.5 + \text{MH}*0.5 + \text{LH}*1$$

Note that LL = 0 in the scale of matched education does not imply that the LL category (low-educated workers in low-skill jobs) is weighted zero, only that it indicates the lowest combined (education/occupation) skill level. The sum of shares of the nine education-by-occupation categories is always unity; the size of any single category (including LL) is always 1 minus the sum of shares of the other eight categories.

Setting the mid-level skill values (between 0 for low and 1 for high) to exactly 0.5 is essentially arbitrary. As indicated above, it is possible to replace these values with empirically grounded numbers by using information from international surveys (ESS and PIAAC) with explicit interview questions on educational requirements in the respondents' jobs and ratings of years of schooling completed at the different stages of education.

According to ESS (see above) the average number of years of education required in jobs at the three skill levels is 5.2, 2.7 and 1.2, respectively. On a scale running from 0 to 1, with low-skill jobs at 0 and high-skill jobs at 1, the ESS estimates imply a mid-level value of 0.375 ((2.7–1.2)/(5.2–1.2) = 1.5/4 = 0.375). The corresponding value based on PIAAC data (see above) is 0.426 ((2.6–0.6)/(5.3–0.6) = 2/4.7 = 0.426). For education, the conversion rate in PIAAC (see above) between stages and years of education is primary = 8 years, secondary = 11.9 years and tertiary 15.3 years. On a scale running from 0 to 1, with low education (primary) at 0 and high education (tertiary) at 1, the PIAAC estimates imply a mid-level (secondary education) value of 0.534 ((11.9–8)/(15.3–8) = 3.9/7.3 = 0.534).

Using these empirically grounded values for the mid-level categories of occupation (based on the mean of estimates from ESS and PIAAC) and education (from PIAAC) yields the following alternatively scaled ORU (skill match) variables:[3]

$$\text{Matched education} = \text{LL}*0 + \text{MM}*0.47 + \text{HH}*1$$

$$\text{Overeducation} = \text{ML}*0.47 + \text{HM}*0.53 + \text{HL}*1$$

$$\text{Undereducation} = \text{LM}*0.46 + \text{MH}*0.54 + \text{LH}*1$$

Replacing the simplified values of 0–0.5–1 with the more empirically grounded values just shown, based on data from ESS and PIAAC as described above, does not substantially influence the parameter estimates of main interest, however (regression results are available upon request). The empirical analyses we use in the paper are therefore based on the more simple 0–0.5–1 values.

The measures are then inserted into the following regression equation, where i indicates country and t indicates year. A set of dummy variables (taking the value one if true and zero otherwise) have been computed for each country and each year (minus one of each which are the reference categories); the parameters tied to these dummies hence constitute fixed effects (FE) for countries and years.

$$\begin{aligned}\text{Youth employment}_{ti} = a &+ b_1*\text{Matched education}_{ti} \\ &+ b_2*\text{Overeducation}_{ti} + b_3*\text{Undereducation}_{ti} \\ &+ b_4*\text{Mid-age employment}_{ti} \\ &+ \sum_{i=1}^{9}\text{Country}_i*b_5^i + \sum_{i=1}^{17}\text{Year}_t*b_6^t + e_{ti}\end{aligned}$$

Figure 3 displays the structural change of skill from 1998 to 2015 for the ten examined countries, as indicated by the three ORU components. For most of the countries, and as summarized by the average chart, a considerable amount of skill upgrading has taken place during the period. On top of a joint growth of skill supply and demand, as indicated by the measure of matched education, the rate of overeducation (excess supply of schooling) has also risen substantially in most countries. Conversely, undereducation has tended to decline.

The analytic task facing us now is to assess the extent to which youth employment decline (see Figure 1) and the structural growth of skill (see Figure 3) are empirically interconnected.

