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Re-Estimating the Returns to Education by Employment Status: Paid Employed vs. Own-Account Workers vs. Employers

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Abstract. This article is devoted to the exploration of the differences in the returns to education among wage earners and self-employed workers, while distinguishing between own-account workers and employers. Using a data base of EU-countries, we provide new evidence that qualifies some previous empirical findings found in the literature. In particular, we find that tertiary education significantly improves the returns to education for employers (relative to wage earners) while secondary education significantly improves the returns to education for own-account workers (relative to wage earners). However, relative to wage earners we also find a negative impact on earnings of self-employment activity as such (i.e., unrelated to education levels). This holds both for own-account workers and employers.

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1. Introduction

Individual and social investments in education have important opportunity costs, so measuring the associated welfare benefits – not only the effects of education on individual labour productivity but also on economic growth – remains an important task (Temple, 2001). In particular, the dependence of the level of output on the stock of human capital has been extensively modelled in models of economic growth (Lucas, 1988; Uzawa, 1965). In this type of model, human capital is considered the key input in the creation of new ideas and the main determinant of growth rates. As a corollary, public subsidies to certain types of education – when market failures exist – or even the most recent process of international competition for the attraction of talent[2], could lead to R&D activities

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or promote a particular allocation of talent between productive and unproductive activities in the sense of Baumol (1986) or Murphy *et al*. (1991). From a similar perspective, one could argue that the allocation of talent between entrepreneurial and non-entrepreneurial activities is a key element for understanding the differences observed in the capacity of national self-employment sectors to contribute to innovation, job creation and economic growth (Iyigun and Owen, 1999). In this respect, one could argue that the allocation of talent towards entrepreneurial activities is a key for economic growth. In particular, the availability of incentive schemes favouring the allocation of talent towards entrepreneurship should have a positive effect not only on entrepreneurship but also on innovation and economic growth.

In fact, people with higher educational attainment have, on average, a higher knowledge of opportunities to do business – to detect and capture profit opportunities – and of latent demands, potential productive combinations, and new methods and innovations than their less-educated counterparts. Then, they have a potentially higher probability to access better profit opportunities, that is, those that allow higher returns, usually associated with innovation, larger scales (higher self-employed firm sizes) and a greater contribution to job creation.

The allocation of talent towards entrepreneurial activity is especially important at the time of writing, when some governments have put self-employment promotion at the centre of the debate on ending the crisis. In this context, the introduction of incentive schemes for promoting entrepreneurship – even among unemployed people – is considered, by policy makers, as a promising strategy for direct and indirect job creation. However, this strategy could lead to distortions in the allocation of talent with potential adverse effects on the capacity of these new self-employed sectors for contributing to economic growth, innovation and job creation. For instance, one could argue that if better educated people have a higher probability to find a job – in the paid-employment sector – thanks to being endowed with a potent signal, some unemployed will be pushed into self-employment due to the lack of job offers. These 'necessity' entrepreneurs decide to become self-employed as a last resort and in consequence will erode the quality of the entrepreneurs on average, with effects on productivity, the type of products, the quality and quantity of jobs created and their capacity for leading innovation and their external competitiveness (Shane, 2009; Congregado, Golpe and Carmona, 2010). Furthermore, in countries with high unemployment rates, the effects of the introduction of these incentive schemes might be particularly strong.

Thus, the study of these questions is particularly useful not only for justifying the expansions of educational provisions to achieve higher levels of attainment in the future but also to determine how a given quantity of educational spending is best allocated. However, these topics are beyond the scope of our work. By

2. The so-called Dream Act approved by Obama's Administration is a good example of this.

contrast, this work has the aim of adding some elements to the previous literature on the optimal allocation among the types of employment that should be taken into account when incentive schemes are being devised. In this sense, a full analysis of policy questions should not only consider educational policies but also the active labour market and entrepreneurship policies as a whole. This is the context of the present work.

