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Returns to education in European countries

Evidence from the European Community Statistics on Income and Living Conditions (EU-SILC)

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SUMMARY

Within human capital literature, an important line of empirical research is concerned with estimating the returns to human capital investments. Typically, empirical work is focused on establishing relations between human capital indicators such as education and training, on the one hand, and outcomes as wages, employment opportunities or job quality on the other hand.

The private rate of return to education is by far the most analysed of the returns. Despite the existence of many comparative studies, there is still a great demand for research evidence on the private returns to education. This is mainly due to fact that, even if wage equations have been widely estimated for different countries, one must be careful when looking at the results. Data and methodologies are not often comparable and, while the differences in the returns to education could be driven by country specificities, they can be the result of a statistical artefact. Besides, dealing with cross-countries comparisons often comes at the cost of a controversial estimation method.

In this paper, we contribute to the debate on returns to education by estimating the wage differentials associated with educational attainment for 24 European countries, using the results of the ***European Community Statistics on Income and Living Conditions (EU-SILC).*** The wealth of the dataset allows us to control for a large set of individual, household and family background characteristics. However, issues of the potential endogeneity of education are not fully taken up in this publication. Further work will attempt to deal with this important issue, exploiting the information on family composition from the EU-SILC dataset.

This report is organized as follows: in the first part, we present an overview of the literature. The second part includes the data used, while the third is about the methodology employed. Section 4 presents the summary statistics and the estimates of returns to education. We conclude in section 5.

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1. Overview of the literature

Within human capital literature, an important line of empirical research is concerned with estimating the returns to human capital investments. In particular, the returns to education have received considerable attention. Most empirical research makes use of large cross-sectional or longitudinal data sets; sometimes, cohort studies are used as well. Typically, empirical work is focused on establishing relationships between human capital indicators, such as education and training - on the one hand - and outcome measures as wages, employment opportunities or job quality, on the other.

A first important analytical and policy relevant distinction that can be made with respect to the returns to education is between the private rate of return and the social rate of return to education. The private rate of return is the yield on the investment in education that is received by the person making the investment, *i.e*. it is the relation between the direct costs of education paid by the student and the gain in net earnings associated with this investment. The social rate of return measures the yield to society from the resources devoted to education. A second distinction is between the monetary and the non-monetary returns to education. The monetary returns refer to the wage effects of education. Non-monetary effects include the effects of education on health and well-being. A third distinction that can be made is between the private returns and the externalities or spillover effects of education. As such, education can increase wages and productivity of others who have not invested in this.[1]

The private rate of return to education is by far the most analysed of the returns distinguished. Despite the existence of many comparative studies, there is still a great demand for comparative evidence on the private returns to education in Europe. This is mainly due to two reasons. Firstly, even if wage equations have been widely estimated for different countries, one must be very careful when interpreting the results. Data and methodologies are not often comparable and, while the differences in the returns to education might be driven by country specificities, they can partially result from a statistical artefact. Secondly, dealing with cross-countries comparisons often comes at the cost of a controversial estimation method. Indeed, few cross-country studies attempt to deal with the endogeneity of education, the only exceptions being Harmon *et al.*, (2003) and Trostel *et al.* (2002). In addition, the validity of the instruments used in those two studies is controversial.[2]

[1] See European Commission (2005): 'Lifelong learning: economic perspectives', *Syntheses paper on Human Capital within the framework of 'Contributing results from research projects'*

[2] Issues of the potential endogeneity of education are not fully taken up in this publication. Further work will attempt to deal with this important issue, exploiting the information on family composition from the EU-SILC dataset.

Many studies which tackle the relation between education and outcomes such as wages either ignore or simply assume a causal relation between the two. The causality question is important, not only for determining the exact relation between education and wages, but also from a policy point of view. Only if the relation between education and wages is a true causal relation, an increase in resources for education can be effective in improving the living standards. Relatively few studies address whether this association really reflects a causal relation. The relation between education and wages is merely a correlation and not a causal relation if: (i) there is a joint relation between education and wages, whereby education not only affects wages but there is also a reverse causality where earnings opportunities determine investments in education; a reverse effect would create a positive simultaneity bias in measuring the effect of education on wages (ii) there are other factors - *i.e.* variables which are either not observable or not observed - which could affect both education and wages; examples are the innate ability or the social background.

In recent years, the literature has mainly focused on two issues. Several country-specific studies examine the causal impact of education on earnings while trying to correct for the "ability bias", for instance: Angrist and Krueger (1991), Ashenfelter and Krueger (1994), Plug (2001), Aakvik *et al.* (2003), Garcia-Mainar and Montuenga-Gomez (2005). Another strand of studies aims to compare the returns to education across countries - see, for instance Psacharopoulos and Patrinos (2004), Harmon *et al.* (2003), Trostel et. al, (2002), Maisonneuve and Strauss (2007). A publication of Psacharopoulos and Patrinos (2004) presents estimates of the returns to investment in education for 83 countries. Trostel *et al.* (2002) examine the returns to education in 28 countries using the International Social Survey Programme (ISSP) over the period 1985-1995. In the framework of the project on public funding and private returns to education (PURE)[3], Harmon *et al.* (2003) estimates the average returns to education in 1995 for 14 European countries, using national individual-level data sets and a similar empirical methodology. Recently, Maisonneuve and Strauss (2007) estimate the gross hourly wage premia on tertiary education from the 1990's to the early 2000's for 21 OECD countries.[4]

The object of this paper is to contribute to this debate. We aim at measuring the wage differentials associated with the attainment of education in 24 European countries, using the results of the ***European Community Statistics on Income and Living Conditions (EU-SILC).***

[3] Ibid.

[4] Boarini and Strauss (2007) propose an estimate of the private internal rates of return to tertiary education for 21 OECD countries, based on the discount method. For the computation of the stream of benefits, they rely on the private wage premia derived from Maisonneuve and Strauss (2007). See also De la Fuente and Jimeno (2005) for estimations of private and fiscal returns to schooling in 14 EU member states, based on a cost/benefit analysis using the wage premia computed by Harmon, Walker and Westergaard-Nielsen (2003).

2. Data used in this publication

The ***Community Statistics on Income and Living Conditions (EU-SILC)*** is an instrument aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional micro-data on income poverty and social exclusion. This survey designed and coordinated by the Statistical Office of the European Communities (EUROSTAT) and is anchored in the European Statistical System (ESS). EU-SILC was launched in 2004 as a replacement of the European Household Panel Survey. In 2005, the survey was covering 25 EU member states, plus Norway and Iceland; the coverage was further extended in 2007 with the inclusion of Bulgaria, Romania, Turkey, and Switzerland.

The instrument aims to provide two types of data: ***cross-sectional data*** pertaining to a given time or a certain time period with variables on income, poverty, social exclusion and other living conditions, and ***longitudinal data*** pertaining to individual-level changes over time, observed periodically over, typically, a four years period. EU-SILC is based on a rotating panel, with 25% of the sample dropped every year and a new sample selected to replace it. There are two main modules in the survey: a household questionnaire, which is answered by the household reference person and an individual questionnaire for each of the household members that are aged 16 and over.

The survey contains comparable information on the household characteristics (e.g. household size and composition, housing and indicators about living conditions, etc.), individual characteristics (such as age, sex, education, working conditions, income, etc.). In addition, for a random sub-sample of the household members aged 16 or more, the survey collects additional detailed information (ex. detailed labour market information, health, access to health care, etc.). Finally, yearly, there is an additional thematic module. In 2005, adults aged 25 to 65 were asked further information when they were 14 years old (financial situation of the household, level of education of the parents, etc.).

The empirical analysis that follows is based on the EU-SILC dataset of 2005. The dataset include 24 countries, as follows: Belgium (BE), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Greece (GR), Spain (ES), France (FR), Ireland (IE), Italy (IT), Cyprus (CY), Lithuania (LT), Luxembourg (LU), Hungary (HU), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE), United Kingdom (UK), Norway (NO). Three countries (Latvia, Malta and Iceland) are not covered in this publication due to missing information on income or other variables used in the empirical estimates.

3. Methodology

We measure the wage equation using the following framework:

$$\omega_i = X_i\alpha_i + Ed_{1i}\alpha_1 + Ed_{3i}\alpha_3 + \varepsilon_i \quad (1)$$

where:

ω_i is the logarithm of the gross monthly wage during the income reference for the individual i,

X_i is a set of covariates, and

ε_i is the disturbance term of the wage equation

We include in the sample individuals who are aged 25 to 65, report to be employed and to have worked on a full-time basis during the income reference period.[5] For 20 countries[6], the gross annual income is computed as cash or near cash income received in the main and any secondary or casual jobs during the reference period and includes the value of any social contributions and income taxes. The gross annual income is divided by 12 to obtain the monthly income. For Greece, Spain, Portugal and Italy, this information is not available but we know the gross current monthly earning in the main job.[7] For this group of countries, we report the wage premia using the logarithm of the gross wage in the current month as dependant variable.[8]

The main variables of interest are Ed_1 and Ed_3. The first dummy variable Ed_1 will take the value one if the person has attained basic education (i.e. pre-primary, primary or lower secondary education), zero otherwise. The second dummy variable Ed_3 will take the value one if the individual has attained a tertiary education (first or second stage), zero otherwise. The excluded category will consist of all individuals having attained upper secondary or post-secondary non-tertiary level of education (Ed_2).[9] The percentage decrease in wages for not having attained the secondary level of education, respectively the percentage increase in wages for having attained tertiary studies, will be given by $e^{\hat{\alpha}_1} - 1$ ($e^{\hat{\alpha}_3} - 1$), with $\hat{\alpha}_1$ ($\hat{\alpha}_3$) the estimated coefficient associated with Ed_1, respectively Ed_3.

[5] The income reference period corresponds to 2004, except for Ireland where the income reference period covers the 12 months preceding the interview. Note that for some countries, the gross income has been converted at the data collection from the net income.

[6] AT, BE, CY, CZ, DE, DK, EE, FI, FR, HU, IE, LT, LU, NL, NO, PL, SE, SI, SK, UK.

[7] Both data is available for Austria, Belgium, Ireland, Poland, and United Kingdom.

[8] The current monthly earning is divided by the number of hours usually work per week during the current period multiplied by 4.

[9] For convenience, throughout this publication, we refer to these two combined levels as of 'secondary education'.

Equation (1) is estimated separately for each country in order to get the country-level estimates of returns to education. The covariates X_i include individual and household characteristics. The individual characteristics are age, age squared, sex, marital status. The household covariates include the household size and the number of children less than 16 years. Regional dummies are also included in the wage equation. A full description of the variables is reported in the ***Annex (Table 1).***

Equation (1) is estimated through ordinary least squared (*OLS*)[10]. It is widely recognized that the *OLS* estimates are unbiased if and only if, education is an exogenous variable. Yet, education may not be completely exogenous to earnings; it may not only affect earnings, there may be a reverse causality as well in which earnings potentials determine the amount of the investment in education. Endogeneity can arise when the individual variables are omitted from the wage equation and they are simultaneously correlated with the education and earnings. In that case, $E[\varepsilon_i/X_i, Ed_{1i}, Ed_{3i}] \neq 0$.

The *OLS* estimates of the rate of return to education may be biased because of measurement error and by third factor effects, such as innate ability or social background, which may affect both investments in education and may have a direct effect on earnings as well. The most obvious omitted variable is the innate ability. If education and earnings are both positively correlated with the innate ability, then the *OLS* estimates of the returns to education will be upwardly biased.[11] Errors in the measurement of education and individual variations in the discount rate are also widely cited as omitted variable.[12]

In recent years, a considerable amount of research effort has been spent in developing methodologies to deal with this endogeneity problem. One way to circumvent the endogeneity of education is to find out instruments firstly and subsequently to apply two-stage least squared estimators (*2SLS*), or to adopt a two-stage control function approach (see Blundell *et al.*, 2005).