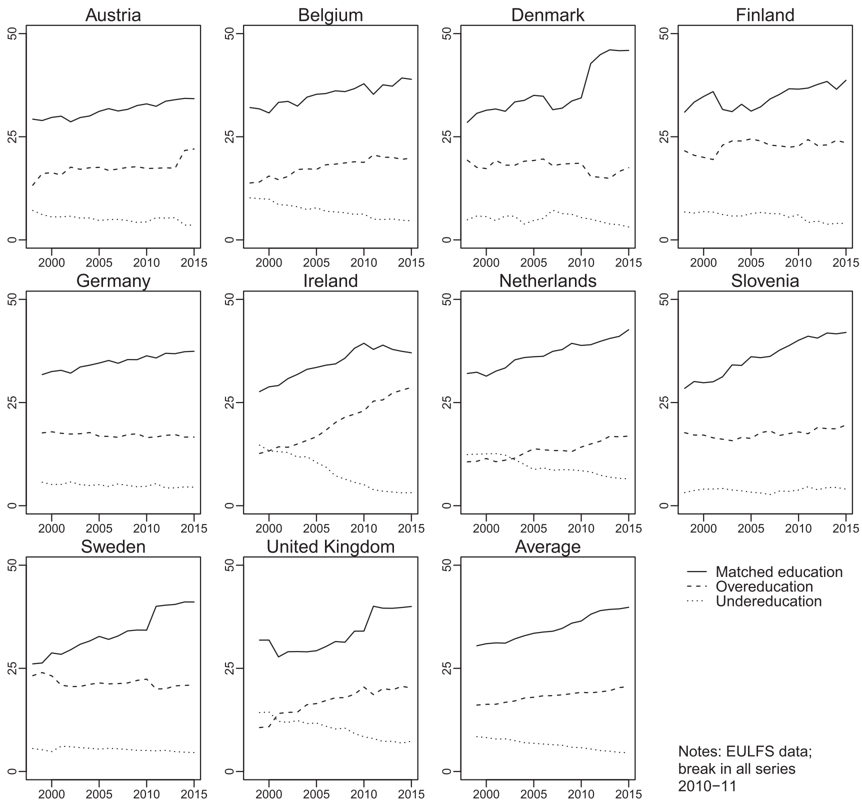

Figure 3. Matched education, overeducation and undereducation in the labor market.

Empirical results

In presenting empirical results, we begin by providing estimates based on the ORU model above, where we expect matched skill upgrading and rising skill mismatch (especially overeducation) to negatively affect youth employment. We also briefly evaluate alternative explanations that have been suggested in accounting for youth employment decline, as outlined above.

In Tables 2(a,b), parameter estimates from the ORU model are shown, for men and women respectively, indicating the separate effects of matched skill upgrading, overeducation and undereducation on youth employment. In model 1, youth employment is predicted by the ORU components only, without country-year fixed effects and regardless of the mid-age employment rate. As hypothesized, both matched upgrading and overeducation are negatively associated with youth employment. This applies to both males and females but the effects are weaker for women.

Table 2a. Regression of male youth employment on required education, overeducation and undereducation.

	Model 1		Model 2		Model 3		Model 4	
	b	*t*	*b*	*t*	*b*	*t*	*b*	*t*
Constant	1.02	17.81	1.06	14.15	0.03	0.33	0.11	1.11
Matched educ.	−0.33	−2.81	−0.45	−3.51	−0.46	−5.77	−0.58	−6.75
Overeduc.	−0.54	−4.53	−0.67	−3.11	−0.70	−5.43	−0.78	−6.02
Undereduc.	0.17	0.86	0.00	0.00	−0.59	−3.33	−0.64	−3.52
Mid-age male employment	–	–	–	–	1.22	14.64	1.18	12.64
Country/year fixed effects	No		Yes		Yes		Yes	
Individual education weight	No		No		No		Yes	
ORU Chi^2	29.559		23.952		43.677		59.006	
	0.000		0.000		0.000		0.000	

Notes: $N = 177$ (country-years); ORU CHI2 = Wald test of the combined effect of Overeducation, Matched education and Undereducation (ORU).

Undereducation has no significant effect. The combined impact of the three ORU parameters is highly significant (see the Chi-square values). When model 1 is estimated with OLS (results not shown but available upon request), more than half of the variation in male youth employment is accounted for by the ORU parameters ($R^2 = 0.55$), and one fourth of the corresponding variation for women ($R^2 = 0.26$).

As discussed earlier, omitted variable bias may occur due to unobserved influence of stable differences across countries and time-bound country-common influences. In model 2, these differences are controlled for by using fixed effects for countries and years. The ORU parameter estimates, especially for women, are stronger in this model specification than in the previous one, suggesting that stable differences between countries and

Table 2b. Regression of female youth employment on required education, overeducation and undereducation.