The aim of this article is to look for differentials in the returns to education by status in employment – i.e., among paid-employees and self-employed workers – in line with the strategy followed in the work of Van Praag, Van Witteloostuijn and Van der Sluis (2013), but qualifying their results with two extensions: i) first, by using an internationally comparable data base to detect potential country-specific effects; and, above all, ii) allowing the possibility of different returns to education across two types of self-employed workers – that is, own-account workers versus job creators – to check if the previous empirical results on the differences between the returns to education by status are biased due to the consideration of self-employed workers as a unique type of status, although it is a highly heterogeneous group composed of two different types of self-employed with a different ability for exploiting the scale economies and therefore with potentially high differences between their respective returns to education. To the best of our knowledge, the latter approach to the analysis of the returns to education by status is novel in a EU-15 context. We find a similar approach broken down by type of entrepreneur in the work of Sorgner et al. (2014), which focuses on Germany.

Our approach has at least two different dimensions with profound implications for this body of literature: i) our results qualify the previous literature, helping us to understand previous puzzles; and ii) the results should be important not only for understanding the why and wherefore of the individual decisions on the educational investment and the occupational choice but also for devising the conjunction of three different types of policies. In particular, how entrepreneurship promotion, labour market policies and educational policies should be targeted to promote self-employment of those individuals endowed with the highest educational levels. In that sense, it should be noted that previous literature suggests that this class of entrepreneurs identify more profit opportunities and have the opportunity to capture the most innovative and productive ones. In addition, they will have a higher probability of survival – see, Millán, Congregado and Román (2011), for a survey – and a higher probability of becoming employers – see, Congregado, Millán and Román (2010).

In sum, looking for the key elements that determine the emergence of these 'ideal' entrepreneurs, that is, those who best contribute to innovation, economic growth, and job creation, is a great challenge for the Economics of Entrepreneurship field and crucial for an adequate devising of the promotion of self-employment among those individuals with higher educational attainments.

From a technical perspective and to avoid the potential endogeneity bias – perhaps best summarised in the controversy between García-Mainar and Montuenga-Gómez (2005, 2009) and Jordahl, Poutvaara and Tuomala (2009) regarding the use of instrumental variables – we circumvent this problem with the use of the Hausman-Taylor estimator and by employing the strategy devised by separating the return to education of the risk premium associated with entrepreneurial activities in Van Praag, Van Witteloostuijn and Van der Sluis (2013).

Thus, the main contribution of this work is to consider a distinction that previous entrepreneurship research on returns to education appears to have overlooked: the distinction between different types of entrepreneurs. In this respect, one could argue that the group of entrepreneurs who hire external labour – employers or job creators – have more opportunities to benefit from high education than do entrepreneurs who work on their own – own-account workers – because employers run larger ventures and thus benefit from economies of scale. One might therefore expect the returns to education for employer entrepreneurs to be higher relative to the returns to education for own-account entrepreneurs. Our empirical estimates shed light on this conjecture.

The rest of the paper is organised as follows: the second section presents a selective review of the literature, focusing on the main hypotheses and inferences on the genuine effects of education on productivity/earnings and putting our approach into the context of the studies that explicitly model heterogeneity in the returns to education across groups or individuals, by employment status in our case. The third section is devoted to presenting the econometric framework, the data and some stylised facts. Finally, section four reports the estimates and discusses the results, while the last section concludes and suggests some avenues for further research.

2. Literature Review

This section presents a selective review of the vast literature devoted to providing evidence on the returns to education, more specifically on the genuine effects of education on productivity. Thus, first we review the key elements of this type of literature, and then we will focus on how conventional findings could be qualified when heterogeneity is taken into account. In particular, we determine the genuine effects of education on productivity when the potential differences between paid employees and self-employed workers are explicitly considered.

2.1. The Literature on the Returns to Education

Researchers in this field typically study the relationship between education and productivity using survey data on the earnings and characteristics of large numbers of individuals, which are combined, sometimes, with aggregate economic variables, and employing different econometric approaches that are increasingly sophisticated and improved.

More specifically, the standard empirical approach for establishing the private returns to education is to explain the variation in earnings across individuals using regressions, for which the explanatory variables include years of schooling, either age or a simple proxy for labour market experience, and other characteristics. The most popular specification, used as a baseline model in much of the works in this field, draws on the work of Mincer (1958, 1974), Becker (1962) and Becker and Chiswick (1966), who use Human Capital Theory. This has been complemented with the Signalling Hypothesis where the direct relation between education and productivity disappears but where highly educated individuals still earn more because they can signal their ability to employers (see Arrow, 1973; Spence, 1973; and Stiglitz, 1975).