In the literature, Card (2001) classifies the various instruments, which were proposed, in two categories: the first category includes instruments derived from the school system characteristics while the second category uses family background characteristics of the respondent as exclusion restrictions.[13] Typical examples of instruments based on supply-side variations in schooling are

[10] Note that we do not control for the selection bias arising from the fact that working individuals are not a random sample of the full sample.
[11] See Card (1999) for a comprehensive literature review.
[12] Note also that individual heterogeneity in the marginal return to education is another reason why the OLS estimates could be biased. In this case, the coefficient associated with Ed_1 and Ed_3 would be, respectively, $(\alpha_1 + \alpha_{1i})$ and $(\alpha_2 + \alpha_{2i})$ with α_{1i} and α_{2i} the individual-specific components of the returns to education.
[13] With panel data, it is also possible to use the generalized instrumental variables (*IV*) procedure proposed by Hausman and Taylor (1981). This approach provides consistent and efficient estimators despite the absence of external instruments. It consists of, firstly, decomposing time varying exogenous variables into individual-specific means and deviations with respect to the individual specific-means and, secondly, using them as instrumental variables. For an application, see Arcand

geographical variations in school supply (*e.g.* proximity of schools in the residence area of respondents), see Card (1995), Conneely and Uusitalo (1997), Maluccio (1997), and school reforms derived from government policies, see Meghir and Palme (1999), Plug (2001), Aakvik *et al.* (2003), Fort *et al.* (2008).[14]

These instruments, based on the characteristics of the school system, have been widely used over the recent years, as they are more likely to satisfy the orthogonality condition, *i.e.* to be orthogonal to disturbance term of the wage equation, once we control for X_i and the level of education of respondent. However, these exclusion restrictions have also received numerous critics because they are often weak or only correlated with the level of education of a subset of the population, see Card (1999) for additional explanations.[15] For this reason and because we do not dispose of such a natural experiment with time and/or spatial variations for each of the 24 countries covered in this study, we cannot rely on such supply-schooling based instruments.[16]

Cross-country studies, in which the endogeneity of education is taken into account, rely usually on the second category of instrument, *i.e.* on instruments based on demand-side variations in schooling. Both Harmon *et al.* (2001) and Trostel *et al.* (2002) use the level of education of the respondents' parents as instrument. To be valid instruments, we need to assume that differences in the family background will have an impact on earnings only through educational differences. It will not be the case, for instance, if the education level of parents influences respondents' earnings through networking. In addition - and the most important - the orthogonality condition will not be satisfied if part of the respondent' ability is inherited from the parents. Despite the various critics associated with the use of family background instruments, yet they have been commonly employed in the literature, mainly because this information is often available.

Another solution to deal with the endogeneity issue is to proxy the individual unobservable heterogeneity. In a second step, we follow this approach by including family background variables in the wage equation. More precisely, we include the level of education of both parents as additional

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et al. (2005) and Garcia-Mainar and Montuenga-Gomez (2005). Finally, it is also possible to estimate the returns to education while relying on twins (or sibling) fixed effects with data on twins or siblings, see Ashenfelter and Zimmerman (1993), Behrman *et al.* (1996).

[14] See Milligan *et al.* (2004), Lleras-Muney (2005), Chevalier and O'Sullivant (2007) for studies which examines the effect of education on non-economic outcomes while instrument education with reforms in the compulsory schooling legislation.

[15] If returns to education are heterogeneously distributed across the population, *IV* estimates provide a local average treatment effect instead of an average treatment effect.

[16] Fort *et al.* (2008) examine the effect of education on the wage distribution for 12 EU countries. They use changes in the minimum number of years of compulsory education to instrument education. The authors are able to distinguish the effect of the reform on the educational attainment from cohort effects because they pool the 12 countries together and do not provide country-specific estimates.

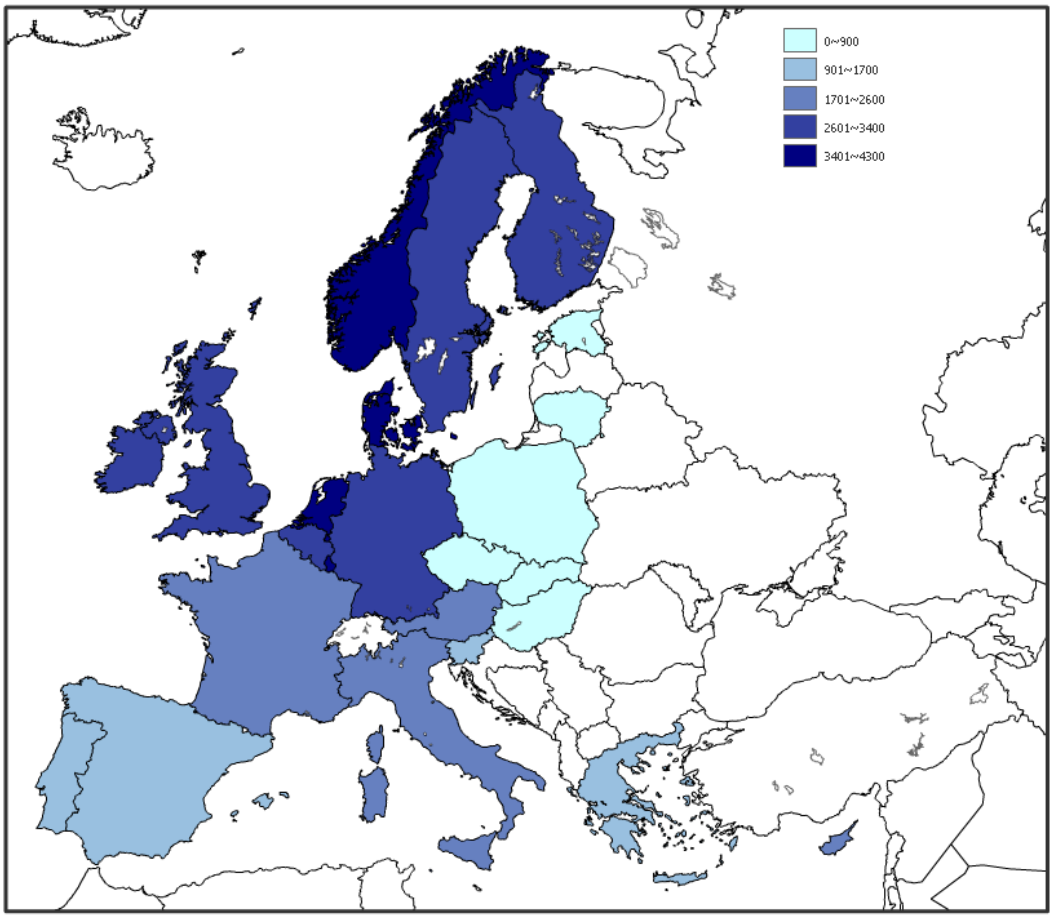
covariates - see, among others, Flabbi *et al.* (2008), for a similar approach. The introduction of those variables should significantly reduce the bias in the estimated returns to education by controlling for the inherited ability. We also add one variable on the household financial situation: the variable takes the value one if the respondent reports financial problems in the household during teenage most of the time or often, zero otherwise. In that way, we control for the family financial resources, potentially inherited, that might have had a direct effect on the current earnings.

4. Empirical results

4.1. Summary statistics

Chart 1 displays the country statistics related to the monthly gross wages.[17] As can be seen, the gross monthly wage varies greatly across European countries: it is above 3500 Euro in Luxembourg, Norway or Denmark whereas in the Eastern European countries - Poland, Hungary, Estonia, Slovakia or Lithuania – it hardly reaches 500 Euro ***(see Table 2 in the Annex).***

***Chart 1**: Distribution of reported monthly wages (Euro)*



Source: Eurostat - European Community Statistics on Income and Living Conditions (EU-SILC)

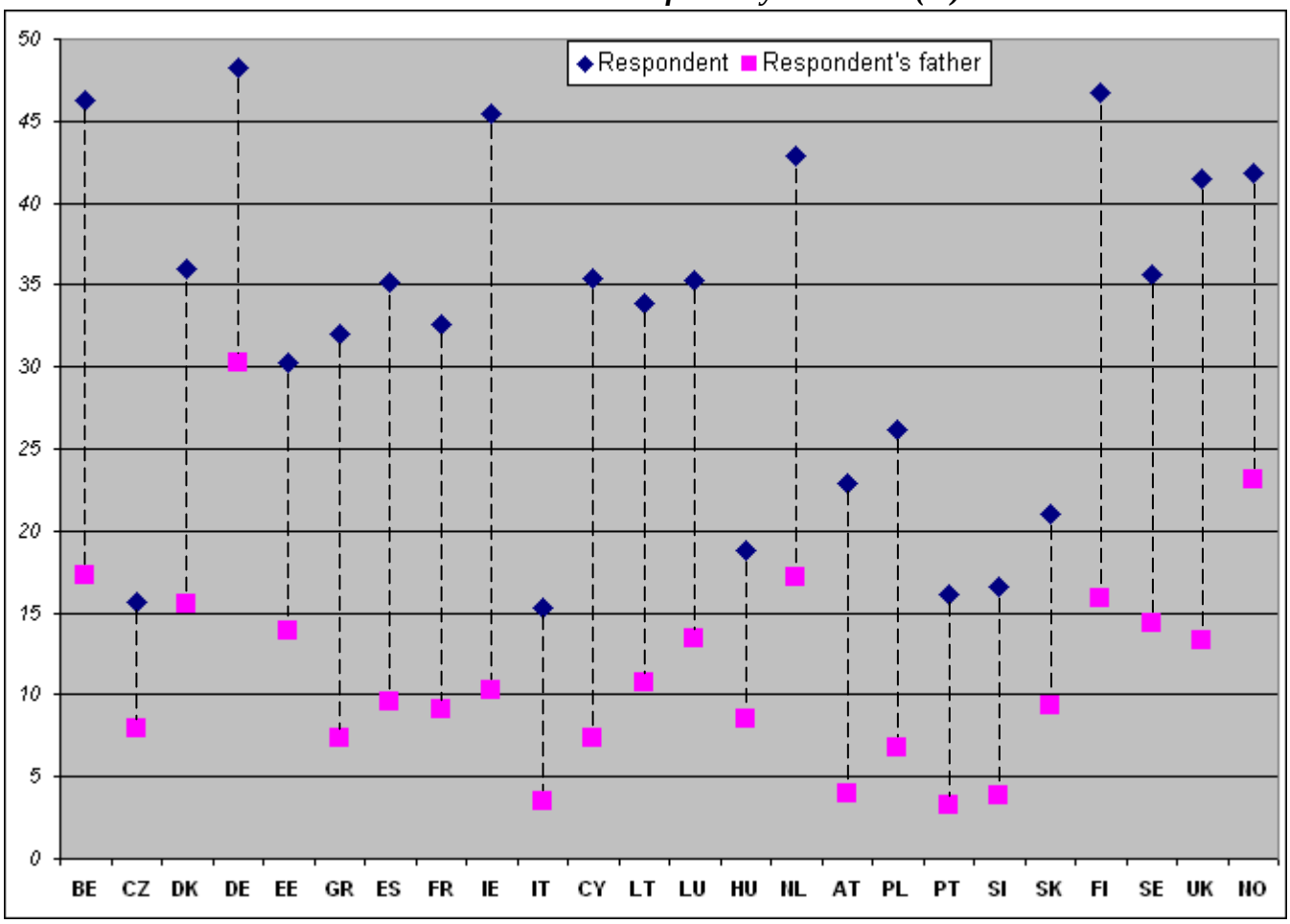
In addition to cross-country price and productivity differences, the income disparities are also due to variations in the structure of income taxes, average working time and employment protection legislation across countries. For example, the level of social security contribution and the proportion paid by the employee (relatively to the employer) differs among countries. Income taxes and social

[17] Note that for five countries (Austria, Belgium, Ireland, Poland and United Kingdom) for which the information on monthly earnings is available for the current period as well as for the income reference period, we observe that the former is slightly higher than the later.

security contributions paid by the employees represents 20% or more than 40% of gross income respectively in Spain and Germany.[18] In addition, the weekly working hours, collectively agreed, vary from 35 in France to 40 in Estonia (Eurostat, 2007).