	Model 1		Model 2		Model 3		Model 4	
	b	*t*	*b*	*t*	*b*	*t*	*b*	*t*
Constant	0.88	10.62	1.16	11.42	0.76	5.03	0.94	5.84
Matched educ.	−0.23	−1.91	−0.71	−4.78	−0.74	−5.59	−0.99	−6.30
Overeduc.	−0.35	−1.99	−0.99	−3.63	−0.98	−3.96	−1.20	−4.60
Undereduc.	−0.05	−0.18	−0.80	−2.32	−1.09	−3.03	−1.53	−3.99
Mid-age male employment	–	–	–	–	0.47	3.65	0.43	3.28
Country/year fixed effects	No		Yes		Yes		Yes	
Individual education weight	No		No		No		Yes	
RU Chi^2	14.289		25.695		32.874		39.988	
	0.003		0.000		0.000		0.000	

Notes: $N = 177$ (country-years); ORU CHI2 = Wald test of the combined effect of Overeducation, Matched education and Undereducation (ORU).

country-common change bias the association between skill structure and youth employment downwards.

In model 3, mid-age male employment is entered as a covariate, for both males and females. This model hence predicts the gap between youth and mid-age employment. The ORU coefficients differ very little between models 2 and 3 for both men and women (with the exception of undereducation for men). This indicates that upgrading of the skill structure increases the youth employment gap primarily by worsening youth employment prospects, not by improving (or otherwise changing) mid-age employment chances. The undereducation parameter is also significantly negative for both men and women in this model.

In model 4, education is held constant between youth and mid-age individuals. This results in slightly stronger associations between changes in the skill structure and youth employment chances, among both women and men. The education advantage of the young relative to the mid-aged apparently contributes to some (but quite limited) closure of the youth employment gap (the remaining part being tied to a deficit in experience), since the gap grows when education is held constant.

Visualizing the empirical association between skill structure and youth employment

In Figure 4(a,b) youth employment rates as predicted by the ORU parameter estimates are shown over observed proportions of the nine education-occupation cells (LL, MM, HH etc.) in the skill match matrix. The visualization is performed in order to facilitate the interpretation of the results and link the coefficient estimates to observed variation in the proportions underlying the ORU model (cf. Table 1). This means that predicted values are computed for observed combinations of values in all the three ORU variables. Variation in cells linked to a specific ORU-variable can hence not be interpreted as controlled for the other two ORU-variables in this visualization (in contrast to the regression), only for fixed effects (countries and years) and general labor demand (mid-age employment). We use estimates from model 3 rather than 4 in order to capture all implications of educational expansion for youth employment, including the (limited) positive effects from the youth advantage in educational attainment. Predicted employment rates are indicated on the vertical axes and observed education-occupation shares on the horizontal axes; the dots in the figures indicate the location of the 177 country-year units in this space.

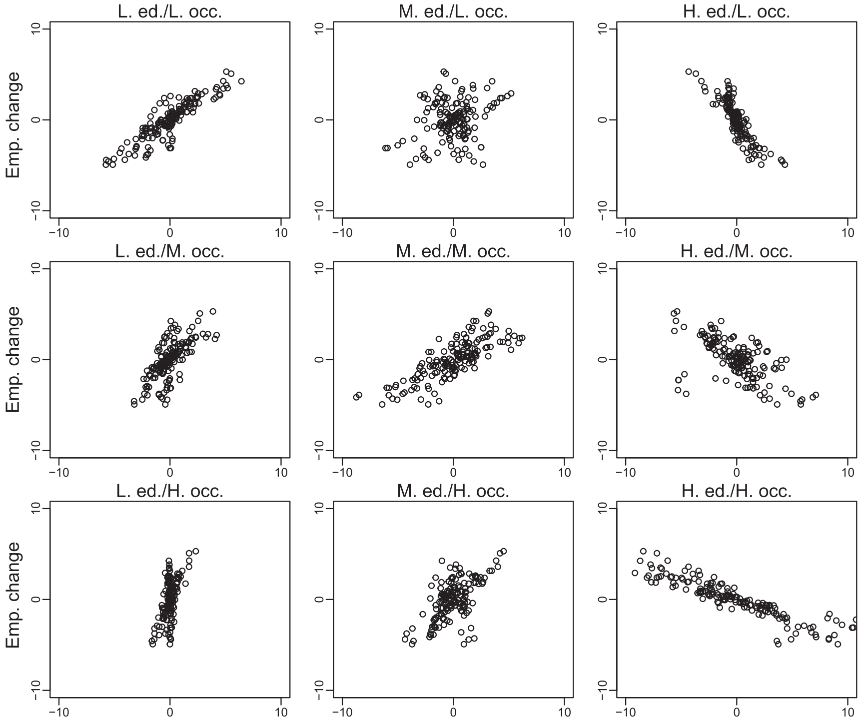

Figure 4a. Predicted changes in male youth employment over changes in ed./occ. combinations.

