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Education and Earnings Differentials: The Role of Family Background Across European Countries

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**Education and Earnings Differentials:
The Role of Family Background Across European Countries**

by

Rosalia Castellano*, Gennaro Punzo**

Abstract

The crucial aim of this paper is to investigate, in a generational perspective, the effects of specific dimensions of human capital on individuals earnings and earnings differentials across a selected set of six developed economies of Western Europe with structural differences in their formal education systems and, more generally, in their institutional frameworks. In a cross-country comparison, we intend to inspect how formal education and work experience stand for critical predictors of inequality between and within earner-groups and/or educational groups. In this light, the role of family background on individuals' earnings in relation to the two main occupational status (*i.e.*, wage-employment rather than self-employment) and, in particular, the impact of parental education and abilities on children's human capital are argued as well. In order to look into the critical determinants of intergenerational im-mobility, in terms of educational and employment decision-making process, and to what extent they vary across countries, two-stage structural probit models with quantile regressions in the second stage are estimated. As we expect that individual earnings also depend on a range of personal and structural factors and on the family background as well, a set of human capital earnings equations, based on extensions of Mincer models, are estimated by the main employment status. Microdata come from EU-SILC survey, the main new reference source for comparative statistics at European level, which also detects a set of retrospective parental information allowing to account for potential generational changes over time. Briefly, empirical results are interesting, taken as a whole. Although not a few determinants appear to be relatively similar across countries, wider national-specific differentials are drawn. Most of all, it emerges how each component of human capital differently affects individuals' earnings and earnings inequality across European countries and, most importantly, how this impact differs along the whole earnings distributions. Also, quite dissimilar patterns of influence of family-specific background on children's outcomes across countries is sketched.

1. Background and Introduction

Since the 1990s most of developing and developed countries have been experimenting the controversial effects of globalisation defined as external opening and increased roles of markets domestically. Though the impact of globalisation is quite unsatisfactory in lowering income inequalities and poverty levels in developing countries (or even negligible in less-developed economies), it results in

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a divisive debate for developed societies so far. Actually, the economic dimension of globalisation is often regarded as one of the culprits of increasing income inequality in several developed countries (Pereira and Martins, 2000; Dreher and Gaston, 2008) so much that both researchers and policy-makers have constantly been emphasizing “the importance of education as a determinant of long-run growth in a knowledge-based economy” (OECD, 1997). Thus, policies aimed at improving average education levels in a country are expected to reduce earnings inequalities by increasing the proportion of high-remunerated workers, although, as highlighted by Budria and Pereira (2009), the final impacts on overall inequality are frequently unclear and ambiguous. However, priority has to be given to human capital investments in order to address “the needs of those whose knowledge and skills are insufficient for full participation in the knowledge-based economy” (OECD, 1996).

Away back in 1962, Becker already stressed how the human capital – in terms of knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity – significantly influences the future potential earnings. In other words, individual income depends on productivity levels which, in turn, depend on the knowledge, skills and abilities necessary to perform the job (Gokcekus and Muedin, 2008) and on the different ways in which they are nurtured and combined. Starting from the seminal works by Mincer (1958; 1962; 1974) and Becker (1962; 1964; 1967), a great deal of researchers (Willis and Rosen, 1979; Behrman and Birdsall, 1983; Card and Krueger, 1992) – conscious of the fact that disparities in earnings reflect differences in productivity due to dissimilar educational or other measurable/unmeasurable skill levels – has widely delved into theories and approaches of human capital in the attempt at getting more accurate conceptual frameworks and methodological strategies in estimating the effects of several individual dimensions and social settings on rates of return to education. In other words, several scholars have recognized over time the heterogeneous and dynamic nature of human capital, regarded as accumulation and interaction of more intangible assets with the capacity to support or enhance productivity and employability. In this light, the formal education at different levels (*i.e.*, early childhood, school-based compulsory education, post-compulsory and tertiary education, etc.), the non-formal enterprise-based training (or public labour market training) and the experience acquired in working life are certainly the most relevant and explored life-wide settings to human capital formation.

In addition, we believe that the large amount of learning that takes place in some more informal environments of families or, more generally, communities can not be neglected in the field of human capital. Indeed, several economists and sociologists (Atkinson et al., 1983; Björklund and Jäntti, 1997; Breen and Goldthorpe, 2001; Erikson and Goldthorpe, 2002; Mazumder, 2005) agree with the idea that the family of origin, considered as a channel through which values and orientations can be passed on to individuals, plays a crucial role for understanding intergenerational transmission of advantages and/or disadvantages. In other words, learning and preparation for learning, that is nurtured within the family and early child care settings, may provide an important basis for future acquisition of human capital. As they say, cultural and human capital, in terms of knowledge, abilities, skills and talents, if transmitted across generations, may enhance the offspring’s ability to perform specific tasks (Becker, 1991; Foley, 2006; Jaeger and Holm, 2007). We believe that as an easier access to parents’ financial and material resources may relax capital market constraints, so a privileged chance to inherit human knowledge, competence and experience might characterize children’s abilities (Dunn and Holtz-Eakin, 2000) and possibly affect their occupational decision-making process (Castellano and Punzo, 2010). As a result, ties and interaction dynamics, operating in different spheres of the same family, in terms of time, efforts and resources that parents invest in their children (Coleman, 1990), or of neighbourhood and society at large (Allen, 2000), matter in a generational perspective as well. In particular, Lang and Ruud (1986), Altonji and Dunn (1996), Ashenfelter and Zimmerman (1997) have been amongst the pioneers to deepen the role of family background in the human capital function and to give some empirical evidence on economic rates of return to education. Briefly, in a household context, parents spread principles, ideals, resources and different forms of capital to their offspring, though the mechanisms of transmission strongly

vary over family components and, even more so, across countries where structural and institutional differences exist. As stressed by OECD (1997), the degree to which settings of different types encourage the creation of human capital also largely depends on specific features of each country (*i.e.*, ways in which formal education and training are organised) as well as on internal demand for skills and, so, on peculiarities of national labour markets. Consequently, analysing the parental influence on children's future opportunities becomes rather complex in a cross-country perspective.

In this light, the crucial aim of our work is to investigate, in a generational perspective, the effects of some measurable dimensions of human capital (*i.e.*, education, health, labour experience) on individual earnings and employment decision-making process across a selected set of six developed economies of Western Europe (*i.e.*, Germany, Denmark, Spain, France, Italy and United Kingdom) with structural differences in their formal educational systems and, more generally, in their institutional frameworks. In a cross-country comparison, we are set to inspect how formal education and work experience stand for critical predictors of inequality *between* and *within* earner-groups and/or educational groups. The role of family background on individuals' earnings in relation to the two main occupational status (*i.e.*, wage-employment rather than self-employment) and, in particular, the impact of parental education and abilities on children's human capital (*i.e.*, orienting their schooling or employment opportunities) are widely argued as well.

2. EU-SILC as a comparable European data source. A harmonized assessment of education

Our analysis draws upon the 2005 *European-Union Survey on Income and Living Conditions* (EU-SILC), the main current reference source for timely, comparable and multidimensional statistics on a substantial range of socio-economic topics both at household and individual level. EU-SILC project is coordinated by Eurostat and it has been developed on the experience of the pioneer ECHP, with a similar in scope and content, as a flexible comparable instrument across European countries¹. In the EU-SILC project, international comparability is assured by a common framework which defines, among other things, a harmonised set of primary and secondary target variables, a recommended design for implementing the survey in each EU member country, common guidelines and procedures for imputation and weighting, universal concepts and classifications. However, flexibility in EU-SILC implementation at a country level, especially in data sources, is also guaranteed in order to anchor the survey in each National Statistical System.

In this work, we refer to wave 2005 – the second one from the first launch of the EU-SILC project, carried out in 26 European countries (all Member States, except for Bulgaria, Malta and Romania, plus Island and Norway), since it includes the special module “Intergenerational transmission of poverty” which collects parental information for each respondent aged over 24 and less than 66 years during his/her childhood period (between ages of 12 and 16) and these retrospective data are also available on whether father or mother was absent from the household. Briefly, although detailed information over the whole current/previous calendar year are provided in each wave, only the issue 2005 also detects a harmonised set of retrospective parental data as secondary target variables (*i.e.*, educational attainment, employment status, activity sector) which allow to account for potential generational changes over time.