In ***Chart 2*** we present some statistics on educational attainment (for detailed information, ***see Table 3 in the Annex).*** We observe the highest proportion of respondents having attained a tertiary level of education in Germany (48.3%), Finland (46.8%) and Belgium (46.2%) whereas the lowest figures can be seen in Slovenia (16.6%), Portugal (16.2%), Czech Republic (15.7%) and Italy (15.4%). In addition, while almost 70% of the respondents in Slovenia have attained the upper secondary or post-secondary non-tertiary educational level, this figure only reach 15.5% in Portugal.

Chart 2: Statistics on the attainment of tertiary education (%)



Source: Eurostat - European Community Statistics on Income and Living Conditions (EU-SILC)

[18] The social contribution paid by employer accounts for a larger part of the labour cost (23%) in Spain, compared to only 16% in Germany. Note that the social contribution paid by employer is not included in the gross income variable.

Some countries have witnessed an impressive increase in the level of educational attainment of the population. For instance, in Portugal, 16.1% of the respondents have declared that they have attained a tertiary level of education, whereas only 3.3% of their fathers had attained the same level of education. We observe similar high inter-generational differences (over 25 percentage points) in Ireland, Finland, Belgium, the United Kingdom, Cyprus, the Netherlands and Spain. The differences are partially explained by the duration of compulsory education and the characteristics of the higher education systems (*numerus clausus*, selection procedures, student fees). As an example, in Portugal, the school legislation in the 1950's has imposed 3 years (before 1956) or 4 years (after 1956) of compulsory education, and only for boys while during the same period, Belgium residents had to stay in school at least 8 years. Nowadays, the duration of full-time compulsory education is 9 years in both countries.

One drawback is related to the use of years of education in the wage equation.[19] Sometimes, this choice reflects a direct interest on the impact of schooling *per se*, but this variable is often used for lack of better measures of educational outcomes. Although most commonly used in both micro and macroeconomic analyses, it is widely recognised that attainment will be an imperfect proxy for the educational outcomes.[20] Still, it is expected that, since many of the relevant skills, which are used later on in the labour market, would be acquired through formal schooling, the correlation between years of education and skills will be sufficiently high for analyses that use the former as a proxy for the latter to yield some useful information.

[19] This approach takes educational attainment as a proxy measure because of an expected high correlation between education and skills, on the one hand, and skills and wages on the other (see OECD and Statistics Canada (2000): *Literacy in the Information Age: Final Report on the International Adult Literacy Survey*).

[20] One solution would be to use information about the skills acquired (for example literacy and numeracy tests scores) and to further extend the original model of Mincer (1974) to include more direct measures of skills than years of schooling.

4.2. *OLS* estimates

The returns to education based on the *OLS* estimates are presented in the ***Annex, Table 4.*** In the first specification (see section 4.2.1), we control for individual characteristics (age, age squared, marital status, gender) and some household characteristics (presence of children, household size). In the second specification (see section 4.2.2), we also control for the family background of respondent (the educational level of parents and the household financial situation when respondent was a teenager). The regional dummies are included in both specifications.[21]

4.2.1 *OLS* cross-country estimates: parsimonious wage specification

Wage premia for tertiary graduates

In the full sample, the wage premia for persons having attained the higher education reaches 43%. The country estimates show large heterogeneity in the links between education and wages, with returns to tertiary education ranging from 98% in Portugal to 21% in Sweden ***(see Chart 3a)***. A first group of countries shows very high returns to tertiary education (above 70%). This group include three new member states (Slovenia, Hungary and Lithuania) as well as Portugal. Labour supply shortages, with respect to the labour demand of tertiary graduates could explain these results partially. Indeed Portugal, Slovenia and Hungary have a relatively lower proportion of the working population holding a tertiary degree. In addition, over the recent period, the yearly rate of economic growth, in part driven by skill-biased technological changes, has been particularly high in Lithuania.

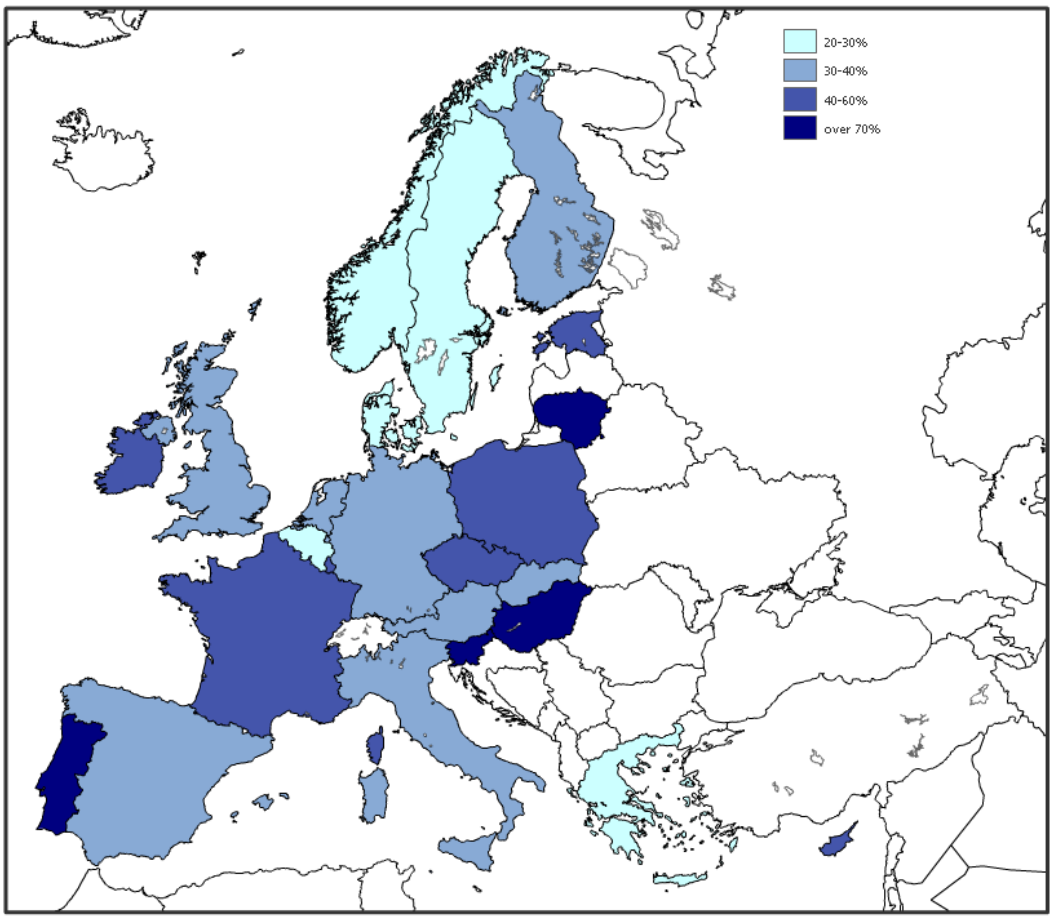
A second group of countries, including again four new member states (Poland, Czech Republic, Estonia and Cyprus), along with Luxembourg, France and Ireland, show high wage premia associated with tertiary education attainment, ranging between 40% and 60%; the average for the 24 European countries (43%) also falls into this group. The majority of European countries (Italy, the Netherlands, Slovakia, the United Kingdom, Spain, Finland, Austria and Germany) falls into a third group, whose returns vary between 30% and 40%, with three Nordic countries (Finland, the United Kingdom and the Netherlands) showing rates of returns of about 35%. Finally, a fourth group includes five countries with low returns to education (20-30%), of which the Scandinavian countries (Sweden, Norway and Denmark) – showing the lowest rates of returns among the countries included in the analysis.

These results are in line with what could be found in the literature. Strauss and Maisonneuve (2007) also report particularly high returns associated with tertiary education attainment in Hungary and

[21] For the Netherlands, Slovenia and Portugal, this information is not available.

Luxembourg for the year 2001. Furthermore, in line with Flabbi *et al.* (2008), we observe that the wage premia for tertiary graduates varies across the new member states, with Hungary and Poland showing significantly higher returns than Slovakia and the Czech Republic. Campos and Jolliffe (2003) have found that the return to education is particularly high in Hungary during the transition period. Estimates for Portugal are sensibly equal to the *OLS* ones reported by Garcia-Mainar and Montuenga-Gomez, both in 2005. However, we estimate a higher wage premia for tertiary graduates in Portugal and Spain than those obtained by Strauss and Maisonneuve (2007).

Chart 3a: Wage premia for tertiary graduates in European countries - OLS estimates



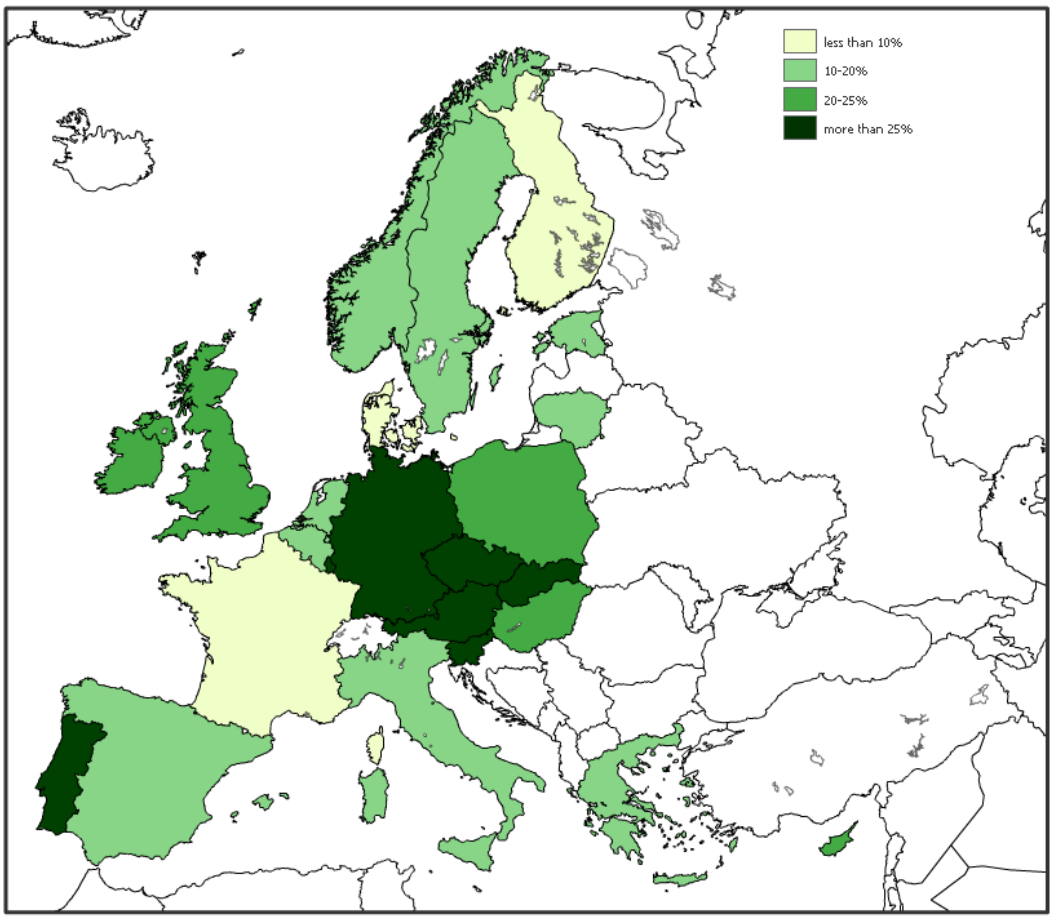
Source: CRELL estimates based on EU-SILC data

Wage penalties for not attaining the secondary education

In the full sample, the wage penalties for not attending the secondary education are 17%. In this case, the grouping of countries is slightly different, with penalties ranging from 7% in Denmark to 31% in Austria. All Nordic countries, except the United Kingdom, along with some Southern European countries (such as Italy, Spain, France and Greece), present wage penalties for not attaining the secondary education, ranging from 7% to 20%; the average for the 24 European countries (17%) also falls into this group. The wage penalties for all new member states except Lithuania, as well as for

Ireland and the United Kingdom, are estimated between 20% and 25%. The remaining group of countries (Portugal, Luxembourg, Slovakia, Czech Republic, Germany, Slovenia and Austria) show the highest wage penalties, 25% and over, for lower educated individuals.