Note: Predicted values are from model 3 and are computed for observed combinations of values in all the three ORU variables. Variation in cells linked to a specific ORU-variable can hence not be interpreted as controlled for the other two ORU-variables in this visualization (in contrast to the regression), only for fixed effects (countries and years) and general labor demand (mid-age employment).

With regard to matched skill upgrading, the figures imply that an observed growth in HH jobs (high education, high occupation) markedly widens the youth employment gap while an observed growth in LL (low education, low occupation) and MM (mid-level education, mid-level occupation) jobs closes the gap. This pattern accords well with our theoretical expectations, supporting the hypothesis that skill upgrading is linked to youth employment decline. The associations involved are strong. For example, a one percentage point decrease in LL jobs is associated with about one percentage point larger youth employment gaps (slightly weaker for males and slightly stronger for females).

With regard to skill mismatch, growth in HL and HM jobs (both indicating overeducation) widens the youth employment gap, in line with the crowding-out hypothesis. An observed increase in undereducation (LH, MH, LM) is positively associated with youth employment in these figures

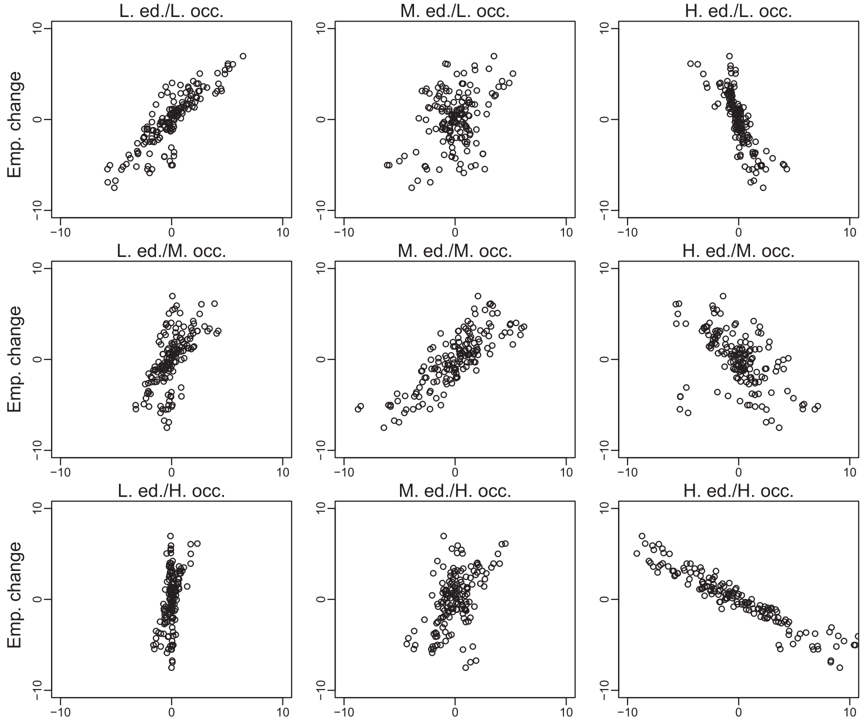

Figure 4b. Predicted changes in female youth employment over changes in ed./occ. combinations. Note: see note to figure 4a.

in contrast to the negative coefficient estimates in Table 2. The reversion is possible because the negative effect in Table 2 is solely driven by variation within undereducation cells (e.g. shifts from LM to LH). That negative effect is in line with what we suggest in our theoretical outline, i.e. that undereducation represents mismatched skill upgrading driven by the demand side (see endnote 2), equally negative for youth employment as matched and supply driven upgrading, although less consequential (since undereducation is both relatively rare and in decline). In Figure 4, on the other hand, effects of undereducation may also be driven by changes in undereducation that affect the other ORU variables (e.g. shifts from ML to MH). On average, this effect seems to be positive for youth employment, plausibly because it decreases crowding in low-skill jobs.

Assessment of alternative explanations

Finally, we briefly assess alternative explanations of youth employment decline. We have estimated models including the following time-varying control variables: GDP and hours worked per capita in the working age population (as indicators of general labor demand), employment protection legislation (regular and temporary), ALMP expenses and the immigrant share of employment.

GDP size and ALMP expenses are all positively and significantly associated with youth employment, net of the ORU parameters. The same is true for the immigrant share of employment, thus indicating that youth and immigrant employment tend to grow together rather than trade off. In contrast, average hours worked in the working age population and employment protection legislation have no significant relationship with youth employment. However, none of the control variables has a substantively large impact, and – crucially – none of them affects our focal estimates (the ORU parameters) more than marginally. Therefore we do not present the results of these analyses in detailed (table) form (but they are available in the article's online appendix).

