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Self-employment :
new empirical evidence on human capital and business cycles

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Self-employment
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Autoempleo
Nueva evidencia empírica sobre capital humano y ciclos económicos

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Preface

This PhD thesis investigates the determinants and success in self-employment across the EU-15. The origins of this contribution can be traced back to 2004, when I finished my Master's thesis at the *Universidad Autónoma de Barcelona* (Quantitative Economics Doctorate, QED), devoted to the study of marginal private returns to education in the EU-15 under the supervision of Professors José Luis Raymond and José Luis Roig. That work became the starting point of one of the essays contained in this dissertation (chapters 2) in which this previous research was extended for exploring the existence of differences in the returns of education by employment status, marking the transition to my current line of research devoted to the economic analysis of entrepreneurship and self-employment. After graduating, I held teaching positions at various departments of economics at different universities in Spain (Autònoma de Barcelona, UNED, and Huelva), where this doctoral dissertation has been written under the supervision of Emilio Congregado.

Several people have been influential during my PhD research. Professors Raymond and Roig acted as supervisors during my Master thesis period. At the end of that period, they encouraged me to continue researching into Applied Economics. I am especially grateful to the Head of the Department of Economics at the University of Huelva, Professor Barroso who allow me resuming my research career after a break. I would also like to express my gratitude to my friends and colleagues, Emilio Congregado, Antonio Golpe, José María Millán and Concepción Román for their constant support, inspiration and understanding. I am also indebted to Juan Sanchis, Juan Máñez and María Engracia Rochina who helped me in different moments by commenting on draft versions of chapters and by encouraging me to continue researching into this topic. Part III of this study gained a great deal from the joint work with Antonio Golpe, while the essay devoted to overqualification gained a lot thanks to the valuable help of José María Millán and Concepción Román.

My work also benefited from a pleasant working environment. Even though there is not enough room to mention everyone, I particularly would like to thank María Teresa Aceytuno, Ángela Eugenio, David Flores, Carmen Guzmán, Antonio Luis Hidalgo and Lidia Luque. Regarding institutional support, I would also like to

I would also like to express my special thanks to my parents, my grandma, my family, my friends and, above all, Lola, for their unconditional support over the years. I would like to end by dedicating this thesis to my daughter Lola. If it was not for all of you, none of this would have been possible.

Huelva, September 2014
Jesús Iglesias Garrido

Part I: Introduction

Chapter 1: Introduction and outline

1.1. Introduction

This chapter reviews the general framework, aim and scope of the set of four essays that make this dissertation. In particular, the dissertation is organized around four essays of applied economics in which self-employment works as nexus among them. Specifically, the first two essays revolves around the role of human capital as determinant of the occupational decision, extending previous literature into two directions: first, checking the returns to education by employment status by distinguishing between the two types of self-employment and second, reviewing the overqualification question from a new perspective based on the differences between wage earners and self-employed. Both questions might be considered very important, not only for understanding the determinants of the allocation of talent but also for contributing to a better management of educational, entrepreneurship and labor market policies –maybe revealing the need to moving towards coordinated actions–.

The second part of this dissertation, addresses a central aspect of the economics of entrepreneurship, especially important, in times of crisis in which self-employment promotion policies are viewed as an alternative response to unemployment and recession. From this premises, the two essays making up this part, are devoted to provide new evidence on the relationship between self-employment and unemployment and GDP, respectively, thanks to the new possibilities opened by the re-

cent availability of richer data sets which allow us to explore new hypotheses by means of econometric approaches which allow nonlinearities in the relationships. In this way new results should contribute to a better understanding of the relationship between entrepreneurship and some macroeconomic variables. These findings should help us not only to a better understanding of the development of the entrepreneurship over the cycle, but also to provide more refined recipes to policy makers, when they decide to use the promotion of self-employment as an anti-cyclical policy or as a way to combat unemployment. To this end, a recently developed set of nonlinear models for panel data are used to provide additional evidence of these relationships, by using a data set of 23 OECD countries.

Let's review the main elements of each relationship analysed in this thesis.

Human capital and self-employment

In the EU-15 the human capital endowments are reaching an increasingly high level. With this general trend, recent developments also document that the traditionally observed differences between wage-workers and self-employed workers by educational attainment –wage workers showed higher levels of education than self-employed ones– are now practically unnoticeable –very similar and around 30%–. This figure breaks the scenario of a decade ago where the more educated workforce was concentrated in wage employment.

As it is well known, human capital is directly related to the growth of economies (Temple, 2001). This hypothesis is built on the idea that the knowledge and skills allow increases in productivity, and thus enable economic growth (De la Fuente, 2007). On these premises, education is set as the substantial element in the development of skills that enable this growth. Moreover, not only to have a higher average human capital endowment, but also and specially the way in which these skills are allocated among entrepreneurial and non-entrepreneurial activities, that is, the

way in which the talent is allocated must have key implications on productivity and growth, employment and innovation (Baumol, 1990, Murphy et al., 1999).