Chart 3b*: *Wage penalties for not attaining the secondary education in European countries (OLS estimates)



Source: CRELL estimates based on EU-SILC data

The wage penalty for not attaining secondary education is likely to be related to the structure of the educational system. In nearly all countries showing the highest wage penalties for not attaining the secondary education (with the exception of Portugal), over 50% of the secondary students follow a vocational program. It is well known that the vocational programmes offer better integration in the labour market associated with higher salaries. As a result, students who do not attend a secondary education programme are likely to be largely penalized in the terms of wages.

4.2.2 *OLS* cross-country estimates, controlling for the family background of the respondent

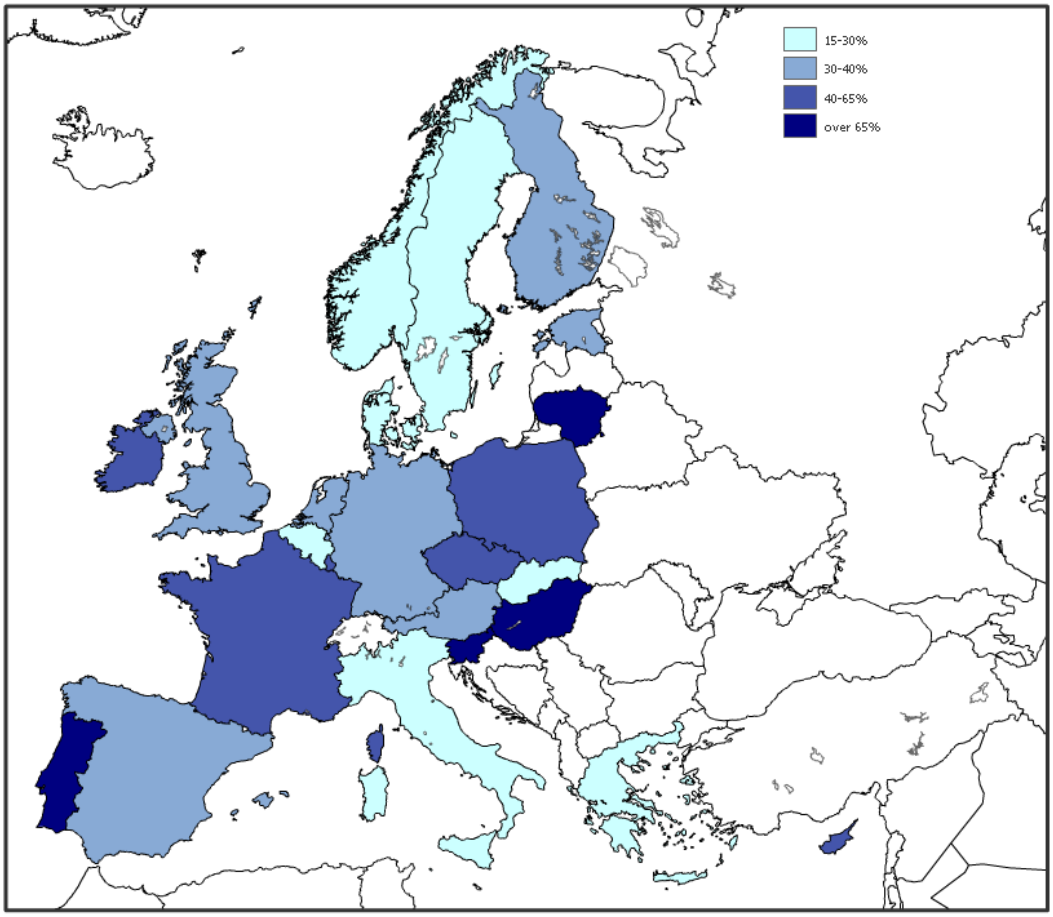
In the second specification, we control for parents' educational level of the respondent and the household financial situation when the respondent was 14 years old. As we said earlier, these family

background-related variables should capture the inherited ability and the economic circumstances that could have influenced the educational decisions through costs of schooling. Estimates reported in the ***Annex (Table 4, second specification)*** show that these family background variables are usually significantly related to earnings, confirming that they cannot be considered as valid instruments.

Wage premia for tertiary graduates

By including these variables, the average returns to tertiary education attainment are slightly reduced for the full sample of 24 European countries, from 43% to 39%. At the country level, the rate of return is sizeable reduced (ex. in Lithuania - from 74% to 64% or Luxemburg - from 58% to 49%), while in others (Germany, Greece, Czech Republic), the difference is negligible. This suggests that the inter-generational mobility must be higher in the second group of countries than in the first one. However, the grouping of countries presented for the first specification is not altered notably.

Chart 4a: Wage premia for tertiary graduates in European countries (OLS estimates controlling for the family background)



Source: CRELL estimates based on EU-SILC data

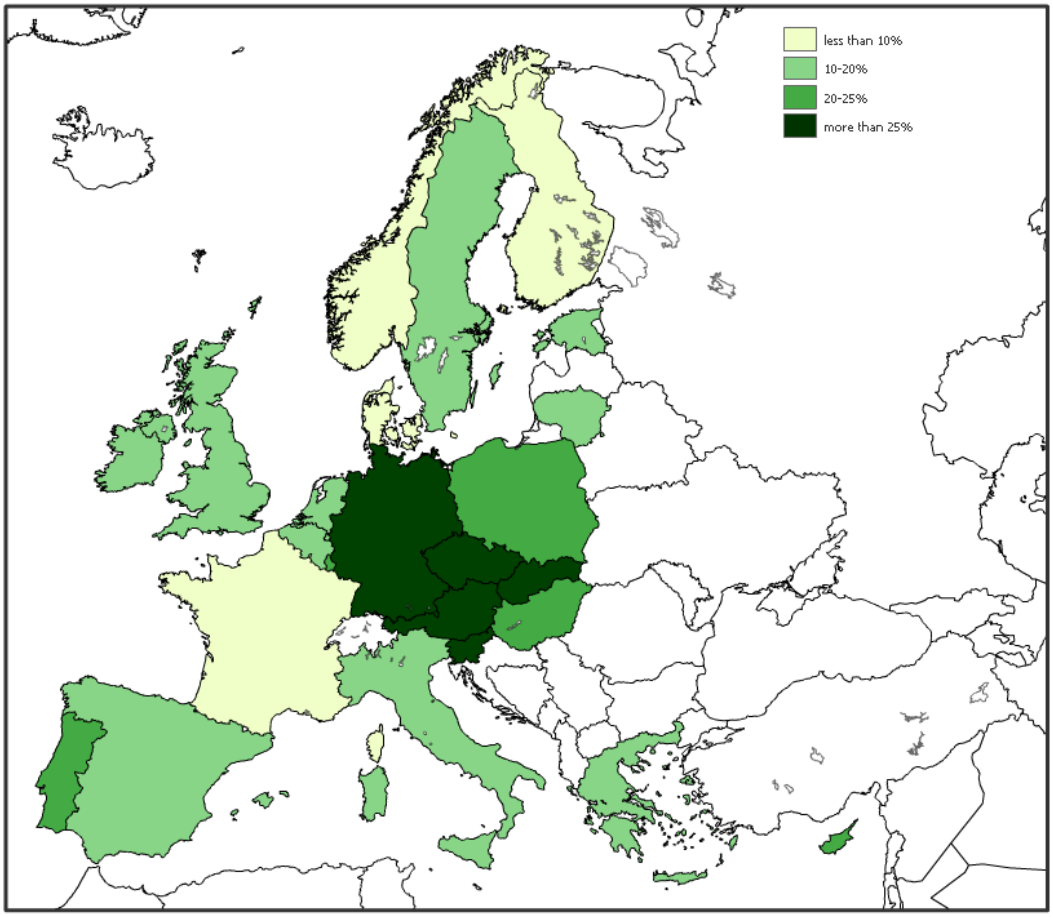
The cross-country differences in the gross wage premia associated with the attainment of tertiary education could also reflect country variations in the duration of tertiary studies. For instance, the average duration of tertiary studies is below 4 years in Belgium or Ireland and above 5 years in Italy,

Greece, or the Netherlands.[22] To control partially for this effect, we have recalculated the rate of return per year of tertiary education (following Strauss and Maisonneuve, 2007) using the average duration of tertiary studies for each country.[23] For most of the countries, the average rate of return per year of tertiary study is around 6%. As found before, the Eastern European countries have experienced the highest increase in returns per annum while in Sweden, the wage premia was only 3%.

Wage penalties for not attaining the secondary education

Controlling for the family background, the wage penalties only change slightly - on average from 17% to 15% for the full sample of 24 countries.

Chart 4b: Wage penalties for not attaining secondary education in European countries (OLS estimates controlling for the family background)



Source: CRELL estimates based on EU-SILC data

[22] The majority of countries have an average length of 4 to 5 years (SE, FI, FR, LT, HU, and ES). These differences must be interpreted in light of differences in national degree structures, as well as possible differences among countries in the academic level of the qualifications of students leaving university. For instance, a short duration may be the result of a high drop out rate or many tertiary programmes with short degree studies whereas in countries with higher duration of tertiary studies there might be fewer dropouts, fewer short degree studies or longer delays in the achievement of a degree. The average duration of tertiary studies can be the effect of a combination of these characteristics of tertiary programmes.

[23] Using the chain method, the duration of study is defined as the sum of the probabilities, for each year of study, that a student who has entered tertiary education will still be enrolled in that year of study. With the chain method all conditional probabilities are derived from data for two adjacent years, the reference year and the preceding year (see OECD, *Education at a Glance*, 2007).

The wage penalties does not change in Greece, Cyprus, France and Finland, but is reduced in most of the countries by 1 or 2 percentage points; Hungary, Slovakia, Luxembourg and the United Kingdom, all present a reduction of 3 percentage points in the wage penalties whereas in Norway the decrease is of 5% (from 11% to 6%).

Conclusions

The aim of this publication was to understand better the link between education and outcomes in terms of wages, through the empirical estimation of the private returns to education. To this end, we provided comparable cross-country estimates for a large number of European countries, using a comparable dataset, a comparable methodology and recent pan-European data.

One conclusion from this publication is that the returns to tertiary education vary greatly across Europe, with the highest wage premia in the Eastern European countries and Portugal and the lowest in Nordic European countries. Ordinary Least Square estimates (*OLS*) show that estimated private returns to education differ considerably across countries with the highest rate in Portugal (98%) and the lowest in Sweden (21%). In addition, the wage penalty for not attaining the secondary education also varies from 7% in Denmark to 31% in Austria.