In EU-SILC framework, the formal education is measured along a simplified version of the International Standard Classification of Education (ISCED-97), where six main levels of educational attainment are categorized (*i.e.*, pre-primary education, primary education, lower secondary educa-

¹ As for ECHP, EU-SILC covers just people living in private households, excluding from the target population all persons living in collective households or in institutions on a permanent or long-term basis. According to the standard EU-SILC definition, a private household means a person living alone or a group of people who live together in the same private dwelling and share expenditures, including the joint provision of the essentials of living. Anyhow, while in the most countries “the main information collection shall pertain to persons aged 16 and over in the previous calendar year” (European Regulation n. 1177/2003), in the register countries a single household member is just interviewed and, thus, other information are collected either through register or the same selected respondent; obviously, different weighting systems and following rules are implemented.

tion, upper secondary education, post-secondary non-tertiary education, first and second stage of tertiary education grouping of 5 and 6 ISCED levels). Generally, as no standardized processes are yet available, European countries collect educational data through their own procedures and, subsequently, a post-hoc harmonization is performed. In this light, individual educational attainment is given by the highest level of an educational programme anyone has successfully completed, that is to say a certificate or diploma has been acquired (or full attendance has been demonstrated in case of no certification). Therefore, a person who has not completed his/her studies should be coded according to the highest level he/she has attained. The matching of an individual programme to a given level of formal education is guaranteed by a set of criteria provided by ISCED-97 where the educational programmes are defined “on the basis of their educational content as an array or sequence of educational activities, which are organised to accomplish a pre-determined objective or a specified set of educational tasks”. In this work, we focus on all those adult individuals aged between 25 and 65, currently working² full-time³, who are either salaried or self-employed earners, so as detected in a question concerning their main employment status⁴, irrespective of their activity sector. In such a way, we leave out all the not-employed individuals – *i.e.*, pupils, further training persons, unpaid apprentices, permanently disabled persons or/and individuals unfit to work or in compulsory military service, homemakers – and all those retired, pensioners and unemployed or other inactive persons (first-job seekers, well-off persons, etc). Also students in vacation jobs from which they return to studies or to other non-work situation and persons who find a job to start in the future are disregarded.

More precisely, younger workers aged between 16-24, whose incidence is fairly negligible in nearly every country, are not considered for two main reasons: first, they could be still in the “almost exclusively” educational period of their life and, second, as anticipated above, retrospective parental information are just available for individuals aged over 24 and under 66. On the grounds of international guidelines, we also exclude workers in the primary sector, which traditionally numbers a very high proportion of self-employed workers, and the unpaid family workers⁵, whose incidence is quite small, because they may not be considered self-employed *stricto sensu* but rather their assistants.

3. A profile of formal education across European countries

As human capital concerns any “activities that influence future real income through the imbedding of resources in people” (Becker, 1962), its nature is so heterogeneous and dynamic that the actual boundaries of its field are not straightforward to establish. Also, any integral approach to evaluation and interpretation of human capital is faced with the problem of the lack of a universal measurement yardstick because of both the richness of theories, which often conflict and overlap about precisely what it means, and the multifaceted set of human attributes, that yield economic value can not be easily quantified. Anyway, the amount of human capital (*i.e.*, level of knowledge, competences

² According to Labour Force Survey definitions, a person is considered as working even if he/she did any work for pay or profit during the reference week, even for as little as one hour, or was not working, but had a job or business from which he/she was absent during the reference week. If the total absence from work exceeds three months, a salaried is considered to have a job only if continues to receive at least 50% of the wage or salary from their employer, while a self-employed is regarded as in employment only if he/she can be said to have a business, farm or professional practice.

³ In EU-SILC, the distinction between full-time and part-time work is made on the basis of a spontaneous answer given by the same respondent. It should be impossible to establish a more exact distinction between part-time and full-time job due to variations in working hours across Member States and branches of industry. Anyway, by checking the answer with the number of hours usually worked, it is possible to detect and even to correct implausible responses since part-time work will hardly ever exceed 35 hours, while full-time work will usually start at about 30 hours.

⁴ In EU-SILC, wage earner is anyone who works for a public or private employer and who receives compensation in the form of wage, salary, fee, gratuity, payment in kind or by results. On the other hand, self-employed worker is anyone who works in his/her own business, professional practice or farm for the purpose of earning a profit; more precisely, a self-employed is classified as employer if he/she employs at least one other person and own-account worker if not.

⁵ In EU-SILC, unpaid family worker is anyone who helps another member of his/her family to run a family business without payment or, at least, receiving remuneration in the form of fringe benefits and/or payments in kind.

and other measurable/unmeasurable skills) held at any one time by individuals in a country as well as its distribution within the population may have relevant effects on social participation⁶. A starting point for thinking about formal education as one of the most relevant life-wide settings to human capital formation is to consider the different ways in which it may be measured. Hence, in this section, classifying the personal EU-SILC information on formal education according to a suitable way, we compute a set of statistical indicators in order to evaluate, in a context of cross-national comparison, both the magnitude of formal education in each European country and its role in affecting occupational pathways. Firstly, the *Educational Attainment Ratio* states the proportion of individuals aged 25-64 who have successfully acquired the highest levels of formal education (*i.e.*, upper-secondary and tertiary education), so as defined by the ISCED-97 classification. By exploring 2005 EU-SILC data, it is worth to note how the EU-26 countries widely differ in the average levels of educational attainment of their populations (fig. B1). In two-thirds of European countries the proportion of population aged 25 to 64 years which has successfully reached *at least* upper secondary education is higher than the EU-26 average with an educational attainment ratio higher than 70 per cent. In particular, eleven EU countries show educational attainment ratios higher than 80 per cent (*i.e.*, United Kingdom, Austria, Latvia, Poland, Sweden, Lithuania, Estonia, Norway) or even higher than 90 per cent (*i.e.*, Czech Republic, Germany and Slovakia). Contrary to what is observed for these economies with higher average levels of education, few countries, especially of the South of Europe (*i.e.*, Portugal, Italy, Spain, Greece) and Ireland, show a proportion of population aged 25-64 with at least upper secondary education less than the EU-15 average. Although in Greece and Ireland the percentage of adult population which has not completed at least upper secondary education is higher than 40 per cent or even close to one-half in Italy and Spain, it is little less than three-quarters in Portugal. Briefly, with regard to the European countries of our interest, the performance of France, Spain and Italy, in terms of incidence of the high-educated adult population, is below the EU-26 average (lower than the EU-15 average for Spain and Italy), while Denmark, United Kingdom and, first of all, Germany perform better than the EU-26 average (table 1, fig. B1).

Table 1 – Educational attainment ratios, incidence of post-secondary education and years of schooling completed of the adult population aged 25-64

Country	Educational attainment ratio	Post-secondary education			Years of schooling completed
		Non tertiary education (1)	Tertiary of I and II stage (2)	Non tertiary and tertiary (1+2)	
Germany (DE)	90.92	8.41	39.36	47.77	16.58
Denmark (DK)	73.72	0.09	28.10	28.19	17.74
Spain (ES)	50.36	1.92	28.26	30.18	12.27
France (FR)	68.41	0.00	24.14	24.14	14.00
Italy (IT)	49.78	5.34	13.01	18.35	11.96
United Kingdom (UK)	80.35	5.76	35.29	41.05	18.43
EU-15	62.23	4.05	23.23	27.28	13.69
EU-26	72.23	4.54	26.56	31.10	14.51

Source: Authors' elaborations on EU-SILC data (2005)

Secondly, if we just consider the educational attainment at the post-secondary level (*i.e.*, non tertiary and tertiary education), differentials amongst European countries appear to be more marked (fig. B2). First, it is worth to focus on countries as Slovakia and Czech Republic which, though

⁶ In practice, three main approaches are usually adopted to estimate human capital stocks in the working-age population within a country. First, to use the highest level of education attained by each adult as a proxy measure of human capital; however, this approach does not take into account either potential individual skills acquired after the attainment of formal education or its deterioration over time. Second, to perform specific tests on adults to verify individual attributes and their relevance to economic activities; anyway, some other characteristics (*i.e.*, personal attitudes and motivation) are hard to evaluate at an aggregate level. Third, to investigate earnings differentials which seem to be correlated with some individual attributes and to estimate their market value; nevertheless, this method does not reflect potential earnings differentials due to other factors beyond education and measurable skills.

show the highest educational attainment ratios, move to the bottom of the country ranking when the proportion of adult population who have just attained the secondary education is excluded. As they say, in these countries, the large part of formal education is at upper-secondary level. Second, in almost every European country, post-secondary education is mainly at the tertiary level, with the clear exception of Lithuania where more than 50 per cent of the adult population reached a post-secondary education level, but more than one-half is non-tertiary. Third, in countries as Belgium, United Kingdom, Germany and Sweden, the incidence of post-secondary education is the highest one and, most importantly, it is in great measure at the tertiary level of first or second stage. Fourth, also in terms of incidence of post-secondary education, southern countries as Portugal, Italy and Greece are still below the EU-15 average, whereas Spain gains some position in the country ranking nonetheless under the EU-26 average. In short, as regards to the countries under study, it is worth to stress that in according to the incidence of post-secondary education Germany still keeps its high position (as much as Denmark and France even though at lower ranks), while United Kingdom considerably improves its status; finally, Spain gets better than Italy (table 1, fig. B2).