In general, the available evidence usually suggests that earnings are positively associated with schooling, that is, the evidence is robust and uncontroversial although the difficulty is to provide a causal interpretation. We construct our first hypothesis in order to confirm earlier literature.

Hypothesis 1: Human capital has a positive effect on earnings.

Leaving aside some econometric problems related to the fact that the group of people with a relatively higher level of educational attainment is not a random selection from the population as a whole, in this type of regression, we want to stress that it seems probable that the costs and benefits of education vary across individuals, and this could be a cause of the variation in completed schooling that scholars use to capture the effects of education.

In other words, heterogeneity means that returns to education vary across individuals, that is, the returns might vary independently of the explanatory variables, leading to potential biased estimates. In this context, the exploration of this heterogeneity by employment status is especially interesting for at least three reasons: i) because the Signalling Hypothesis does not apply to the group of employed who work for themselves; ii) for entrepreneurs, we can argue more about the mechanisms by which education contributes to higher returns, i.e., more educated individuals will be able to identify and capture – starting new entrepreneurial ventures – more and better profit opportunities, being more productive, whatever their chosen type of business; and iii) more educated entrepreneurs will most likely have the ability to equip workers with more

advanced technologies, providing better goods and services and more competition, leading to larger scales and a greater contribution to job creation.

The next section will focus more specifically on the returns to education for entrepreneurs.

2.2. Returns to Education and Self-Employment

What are the reasons for the different returns to education by employment status? Van Praag *et al.* (2013) summarise some of the factors that can help us to understand the why and wherefore of these differences. First, highly educated individuals need a higher risk premium to undertake an entrepreneurial activity, compared to earning a wage, which is configured as a higher opportunity cost for these individuals. This idea, initially introduced by Shane and Venkataraman (2000), has been recently put in perspective in the work of van Praag *et al.* (2013).

However, there are further arguments for expecting a differential in the returns to education between the group of self-employed workers and the group of paid-employed. First, self-employed earnings are undervalued, given that they have disincentives to declare their true returns (Hamilton, 2000; Parker, 2004; Levitt and Dubner, 2005). Second, the returns of self-employment may comprise of mixed incomes, that is, the earnings may include the return on capital as they own the business (Feldman and Slemrod, 2007), depending on characteristics of the data. Third, on average, one could also expect higher returns to education in self-employment, either because the self-employed are businessmen or are highly qualified professionals, such as doctors or lawyers, who develop highly paid business activities that cause this type of work to be overvalued.

However, compared to the set of technical explanations outlined above, this work explores two new hypotheses for understanding this differential, with which we can extend and qualify the previous findings. These two hypotheses are based on a stylised fact recently highlighted. In particular, some recent studies have explained the high heterogeneity across the self-employed and firms. In particular, Poschke (2013a, 2013b) provide evidence on the U-shaped relationship between entrepreneurship and education. This stylised fact stems from the fact that some individuals decide to become entrepreneurs because of the lack of job opportunities (necessity entrepreneurs), while others (opportunity entrepreneurs) start a venture as the optimal solution to their occupational choice problem as a way to obtain much greater returns than in salaried work. In this way, many self-employed operate very small businesses, and others operate on larger scales. For this reason, the returns to entrepreneurship have a much larger cross-sectional variance than the returns to wage-work (Poschke, 2013b).[3]

3. Poschke (2013b) develops a model in which the most and the least able individuals choose to become entrepreneurs.

Following this heterogeneity, we can expect two opposite sources of heterogeneity in the returns to education across the two types of self-employed and with regard to wage-workers. On the one hand, there exists a powerful argument for expecting higher returns to education among wage-workers compared with necessity entrepreneurs, most of whom will be own-account workers. However, we also can expect the reversal effect, that is, higher returns to education among job creators compared with paid-employees given that job creators can exploit in a better way their endowments of human capital. Attending these arguments, we propose our hypothesis two and three:

Hypothesis 2: The returns to education are higher for employees than for own-account workers

Hypothesis 3: The returns to education are higher for employer entrepreneurs than for employees.

These two hypotheses are tested in this work. Whereas hypothesis 2 has been investigated for Germany by Sorgner et al. (2014), to the best of our knowledge, hypothesis 3 is novel.

2.2.1. Available Evidence Thus Far on the Returns to Education in Self-Employment

On the basis of the idea of Davidson and Honig (2003), according to which education provides cognitive abilities for entrepreneurial discovery, an incipient line of research is devoted to studying the effect of education on entrepreneurial activity – see Hyytinen *et al*. (2013) or Block *et al*. (2013) for two recent surveys in this field.