We further employed some variables related to family background of respondent, assuming that they would capture the inherited ability and the economic circumstances, which could have influenced the educational decisions through the costs of schooling. We re-estimated the wage equation, controlling for the family background of respondent and we concluded that results does not change significantly.

However, issues of the potential endogeneity of education are not fully taken up in this publication. Further work will attempt to deal with this important issue, exploiting the information on family composition from the EU-SILC dataset.

ANNEXES

Table 1: Definition of variables

WAGES	
Annual wage	Gross annual cash or near cash income perceived in the main and any secondary or casual jobs during the reference period. It includes the value of any social contributions and income taxes. The gross annual income is divided by 12 to obtain the monthly income in the following countries: *Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Estonia, Finland, France, Hungary, Ireland, Lithuania, Luxembourg, Netherlands, Norway, Poland, Sweden, Slovenia, Slovakia*
Monthly wage	Gross current monthly earning in the main job is reported for: *Greece, Spain, Portugal, Italy*
W_i	Logarithm of the gross monthly income
PERSONAL COVARIATES	
Sex	Indicator taking value one if the individual is a male, zero otherwise
Age	Age of the respondent
EDUCATIONAL ATTAINMENT	
Ed_1	Indicator taking value one if the individual has no education, or has attained pre-primary or lower-secondary level of education, zero otherwise
Ed_2	Indicator taking value one if the individual has attained upper-secondary or post-secondary non-tertiary level of education, zero otherwise
Ed_3	Indicator taking value one if the individual has attained first or second stage of tertiary education, zero otherwise
HOUSEHOLD COVARIATES	
Household size	Size of the household
Children	Indicator taking value one if there were children living at home, zero otherwise
Cohabitation status	Indicator taking value one if the respondent is married or living with his/her partner, zero otherwise
FAMILY BACKGROUND	
Mother, Father level 1	Indicator taking value one if the respondent mother/father has no education, or has attained pre-primary or lower-secondary level of education, zero otherwise
Mother, Father level 3	Indicator taking value one if the respondent mother/father has attained first or second stage of tertiary education, zero otherwise
Financial status	Indicator taking value one if the respondent reports financial problems in the household during teenage most of the time or often, zero otherwise
REGIONAL DUMMIES	

Source: Eurostat - Community Statistics on Income and Living Conditions (SILC)

Table 2: Summary statistics on wages

Countries		Monthly wage* (Euro)	Hourly wage (Euro)	Sample size
Belgium* **	**BE**	**3030/2780**	**17.2**	**2353**
Czech Republic	**CZ**	**540**	**:**	**3087**
Denmark	**DK**	**3623**	**:**	**1730**
Germany	**DE**	**3331**	**:**	**4963**
Estonia	**EE**	**438**	**:**	**3202**
Greece **	**GR**	**1280**	**8.42**	**2849**
Spain	**ES**	**1554**	**9.57**	**7579**
France	**FR**	**2446**	**:**	**4527**
Ireland* **	**IE**	**3431/3364**	**21.84**	**1676**
Italy	**IT**	**1907**	**12.38**	**1556**
Cyprus	**CY**	**1721**	**:**	**3058**
Lithuania	**LT**	**365**	**:**	**3111**
Luxembourg	**LU**	**4229**	**:**	**2258**
Hungary	**HU**	**480**	**:**	**2890**
Netherlands	**NL**	**3407**	**:**	**1702**
Austria* **	**AT**	**2724/2409**	**14.91**	**1834**
Poland* **	**PL**	**488/426**	**2.68**	**7958**
Portugal	**PT**	**923**	**5.78**	**3193**
Slovenia	**SI**	**1256**	**:**	**2764**
Slovakia	**SK**	**377**	**:**	**4372**
Finland	**FI**	**2814**	**:**	**3176**
Sweden	**SE**	**2723**	**:**	**1810**
United Kingdom* **	**UK**	**3309/3128**	**19.22**	**1303**
Norway	**NO**	**3571**	**:**	**1452**

Source: Eurostat - Community Statistics on Income and Living Conditions (SILC)

(:) Missing or not available

(*) Monthly wage usually refers to income during the reference period

(**) Monthly wage refers to current month

(***) Both monthly wages are reported (current month and income during the reference period)

Table 3: Summary statistics on educational attainment*

Countries		Secondary education** (%)	Tertiary education*** (%)	Father having tertiary education (%)
Belgium	**BE**	**34.0**	**46.2**	**17.3**
Czech Republic	**CZ**	**78.7**	**15.7**	**8.0**
Denmark	**DK**	**48.6**	**36.0**	**15.5**
Germany	**DE**	**47.4**	**48.3**	**30.2**
Estonia	**EE**	**62.1**	**30.2**	**13.9**
Greece	**GR**	**39.9**	**32.0**	**7.4**
Spain	**ES**	**23.8**	**35.2**	**9.6**
France	**FR**	**46.2**	**32.6**	**9.1**
Ireland	**IE**	**30.6**	**45.4**	**10.2**
Italy	**IT**	**47.0**	**15.4**	**3.5**
Cyprus	**CY**	**41.1**	**35.4**	**7.4**
Lithuania	**LT**	**60.5**	**33.9**	**10.8**
Luxembourg	**LU**	**35.7**	**35.3**	**13.5**
Hungary	**HU**	**65.8**	**18.8**	**8.5**
Netherlands	**NL**	**39.8**	**42.8**	**17.1**
Austria	**AT**	**67.2**	**22.9**	**4.0**
Poland	**PL**	**68.4**	**26.1**	**6.7**
Portugal	**PT**	**15.5**	**16.2**	**3.3**
Slovenia	**SI**	**68.9**	**16.6**	**3.9**
Slovakia	**SK**	**75.4**	**21.0**	**9.4**
Finland	**FI**	**41.3**	**46.8**	**15.9**
Sweden	**SE**	**53.5**	**35.6**	**14.4**
United Kingdom	**UK**	**43.8**	**41.5**	**13.3**
Norway	**NO**	**51.7**	**41.8**	**23.2**

Source: Eurostat - Community Statistics on Income and Living Conditions (SILC)

(:) Missing or not available

(*) Educational attainment of a respondent/person is the highest level of an educational programme that the person has successfully completed based on International Standard Classification of Education (ISCED-97)

(**) Include upper secondary and post-secondary non-tertiary education (ISCED levels 3 and 4)

(***) Include first and second stages of tertiary education (ISCED levels 5 and 6)

Table 4: Returns to education in European countries - OLS estimates

Countries		First specification*		Second specification**		Number of observations
		Ed_1	Ed_3	Ed_1	Ed_3	
Belgium	**BE**	**-0.154**	**0.243**	**-0.145**	**0.218**	**2353**
		(0.019)	*(0.015)*	*(0.019)*	*(0.016)*	
Czech Republic	**CZ**	**-0.342**	**0.441**	**-0.326**	**0.426**	**3087**
		(0.032)	*(0.022)*	*(0.033)*	*(0.023)*	
Denmark	**DK**	**-0.069**	**0.207**	**-0.06**	**0.185**	**1730**
		(0.026)	*(0.023)*	*(0.026)*	*(0.022)*	
Germany	**DE**	**-0.357**	**0.322**	**-0.342**	**0.318**	**4963**
		(0.051)	*(0.011)*	*(0.053)*	*(0.011)*	
Estonia	**EE**	**-0.203**	**0.336**	**-0.171**	**0.287**	**3202**
		(0.032)	*(0.021)*	*(0.032)*	*(0.022)*	
Greece	**GR**	**-0.179**	**0.221**	**-0.177**	**0.212**	**2849**
		(0.017)	*(0.015)*	*(0.017)*	*(0.016)*	
Spain	**ES**	**-0.157**	**0.313**	**-0.143**	**0.292**	**7579**
		(0.011)	*(0.012)*	*(0.011)*	*(0.012)*	
France	**FR**	**-0.097**	**0.421**	**-0.092**	**0.384**	**4527**
		(0.02)	*(0.014)*	*(0.02)*	*(0.014)*	
Ireland	**IE**	**-0.223**	**0.387**	**-0.206**	**0.365**	**1676**
		(0.031)	*(0.025)*	*(0.032)*	*(0.027)*	
Italy	**IT**	**-0.164**	**0.278**	**-0.153**	**0.241**	**1556**
		(0.018)	*(0.032)*	*(0.018)*	*(0.033)*	
Cyprus	**CY**	**-0.281**	**0.384**	**-0.271**	**0.368**	**3058**
		(0.025)	*(0.021)*	*(0.025)*	*(0.022)*	
Lithuania	**LT**	**-0.125**	**0.555**	**-0.117**	**0.492**	**3111**
		(0.043)	*(0.021)*	*(0.042)*	*(0.022)*	
Luxembourg	**LU**	**-0.312**	**0.456**	**-0.28**	**0.4**	**2258**
		(0.023)	*(0.022)*	*(0.023)*	*(0.024)*	
Hungary	**HU**	**-0.258**	**0.607**	**-0.226**	**0.586**	**2890**
		(0.023)	*(0.027)*	*(0.023)*	*(0.028)*	
Netherlands	**NL**	**-0.164**	**0.298**	**-0.154**	**0.28**	**1702**
		(0.018)	*(0.018)*	*(0.018)*	*(0.018)*	
Austria	**AT**	**-0.365**	**0.322**	**-0.339**	**0.299**	**1834**
		(0.045)	*(0.029)*	*(0.045)*	*(0.029)*	
Poland	**PL**	**-0.286**	**0.453**	**-0.261**	**0.416**	**7958**
		(0.024)	*(0.014)*	*(0.024)*	*(0.015)*	
Portugal	**PT**	**-0.298**	**0.684**	**-0.293**	**0.662**	**3193**
		(0.024)	*(0.03)*	*(0.024)*	*(0.03)*	
Slovenia	**SI**	**-0.36**	**0.608**	**-0.341**	**0.586**	**2964**
		(0.023)	*(0.029)*	*(0.025)*	*(0.03)*	
Slovakia	**SK**	**-0.322**	**0.305**	**-0.289**	**0.252**	**4372**
		(0.041)	*(0.021)*	*(0.041)*	*(0.022)*	
Finland	**FI**	**-0.088**	**0.315**	**-0.081**	**0.285**	**3058**
		(0.025)	*(0.015)*	*(0.025)*	*(0.016)*	
Sweden	**SE**	**-0.129**	**0.192**	**-0.105**	**0.149**	**1810**
		(0.043)	*(0.03)*	*(0.043)*	*(0.033)*	
United Kingdom	**UK**	**-0.245**	**0.307**	**-0.216**	**0.267**	**1303**
		(5.67)	*(3.63)*	*(4.91)*	*(7.10)*	
Norway	**NO**	**-0.117**	**0.2**	**-0.067**	**0.173**	**1452**
		(0.059)	*(0.026)*	*(0.061)*	*(0.027)*	
Full sample	**EUR24**	**-0.182**	**0.36**	**-0.165**	**0.328**	**64292**
		(0.005)	*(0.004)*	*(0.005)*	*(0.004)*	

Source: CRELL estimates based on data from Community Statistics on Income and Living Conditions (SILC)

Standard errors in parentheses

(*) Control variables are age, age squared, marital status, presence of children, household size, gender, and region of residence

(**) Control variables are those included in the first specification plus level of education for respondent parents, financial situation of the household when respondent was a teenager