Thirdly, beyond formal education, educational attainment ratios do not reflect the different kinds of learning that take place in some more informal and/or non-formal ways. A further drawback concerns the international comparability as a given level of formal education may correspond to quite dissimilar character and length of formal educational cycles in different economies. That is why we prefer to estimate the average number of years of schooling completed in the population aged 25-64 (fig. B3)⁷ in addition to the previous two stock indicators of formal education. Though the indicator “average of years of schooling” is regarded as a proxy of the national human capital stock, it still disregards any specific set of informal knowledge or skills and, most of all, it takes a year of education as a constant unit irrespective of educational degree (*i.e.*, primary school rather than secondary or tertiary level). As regards to the educational attainment of adult populations expressed in terms of average years of schooling completed rather than proportions reaching specified formal education levels, European countries do not substantially modify their general positions in the overall ranking. In fact, on the one side, the Mediterranean countries (*i.e.*, Portugal, Greece, Italy and Spain) keep their low positions with averages of about 12 years of schooling completed; Portuguese adults have average even less than 9 years. On the other side, the majority of countries with high educational attainment ratios (*i.e.*, Latvia, Lithuania, Slovenia, Estonia, Germany, Finland, Netherlands, Denmark, United Kingdom and Sweden) keeps own position above the EU-26 average. By contrast, Poland, Slovakia and Belgium worsen their rankings at below of the EU-26 average, while Hungary and Austria even less than the EU-15 average. Finally, it shows the large decline of Czech Republic and the slight improvement of Ireland. In brief, as regards to the economies of interest, Germany, Denmark and United Kingdom validate their high performance with a sizeable average number of years of formal education completed in opposite to Italy and Spain (table 1, fig. B3).

Fourthly, as discussed above, education is one of the main channels of the intergenerational transmission of socio-economic status since it also mediates the influence of other factors, *i.e.*, income or employment status (Feinstein et al., 2004). In other words, both inherited abilities and family background contribute to explain intergenerational transmission of educational outcomes and the impact of the parental characteristics on individual performance is significant as well. For example, De Broucker and Underwood (1998) evaluate the intergenerational educational mobility gap in terms of

⁷ Unfortunately, this variable is not directly available in the EU-SILC database. Hence, in this work it has been approximated as difference between the year when the highest level of education was attained and the year of birth minus 6 for considering the age in which individuals start a compulsory education pathway in the most countries. This “derived” variable cannot be constructed for Norway since the variable “year when the highest level of education was obtained” is missing for this country. In addition, in order to evaluate the degree of approximation of this proxy, a similar variable has been constructed by associating a number of years necessary to attain each level of formal education. As the mean of differences between the previous two variables is very close to zero, this approximation may be considered as a good proxy of years that a person has spent in formal education.

probabilities that children, whose parents have either less than upper-secondary or post-secondary education levels, succeed in graduating from upper-secondary school. In this light, a useful indicator is the *Intergenerational Education Gap Ratio* which lets to examine the educational gap between the parents and children's generations as expression of educational mobility between generations. It is a coexistence ratio between two groups of individuals with tertiary education: the former is composed of high-educated individuals by first generation since they come from a family where *neither* of the parents attained a formal education at the tertiary level, while the latter is composed of high-educated individuals who come from a family where *at least one* parent reached the tertiary education (second generation). In such a way, intergenerational education gaps also allow to shed light on equality of opportunity and on prospects of improving overall human capital stock as well.

Table 2 – Share of the adult population aged 25-64 with the highest ISCED-97 level attained by “generational stage” and intergenerational education gap ratios

Country	Tertiary education by second generation		Intergenerational education gap*
	At least one high-educated parent	With both high-educated parents	
Germany (DE)	44.08	11.94	1.27
Denmark (DK)	19.75	6.46	4.06
Spain (ES)	24.99	7.10	3.00
France (FR)	27.06	9.47	2.70
Italy (IT)	18.49	4.47	4.41
United Kingdom (UK)	26.31	8.79	2.80
EU-15	31.63	9.24	2.16
EU-26	30.05	9.34	2.33

* Each ratio is divided by 100

Source: Authors' elaborations on EU-SILC data (2005)

The proportion of high-educated individuals (*i.e.*, with tertiary education of first or second stage) by second generation widely differs across EU-26 countries (fig. B4). In particular, the intergenerational education gaps are higher than the EU-26 average in almost two-third of the European countries, also including the economies under study, except for Germany. This denotes a large incidence of graduates by first generation in relation to graduates by second generation, that is to say substantial differences in the formal levels of educational attainment between parents and children's generations and, thus, a certain degree of ascendant educational mobility. By contrary, in countries with lower intergenerational education gaps (*i.e.*, Germany with the lowest values and with the highest incidence, almost one-half, of high-educated individuals by second generation), children of graduated parents are more likely to become high-educated themselves (table 2, fig. B4).

Finally, by considering income differentials associated with different levels of educational attainment, it is possible to look at the coexistence ratios of earnings of higher educated to lower educated workers as potential economic measures of human capital. Though these indicators are based on assumptions that may not always hold, they allow for changes in the relative productivity of workers across countries as it is assumed that workers at the same level of educational attainment necessarily have the same level of skills.

Table 3 – Earnings differentials ratios at different levels of formal education in the adult population aged 25-64

	Highest (ISCED-97: 5) vs lowest ISCED-97 (0;1;2) levels			Highest (ISCED-97: 5) vs medium ISCED-97 (3;4) levels		
	Total	Wage	Self	Total	Wage	Self
Germany (DE)	1.7792	2.4970	1.8404	1.4101	1.6862	1.4439
Denmark (DK)	1.3483	1.8134	1.3838	1.2549	2.4222	1.3208
Spain (ES)	1.5287	1.3294	1.5557	1.3065	1.3211	1.3289
France (FR)	1.6153	1.9369	1.6442	1.4294	1.6777	1.4515
Italy (IT)	1.5213	1.9562	1.6164	1.3022	1.6816	1.3887
United Kingdom (UK)	1.8794	1.8736	1.8537	1.3641	1.6733	1.3952

Source: Authors' elaborations on EU-SILC data (2005)

4. A methodological view: a two-stage structural probit model and quantile regression

Generally, educational investments are characterized by a uncertainty perspective which strongly affects individuals' decisions about their educational and employment choices. This vagueness might be due to earnings differentials usually related to individuals with different educational levels (table 3), but, most importantly, to dissimilar degrees of dispersion of earnings at each educational level. In other words, by taking into account the ways through which education affects earnings, two main potential sources of earnings inequality may be identified. First, a *between-levels inequality*, linked to different degrees of formal education given that higher earnings are usually associated with higher educational levels. Second, a *within-levels inequality*, related to a same degree of formal education since returns to schooling might widely vary as one moves along the earnings distribution, that is to say individuals with a same education obtain different rewards in the labour market. Though average differentials between educational groups are captured by OLS returns to education, which assume a constant marginal impact of schooling over the whole earnings distribution, they do not allow to evaluate the effect of education on earnings at different points of the same distribution. In this light, in order to assess the potential different size of returns to schooling along the earnings distribution and, thus, the earnings differentials between individuals with a same educational level but placed at different quantiles of the earnings distribution, the quantile regression is adopted. In such a way, a joint interpretation of OLS and quantile returns to education (and to experience) allows to assess the impact of a relevant part of human capital on earnings inequality both between and within educational groups.