On the whole, the empirical evidence linking education and self-employment is ambiguous. On the one hand, some findings suggest that the returns to education are similar for entrepreneurs and employees, though somewhat higher for entrepreneurs in the U.S. However, other empirical studies demonstrated that the returns to education are high for entrepreneurs and even higher than for employees (Hartog *et al.*, 2010 or previously, Bates, 1990). Finally, for some European countries, Van Praag *et al.* (2013) and García-Mainar and Montuenga-Gómez (2005) provide opposite results. While the former study provides evidence on higher returns to education for self-employed workers, the latter, for Spain and Portugal, reports higher returns to education in wage-employment.

Recently, Toth (2012) has estimated the causal effect of entrepreneurial experience on earnings by using self-employment experience as a proxy for entrepreneurship-specific human capital acquisition. Finally, in a recent work of Sorgner et al. (2014) where they distinguish by type of entrepreneur, it was found

that the median self-employed entrepreneur with employees earns significantly more than the median salaried employee, while the median solo entrepreneur earns less. They also found that *solo* entrepreneurship pays for those with a university entrance degree but no further professional qualification as well as for those who were in the upper percentiles of the income distribution in their previous salaried job.

3. Econometric Framework and Data

In this section, we describe the econometric strategy and the data to test for differences in returns to education between individuals with different employment statuses. After considering the basic Mincerian model, our empirical strategy discusses the two alternative ways to circumvent the problems associated with the potential endogeneity bias of some regressors.

3.1. Econometric Framework

The empirical model for our estimates, is based on the following Mincerian earnings equation:

$$\log W_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 X_{it} + \beta_3 X_{it}^2 + \beta_4 \Pi_{it} + \xi_{it}$$

where W_{it} is gross annual earnings in year t – a proxy for individual productivity – S_{it} is the educational attainment and X_{it} is the potential labour market experience – defined as age minus age when working life began – and the error term ξ_{it}. The standard Mincerian equation associates log earnings to schooling and labour market experience, experience squared and a set of control variables included in the vector Π_{it}; this set of variables includes demographic, regional and labour characteristics. Finally, the individual effect captures unobserved characteristics – the most obvious one being individual ability – that are clearly correlated with education and experience (Card, 1999).[4] As is well known, the availability of panel data helps us to control for this unobservable heterogeneity by taking first differences.

4. In particular, we use the alternative specification of the Mincerian equation proposed by Blundell *et al*. (2004), which decomposes the error term into three components: $\xi_{it} = \mu_i + \upsilon_i + \varepsilon_{it}$, where μ_i captures unobserved individual components related to the individual, whether an individual's ability or motivation (endogeneity of wages), υ_i contains any errors that are generated by unobserved individual factors related to explanatory variables, especially education (endogeneity of education), and, finally, ε_{it} which is derived from the standard error of measurement errors of the variables included in the model.

We use some of the econometric strategies recently proposed in the literature to measure the education returns. The use of instrumental variables is to control for potential endogeneity in the Mincerian equation.[5]

Endogeneity bias

The key question concerning estimating the earnings equation is the endogeneity bias for omitted ability variables arising from the OLS estimations.[6] As is well known, to solve the endogeneity bias, two approaches are frequently used: the use of instrumental variables and the '*control variable approach'* through an ordinary least squares approach (henceforth OLS).[7]

While the Instrumental Variable (henceforth, IV) approach requires the disposal of the appropriate instrumental variables, correlated with the endogenous explanatory variable but not with the error term, these instruments are not always available. Moreover, this approach requires that there be at least as many instruments as endogenous variables. In our database, unfortunately, we do not have information on some of the instruments that are adequate to implement the IV approach, such as the family background or similar variables – see, Harmon *et al*. (2000), Card (1999) or Angrist and Krueger (1991) to have an idea of the type of instruments usually adopted in these studies.[8] Consequently, in this paper, we combine the use of IV estimates following the Hausman-Taylor strategy[9] and the control variable approach, including some additional regressors in the earnings equation to approximate the influence of unobserved ability.