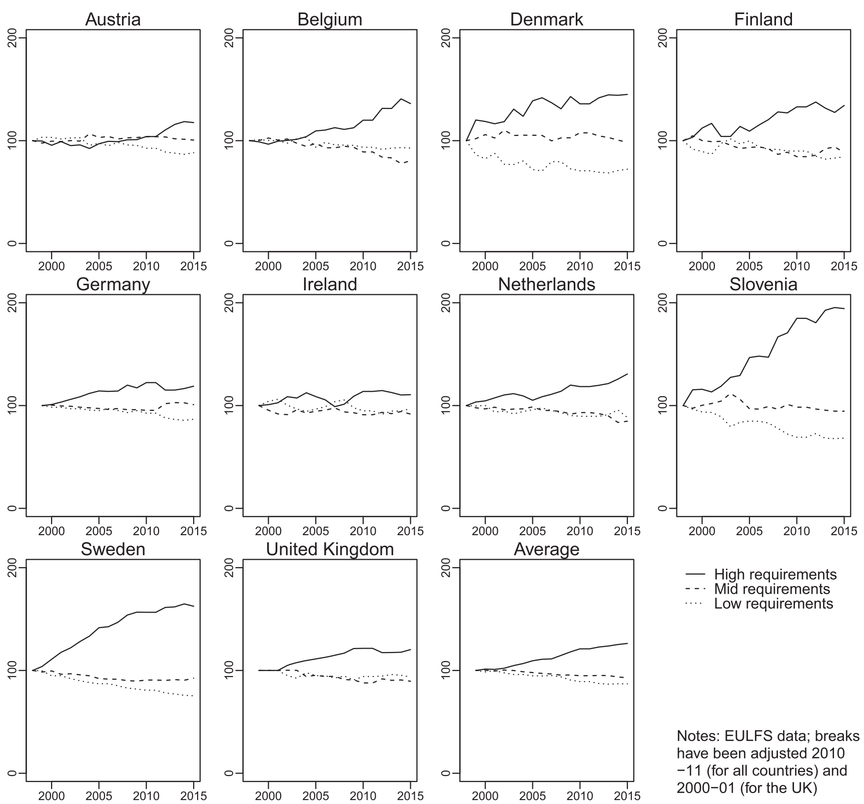

Figure 5. Relative evolution of educational requirements in the labor market 1998–2015 (1998 = 100).

The issue of job polarization is not as easily assessed, since the structural change of skill is already included as part of our main independent variables (i.e. the ORU-parameters). We can however assess how well a polarization scenario, in contrast to our main story, fits our analysis. First of all, consider Figure 5, showing the relative evolution of educational requirements of jobs as indicated by our three ISCO-categories. It is evident that polarization does not seem to occur over the observed time-period in the examined countries. Low-skill and mid-skill occupations appear to decline at a similar rate, while the share of high-skill occupations steadily increases throughout the whole period. We interpret this pattern as clearly indicating structural upgrading, not polarization. Furthermore, in Figure 4, it is quite evident that youth employment varies with flows downward of highly educated individuals to low-skill jobs, not flows downward of mid-educated individuals to low-skill jobs. We hence conclude that both the descriptive data and the regression models fit our story much better than the polarization scenario.

Concluding discussion

Labor market prospects for youth have deteriorated significantly in many OECD countries over recent decades. This development has so far not been adequately explained. In the spirit of Ryan (2001), and consistent with standard human capital theory, we have proposed an explanatory account based on skill upgrading as a main cause of youth employment decline, and augmented this account with crowding-out mechanisms tied to skill mismatch, normally not considered in the human capital framework. Using data on ten northwestern European countries over the period 1998–2015, we have estimated associations between the structural change of skill and youth employment decline. The main conclusion is that both matched skill upgrading and overeducation are strongly and negatively linked to young people's employment chances. In concluding, we point to some issues that need further discussion and analysis.

First, it is important to note that youth is (obviously) not a homogeneous category. On the contrary: there is a very large variation among young people (as in other age groups) in resources of different kinds, related to family background, ethnicity, education, health, etc. Many young people today certainly have good long-term opportunities, maybe better than those of previous generations. While a majority of youth might do fine, delayed entry to – or long-term exclusion from – the labor market probably has strongly negative consequences for the least resourceful youth categories. Hence, inequality among young people is likely to increase as a consequence of deteriorating employment chances for youth, with potential repurcussions across the life-course. Therefore, widening youth employment gaps both reflect and increase more general inequality.