In general, the quantile regression (Koenker and Bassett, 1978; Buchinsky, 1994; 1998) allows to estimate functional relations between variables for all portions of a probability distribution. In case of unequal variations, which may occur along a statistical distribution because of several factors affecting the variable of interest, the quantile regression estimates multiple slopes, from the minimum to maximum response, which describe the relationship between the dependent variable and predictors measured on a subset of these factors and provide a more complete picture of the relations between variables missed by OLS regression. In other words, the quantile regression estimates conditional quantile functions where quantiles of the conditional distribution of response variable are expressed as functions of observed covariates. In such a way, if different estimates for several quantiles are obtained, changes in the influence of covariates on the dependent variable along the whole conditional distribution can be more easily interpreted.

By considering functions of X that are linear in the parameters:

$$\ln w_i = X_i \beta_\theta + \varepsilon_{\theta i} \quad \text{with} \quad \text{Quant}_\theta(\ln w_i | X_i) = X_i \beta_\theta$$

where X_i and β_θ are the vectors of auxiliary variables and unknown parameters, respectively, while $\text{Quant}_\theta(\ln w_i | X_i)$ stands for the θ th conditional quantile of the dependent variable given X.

The θ th regression quantile, $0 < \theta < 1$, is defined as the solution to the following problem:

$$\min \left\{ \sum_{i: \ln w_i \geq x_i \beta} \theta |\ln w_i - x_i \beta_\theta| + \sum_{i: \ln w_i < x_i \beta} (1 - \theta) |\ln w_i - x_i \beta_\theta| \right\}$$

This equation is normally written as:

$$\min \sum_i \rho_\theta(\ln w_i - x_i \beta_\theta)$$

where $\rho_\theta(z)$ is the check function so defined:

$$\rho_{\theta}(z) = \theta z \quad \text{if} \quad z \geq 0 \quad \text{and} \quad \rho_{\theta}(z) = (\theta - 1)z \quad \text{if} \quad z < 0$$

This problem is solved by means of linear programming methods, while standard errors for the vector of coefficients are estimated with the bootstrap procedure by Buchinsky (1998). Quantile regression provides robust estimates of coefficients which are insensitive to outliers of the dependent variable and, even if error terms are not normally distributed, quantile regression estimators may be more efficient than OLS estimators.

More precisely, in order to predict expected earnings for employees and self-employed workers, earnings equations are separately estimated for individuals in each employment status since incomes are just observed in the occupation that individuals choose to participate in. Also, considering that in a selected sub-sample of individuals self-employed and employees may differently behave, a two-stage estimation method by Heckman (1979) is adopted to overcome the potential selection bias. In particular, in the second stage, the earnings equations are simultaneously estimated on control variables, that is a set of human capital characteristics, and on the selection terms (λ_{ij}) from the probit equation estimated in the first stage, which allow to obtain consistent estimations of the earnings equations for employees (E) and self-employed (S), respectively:

$$\begin{aligned} [\ln w_{iE} | X_{iE}] &= X_{iE} \beta_{\theta E} + \lambda_{iE} \delta_{iE} + \varepsilon_{i\theta E} \\ [\ln w_{iS} | X_{iS}] &= X_{iS} \beta_{\theta S} + \lambda_{iS} \delta_{iS} + \varepsilon_{i\theta S} \end{aligned}$$

where β and δ are the vectors of parameters to be estimated; λ_{iE} and λ_{iS} are the Inverse Mills Ratios to correct for selectivity into each occupation.

4.1 A brief overview of the set of predictors

As just discussed, in the first stage, a probit equation with salaried status as reference category (the i_{th} worker is coded 0 if employee and 1 if self-employed) is estimated with the crucial aim to calculate the selectivity terms. The probit model is tested, according to a stepwise procedure, both on a vector of variables, whose values vary across individuals⁸, and on a vector of variables whose values vary across countries (*i.e.*, institutional variables)⁹ or across sub-area in a same country (*i.e.*, area-level variables at NUTS1 level)¹⁰. Then, in the second stage, the earnings equations are estimated with the selectivity terms on the basis of some extensions of the basic Mincer human capital model. In particular, in this work, we assume that the workers' earnings depend not just on the edu-

⁸ While a first set of individual-level covariates captures some socio-demographic characteristics (*i.e.*, gender, citizenship, age, marital status, children, health), a second set is used as proxies for the measurement of different forms of capital. In particular, in the probit model, some aspects of social and financial capital are captured by the parental work status, as a derived "generational" variable which detects if *only one* or *both* the parents are/were self-employed or if *neither* of the parents is/was self-employed, and tenure status, as dummy with value 1 if the worker or his/her family owns the home where lives and 0 otherwise.

⁹ It is a vector of derived dummy variables each of them captures a specific aspect of social security systems in each European country considered (*i.e.*, insurance for unemployment and social security for sickness, disability, health insurance, old age, child allowance, pregnancy and care). Their value is 1 if there are structural differences between the judicial position of employees and self-employed which may cause serious obstacles (negative signals) on the path to self-employment and value 0 if no structural differences exist (positive or neutral signals). Some other institutional characteristics (*i.e.*, taxation regimes and labour law systems) are captured by other dummies with value 1 if obstacles arise from different taxation and labour law systems for employees and self-employed or from requirements to meet for starting self-employment.

¹⁰ In order to evaluate how the occupational choice might also be affected by socio-economic background, which greatly vary across European countries, the probit model is enriched by a set of EU-harmonized indicators – *i.e.*, long-term unemployment rate, gross domestic product per capita in purchasing power standard and degree of urbanisation – related to each NUTS1 region where the worker lives and selected by the Eurostat data base of territorial indicators.

cational attainment and work experience but also on a range of personal characteristics (*i.e.*, gender, citizenship, health status), on the family background (*i.e.*, parents' education level and parental work status) and structural factors (*i.e.*, activity sectors).

Table 4 – Description of auxiliary variables matrix

Variable	Description
Gender	Dummy variable with value 1 if the worker is <i>male</i> and 0 otherwise
Citizenship	Dummy variable with value 1 for workers with <i>citizenship in the same country of residence</i> and 0 for workers with citizenship in any other EU-25 country, except for the country of residence, or any other country
Age	Age in years of the worker at the date of interview
Health	Dummy variable with value 1 for workers who suffer from any <i>chronic (long-standing) illness or condition</i> and 0 otherwise
Individual education level (schooling)	Highest ISCED-97 level attained in terms of years spent in education needed to acquire it
Experience	Number of years, since starting the first regular job, spent in paid works, whether as employee or self-employed
Experience-squared	Squared of years spent in paid works
Parents' education level	Highest ISCED-97 level attained (<i>three levels</i>): <i>Low level</i> (ISCED-97: 0; 1; 2) (<i>as reference group</i>) - 0: Pre-primary education - 1: Primary education - 2: Lower secondary education <i>Medium level</i> (ISCED-97: 3; 4) - 3: Upper secondary education - 4: Post-secondary non tertiary education <i>High level</i> (ISCED-97: 5) - 5: First stage of tertiary education (not leading directly to an advanced research qualification) and second stage of tertiary education (leading to an advanced research qualification)
Activity sector	Main branches of economic activity according to the NACE (Rev 1.1) classification (<i>three dummies</i>): - Construction (<i>as reference group</i>) - Industry - Service

5. Main empirical evidence: beyond between-levels inequality

As illustrated earlier, our analysis concerns six developed economies of Western Europe (*i.e.*, Germany, Denmark, Spain, France, Italy and United Kingdom) classified as OECD countries with high income. Although the probit model yields early evidence on the impact of some individual and familiar characteristics on the selection into self-employment, in this section we essentially discuss the main empirical findings obtained by estimating the human capital earnings equations.

At first, in order to stress the average earnings differentials related to individuals with different educational levels, the earnings equations are estimated by the traditional OLS regression¹¹. As regards to crucial variables of the earnings equations, it is worth to note how the experience in the labour

¹¹ For brevity, empirical evidence by probit model estimated in the first stage and some results by OLS and quantile regressions of the second stage are not shown. For example, by focusing on some individual-level determinants of earnings, OLS regressions show how being a *man* with *citizenship* in the country of residence and enjoying *good health* play a significant role on workers' earnings practically over all the countries considered (table A2). Anyhow, these and other empirical results are reported in appendix A (tables) and appendix B (figures) and they are available upon request.

market is statistically significant both for employees and self-employed (table 5). In particular, the consistently negative signs of experience-squared (table A2) – which is also tested in addition to the actual experience in order to capture potential non-linear relations between work experience and earnings – substantially confirm the concavity of this relationship. Our findings partially agree with those of other studies (Rees and Shah, 1986; Le, 1999), where it also emerges how the labour experiences usually play a larger influence on the earnings of employees than self-employed workers.