Although the estimators implemented in Hausman & Taylor (1981) and the Two Step IV approach use the method of instrumental variables, each one is

5. Iglesias (2014) reports a summary of alternative microeconometric approaches applied to the estimation of the returns to education.
6. At this point, we refer to the potential endogeneity of the returns, education and experience. On the one hand, we agree that individuals with higher innate ability will be able to develop their skills more efficiently and, therefore, are able to seize opportunities in the labor market (Card, 1994). It is also possible to argue that the wage level is related to job satisfaction, so that efforts to increase the motivation are to be found in more skilled jobs, and this ultimately brings greater income (Lydon and Chevalier, 2002). On the other hand, education is correlated with innate ability, while more educated individuals are, as a rule, the most skilled. From this perspective, skipping the innate ability should affect the level of wages, and the coefficient biases of OLS estimates could generate econometric problems by the omission of the relevant variables (see Inchino and Winter-Ebmer, 2004 and Denny and Harmon, 2000).
7. The differences and advantages of the use of IV versus OLS estimates are reviewed in Wooldridge (2002 and 2005), Heckman and Urzúa (2010) and Larcker and Rusticus (2010), among others.
8. A wide summary of the most common instruments used in the literature can be found in Iglesias (2014).
9. The standard Hausman test for the Hausman & Taylor estimator rejects the null hypothesis that the conditional mean of the disturbances given the regressors is zero (chi^2= 525.34, Prob>chi2 =0.0000). The results we present in the next section using the GLS approach are with random effects, discarding FE despite being recommended after applying the Hausman test due to the nature of the data of our variables of interest, for which the educational level just indicates the variability pathway.

designed for different problems. The estimators implemented in Two Step IV approach assume that a subset of the explanatory variables in the model are correlated with the idiosyncratic error ε_{it}. On the other hand, in the Hausman & Taylor Estimator it is assumed that some of the explanatory variables are correlated with the individual-level random effects, u_i, but that none of the explanatory variables are correlated with the idiosyncratic error, ε_{it}. In this work we have implemented the Hausman & Taylor (1981) procedure because this estimator can treat the endogeneity bias without using specific instruments. Our database does not allow us to use the right tools, however this estimator allows to distinguish between endogenous and exogenous regressors and between time-variant versus time-invariant regressors.

Based on the information of educational levels, the model is developed as follows:

$$\log W_{it} = \alpha + \gamma_1 \mathrm{D1}_{it} + \gamma_2 \mathrm{D2}_{it} + \gamma_3 \mathrm{D3}_{it} + \gamma_4 X_{it} + \gamma_5 X_{it}^2 + \gamma_i C_{it} + \xi_{it}$$

where D_i are dummy variables that take value 1 for each level of education and 0 for the rest. Thus, D1 is equal to 1 if the individual has a level of education corresponding to compulsory education and 0 for the rest. The same procedure creates the two dummies D2 and D3, corresponding to the levels of upper secondary education and higher education, respectively. Finally, C_{it} denotes the set of demographic and work control variables.

3.2. Data and Variables

The data used are from the European Community Household Panel (henceforth, ECHP).[10] The ECHP is a panel of European households belonging to the EU-15[11], covering the period 1994-2001. Every year, the members of the interviewed households are questioned about issues relating to demographic characteristics such as gender, marital status and age, among others, about their labour market participation and their employment record, about incomes and even about health and living conditions. The use of the same questionnaire for all countries makes the information directly comparable across countries.[12] Given the goals of this work, the first step to obtain a valid sample for our empirical estimates is to identify the employment status, – i.e., to be able to distinguish between self-employed workers and paid employees – and more precisely, given our main

10. ECHP data are used with the permission of Eurostat (Contract ECHP/2006/09).
11. The countries included in this study number only 14: Austria, Germany, Denmark, Luxembourg, Netherlands, Belgium, France, Finland, UK, Ireland, Italy, Greece, Spain and Portugal. Sweden is excluded because its data presents missing values in some relevant educational variables in the sample period considered.
12. See Peracchi (2002) for a detailed description of this survey.

objective, between the two groups of self-employed workers: own-account workers, – i.e., self-employed workers who have not contracted any employees – and employers or job creators. The sample contains information about the current employment status of each individual, i.e., information for distinguishing between self-employed and paid-employed workers. To distinguish between the two groups of self-employed workers, we must use the available information in the sample about the number of paid employees in the local unit at the current job. This information allows to differentiate between own-account workers if this number is zero and employers otherwise. The sample, taken from the six waves of the ECHP dataset, is comprised of men and women aged 15 to 65 who have completed schooling and are working in a full-time job more than 15 hours a week at the time of being interviewed, in non-agricultural sectors.