Second, joint analyses of employment and wages are needed. Since shifts in supply and demand affect both quantities and prices, or employment and wages in this case, an analysis of the change in relative strength of different groups in the labor market should ideally consider both outcomes. As noted above, different countries display different relative magnitudes of employment and wage changes as consequences of supply-demand shifts, depending on the character of labor market institutions. It is therefore important to take wages into account when assessing the evolution of employment gaps between population categories. An innovative and useful approach can be found in Christopoulou (2013) who estimates a system of simultaneous equations, with employment and wages as co-determined and correlated outcomes. Integrating such an approach with the structural supply-demand model used in the present paper would be a productive way forward and a useful complement to the analyses reported above.

Third, what are the policy implications of our findings? Our main conclusion is that skill upgrading and skill mismatch are associated with youth employment decline. But skill upgrading is of course beneficial in many ways. Perhaps the most important lesson to be learned from our analysis is that employment difficulties for youth, at least relative to other age groups but probably also in absolute terms, are strongly linked to economic and technological advancement. In that sense, youth employment decline can be seen as a negative side-effect of a positive general development. A possible avenue forward would be to raise the general employment rate by subsidizing low-skill entry-level jobs in sectors where labor demand is high but wage floors are (prohibitively) high as well. While stimulating expansion of low-skill jobs reduces average productivity of the workforce, it might, by lifting the employment rate, raise average productivity of the population. This dynamic could be further improved by expanding opportunities for upward job mobility from the entry level, something easier said than done. Regardless of specific policy proposals, however, it is of course important to understand the general causes of secular change in youth labor markets in order to evaluate more long-run options.

With regard to skill mismatch it is easier to see how policies might be usefully redesigned. Our results indicate that educational expansion can go too far, or at least go in a less than optimal direction. Here we seem to confront a problem of the 'tragedy of the commons' type: at the individual level, it is typically rational to pursue further education in order to become more competitive in the job market. And this is also the standard policy recommendation. But the more individuals in general increase their education, the tougher the competition will get for each person. According to our results, aggregate overeducation may hurt young people's employment opportunities considerably. The paramount policy task under such circumstances is therefore hardly to expand education in general but in a more prudent manner regarding both magnitude and direction.

Finally, the theoretical outline and empirical analyses of the present paper need much further elaboration. We have suggested a model of the underlying causes of youth employment decline – a widespread and important contemporary social problem that has so far eluded explanation – and found it to be a plausible account of the observed empirical patterns. In contrast, as far as we can determine, alternative explanations suggested in the literature appear empirically less well founded, or at least our main conclusions are unaffected by taking the alternatives into account. Still, our theory and findings at this stage are both limited and preliminary. We anticipate future advances along these and other lines in the years ahead.

Notes

1. Assumption (a): Experience is clearly more valued for the hiring of higher white-collar than blue-collar workers: mean difference = .27, $p < .001$; Assumption (b): Experience is clearly more valued than education for the hiring of blue-collar workers: mean difference = .26, $p < .001$. In principle, we can also use supply side (worker reported) data in order to test the assumptions, such as The Programme for the International Assessment of Adult Competencies (PIAAC; data collected 2008–2016 in 30 OECD countries; N=24,891 for the selection of countries we also analyze in this study). Both self-reported experience and education demands are recorded in this survey but they are measured on different scales, so without additional strong assumptions, we can only test assumption A. Experience demands were measured on an ordinal scale which we recoded into the following values: None = 0, Less than 1 month = 0.05, 1–6 months = 0.25, 7–11 months = 0.75, 1 or 2 years = 1.5, and 3 years or more = 4. The consequent mean difference between low-skill and high-skill work (as defined in our paper, see methods section) provides further clear support for assumption A (mean difference = 1.33, $p < .001$).
2. Note that as long as skill grows both on the supply and demand side, or at least grows on one side without declining on the other, both kinds of mismatch – overeducation and undereducation – imply upgrading of the overall skill

structure, and can therefore negatively affect employment chances of youth. Of the two mismatch types, a focus on overeducation is motivated because it affects many more individuals: as will become evident below (see table 1 and figure 3) it is widespread as a share of the workforce and shows an increasing rate over time while the rate of undereducation is relatively low and falling.