Table 5 – OLS returns to education and to experience: wage earners vs self-employed workers

Country	Employment status	Schooling	Experience	Parental education level (low as reference group)	
				Medium	High
Germany	Wage earners	0.0195 (.0012)	0.0372 (.0027)	0.1032 (.0199)	0.1207 (.0218)
	Self-employed	0.0383 (.0084)	0.0391 (.0177)	0.1974 (.0901)	0.1941 (.0894)
Denmark	Wage earners	0.0234 (.0025)	0.0626 (.0055)	0.0280 (.0292)	0.0991 (.0359)
	Self-employed	–	–	–	–
Spain	Wage earners	0.0209 (.0010)	0.0380 (.0018)	0.1547 (.0205)	0.2667 (.0175)
	Self-employed	0.0188 (.0054)	0.0235 (.0087)	0.2595 (.1107)	0.2436 (.0821)
France	Wage earners	0.0202 (.0014)	0.0435 (.0029)	0.1150 (.0175)	0.3171 (.0243)
	Self-employed	0.0279 (.0095)	0.0410 (.0234)	0.0134 (.0063)	0.3300 (.1569)
Italy	Wage earners	0.0155 (.0007)	0.0347 (.0014)	0.0976 (.0104)	0.1730 (.0187)
	Self-employed	0.0159 (.0022)	0.0355 (.0044)	0.1195 (.0361)	0.3323 (.0593)
United Kingdom	Wage earners	0.0076 (.0012)	0.0271 (.0029)	0.1102 (.0212)	0.2665 (.0219)
	Self-employed	0.0129 (.0059)	0.0327 (.0124)	0.2269 (.1182)	0.2594 (.1386)

– : not significant at the conventional levels

Source: Authors' elaborations on EU-SILC data (2005)

Also, our evidence highlight how the individuals' education levels are crucial in the determination of personal earnings and draw attention to the role of parents' education and how, in general, its impact tends to increase when the parental education level is higher. It is interesting to note how the returns to schooling, consistently significant at the conventional levels, are quite different across European countries taken into account. In particular, for employees, the average OLS returns to an additional year of education range from 0.76 per cent in United Kingdom to 2.34 per cent in Denmark and, in general, they appear to be lower than the average returns for self-employed workers which vary from 1.29 per cent in United Kingdom to 3.83 per cent in Germany. Both for employees and, more markedly, for self-employed, the earnings equations show moderately good pseudo R-squared and this may reflect the importance of some unmeasured skills. Finally, in earnings equations the coefficients of selection correction are statistically significant and consistently positive for self-employed workers (not shown for brevity); it means that selection bias is found, so individuals who work in one status have comparative advantages than workers in other ones. At second, in order to capture the within-levels inequality due to different degrees of dispersion of individuals earnings at each educational level¹², the earnings equations are estimated by simultaneously quantile regressions at the most representative quantiles (table 6). As regards to wage-earners, although our results prove the consistently significant impact of education on earnings over all the countries considered, they also stress how the same returns to schooling significantly vary over the earnings distributions and, more precisely, how they tend to increase along the conditional distribution (fig. B5). As they say, formal education levels being equal, workers in high-remunerated jobs (and, thus, in

¹² As in the EU-SILC framework the variable “education” is measured along a simplified version of the ISCED-97 classification, where only six levels of formal education are categorized, all distinctions within these same education levels are neglected. When the vocational or general educational courses are not distinguished into each formal level, it may lead to a considerable heterogeneity within the same aggregated education levels and, consequently, to a substantial underestimation of the explanatory power of education. Anyway, as stressed by Koenker and Bassett (1982), quantile regressions are also adopted to interpret evidence of heteroscedasticity and to test non-spherical errors.

the top quantiles of the earnings distribution) also get higher returns from their education investments than workers involved in lower remunerated jobs. This implies a higher dispersion in the earnings distribution taken as a whole if a year of schooling is added to individuals with similar education but differently placed in the earnings distribution. In other words, education positively affects both individual earnings and earnings inequality because it tends to increase the within-group earnings dispersion. Obviously, the extent to which the rightward shifts in earnings distributions as one moves upward in education depends on the size of returns to schooling as well as on the effect of within-education inequality given by returns-deciles in the quantile regression. Even though for Denmark the returns to education show a u-shaped pattern, they never decrease over conditional quantiles in none of the European countries considered.

Table 6 – Quantile Regression (QR) returns to education and to experience: wage earners vs self-employed workers

Country	Quantile	Employment status	Education	Experience	Parental education level (low as reference group)	
					Medium	High
Germany	q10	Wage earners	0.0134 (.0022)	0.0648 (.0065)	0.1420 (.0514)	0.0939 (.0527)
		Self-employed	0.0387 (.0163)	–	–	–
	q25	Wage earners	0.0132 (.0013)	0.0372 (.0047)	0.0926 (.0189)	0.0912 (.0217)
		Self-employed	0.0349 (.0140)	0.0423 (.0201)	0.2436 (.1118)	–
	q50	Wage earners	0.0197 (.0011)	0.0286 (.0025)	0.0806 (.0152)	0.1226 (.0161)
		Self-employed	0.0351 (.0145)	0.0460 (.0235)	–	–
	q75	Wage earners	0.0302 (.0021)	0.0279 (.0020)	0.0540 (.0196)	0.1157 (.0228)
		Self-employed	0.0347 (.0124)	0.0549 (.0210)	–	0.3389 (.1897)
	q90	Wage earners	0.0356 (.0045)	0.0257 (.0035)	0.0483 (.0288)	0.1196 (.0279)
		Self-employed	0.0358 (.0160)	0.0674 (.0258)	–	–
Denmark	q10	Wage earners	0.0224 (.0040)	0.0942 (.0115)	0.0577 (.0395)	0.0225 (.0660)
		Self-employed	–	–	–	–
	q25	Wage earners	0.0167 (.0026)	0.0440 (.0081)	0.0532 (.0203)	0.1004 (.0257)
		Self-employed	–	–	–	–
	q50	Wage earners	0.0170 (.0023)	0.0353 (.0039)	0.0595 (.0185)	0.1079 (.0265)
		Self-employed	–	–	–	–
	q75	Wage earners	0.0209 (.0033)	0.0344 (.0045)	0.0473 (.0213)	0.1422 (.0194)
		Self-employed	–	–	–	–
	q90	Wage earners	0.0293 (.0033)	0.0424 (.0050)	0.0159 (.0223)	0.1685 (.0304)
		Self-employed	–	–	–	–
Spain	q10	Wage earners	0.0128 (.0017)	0.0484 (.0039)	0.2595 (.1107)	0.2619 (.0290)
		Self-employed	–	0.0402 (.0170)	0.1917 (.0350)	0.3037 (.1405)
	q25	Wage earners	0.0165 (.0014)	0.0346 (.0019)	0.2707 (.1637)	0.2541 (.0198)
		Self-employed	–	0.0314 (.0137)	0.1581 (.0210)	0.2193 (.1257)
	q50	Wage earners	0.0239 (.0014)	0.0299 (.0014)	–	0.2562 (.0146)
		Self-employed	0.0176 (.0056)	0.0208 (.0109)	0.1170 (.0220)	0.1908 (.0679)
	q75	Wage earners	0.0338 (.0018)	0.0311 (.0021)	0.1976 (.0968)	0.2115 (.0227)
		Self-employed	0.0221 (.0058)	0.0125 (.0070)	0.1056 (.0142)	0.1530 (.0814)
	q90	Wage earners	0.0429 (.0020)	0.0341 (.0024)	0.2610 (.1106)	0.2381 (.0182)
		Self-employed	0.0414 (.0141)	0.0277 (.0148)	0.0674 (.0328)	–
France	q10	Wage earners	0.0074 (.0014)	0.0471 (.0068)	0.0869 (.0268)	0.2168 (.0464)
		Self-employed	–	–	–	–
	q25	Wage earners	0.0138 (.0019)	0.0318 (.0037)	0.0889 (.0179)	0.2294 (.0331)
		Self-employed	–	–	–	–
	q50	Wage earners	0.0228 (.0016)	0.0351 (.0022)	0.1053 (.0136)	0.3019 (.0260)
		Self-employed	0.0414 (.0119)	–	–	0.4220 (.1239)
	q75	Wage earners	0.0337 (.0021)	0.0372 (.0045)	0.1008 (.0138)	0.3450 (.0293)
		Self-employed	0.0296 (.0105)	0.0381 (.0137)	0.0354 (.0122)	0.3032 (.1408)
	q90	Wage earners	0.0464 (.0036)	0.0407 (.0062)	0.1195 (.0200)	0.3581 (.0436)
		Self-employed	–	0.0208 (.0098)	0.0873 (.0497)	0.6247 (.2684)