Dependent Variable

In our empirical approach, the dependent variable is the return – wages for employees or profit for self-employed workers – expressed in natural logs. At this point, it should be noted that in ECHP, losses from entrepreneurial activity are not allowed. Furthermore and to ensure comparability across countries and time, incomes and returns are converted into constant euros of the year 1996 by using the harmonised consumer price index for ensuring comparability across time and using purchasing power parity to ensure comparability across countries.

Exogenous Variables

The model includes the education and experience as regressors. The value of the years of potential labour market experience for the individual i (X_{it}) is obtained by subtracting from the individual's age (denoted by a) the age when working life began (S). This measure of potential experience is not exactly the same as that conventionally proposed by Mincer (1974).[13] The usual definition is age minus years of schooling minus age when school starts. Then, potential experience in this work is calculated as follows:

$$X_{it} = a_{it} - S_i$$

Following common practice, the educational attainment and the number of years of education were considered as candidate proxies for education. However, the use of the proxy 'years of education' is problematic in analysis across nations with different educational systems not only in terms of duration but also in terms of different schemes of compulsory education (Card, 2001; Blundell *et al*., 2004). Different durations of the same educational attainment across countries may be a

13. Mincer (1974) defined the potential experience as the difference between the number of years an individual of age a could have worked, assuming he started school at age 6, finished S years of schooling in exactly S years, and began working immediately thereafter: $X = a - S - 6$.

source of bias, leading to low education returns for those countries in which the same educational attainment is achieved in a longer period. Additionally, if the goal is to capture the effect of credentials, it is more appropriate to use educational levels, while the linearity assumption that yields the years of education has been rejected (Hungerford and Solon, 1987; Park, 1999).

In our exercises, the interpretation of results should be in terms of each additional level of education. The level 1 of the ECHP includes levels 0, 1 and 2, as established by the International Standard League Table of Education (ISCED), determined by the OECD, including compulsory education, which in most cases corresponds to the primary education and lower secondary education; for level 2, this includes ISCED level 3; and for 3, it includes ISCED level 5, 6 and 7, relating to higher education.

Control variables

Finally, we introduce a set of explanatory variables related to demographic characteristics – gender and the number of children under 14 – and employment characteristics such as sector of activity, firm size, second language used at work and working hours.

Table A1 – in the appendix – provides a detailed description of the variables included in the analysis.

4. Results

The estimates reported in Table 1 have been obtained using the Hausman-Taylor (1981) procedure to control for the endogeneity bias. The first column shows the results for the full sample (including both entrepreneurs and wage workers), while the second to fourth column present results for various subsets and combinations of employment statuses.

The first estimation ('All') shows that individuals with secondary or tertiary education earn more than those with only basic education (coefficients 0.338 and 0.672, respectively), thereby confirming Hypothesis 1. We also see that for entrepreneurs, the returns to education are even higher than for employees as the interaction terms of education with entrepreneurship are significantly positive (coefficients 0.122 and 0.187, respectively). The second estimation shows that for employers, this reflects a higher return to *tertiary* education (coefficient 0.221) while the third estimation shows that for own-account workers, this reflects a higher return to *secondary* education (coefficient 0.274).

As, compared to wage employees, the returns to (secondary) education are higher for own-account workers, Hypothesis 2 is not confirmed. In contrast, Hypothesis 3 is confirmed to the extent that the returns to tertiary education are higher for employer entrepreneurs compared to wage employees.

The result for employer entrepreneurs confirms the conjecture that employers can receive higher returns to tertiary education by working on larger scales. As a result of higher educational attainment, employers are better able to manage larger businesses, which translates into larger scale and higher earnings.

The result for own-account workers is in line with Sorgner et al. (2014) who argue that formal tertiary education is particularly useful when pursuing careers in paid employment or employership, but less useful in solo self-employment.

However, apart from the results on returns to education, it is also found that self-employment as such reduces earnings considerably (coefficients -0.738 and -0.631 for employers and own-account workers, respectively). While this finding for solo self-employed was also found by Sorgner et al. (2014), the lower earnings of employers compared to wage earners is surprising. Maybe employers in Germany (the country studied by Sorgner et al) are, on average, of higher 'quality' than the average employer in the EU.