Returns to education in Belgium

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.027**	**0.03**	**-0.132**
	(3.32)	*(3.67)*	*(4.75)*
Age squared	**0**	**0**	**0**
	(1.44)	*(1.72)*	*(4.58)*
Marital status (married)	**0.052**	**0.058**	**0.01**
	(3.11)	*(3.41)*	*(0.16)*
Household size	**0.001**	**0.001**	**-0.007**
	(0.09)	*(0.12)*	*(0.24)*
Children	**0.026**	**0.022**	**0.188**
	(1.29)	*(1.11)*	*(2.46)*
Ed $_{1\ father}$		**-0.002**	**-0.323**
		(0.12)	*(5.13)*
Ed $_{3\ father}$		**0.057**	**0.5**
		(2.41)	*(5.35)*
Ed $_{1\ mother}$		**-0.036**	**-0.493**
		(2.21)	*(8.62)*
Ed $_{3\ mother}$		**0.009**	**0.502**
		(0.39)	*(4.6)*
Financial problems during childhood		**0.035**	**0.163**
		(1.44)	*(1.88)*
Ed $_1$	**-0.154**	**-0.145**	
	(8.07)	*(7.55)*	
Ed $_3$	**0.243**	**0.218**	
	(16.18)	*(13.21)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.037**
			(2.68)
Single-parent family			**-0.219**
			(2.09)
Family with new partner			**-0.144**
			(0.63)
ρ			
Constant	**6.921**	**6.834**	
	(42.56)	*(41.55)*	
Number of observations	**2353**	**2353**	**2353**
R^2	**0.26**	**0.26**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Denmark

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.05**	**0.053**	**0.023**
	(4.03)	*(4.23)*	*(0.75)*
Age squared	**-0.001**	**-0.001**	**0**
	(3.8)	*(3.97)*	*(0.76)*
Marital status (married)	**0.105**	**0.101**	**0**
	(3.5)	*(3.31)*	*(0.0)*
Household size	**-0.036**	**-0.035**	**0.022**
	(1.4)	*(1.37)*	*(0.57)*
Children	**0.077**	**0.078**	**0.004**
	(1.58)	*(1.57)*	*(0.04)*
Ed $_{1\ father}$		**-0.041**	**-0.373**
		(1.88)	*(6.19)*
Ed $_{3\ father}$		**0.04**	**0.581**
		(1.27)	*(6.48)*
Ed $_{1\ mother}$		**0**	**0.042**
		(0.0)	*(0.25)*
Ed $_{3\ mother}$		**0.056**	**0.453**
		(1.7)	*(4.56)*
Financial problems during childhood		**0.085**	**-0.012**
		(1.18)	*(0.07)*
Ed $_1$	**-0.069**	**-0.06**	
	(2.64)	*(2.31)*	
Ed $_3$	**0.207**	**0.185**	
	(8.72)	*(8.1)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.043**
			(-1.8)
Single-parent family			**-0.28**
			(2.7)
Family with new partner			**-0.034**
			(0.16)
ρ			
Constant	**6.9**	**6.748**	
	(24.52)	*(22.71)*	
Number of observations	**1730**	**1730**	**1730**
R^2	**0.1**	**0.1**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Germany

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.059**	**0.058**	**0.07**
	(8.35)	*(8.23)*	*(3.74)*
Age squared	**-0.001**	**-0.001**	**-0.001**
	(7.1)	*(6.97)*	*(2.96)*
Marital status (married)	**0.094**	**0.095**	**0.063**
	(5.57)	*(5.67)*	*(1.34)*
Household size	**0.001**	**0.001**	**0.031**
	(0.14)	*(0.17)*	*(1.37)*
Children	**0.048**	**0.048**	**0.074**
	(2.63)	*(2.64)*	*(1.46)*
Ed $_{1\ father}$		**-0.028**	**-0.363**
		(1.48)	*(6.49)*
Ed $_{3\ father}$		**-0.007**	**0.506**
		(0.47)	*(11.89)*
Ed $_{1\ mother}$		**-0.062**	**-0.104**
		(2.1)	*(1.37)*
Ed $_{3\ mother}$		**0.011**	**0.326**
		(0.45)	*(4.82)*
Financial problems during childhood		**0.059**	**0.136**
		(2.86)	*(1.68)*
Ed $_1$	**-0.357**	**-0.342**	
	(6.92)	*(6.4)*	
Ed $_3$	**0.322**	**0.318**	
	(27.34)	*(28.69)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.066**
			(5.02)
Single-parent family			**-0.181**
			(2.34)
Family with new partner			**-0.123**
			(1.43)
ρ			
Constant	**6405**	**6360**	
	(42.78)	*(42.04)*	
Number of observations	**4963**	**4963**	**4963**
R^2	**0.28**	**0.29**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Estonia

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**-0.016**	**-0.01**	**0.097**
	(1.94)	*(1.19)*	*(4.57)*
Age squared	**0**	**0**	**0**
	(0.71)	*(0.37)*	*(3.68)*
Marital status (married)	**0.1**	**0.097**	**0.248**
	(4.81)	*(4.69)*	*(4.93)*
Household size	**-0.003**	**-0.002**	**-0.088**
	(0.37)	*(0.21)*	*(4.69)*
Children	**0.013**	**0.02**	**0.178**
	(0.54)	*(0.85)*	*(3.1)*
Ed $_{1\ father}$		**-0.086**	**-0.354**
		(3.66)	*(6.61)*
Ed $_{3\ father}$		**0.095**	**0.359**
		(2.67)	*(4.7)*
Ed $_{1\ mother}$		**-0.056**	**-0.205**
		(2.2)	*(3.25)*
Ed $_{3\ mother}$		**0.06**	**0.547**
		(1.71)	*(7.24)*
Financial problems during childhood		**0.033**	**0.435**
		(1.43)	*(4.96)*
Ed $_1$	**-0.203**	**-0.171**	
	(0.0)	*(0.0)*	
Ed $_3$	**0.336**	**0.287**	
	(15.43)	*(12.78)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.1**
			(7.06)
Single-parent family			**-0.039**
			(0.42)
Family with new partner			**-0.004**
			(0.02)
ρ			
Constant	**6.352**	**6.141**	
	(35.39)	*(33.97)*	
Number of observations	**3202**	**3202**	**3202**
R^2	**0.13**	**0.14**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Greece

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.055**	**0.057**	**0.042**
	(7.93)	*(8.11)*	*(1.85)*
Age squared	**0**	**0**	**-0.001**
	(5.85)	*(6.03)*	*(2.07)*
Marital status (married)	**0.082**	**0.084**	**-0.002**
	(4.19)	*(4.27)*	*(0.03)*
Household size	**-0.008**	**-0.008**	**-0.113**
	(1.26)	*(1.24)*	*(5.31)*
Children	**0.057**	**0.057**	**0.279**
	(2.96)	*(2.99)*	*(4.39)*
Ed $_{1\ father}$		**0.001**	**-0.43**
		(0.03)	*(5.78)*
Ed $_{3\ father}$		**0.02**	**0.262**
		(0.6)	*(2.31)*
Ed $_{1\ mother}$		**-0.012**	**-0.487**
		(0.53)	*(7.84)*
Ed $_{3\ mother}$		**0.078**	**0.363**
		(1.81)	*(2.4)*
Financial problems during childhood		**-0.012**	**0.141**
		(0.43)	*(0.8)*
Ed $_1$	**-0.179**	**-0.177**	
	(10.5)	*(10.26)*	
Ed $_3$	**0.221**	**0.212**	
	(14.13)	*(13.24)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.139**
			(8.22)
Single-parent family			**-0.284**
			(1.6)
Family with new partner			**-0.021**
			(0.04)
ρ			
Constant	**5.502**	**5.482**	
	(38.54)	*(37.71)*	
Number of observations	**2849**	**2849**	**2849**
R^2	**0.29**	**0.29**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Spain

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.036**	**0.038**	**0.028**
	(7.74)	*(8.15)*	*(1.97)*
Age squared	**0**	**0**	**0**
	(5.49)	*(5.85)*	*(2.95)*
Marital status (married)	**0.125**	**0.132**	**-0.059**
	(10.41)	*(11.04)*	*(1.67)*
Household size	**-0.018**	**-0.018**	**-0.101**
	(3.83)	*(4.01)*	*(7.48)*
Children	**0.07**	**0.07**	**0.175**
	(5.68)	*(5.69)*	*(4.78)*
Ed $_{1\ father}$		**-0.016**	**-0.683**
		(0.84)	*(12.89)*
Ed $_{3\ father}$		**0.09**	**0.417**
		(3.64)	*(5.78)*
Ed $_{1\ mother}$		**-0.069**	**-0.264**
		(4.08)	*(5.67)*
Ed $_{3\ mother}$		**0.019**	**0.507**
		(0.6)	*(5.16)*
Financial problems during childhood		**0.015**	**0.275**
		(0.64)	*(3.48)*
Ed $_1$	**-0.157**	**-0.143**	
	(13.44)	*(12.01)*	
Ed $_3$	**0.313**	**0.292**	
	(24.97)	*(23.31)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.122**
			(16.34)
Single-parent family			**-0.089**
			(1.25)
Family with new partner			**-0.718**
			(1.88)
ρ			
Constant	**6.021**	**6.023**	
	(62.5)	*(61.13)*	
Number of observations	**7579**	**7579**	**7579**
R^2	**0.28**	**0.29**	

Source: CRELL estimates based on EU-SILC data

Returns to education in France

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.04**	**0.046**	**-0.058**
	(5.43)	*(6.17)*	*(2.86)*
Age squared	**0**	**0**	**0**
	(3.48)	*(4.11)*	*(1.81)*
Marital status (married)	**0.076**	**0.079**	**0.037**
	(4.98)	*(5.13)*	*(0.89)*
Household size	**-0.01**	**-0.011**	**-0.043**
	(1.17)	*(1.3)*	*(2.05)*
Children	**0.075**	**0.079**	**0.177**
	(3.82)	*(4.0)*	*(3.3)*
Ed $_{1\ father}$		**-0.083**	**-0.45**
		(3.43)	*(5.87)*
Ed $_{3\ father}$		**0.016**	**0.349**
		(0.47)	*(3.37)*
Ed $_{1\ mother}$		**-0.059**	**-0.344**
		(3.78)	*(7.89)*
Ed $_{3\ mother}$		**0.014**	**0.415**
		(0.4)	*(4.17)*
Financial problems during childhood		**0.075**	**0.225**
		(2.49)	*(1.98)*
Ed $_1$	**-0.097**	**-0.093**	
	(4.81)	*(4.54)*	
Ed $_3$	**0.421**	**0.384**	
	(29.47)	*(25.89)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.071**
			(7.99)
Single-parent family			**-0.32**
			(3.8)
Family with new partner			**-0.145**
			(0.96)
ρ			
Constant	**6.489**	**6.39**	
	(44.9)	*(42.45)*	
Number of observations	**4975**	**4975**	**4527**
R^2	**0.25**	**0.26**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Ireland

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.046**	**0.048**	**0.003**
	(4.3)	*(4.53)*	*(0.09)*
Age squared	**0**	**0**	**0**
	(3.41)	*(3.6)*	*(0.71)*
Marital status (married)	**0.153**	**0.153**	**0.125**
	(5.76)	*(5.79)*	*(1.71)*
Household size	**0.003**	**0.002**	**-0.113**
	(0.22)	*(0.18)*	*(3.9)*
Children	**0.025**	**0.025**	**0.219**
	(0.8)	*(0.81)*	*(2.65)*
Ed $_{1\ father}$		**-0.067**	**-0.396**
		(1.74)	*(4.17)*
Ed $_{3\ father}$		**-0.017**	**0.457**
		(0.31)	*(2.99)*
Ed $_{1\ mother}$		**-0.054**	**-0.601**
		(1.85)	*(8.91)*
Ed $_{3\ mother}$		**-0.013**	**0.414**
		(0.29)	*(2.68)*
Financial problems during childhood		**0.051**	**0.058**
		(0.95)	*(0.33)*
Ed $_1$	**-0.223**	**-0.206**	
	(7.04)	*(6.4)*	
Ed $_3$	**0.387**	**0.365**	
	(15.52)	*(15.52)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.052**
			(4.38)
Single-parent family			**-0.453**
			(1.62)
Family with new partner			**-8.957**
			(56.56)
ρ			
Constant	**6.604**	**6.573**	
	(30.25)	*(29.24)*	
Number of observations	**1681**	**1681**	**1677**
R^2	**0.27**	**0.27**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Italy