– : not significant at the conventional levels

Source: Authors' elaborations on EU-SILC data (2005)

Table 6 (continued) – Quantile Regression (QR) returns to education and to experience: wage earners vs self-employed workers

Country	Quantile	Employment status	Education	Experience	Parental education level (low as reference group)	
					Medium	High
Italy	q10	Wage earners	0.0074 (.0010)	0.0437 (.0033)	0.0960 (.0205)	0.0410 (.0564)
		Self-employed	–	0.0304 (.0082)	–	–
	q25	Wage earners	0.0109 (.0007)	0.0290 (.0015)	0.0684 (.0094)	0.0922 (.0224)
		Self-employed	0.0058 (.0021)	0.0211 (.0027)	–	0.2787 (.0877)
	q50	Wage earners	0.0153 (.0007)	0.0235 (.0014)	0.0851 (.0056)	0.1447 (.0138)
		Self-employed	0.0153 (.0020)	0.0344 (.0028)	0.1110 (.0490)	0.3379 (.0572)
	q75	Wage earners	0.0236 (.0012)	0.0233 (.0016)	0.0862 (.0098)	0.2131 (.0306)
		Self-employed	0.0254 (.0038)	0.0363 (.0039)	0.1424 (.0407)	0.3649 (.0725)
	q90	Wage earners	0.0333 (.0018)	0.0273 (.0020)	0.1275 (.0219)	0.2323 (.0352)
		Self-employed	0.0351 (.0049)	0.0419 (.0074)	0.2269 (.0699)	0.2699 (.0923)
United Kingdom	q10	Wage earners	0.0027 (.0014)	0.0142 (.0040)	0.0520 (.0274)	0.1795 (.0364)
		Self-employed	–	–	–	–
	q25	Wage earners	0.0049 (.0010)	0.0163 (.0028)	0.0575 (.0239)	0.2456 (.0323)
		Self-employed	–	0.0448 (.0206)	–	–
	q50	Wage earners	0.0069 (.0012)	0.0248 (.0035)	0.1070 (.0275)	0.2541 (.0234)
		Self-employed	–	–	0.2282 (.1235)	0.1216 (.0617)
	q75	Wage earners	0.0116 (.0015)	0.0371 (.0031)	0.1197 (.0255)	0.2785 (.0350)
		Self-employed	0.0050 (.0020)	–	0.1958 (.0983)	0.3930 (.2002)
	q90	Wage earners	0.0157 (.0022)	0.0486 (.0043)	0.1451 (.0374)	0.3695 (.0461)
		Self-employed	0.0333 (.0119)	–	–	0.7198 (.2940)

– : not significant at the conventional levels

Source: Authors' elaborations on EU-SILC data (2005)

Also for self-employed workers, our results confirm the significant positive influence of education on individual earnings over all the countries of interest. Most importantly, they also stress how the same returns to schooling tend to impact in a stronger way over the right side of the earnings distributions. In effect, while for Germany and Italy the returns to education are consistently significant along the whole earnings distributions, for France, Spain and, more markedly, United Kingdom, they just become significant at the top of distribution. In such a way, the impact of education on individual earnings and earnings inequality may be stronger for self-employed than salaried because it tends to increase the within-group earnings dispersion more severely. Specifically for employees, in order to sum up the extent of the within-group wage inequality in each country of interest, we measure, in percentage points, the distance in returns to education between the top and the bottom quantiles (90q-10q spread), the 0.80 and the 0.20 quantiles (80q-20q spread) and the 0.75 and 0.25 quantiles (75q-25q spread) of the wage distributions. Briefly, returns differential between the top and the bottom deciles is quite high for France, followed by Spain at once; the same 90q-10q spread is less important in Denmark for which the returns to education are more uniform over all the conditional quantiles, probably also due to a higher degree of corporatism in industrial relations in this country and, thus, with a more centralized bargaining system (fig. B6).

Table 7 – Differentials in returns to schooling between some representative quantiles for wage-earners

Country	q90-q10	q80-q20	q75-q25	q90-q50	q75-q50
Germany	0.0222	0.0208	0.0170	0.0159	0.0105
Denmark	0.0069	0.0059	0.0042	0.0123	0.0039
Spain	0.0301	0.0220	0.0173	0.0189	0.0098
France	0.0390	0.0262	0.0198	0.0236	0.0109
Italy	0.0259	0.0167	0.0126	0.0180	0.0083
United Kingdom	0.0131	0.0091	0.0067	0.0088	0.0047

– : not significant at the conventional levels

Source: Authors' elaborations on EU-SILC data (2005)

Moving to experience as the other crucial dimension of human capital tested in our analysis, with regard to wage-earners yet, our empirical results also prove how on-the-job training increases human capital accumulation along the life-cycle through the consistently significant impact of work experience over all the countries considered, although with some differences amongst them. More precisely, earnings-experience profiles vary over the earnings distributions with a decreasing pattern along the conditional distributions and a slight increase over the top quantiles (fig. B7). In particular, for Spain and France the returns to experience decrease up to median and, then, they start again to increase until to acquire values similar to those ones of the bottom quantiles; by the way, the u-shaped pattern of returns to experience is slightly less marked for Denmark. A single exception is given by United Kingdom for which earnings-experience profiles appear to be slightly increasing over all the conditional quantiles. However, this decreasing pattern of returns to experience implies a higher dispersion in the earnings distribution taken as a whole. In fact, though experience directly influences individual earnings as well as earnings inequality, whose intensity essentially depends on the size of respective returns, the constantly negative signs of the experience-squared give a further prove of the concavity of this relationship.

Our analysis also points to a positive effect of work experience on the probability of being or entering self-employment (table A1) and, thus, on individual earnings and earnings inequality (table 6). In particular, for self-employed, in all the countries of interest, except for France and United Kingdom, returns to experience differently impact over the whole earnings distributions with a more ambiguous potential impact on earning inequality. Indeed, for France and United Kingdom, though the OLS returns to experience are consistently significant at the conventional levels, the quantile regression returns to experience just become significant for the top and bottom quantiles of earnings distributions, respectively.

Specifically for employees, as regards to experience, returns differentials, in percentage points, between the top and the bottom deciles are obviously all negative, except for United Kingdom, and these distances gradually decrease if q80-q20 and q75-q25 spreads are then considered. As Denmark shows a slightly less marked u-shaped pattern of returns to experience, it detects the largest negative 90q-10q difference, followed by Germany at once (fig. B8).