In line with Toth (2012), our results also indicate the causal effect of entrepreneurial experience on earnings by using self-employment experience as a proxy for entrepreneurship-specific human capital acquisition. Previous experience increases wages by approximately 9% per year of accumulated experience. Nevertheless, after some optimal level of experience, the effect becomes negative (squared term). Finally, and with regard to the control variables included in the model, the results are in line with the evidence provided by the previous literature. Among others, earnings are higher for men, and increase with firm size. Finally, our results also show in the last column that employees in the public sector, despite having higher earnings in relation to the private sector (positive intercept dummy), suffer lower returns to education than private sector employees (negative slope dummy).

Table 1: Estimated coefficients of the Mincerian earnings function by Hausman-Taylor estimator.

Sample	All		Employers & Wage earners		Own Account & Wage earners		Wage earners	
Dependent variable: Personal net income (log)	***Coefficient***	***z-stat***	***Coefficient***	***z-stat***	***Coefficient***	***z-stat***	***Coefficient***	***z-stat***
Time Variant endogenous								
Secondary education [a] (*ref. Basic education)*	0.338***	5.25	0.409***	6.87	0.297***	4.64	0.335***	6.55
Tertiary education [a](*ref. Basic education)*	0.672***	9.32	0.704***	10.67	0.726***	10.41	0.821***	14.82
Experience	0.089***	15.95	0.090***	17.13	0.097***	18.45	0.106***	24.55
Time Variant exogenous								
Experience^2	-0.160***	-13.60	-0.165***	-14.42	-0.179***	-16.02	-0.203***	-21.16
Entrepreneurs [a] (ref. wage earners)	-0.847***	-22.11						
Entrepreneurs * Secondary education	0.122**	2.17						
Entrepreneurs * Tertiary education	0.187***	2.81						
Employers [a] (ref. wage earner)			-0.738***	-19.36				
Employers * Secondary education			-0.064	-1.12				
Employers * Tertiary education			0.221***	3.33				
Own Account [a] (ref. wage earner)					-0.631***	-9.15		
Own Account * Secondary education					0.274***	4.54		
Own Account * Tertiary education					0.016	0.21		
Public Employee							0.19***	5.42
Public Employee* Secondary education							-0.071	-1.51
Public Employee* Tertiary education							-0.19***	-3.68
Number of children under 14	-0.039***	-4.10	-0.039***	-4.47	-0.052***	-5.96	-0.066***	-8.78
Second language	0.017	0.88	0.040***	2.31	0.023***	1.27	0.050***	3.68
Services sector [a]*(ref. Primary sector)*	0.604***	17.77	0.567***	15.63	0.518***	15.95	0.406***	11.83
Industrial sector [a]*(ref. Primary sector)*	0.589***	16.47	0.553***	15.04	0.513***	15.19	0.44***	12.84
Construction sector [a] *(ref. Primary sector)*	0.506***	12.85	0.457***	11.49	0.416***	11.17	0.333***	9.15
Firm size [a] 1-4 *(ref. None Regular paid employees)*	0.163***	6.66	0.171***	2.72	0.510***	8.15	0.311***	6.41
Firm size [a] 5- 19 *(ref. None Regular paid employees)*	0.374***	12.66	0.347***	5.50	0.707***	11.25	0.469***	9.66
Firm size [a] 20 – 49 *(ref. None Regular paid employees)*	0.504***	15.31	0.468***	7.28	0.802***	12.54	0.549***	11.14
Firm size [a] 50 – 99 *(ref. None Regular paid employees)*	0.566***	15.98	0.528***	8.10	0.860***	13.26	0.602***	12.06
Firm size [a] 100 – 499 *(ref. None Regular paid employees)*	0.606***	17.62	0.569***	8.80	0.895***	13.90	0.635***	12.81
Large firm>500 [a] *(ref. None Regular paid employees)*	0.630***	17.54	0.586***	8.93	0.921***	14.10	0.654***	13.05
Working hours	0.025***	7.01	0.023***	6.22	0.021***	6.07	0.027***	7.22
Working hours squared	-0.0002***	-7.28	-0.0002***	-6.95	-0.0002***	-5.23	-0.0002***	-6.05
Time Invariant exogenous								
Male [a]	0.507***	25.21	6.327***	42.02	0.407***	23.02	0.228***	16.72
Country controls	Yes		Yes		Yes		Yes	
Constant	6.015***	44.34	0.387***	21.48	5.870***	39.97	6.17***	45.73
Number of observation / Number of groups	126185	44604	110651	40635	112579	41418	97045	35925