3. The mean of ESS and PIAAC for mid-level occupations is 0.401 while the PIAAC estimate for mid-level education is 0.534. For matched education with LL=0 and HH=1 as givens, these values imply MM=0.467 estimated as the average of 0.401 and 0.534. For overeducation, ML is 0.534 (for mid-level education) minus 0 (low-level occupation) equals 0.534, while HM is 1 (for high-level education) minus 0.401 (for mid-level occupation) equals 0.599. Since HL is the sum of ML and HM and is set to 1, the values of ML and and HM need to be multiplied by 1 divided by the sum of ML and HM, thus ML=0.534*(1/(0.534+0.599))=0.471 and HM=0.599*(1/(0.534+0.599))=0.529. For undereducation, LM is 0.401 (for mid-level occupation) minus 0 (for low-level education) equals 0.401, while MH is 1 (for high-level occupation) minus 0.534 (for mid-level education) equals 0.466. Since LH is the sum of LM and MH and is set to 1, the values of LM and and MH need to be multiplied by 1 divided by the sum of LM and MH, thus LM=0.401*(1/(0.401+0.466))=0.462 and MH=0.466*(1/(0.401+0.466))=0.538.

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Notes on contributors

Michael Tåhlin is professor of sociology at the Swedish Institute for Social Research (SOFI), Stockholm University. His research concerns patterns and explanations of social and economic inequality, in particular the level, distribution and development of individual resources and rewards in the labor market. He has published extensively in international journals and readers on topics such as class theory, wage inequality, skill demand and the impact of globalization on national labor markets.

Johan Westerman is a doctoral candidate in sociology at the Swedish Institute for Social Research (SOFI), Stockholm University. His dissertation concerns the role of individuals' motivation for patterns of inequality in the labor market, especially with regard to wage attainment, job mobility and skill formation. A recent publication is 'Unequal involvement, unequal attainment?' in *Social Science Research* (2018).

References

Åberg, R. (2003) 'Unemployment persistency, over-education and the employment chances of the less educated', *European Sociological Review* 19: 199–216.

Abrassart, A. (2015) 'Low-skill jobs or jobs for low-skilled workers? An analysis of the institutional determinants of the employment rates of low-educated workers in 19 OECD countries, 1997–2010', *Journal of European Social Policy* 25: 225–241.

Acemoglu, D. (2002), 'Technical change, inequality, and the labor market', *Journal of Economic Literature* 40: 7–72.

Autor, D. (2010) *The Polarization of Job Opportunities in the US Labor Market: Implications for Employment and Earnings*, Washington, DC: Center for American Progress/The Brookings Institution.

Banerji, A., Lin, M.H.H. and Saksonovs, M.S. (2015). *Youth unemployment in advanced Europe: Okun's law and beyond*. IMF Working Paper 15/5, International Monetary Fund.

Beck, N. and Katz, J.N. (1995) 'What to do (and not to do) with time-series cross-section data', *American Political Science Review* 89: 634–647.

Becker, G.S. (1964) *Human Capital*, New York: Columbia University Press.

Blanchflower, D.G. and Freeman, R.B. (2000) 'The declining economic status of young workers in OECD countries', in D.G. Blanchflower and R.B. Freeman (eds.), *Youth Employment and Joblessness in Advanced Countries*, Chicago: Chicago University Press/NBER, pp. 19–55.

Blossfeld, H-P, Kurz, K., Buchholz, S. and Bukodi E. (eds.) (2008) *Young Workers, Globalization and the Labour Market: Comparing Early Working Life in Eleven Countries*, Cheltenham: Edward Elgar.

Breen, R. (2005) 'Explaining cross-national variation in youth unemployment – market and institutional factors', *European Sociological Review* 21: 125–134.

Bryan, M.L. and Jenkins, S.P. (2015) 'Multilevel modelling of country effects: a cautionary tale', *European Sociological Review* 32: 3-22.

Chevalier, T. (2016) 'Varieties of youth welfare citizenship: Towards a two-dimension typology', *Journal of European Social Policy* 26: 3–19.

Christopoulou, R. (2013) 'Why have labour market outcomes of youth in advanced economies deteriorated?', *B E Journal of Economic Analysis & Policy* 13: 203–237.

Christopoulou, R. and Ryan, P. (2009) 'Youth outcomes in the labour markets of advanced economies: decline, deterioration, and causes', in I. Schoon and R.K. Silbereisen (eds.), *Transitions from School to Work. Globalization, Individualization, and Patterns of Diversity*, New York: Cambridge University Press, pp. 67–94.

de Lange, M., Gesthuizen, M. and Wolbers, M. H. J. (2014). 'Youth labour market integration across Europe: the impact of cyclical, structural, and institutional characteristics', *European Societies*, 16: 194–212.