Table 8 – Differentials in returns to experience between some representative quantiles for wage-earners

Country	q90-q10	q80-q20	q75-q25	q90-q50	q75-q50
Germany	- 0.0391	- 0.0152	- 0.0093	- 0.0028	- 0.0007
Denmark	- 0.0518	- 0.0153	- 0.0096	0.0071	- 0.0010
Spain	- 0.0143	- 0.0037	- 0.0035	0.0042	0.0012
France	- 0.0064	0.0059	0.0053	0.0056	0.0021
Italy	-0.0164	0.0089	- 0.0056	0.0038	- 0.0002
United Kingdom	0.0344	0.0246	0.0208	0.0238	0.0123

Source: Authors' elaborations on EU-SILC data (2005)

Finally, as demonstrated above, parental education, as proxy for the measurement of human capital in a generational perspective and a measure of quality of upbringing as well, also significantly affects workers' earnings (table 6). More precisely, as regards to wage-employed, the direct impact on personal earnings is as large as the parental formal education is higher¹³. First, our results empha-

¹³ The probit model (first stage) highlights how the parental education (as with individual education) and, most importantly, the parental work status, as proxies for the measurement of human and social capital in a generational perspective, have a significant positive effect on the probability to become self-employed which enhances when both the parents are/were self-employed themselves (table A1). In fact, Dunn and Holtz-Eakin (2000) identified the parental self-employment experience and the business success as the two main channels through which intergenerational transmission process may take place. As they say, self-employment tends to run in families, parents transfer managerial skills to their offspring, and, so, strong intergenerational links usually exist. In particular, on the basis of a joint interpretation of the several "generational" factors influencing the propensity to self-employment, it is interesting to remind that older

size the different orders of magnitude of impact on earnings for the two parental educational levels tested (medium vs low and high vs low) and it is consistently stronger for the top levels of parental education across all countries of interest. Second, although as regards to medium levels of parental education the slopes are substantially stable over the whole conditional distribution for the most of countries considered, as regards to high levels they vary over the earnings distributions in a different way across countries with a larger impact for France, United Kingdom and Spain.

6. Some concluding remarks

Education is undoubtedly one of the key contributors to the construction of individuals' identity and personality and, all at once, it performs a crucial instrument in the development of individuals' skills and in their capability of gaining employment. More generally, human and cultural capital, in terms of formal knowledge and vocational training, but also attitudes and talents or their creative use as well, play a crucial role for the national economic growth. As argued above, our analysis is aimed at exploring, in a generational perspective, how some dimensions of human capital stand for critical predictors of inequality between and within earner-groups and educational groups in relation to both salaried and self-employed workers. Our empirical results are interesting taken as a whole; nonetheless, they require a joint interpretation in the light of specificities of each national educational system and all the other institutional frameworks and/or their potential interactions.

Firstly, it is worth to note how, in general, education and Gross Domestic Product (GDP) are mutually correlated in each country, that is to say better education means higher GDP as well as more investments in education, in terms of higher expenditures per student relative to per-capita GDP, means better education. However, although OECD countries are currently expanding the scope of their educational systems, public spending on education, as percentage of GDP, has been threatened by a decline in most countries (OECD, 2005). In particular, as regards to countries of our interest, Denmark and France traditionally spend a high share of their national resources on education, followed by United Kingdom, while this share is smaller for Spain, Germany and Italy. Our empirical returns to education, consistently significant at the conventional levels both for employees and self-employed workers, are quite different across countries of Western Europe taken into account and these unlike patterns surely reflect the differences in the respective educational systems.

Indeed, beyond the amount of financial resources invested in education, EU countries also differ both in the composition of educational attainment and in some dimensions of their educational systems. In particular, the profile of formal education sketched in this work sheds some light on how European countries widely differ in the average levels of educational attainment of their populations. Southern countries (*i.e.*, Italy and Spain with more or less than 50 per cent of adult population which has successfully reached at least upper secondary education) show substantially lower incidence of more educated individuals than Nordic countries (*i.e.*, Denmark with more than 70 per cent) or than other countries with values even higher (*i.e.*, United Kingdom and Germany). Also in according to incidence of post-secondary education, Germany keeps its high position in the country ranking, so as Denmark and France though at lower ranks, while United Kingdom considerably improves its status and Spain gets better than Italy. Similarly, in terms of years of schooling completed, EU countries do not substantially modify their general positions in the overall ranking and the Mediterranean countries still keep their low positions with averages of just 12 years of education against the averages of about 18 years of Germany, Denmark and United Kingdom. Moreover, educational systems in Western Europe also appear to be quite a few different in terms of school laws and organisation (*i.e.*, compulsory education is not the same across countries), access to education and progression, impact of learning on labour markets, teachers training (*i.e.*, from integrated models typical of Germany and Denmark, reflecting a more theoretical education, to consecutive models for France, Italy and Spain, which also include a professional training, or to mixed models

persons are more likely to have received inheritances and to have accumulated capital which can be used to set up a business more cheaply.

for United Kingdom), decentralization level (*i.e.*, Italian, French and German educational systems are centralized at different degrees, while Spanish system is more decentralized), degree of differentiation between vocational and general education (*i.e.*, from stratified systems for Germany, which differentiate students in the early stages into different tracks as regards to curricula and probability of going on to tertiary education, to comprehensive systems typical of Britain and, at different degrees, of other countries considered, where tracking starts later and less important differences exist).

Secondly, the same returns to experience, consistently significant at the conventional levels for employees and, at the top and bottom quantiles of earnings distributions, for self-employed workers, are quite different across countries of Western Europe considered, also due to regulations of respective national labour systems and specificities of workforce composition. More generally, the less or more marked differences across countries in returns to education and/or to experience as well as their trends along the earnings distributions are certainly affected by the interactions between educational systems and labour-market institutions in each country, in terms of earnings inequality, which differently work across countries. The same mechanisms of human and social capital across generations may be strongly affected by other different institutional frameworks (*i.e.*, taxation, credit market intervention, social protection system) and/or by different stages of national economic development. For example, wage determination may be differently affected by the degree of corporatism in industrial relations; thus, while in lowly corporatist economies (*i.e.*, France, Italy, United Kingdom) the bargains between unions and employers may occur locally, highly corporatist countries (*i.e.*, Denmark and Germany) are characterized by more centralized bargaining systems. Also, the social protection system in its several components (*i.e.*, social security for unemployment, sickness, disability, health, old age and child, pregnancy and care) as well as the legal and fiscal framework consistently vary across European countries and, since they act on working and living conditions, they are of course of influence on the position of employees and self-employed as well as on the related decision-making process. More precisely, structural differences in social insurance systems between self-employment and wage-employment, along with those ones related to taxation systems, are partly linked to the different welfare regime in each country (*i.e.*, from a social democratic regime, typical of Denmark and other Nordic countries, which provides a universal coverage of social risks where all workers have formally a same social security scheme, to a conservative regime for Germany, France and Italy, where regular employees are covered with high costs and low benefits and where structural differences in social benefits between self-employed and employees exist, or to liberal regime for United Kingdom, where a few social risks are covered, the recourse to market is promoted and self-employed are usually excluded from mandatory public schemes).

Thirdly, with regard to wage-earners, results by quantile regressions prove how the returns to education tend to increase along the conditional earnings distribution. As they say, formal education levels being equal, wage-employed in high-remunerated jobs also get higher returns from their education investments than workers involved in lower paid jobs. In other words, education seems to affect positively individual earnings and earnings inequality because it tends to increase the within-group earnings dispersion. For self-employed workers, our evidence stress how the returns to education tend to impact in a stronger way over the right side of the earnings distributions with a potential stronger impact on earnings inequality. As illustrated above, asymmetries in returns to education may be also regarded as output of labour market regulations and its degree of integration with the educational systems. In fact, also the extent to which workers continue developing their skills and knowledge – for example, taking part in non-formal job-related education and training – widely varies across European countries, from more than 40 per cent for Denmark to less than 10 per cent for Italy and Spain. In this light, countries with stratified educational systems, where school leavers may have the opportunity of improving their vocational skill through apprenticeships or additional on-the-job training, may show better experience profiles. Moreover, the quite clear increasing impact of schooling on within-levels earnings inequality over all countries of interest with

higher earnings dispersion within high-educated individuals may be partly associated with the over-education (*i.e.*, low marginal rewards some individuals reap from their schooling) and with a mismatching between educational qualifications and labour market requirements which implies substantially lower returns from education with a positive impact on earnings inequality within educational groups for educational mismatched workers relative to their matched peers. In this light, it is interesting to note how Denmark and Germany show the lowest ratios of young individuals with upper secondary or tertiary education which work in elementary occupations in contrast with the highest values of Spain and United Kingdom (OECD, 2005).

Fourth, it is worth stressing how the impact of several individual characteristics also differs across the selected countries and, above all, how the family-specific background, as proxy of human capital in a generational perspective, also significantly affects individuals earnings and the employment decision-making process. The impact is larger when the parental educational level is higher and this implies a less risk aversion associated with their educational decisions for those children who come from a family where at least one parent is/was more educated. As regards to European countries of interest, the impact of the high level of parental education appears to be more relevant for those countries with lower intergenerational education gaps (*i.e.*, France, United Kingdom and Spain), though with different patterns along the conditional earnings distributions. Obviously, more insights in the earnings differentials could be created by looking into the heterogeneous category of self-employment for which we expect a different impact of some crucial determinants, especially in the main spheres of family background, for example, for the two distinct sub-groups of employers, who create jobs for others, and own-account self-employed, who do not employ any other person, or, within them, for the main sub-categories of entrepreneurs (*i.e.*, corporate managers and small businessmen), members of profession, craft workers and other skilled/unskilled individual producers. Anyway, we deliberately neglected these aspects but we intend to examine them closely afterwards.