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.028**	**0.029**	**-0.066**
	(2.87)	*(2.95)*	*(1.92)*
Age squared	**0**	**0**	**0**
	(1.93)	*(1.98)*	*(1.71)*
Marital status (married)	**0.066**	**0.062**	**-0.096**
	(3.25)	*(0.0)*	*(0.0)*
Household size	**-0.006**	**-0.004**	**-0.022**
	(0.6)	*(0.42)*	*(0.68)*
Children	**0.093**	**0.09**	**0.137**
	(3.8)	*(3.72)*	*(1.69)*
Ed $_{1\ father}$		**-0.038**	**-0.717**
		(1.3)	*(7.76)*
Ed $_{3\ father}$		**0.123**	**1.086**
		(1.32)	*(3.65)*
Ed $_{1\ mother}$		**-0.036**	**-0.402**
		(1.57)	*(5.55)*
Ed $_{3\ mother}$		**-0.001**	**-0.332**
		(0.01)	*(0.75)*
Financial problems during childhood		**0.018**	**0.286**
		(0.79)	*(3.13)*
Ed $_1$	**-0.164**	**-0.153**	
	(8.92)	*(8.12)*	
Ed $_3$	**0.278**	**0.241**	
	(8.52)	*(7.16)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.106**
			(5.49)
Single-parent family			**-0.092**
			(0.64)
Family with new partner			**0.085**
			(0.32)
ρ			
Constant	**6.773**	**6.776**	
	(33.52)	*(33.06)*	
Number of observations	**1556**	**1556**	**1556**
R^2	**0.21**	**0.22**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Cyprus

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.023**	**0.024**	**0.055**
	(2.49)	*(2.61)*	*(2.61)*
Age squared	**0**	**0**	**-0.001**
	(0.59)	*(0.67)*	*(3.02)*
Marital status (married)	**0.149**	**0.15**	**-0.149**
	(4.84)	*(4.88)*	*(2.33)*
Household size	**-0.011**	**-0.011**	**-0.047**
	(1.28)	*(1.29)*	*(2.33)*
Children	**0.119**	**0.121**	**0.328**
	(4.02)	*(4.1)*	*(5.14)*
Ed $_{1\ father}$		**-0.084**	**-0.525**
		(2.57)	*(8.26)*
Ed $_{3\ father}$		**-0.056**	**0.698**
		(1.25)	*(6.03)*
Ed $_{1\ mother}$		**0.018**	**-0.258**
		(0.51)	*(4.0)*
Ed $_{3\ mother}$		**0.09**	**0.213**
		(1.69)	*(1.44)*
Financial problems during childhood		**0.099**	**0.484**
		(2.47)	*(3.66)*
Ed $_1$	**-0.281**	**-0.271**	
	(11.12)	*(10.66)*	
Ed $_3$	**0.384**	**0.368**	
	(17.62)	*(16.06)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.107**
			(9.32)
Single-parent family			**0.064**
			(0.56)
Family with new partner			**-0.573**
			(1.23)
ρ			
Constant	**6.202**	**6.121**	
	(34.05)	*(32.76)*	
Number of observations	**3058**	**3058**	**3058**
R^2	**0.24**	**0.25**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Lithuania

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.009**	**0.021**	**0.043**
	(0.9)	*(2.03)*	*(1.81)*
Age squared	**0**	**0**	**0**
	(0.69)	*(1.46)*	*(1.31)*
Marital status (married)	**0.12**	**0.12**	**-0.037**
	(4.94)	*(5.02)*	*(0.64)*
Household size	**-0.017**	**-0.016**	**-0.084**
	(1.75)	*(1.67)*	*(3.96)*
Children	**-0.009**	**-0.009**	**0.112**
	(0.35)	*(0.38)*	*(1.84)*
Ed $_{1\ father}$		**-0.1**	**-0.308**
		(3.6)	*(5.08)*
Ed $_{3\ father}$		**0.049**	**0.463**
		(1.17)	*(4.52)*
Ed $_{1\ mother}$		**-0.021**	**-0.219**
		(0.81)	*(3.86)*
Ed $_{3\ mother}$		**0.151**	**0.551**
		(3.65)	*(5.25)*
Financial problems during childhood		**0.064**	**0.163**
		(2.35)	*(1.54)*
Ed $_1$	**-0.125**	**-0.117**	
	(2.87)	*(2.74)*	
Ed $_3$	**0.555**	**0.492**	
	(25.55)	*(21.55)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.039**
			(3.04)
Single-parent family			**-0.147**
			(1.38)
Family with new partner			**-0.275**
			(2.14)
ρ			
Constant	**5.249**	**4.93**	
	(24.28)	*(22.51)*	
Number of observations	**3111**	**3111**	**3111**
R^2	**0.21**	**0.22**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Luxembourg

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.047**	**0.048**	**-0.022**
	(5.06)	*(5.2)*	*(0.86)*
Age squared	**0**	**0**	**0**
	(2.67)	*(2.7)*	*(1.08)*
Marital status (married)	**0.052**	**0.055**	**0.027**
	(2.46)	*(2.61)*	*(0.46)*
Household size	**-0.011**	**-0.008**	**-0.072**
	(1.06)	*(0.8)*	*(2.79)*
Children	**0.007**	**0.008**	**0.087**
	(0.27)	*(0.29)*	*(1.26)*
Ed $_{1\ father}$		**-0.066**	**-0.565**
		(2.88)	*(9.93)*
Ed $_{3\ father}$		**0.019**	**0.546**
		(0.52)	*(4.82)*
Ed $_{1\ mother}$		**-0.087**	**-0.569**
		(3.5)	*(8.74)*
Ed $_{3\ mother}$		**0.01**	**0.841**
		(0.23)	*(6.02)*
Financial problems during childhood		**0.068**	**-0.122**
		(1.74)	*(0.97)*
Ed $_1$	**-0.312**	**-0.28**	
	(13.56)	*(11.87)*	
Ed $_3$	**0.456**	**0.4**	
	(20.14)	*(16.68)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.114**
			(8.1)
Single-parent family			**-0.222**
			(2.2)
Family with new partner			**0.035**
			(0.12)
ρ			
Constant	**6.709**	**6.702**	
	(36.07)	*(35.51)*	
Number of observations	**2274**	**2274**	**2258**
R^2	**0.41**	**0.43**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Hungary

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.011**	**0.014**	**-0.074**
	(1.21)	*(1.45)*	*(2.92)*
Age squared	**0**	**0**	**0.001**
	(0.8)	*(0.8)*	*(2.95)*
Marital status (married)	**0.125**	**0.124**	**0.105**
	(5.9)	*(5.85)*	*(1.9)*
Household size	**-0.034**	**-0.034**	**-0.101**
	(3.96)	*(3.94)*	*(4.52)*
Children	**0.039**	**0.036**	**0.308**
	(1.69)	*(1.58)*	*(5.0)*
Ed $_{1\ father}$		**-0.075**	**-0.371**
		(3.53)	*(6.83)*
Ed $_{3\ father}$		**0.047**	**0.839**
		(1.09)	*(8.57)*
Ed $_{1\ mother}$		**-0.091**	**-0.219**
		(3.77)	*(3.39)*
Ed $_{3\ mother}$		**-0.066**	**0.709**
		(1.18)	*(5.35)*
Financial problems during childhood		**0.033**	**-0.002**
		(1.23)	*(0.02)*
Ed $_1$	**-0.258**	**-0.226**	
	(11.08)	*(9.54)*	
Ed $_3$	**0.607**	**0.586**	
	(22.3)	*(20.8)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.172**
			(9.8)
Single-parent family			**-0.144**
			(1.19)
Family with new partner			**-0.263**
			(1.88)
ρ			
Constant	**5.732**	**5.642**	
	(29.79)	*(29.18)*	
Number of observations	**2890**	**2890**	**2890**
R^2	**0.28**	**0.29**	

Source: CRELL estimates based on EU-SILC data

Returns to education in the Netherlands

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.051**	**0.05**	**0.026**
	(5.68)	*(5.54)*	*(0.85)*
Age squared	**0**	**0**	**0**
	(4.29)	*(4.1)*	*(0.74)*
Marital status (married)	**0.086**	**0.091**	**0.116**
	(4.05)	*(4.31)*	*(1.46)*
Household size	**0.012**	**0.012**	**-0.008**
	(1.04)	*(1.03)*	*(-0.19)*
Children	**0.046**	**0.046**	**-0.145**
	(1.43)	*(1.44)*	*(-1.32)*
Ed $_{1\ father}$		**-0.001**	**-0.265**
		(0.06)	*(3.6)*
Ed $_{3\ father}$		**0.064**	**0.328**
		(2.18)	*(3.22)*
Ed $_{1\ mother}$		**-0.043**	**-0.346**
		(2.25)	*(5.24)*
Ed $_{3\ mother}$		**-0.039**	**0.629**
		(1.12)	*(4.15)*
Financial problems during childhood		**0.064**	**0.425**
		(2.06)	*(3.39)*
Ed $_1$	**-0.164**	**-0.154**	
	(9.12)	*(8.35)*	
Ed $_3$	**0.298**	**0.28**	
	(16.32)	*(15.39)*	
Regional dummies	***NO***	***NO***	***NO***
Number of siblings			**-0.076**
			(4.79)
Single-parent family			**-0.134**
			(0.87)
Family with new partner			**-0.066**
			(0.31)
ρ			
Constant	**6.548**	**6.499**	
	(37.67)	*(37.15)*	
Number of observations	**1702**	**1702**	**1702**
R^2	**0.32**	**0.33**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Austria

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.006**	**0.011**	**0.008**
	(0.48)	*(0.81)*	*(0.26)*
Age squared	**0**	**0**	**0**
	(0.17)	*(0.15)*	*(0.06)*
Marital status (married)	**0.051**	**0.054**	**-0.121**
	(1.49)	*(1.57)*	*(1.75)*
Household size	**-0.025**	**-0.025**	**-0.036**
	(2.16)	*(2.08)*	*(1.32)*
Children	**0.081**	**0.078**	**0.257**
	(2.09)	*(2.02)*	*(3.29)*
Ed $_{1\ father}$		**-0.122**	**-0.348**
		(4.81)	*(6.0)*
Ed $_{3\ father}$		**0.122**	**0.304**
		(1.82)	*(1.76)*
Ed $_{1\ mother}$		**0.041**	**-0.189**
		(1.01)	*(1.32)*
Ed $_{3\ mother}$		**-0.013**	**0.967**
		(0.11)	*(4.16)*
Financial problems during childhood		**0.023**	**-0.005**
		(0.46)	*(0.04)*
Ed $_1$	**-0.365**	**-0.339**	
	(8.02)	*(7.42)*	
Ed $_3$	**0.322**	**0.299**	
	(10.86)	*(10.11)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.109**
			(7.09)
Single-parent family			**-0.217**
			(1.7)
Family with new partner			**-0.017**
			(0.09)
ρ			
Constant	**7.346**	**7.286**	
	(26.56)	*(25.07)*	
Number of observations	**1834**	**1834**	**1834**
R^2	**0.14**	**0.15**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Poland