Duncan, G. and Hoffman, S. (1981) 'The incidence and wage effects of overeducation', *Economics of Education Review* 1: 75–86.

Eurostat (2016) *European Union Labour Force Survey Micro Dataset (Release of 2016)*, Luxembourg: Eurostat.

Gangl, M. (2002) 'Changing labour markets and early career outcomes: labour market entry in Europe over the past decade', *Work, Employment and Society* 16: 67–90.
Gebel, M. and Giesecke, J. (2016) 'Does deregulation help? The impact of employment protection reforms on youths' unemployment and temporary employment risks in Europe', *European Sociological Review* 32: 486–500.
Gesthuizen, M. and Wolbers, M.H.J. (2010) 'Employment transitions in the Netherlands, 1980-2004: Are low educated men subject to structural or cyclical crowding out?', *Research in Social Stratification and Mobility* 28: 437–451.
Goldthorpe, J.H. and McKnight, A. (2004). *The economic basis of social class*. CASE paper 80, Centre for Analysis of Social Exclusion, London School of Economics.
Goos, M. and Manning, A. (2007) 'Lousy and lovely jobs: The rising polarization of work in Britain', *Review of Economics and Statistics*, 89: 118-33.
Holzer, H.J. (1996) *What Employers Want: Job Prospects for Less-Educated Workers*, New York: Russell Sage Foundation.
International Labour Organization (ILO) (2012) *International Standard Classification of Occupations, ISCO-08. Volume 1: Structure, Group Definitions and Correspondence Tables*, Geneva: ILO.
Katz, L.F. and Margo, R.A. (2014), 'Technical change and the relative demand for skilled labor: The United States in historical perspective', in Boustan, L., C. Frydman and R.A. Margo (eds.), *Human Capital in History*, Chicago: University of Chicago Press/NBER, pp. 15–57
Kluve, J., Puerto, S., Robalino, D., Romero, J. M., Rother, F., Stöterau, J., Weidenkaff, F. and Witte, M. (2017) 'Interventions to improve the labour market outcomes of youth: a systematic review,' *A Campbell Systematic Review* 2017:12. Campbell Collaboration.
Mincer, J. (1958) 'Investment in human capital and personal income distribution', *Journal of Political Economy* 66: 281–302.
Mincer, J. (1974) *Schooling, Experience and Earnings*, New York: Columbia University Press.
Mincer, J. (1984) 'Human capital and economic growth', *Economics of Education Review* 3: 195–205.
Neumark, D. and Wascher, W. (2004) 'Minimum wages, labor market institutions, and youth employment: a cross-national analysis', *Industrial and Labor Relations Review* 57: 223–48.
OECD (2017). *OECD online database*. Paris: OECD. [Accessed 15 May 2017].
Ryan, P. (2001) 'The school-to-work transition: A cross-national perspective', *Journal of Economic Literature* 39: 34–92.
Saar, E., Unt, M. and Kogan, I. (2008) 'Transition from educational system to labour market in the European Union. A comparison between new and old members', *International Journal of Comparative Sociology* 49: 31–59.
Schneider, S. L. and Kogan, I. (2008) 'The International Standard Classification of Education 1997: challenges in the application to national data and the implementation in cross-national surveys', in S. L. Schneider (ed), *The International Standard Classification of Education (ISCED-97). An Evaluation of Content and Criterion Validity for 15 European Countries*, Mannheim: Mannheimer Zentrum für Europäische Sozialforschung (MZES), pp. 13-46.

Smith, C.L. (2011) *Polarization, immigration, education: What's behind the dramatic decline in youth employment?* FEDS Working Paper 2011-41, Federal Reserve Board of Governors.

Smith, C.L. (2012) 'The impact of low-skilled immigration on the youth labor market', *Journal of Labor Economics* 30: 55–89.

Tåhlin, M. (2007) 'Class clues', *European Sociological Review*, 23: 557–72.

Teulings, C. and Koopmanschap, M. (1989) 'An econometric model of crowding out of lower educational levels', *European Economic Review* 33: 1653–64.

Thurow, L. (1975) *Generating Inequality*. New York: Basic Books.

van Ours, J.C. and Ridder, G. (1995) 'Job matching and job competition: Are lower educated workers at the back of job queues?', *European Economic Review* 39: 1717–31.

Wooldridge, J.M. (2008) *Introductory Econometrics: A Modern Approach*, 4th ed., Mason, OH: South Western Educational Publishing.