References

- Allen D. (2000): Social Networks and Self-Employment. *Journal of Socio-Economics*, 29, 487-501.
- Altonji J.G. and Dunn T.A. (1996), The Effects of Family Characteristics on the Return to Education, *Review of Economics and Statistics*, 78, n° 4.
- Ashenfelter O., Zimmerman D.J. (1997): Estimates of the Returns to Schooling From Sibling Data: Fathers, Sons and Brothers. *Review of Economics and Statistics*, 79, n° 1.
- Atkinson A.B., Maynard A.K., Trinder C.G. (1983): *Parents and Children: Incomes in Two Generations*, London: Heinemann.
- Becker G. S. (1962): Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, LXX, 9-49.
- Becker G.S. (1964): *Human Capital*. Columbia University Press.
- Becker G.S. (1967): Human Capital and the Personal Distribution of Income: An Analytical Approach, Woytinsky Lecture, n° 1, University of Michigan, Institute of Public Administration.
- Becker G.S. (1991): *A Treatise on the Family*, Harvard University Press. Cambridge, MA.
- Becker G.S., Tomes N. (1986): Human Capital and the Rise and Fall of Families. *Journal of Labour Economics*, 4, 1-39.
- Behrman J.R., Birdsall N. (1983): The Quality of Schooling: Quantity Alone is Misleading. *American Economic Review*, 73 (5), 928-946.
- Björklund A., Jäntti M. (1997): Intergenerational Income Mobility in Sweden Compared to the United States. *American Economic Review*, 87 (5), 1009-1018.
- Breen R., Goldthorpe J.H. (2001): Class, Mobility and Merit: The Experience of Two British Birth Cohorts. *European Sociological Review*, 17, 81-101.
- Buchinsky M. (1994): Changes in the U.S. Wage Structure 1963-1987: Application of Quantile Regression. *Econometrica*, 62 (2), 405-458.
- Buchinsky M. (1998): Recent Advances in Quantile Regression Models: A Practical Guideline for Empirical Research. *The Journal of Human Resources*, 33 (1).
- Budria S., Pereira P.T. (2009): Education and Wage Dispersion: New Evidence for Europe. In Dolton P., Asplund R. and Barth E. (eds): *Education and Inequality Across Europe*. Edward Elgar, 147-170.
- Card D., Krueger A.B. (1992): Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States. *Journal of Political Economy*, 100, 1-40.
- Castellano R., Punzo G. (2010): The Employment Status as a Dimension of the Intergenerational Mobility: Evidence from European Countries. *Proceedings of 31th IARIW General Conference, St. Gallen (Switzerland), August 22-28*.
- Coleman J. (1990): *Foundations of Social Theory*. Cambridge, Harvard University Press, MA.
- d'Addio A.C. (2007): Intergenerational Transmission of Disadvantage: Mobility or Immobility across Generations? A Review of the Evidence for OECD Countries, *OECD Social, Employment and Migration Working Papers* 52.
- De Broucker P. and Underwood K. (1998): Intergenerational Education Mobility: An International Comparison with a Focus on Post-Secondary Education. *Education Quarterly Review*, 5 (2), 30-45.
- Dreher A., Gaston N. (2008): Has Globalization Increased Inequality. *Review of International Economics*, 16 (3), 516-536.
- Dunn T., Holtz-Eakin D. (2000): Financial Capital, Human Capital and the Transition to Self-Employment: Evidence from Intergenerational Links. *Journal of Labour Economics*, 18 (2), 282-305.
- Erikson R., Goldthorpe J.H. (2002): Intergenerational Inequality: A Sociological Perspective. *Journal of Economic Perspectives*, 16 (3), 31-44.
- Esping-Andersen G. (1990): *The Three World of Welfare Capitalism*. Cambridge, Policy Press.
- European Commission Regulation (EC) n° 1177/2003 of the European Parliament and of the Council of 16 June 2003 concerning Community Statistics on Income and Living Conditions (EU-SILC)
- Feinstein L. (2006): *The Effects of Education on Health: Concepts, Evidence and Policy Implications: A Review for the OECD Centre for Educational Research and Innovation (CERI)*, OECD, Paris.
- Feinstein L., Duckworth K., Sabates R. (2004): *A Model of the Inter-generational Transmission of Educational Success. Wider Benefits of Learning Research* 10, Centre for Research on the Wider Benefits of Learning, London.
- Foley K. (2006): *New Perspectives on Intergenerational Mobility in Education*, PhD Thesis Prospectus, Department of Economics, University of British Columbia, Vancouver.
- Gokcekus O., Muedin A.E. (2008): Quantifying Corruption by a Human Capital Earnings Equation. *Int Rev Econ*, 55, 243-252.
- Jæger M.M., Holm A. (2007): Does Parents' Economic, Cultural and Social Capital Explain the Social Class Effect on Educational Attainment in the Scandinavian Mobility Regime? *Social Science Research*, 36, 719-744
- Koenker R., Bassett G.W. (1978): Regression Quantiles. *Econometrica*, 46 (1), 33-50
- Koenker R., Bassett G.W. (1982): Robust tests for heteroscedasticity based on regression quantiles. *Econometrica*, 50, 43-61.
- Laferrere A., McEntee P. (1995): Self-Employment and Intergenerational Transfers of Physical and Human Capital: An Empirical Analysis of French Data. *The Economic and Social Review*, 27 (1), 43-54.

- Lang K., Ruud P.A. (1986): Returns to Schooling, Implicit Discount Rates and Black-White Wage Differentials. *Review of Economics and Statistics*.
- Le A.T. (1999): Empirical Studies of Self-Employment. *Journal of Economic Surveys*, 13, 381-416.
- Long J.S. (1997): Regression Models for Categorical and Limited Dependent Variables. *Advanced Quantitative Techniques in the Social Sciences Series 7*. Sage.
- Mazumder B. (2005): Fortunate Sons: New Estimates of Intergenerational Mobility in the U.S. Using Social Security Earnings Data. *Review of Economics and Statistics*, 87 (2), 235-255.
- Mincer J. (1958): Investment in Human Capital and Personal Income Distribution. *Journal of Political Economy*, 281-302.
- Mincer J. (1962): On-the-job Training: Costs, Returns and Some Implications. *Journal of Political Economy*, 70 (5), 50-79.
- Mincer J. (1974): *Schooling, Experience and Earnings*. New York: Columbia University Press.
- OECD (1996): *The Knowledge-Based Economy*. Paris.
- OECD (1997): *Human Capital Investment – An International Comparison*. Paris.
- OECD (1998): *Education at a Glance – OECD Indicators*. Paris.
- OECD (2005): *Education at a Glance – OECD Indicators*. Paris
- OECD (2010): *The High Cost of Low Educational Performance, The Long-Run Economic Impact of Improving PISA Outcomes*. Paris.
- Parker S.C. (2004): *The Economics of Self-Employment and Entrepreneurship*. Cambridge.
- Pereira P.T., Martins P.S. (2000): Does Education Reduce Wage Inequality? Quantile Regressions Evidence from Fifteen European Countries. *IZA Discussion Paper Series n° 120*.
- Quintano C., Castellano R., Punzo G. (2009), Generational Determinants on the Employment Choice in Italy. In: *Statistical Methods for the analysis of large data-sets*. Cleup (Eds.), 499-502.
- Rees H., Shah A. (1986): An Empirical Analysis of Self-Employment in the UK. *Journal of Applied Econometrics*, 1, 95-108.
- Stevenson L., Lundström A. (2001): Patterns and Trends in Entrepreneurship/SME Policy and Practice in Ten Economies. *Entrepreneurship Policy for the Future Series*, 3.
- Torrini R. (2005): Cross-country differences in self-employment rates: the role of institutions. *Labour Economics*, 12, 661-683.
- Willis R.J., Rosen S. (1979): Education and Self-Selection. *J. Polit. Econ.*, 87 (5).