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.022**	**0.026**	**-0.062**
	(3.54)	*(4.23)*	*(3.8)*
Age squared	**0**	**0**	**0.001**
	(1.73)	*(2.12)*	*(3.5)*
Marital status (married)	**0.09**	**0.09**	**-0.01**
	(5.63)	*(5.65)*	*(0.24)*
Household size	**-0.032**	**-0.026**	**-0.103**
	(6.83)	*(5.5)*	*(8.35)*
Children	**0.045**	**0.037**	**0.115**
	(2.86)	*(2.34)*	*(2.93)*
Ed $_{1\ father}$		**-0.06**	**-0.354**
		(3.51)	*(8.71)*
Ed $_{3\ father}$		**0.032**	**0.806**
		(1.05)	*(11.58)*
Ed $_{1\ mother}$		**-0.053**	**-0.264**
		(3.03)	*(6.48)*
Ed $_{3\ mother}$		**0.039**	**0.64**
		(1.17)	*(7.51)*
Financial problems during childhood		**0.023**	**-0.035**
		(0.79)	*(0.42)*
Ed $_1$	**-0.286**	**-0.261**	
	(11.65)	*(10.52)*	
Ed $_3$	**0.453**	**0.416**	
	(32.1)	*(27.73)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.113**
			(13.0)
Single-parent family			**-0.492**
			(6.87)
Family with new partner			**0.087**
			(0.42)
ρ			
Constant	**5.338**	**5.232**	
	(43.11)	*(41.62)*	
Number of observations	**7958**	**7958**	**7958**
R^2	**0.19**	**0.2**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Portugal

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.048**	**0.05**	**-0.02**
	(6.29)	*(6.52)*	*(0.91)*
Age squared	**0**	**0**	**0**
	(4.97)	*(5.19)*	*(0.52)*
Marital status (married)	**0.07**	**0.069**	**-0.197**
	(3.45)	*(3.4)*	*(3.41)*
Household size	**-0.025**	**-0.024**	**-0.088**
	(3.74)	*(3.58)*	*(4.10)*
Children	**0.073**	**0.071**	**0.174**
	(3.53)	*(3.44)*	*(2.81)*
Ed $_{1\ father}$		**0.017**	**-0.494**
		(0.41)	*(4.01)*
Ed $_{3\ father}$		**0.203**	**0.566**
		(2.96)	*(3.22)*
Ed $_{1\ mother}$		**-0.062**	**-0.356**
		(1.56)	*(3.06)*
Ed $_{3\ mother}$		**-0.118**	**0.598**
		(1.59)	*(3.16)*
Financial problems during childhood		**0.06**	**0.851**
		(2.46)	*(6.46)*
Ed $_1$	**-0.298**	**-0.293**	
	(12.36)	*(12.11)*	
Ed $_3$	**0.684**	**0.662**	
	(22.74)	*(21.8)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.164**
			(11.88)
Single-parent family			**-0.281**
			(2.03)
Family with new partner			**0.251**
			(0.98)
ρ			
Constant	**5.518**	**5.461**	
	(36.15)	*(35.37)*	
Number of observations	**3289**	**3289**	**3193**
R^2	**0.41**	**0.41**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Slovenia

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.059**	**0.062**	**-0.076**
	(4.71)	*(4.91)*	*(2.77)*
Age squared	**-0.001**	**-0.001**	**0.001**
	(3.69)	*(3.85)*	*(2.67)*
Marital status (married)	**-0.049**	**-0.047**	**0.096**
	(2.05)	*(1.97)*	*(1.77)*
Household size	**-0.01**	**-0.007**	**-0.052**
	(1.12)	*(0.78)*	*(2.21)*
Children	**0.037**	**0.034**	**0.215**
	(1.36)	*(1.24)*	*(3.41)*
Ed $_{1\ father}$		**-0.026**	**-0.522**
		(1.02)	*(9.01)*
Ed $_{3\ father}$		**0.076**	**0.326**
		(1.59)	*(2.26)*
Ed $_{1\ mother}$		**-0.043**	**-0.434**
		(1.63)	*(7.37)*
Ed $_{3\ mother}$		**-0.105**	**0.932**
		(1.18)	*(4.16)*
Financial problems during childhood		**0.008**	**0.19**
		(0.28)	*(1.78)*
Ed $_1$	**-0.36**	**-0.341**	
	(15.11)	*(13.65)*	
Ed $_3$	**0.608**	**0.586**	
	(20.53)	*(19.11)*	
Regional dummies	***NO***	***NO***	***NO***
Number of siblings			**-0.121**
			(7.53)
Single-parent family			**-0.014**
			(0.13)
Family with new partner			**-0.338**
			(1.7)
ρ			
Constant	**5.501**	**5.456**	
	(21.62)	*(21.33)*	
Number of observations	**2764**	**2764**	**2764**
R^2	**0.24**	**0.25**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Slovakia

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.013**	**0.015**	**-0.06**
	(1.69)	*(1.98)*	*(2.83)*
Age squared	**0**	**0**	**0.001**
	(1.31)	*(1.32)*	*(3.4)*
Marital status (married)	**0.014**	**0.021**	**-0.109**
	(0.66)	*(1.01)*	*(1.9)*
Household size	**-0.016**	**-0.012**	**-0.087**
	(2.64)	*(1.94)*	*(4.94)*
Children	**0.044**	**0.037**	**0.363**
	(2.27)	*(1.94)*	*(6.39)*
Ed $_{1\ father}$		**-0.069**	**-0.56**
		(3.98)	*(10.56)*
Ed $_{3\ father}$		**0.104**	**0.693**
		(3.01)	*(9.04)*
Ed $_{1\ mother}$		**-0.055**	**-0.342**
		(2.38)	*(3.82)*
Ed $_{3\ mother}$		**0.145**	**0.707**
		(2.89)	*(6.67)*
Financial problems during childhood		**-0.019**	**-0.025**
		(0.66)	*(0.23)*
Ed $_1$	**-0.322**	**-0.289**	
	(7.84)	*(6.99)*	
Ed $_3$	**0.305**	**0.252**	
	(13.93)	*(11.3)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.08**
			(5.64)
Single-parent family			**-0.036**
			(0.34)
Family with new partner			**0.561**
			(2.39)
ρ			
Constant	**5.446**	**5.376**	
	(35.5)	*(34.69)*	
Number of observations	**4372**	**4372**	**4372**
R^2	**0.09**	**0.1**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Finland

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.011**	**0.01**	**0.073**
	(1.48)	*(1.4)*	*(3.52)*
Age squared	**0**	**0**	**-0.001**
	(0.51)	*(0.04)*	*(3.16)*
Marital status (married)	**0.048**	**0.045**	**0.13**
	(2.64)	*(2.51)*	*(2.54)*
Household size	**-0.015**	**-0.014**	**-0.037**
	(1.45)	*(1.41)*	*(1.45)*
Children	**0.058**	**0.057**	**0.19**
	(2.21)	*(2.2)*	*(2.82)*
Ed $_{1\ father}$		**-0.027**	**-0.258**
		(1.37)	*(4.6)*
Ed $_{3\ father}$		**0.072**	**0.433**
		(2.32)	*(5.26)*
Ed $_{1\ mother}$		**-0.059**	**-0.08**
		(3.1)	*(1.53)*
Ed $_{3\ mother}$		**0.074**	**0.404**
		(2.38)	*(4.8)*
Financial problems during childhood		**0.024**	**0.169**
		(1.28)	*(2.48)*
Ed $_1$	**-0.088**	**-0.081**	
	(3.42)	*(3.16)*	
Ed $_3$	**0.315**	**0.285**	
	(19.87)	*(16.91)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			**-0.068**
			(5.19)
Single-parent family			**-0.206**
			(2.49)
Family with new partner			**-0.221**
			(1.24)
ρ			
Constant	**7.169**	**7.138**	
	(49.84)	*(49.52)*	
Number of observations	**3176**	**3176**	**3176**
R^2	**0.19**	**0.21**	

Source: CRELL estimates based on EU-SILC data

Returns to education in Sweden

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.075**	**0.079**	**0**
	(5.39)	*(5.7)*	*(0.0)*
Age squared	**-0.001**	**-0.001**	**0**
	(4.77)	*(4.96)*	*(0.28)*
Marital status (married)	**0.073**	**0.071**	**0.185**
	(2.32)	*(2.27)*	*(2.88)*
Household size	**-0.047**	**-0.046**	**-0.083**
	(1.78)	*(1.76)*	*(2.14)*
Children	**0.009**	**0.01**	**0.209**
	(0.17)	*(0.19)*	*(2.14)*
Ed $_{1\ father}$		**-0.08**	**-0.515**
		(1.86)	*(5.98)*
Ed $_{3\ father}$		**0.001**	**0.158**
		(0.02)	*(1.37)*
Ed $_{1\ mother}$		**-0.078**	**-0.402**
		(2.45)	*(6.31)*
Ed $_{3\ mother}$		**0.033**	**0.339**
		(0.51)	*(3.11)*
Financial problems during childhood		**0.093**	**0.456**
		(1.52)	*(3.09)*
Ed $_1$	**-0.129**	**-0.105**	
	(2.96)	*(2.4)*	
Ed $_3$	**0.192**	**0.149**	
	(6.33)	*(4.47)*	
Regional dummies	***YES***	***YES***	***YES***
Number of siblings			
Single-parent family			**-0.245**
			(2.61)
Family with new partner			**-0.339**
			(2.11)
ρ			
Constant	**6.014**	**5.91**	
	(19.98)	*(19.36)*	
Number of observations	**1810**	**1810**	**1810**
R^2	**0.08**	**0.09**	

Source: CRELL estimates based on EU-SILC data

Returns to education in the United Kingdom

	OLS_1 ω_i	OLS_2 ω_i	Ordered probit *Ed*
Age	**0.047**	**0.05**	**0.027**
	(3.57)	*(3.77)*	*(0.95)*
Age squared	**-0.001**	**-0.001**	**-0.001**
	(3.56)	*(3.66)*	*(1.62)*
Marital status (married)	**0.073**	**0.076**	**0.153**
	(1.91)	*(2.01)*	*(2.05)*
Household size	**-0.041**	**-0.042**	**-0.143**
	(1.98)	*(2.01)*	*(3.62)*
Children	**0.078**	**0.092**	**0.352**
	(1.58)	*(1.89)*	*(3.69)*
Ed $_{1\ father}$		**-0.088**	**-0.289**
		(2.05)	*(3.34)*
Ed $_{3\ father}$		**0.047**	**0.396**
		(0.68)	*(2.96)*
Ed $_{1\ mother}$		**-0.091**	**-0.519**
		(2.18)	*(6.8)*
Ed $_{3\ mother}$		**-0.009**	**0.228**
		(0.13)	*(1.53)*
Financial problems during childhood		**0.078**	**-0.054**
		(0.85)	*(0.28)*
Ed $_1$	**-0.245**	**-0.216**	
	(5.67)	*(4.91)*	
Ed $_3$	**0.307**	**0.267**	
	(8.4)	*(7.1)*	
Regional dummies			
Number of siblings			**-0.083**
			(4.67)
Single-parent family			**-0.085**
			(0.44)
Family with new partner			
ρ			
Constant	**6.878**	**6.832**	
	(25.16)	*(23.15)*	
Number of observations	**1303**	**1303**	**1303**
R^2	**0.13**	**0.14**	

Source: CRELL estimates based on EU-SILC data

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Abstract
Within human capital literature, an important line of empirical research is concerned with estimating the returns to human capital investments; above all, the returns to education have received considerable attention lately. Typically, empirical work is focused on establishing relations between human capital indicators such as education and training, on the one hand, and outcomes as wages, employment opportunities or job quality on the other hand. The private rate of return to education is by far the most analysed of the returns. Despite the existence of many comparative studies, there is still a great demand for research evidence on the private returns to education. In this paper, we contribute to the debate on returns to education by estimating the wage differentials associated with educational attainment for 24 European countries, using the results of the European Community Statistics on Income and Living Conditions (EU-SILC).

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