Notes: [a] Dummy variable. [b] In thousands of the average euro of 1996, corrected by purchasing power parity (across countries) and harmonised consumer price index (across time)
.* 0.1 >p 0.05; ** 0.05 >p 0.01; *** p< 0.01. Robust standard errors

5. Conclusions

In this article we explored the differences in the returns to education among wage earners and self-employed workers, while distinguishing between own-account workers and employer entrepreneurs. Using a data base of EU-countries, we found that *tertiary* education significantly improves the returns to education for employers (relative to wage earners) while *secondary* education significantly improves the returns to education for own-account workers (relative to wage earners). However, relative to wage earners we also found a negative impact on earnings of self-employment activity as such (i.e., unrelated to education levels). This holds both for own-account workers and employers.

The utility of our results is to understand how the labour market rewards the investment in education, which largely determines the decision of individuals to put their talent in paid employment versus self-employment, and, within the category of self-employment, in own-account worker entrepreneurship or employer entrepreneurship. Therefore, the maps of incentives that have emerged from entrepreneurship and labour market policies should be coordinated with educational policies to avoid distortions in the occupational choice decisions, especially if one has the objective of promoting self-employment among those with higher levels of education to foster innovation, competitiveness, economic growth and job creation.

In sum, exploring the differences in the returns to education by employment status is not only a promising avenue for research on returns to schooling but also for policy-makers. In particular, a greater understanding of the pattern of heterogeneity in the returns to education among paid employees and the self-employed should lead to better policy decisions. In addition, relevant to policy makers as well, although out of the scope of this work, should be the analysis of this type of heterogeneity in the returns to education taking into account the differences introduced by the type of study (e.g., technical versus non-technical education), given that this may have a key influence on the quantity and type of jobs and profit opportunities available for the individual.

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Appendix

Table A.1. Variables description

Variable	**Description**
	Dependent variable
Log (annual earnings)	Work incomes earned during the year to the interview, converted to average € of 1996, being corrected by Purchasing Power Parity (across countries) and Harmonised Consumer Price Index (across time). This variable is expressed in natural logarithms.
	Independent variables
Education	
Primary education	Dummy equals 1 for individuals with less than second stage of secondary level education (ISCED 0-2).
Secondary education	Dummy equals 1 for individuals with second stage of secondary level education (ISCED 3).
Tertiary education	Dummy equals 1 for individuals with recognized third level education (ISCED 5-7).
Experience	Age minus age when the highest level of general or higher education was completed and minus six.
Job status	
Entrepreneurs	Dummy equals 1 for own account workers and employers.
Public	Dummy equals 1 for salaried employees who work in the public sector and 0 for those who work in the private sector.
Demographic characteristics	
Male	Dummy equals 1 for male individuals.
Number of children under 14	Number of children aged under 14 living in the household.
Job characteristics	
Second language	Dummy equals 1 for individuals who speak a second language in current job.
Industrial sector	Dummy equals 1 for individuals who work in industrial sector.
Construction sector	Dummy equals 1 for individuals who work in secondary sector.
Services sector	Dummy equals 1 for individuals who work in services sector.
Firm-sized firm 1-4	Dummy equals 1 for individuals who work in a firm with more than 1 employee and less than 5.
Firm-sized firm 5-19	Dummy equals 1 for individuals who work in a firm with more than 4 employees and less than 20.
Firm-sized firm 20-49	Dummy equals 1 for individuals who work in a firm with more than19 employees and less than 50.
Firm-sized firm 50-99	Dummy equals 1 for individuals who work in a firm with more than 49 employees and less than 100.
Firm-sized firm 100-499	Dummy equals 1 for individuals who work in a firm with more than 99 employees and less than 500.
Firm-sized firm>500	Dummy equals 1 for individuals who work in a firm with more than 499 employees.
Working hours	Total number of hours working per week (in main + additional jobs).
Country dummies	14 dummies equalling 1 for individuals living in the named country: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and the United Kingdom.