This relationship has intensively explored. For instance, human capital and entrepreneurship have been associated to the economic performance given the importance of knowledge in the economic process (Thurik and Wennekers, 2004) in the so-called modern 'entrepreneurial economy' (Audretsch and Thurik, 2000, 2001) where many entrepreneurs try to commercialize new ideas which depend on their human capital endowments ultimately (Fritsch, 2008). A pool of self-employed individuals trying to exploit new ideas contributes to a high degree of variety and selection in the economy, which ultimately leads to innovation and economic growth (Carree and Thurik, 2003, 2008).

From a different perspective, the effect of human capital on the decision to become entrepreneur –see van der Sluis et al., (2008) for a survey[1]– and on whether self-employment influences subsequent economic performance has also been intensively explored –Fritsch and Mueller (2004), Thurik et al (2008), Van Praag y Verloot (2007) or Henrekson y Johanson (2009)–.

At the same time, studies on the returns to education are very extensive, and illustrate that human capital investment is positive too (see, for instance Ashenfelter et al., 1999 as example of this body of literature). However, the literature on the returns of education among statuses is relatively scarce. This literature focuses on the performance of the investment in education as explanatory factor of the decision to become entrepreneur and its effects on the distribution of talent in the labor market (see, Van der Sluis et al. 2008 or Hartog et al. 2010). In sum, the key element is to

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[1] Van der Sluis et al. (2008) using a meta-analysis for more than a hundred studios showed that previous empirical evidence presents an ambiguous scenario. On the one hand there is much justification to believe that the more educated are able to capture major business opportunities and, on the contrary, this decision is reversed because it relates to the high opportunity cost of supporting the most qualified individuals to reject job offers highly paid.

estimate the impact on educational attainment or experience on the incomes of entrepreneurs in comparison with employees, reconsidering the effect of education on the occupational decision in the framework of the analysis of the returns to education.

As we mentioned above, the data reveal that human capital in the countries of the EU-15 is growing regardless of the type of employment. Looking at the data of human capital and its distribution by occupation, is that differences in skilled employment that existed in the nineties are disappearing in recent years. In 1999 the self-employed rates with higher education was 11% and 10 years later these levels are at 30%, surpassing the average wage earners.

In this thesis, we will investigate whether the education, and in particular its returns, is indeed one of the main determinants of the occupational choice, as theoretical models suggest.

Education, productivity and returns

A key assumption in the literature on human capital is that individuals will be more productive by having more training, and therefore expect to receive a higher level of income. This is the key element that determines the foundations of the Human Capital Theory proposed by Mincer (1958, 1974), Becker (1962) and Becker et al. (1966). From this theory, literature usually takes as starting point, a statistical earnings function as shown in the following expression:

$$Y = \phi(X, S) + \xi$$

Where ξ reflects the differences in individuals resulting from productivity. The mincerian equation usually employed as specification for emprirical analyses can be expressed as follows:

$$\log W_i = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \xi_i$$

Where W_i is individual income, S_i is schooling and X_i represents experience. As we can observe a quadratic term of experience is included for collecting potential parabolic shape of the function, corresponding to the assumption of increased production capacity associated with investment in education, but is declining in the last years of work. The coefficient of schooling is β_1, which is constant, positive and provides an estimate of the discount rate of education. The path of life cycle earnings as Mincerian model postulates that given two individuals with different education levels they will have different distributions of of earnings over their lives.

In principle, one could expect a positive effect of education on wages but no effect on productivity as the "Signaling Hypothesis" suggests. Arrow (1973), using the theory of filters, and Spence (1973) and Stiglitz (1975) with the credentials hypothesis as an alternative to human capital theory, considering the idea that educational attainment provides a signal to employers about skills in order to solve the problem of asymmetric information between employers and workers. From this perspective, education endowment can be considered as the only signal –source of in information about the productivity that they have–.

Returns to education, self-employment and human capital and signalling hypotheses

What is (are) the reason(s) behind one could expect different returns to education by employment status. Following Van Praag et al. (2006), there are several factors, which can help us to understand these differences. First, the highly educated individuals need to feel an attraction or a risk premium to undertake an entrepreneurial activity, compared to wages in case you decide would be wage earners, which is configured as a higher opportunity cost for these individuals. This idea initially introduced by Shane and Venkataraman (2000) and put in perspective by van Praag

et al. Van Praag et al. (2010)[2]. But once the risk premium is isolated, there are more arguments for expecting a differential in the returns to education between both groups: i) because the self-employed earnings are undervalued (Hamilton, 2000, Parker, 2004 and Levitt and Durner, 2005); ii) because returns of self-employment may be including the return on capital, since they are business owner-ships (Feldman and Slemrod, 2007); iii) on average one could also expect higher returns to education in self-employment, either because they include businessmen or because there is highly qualified professionals as doctors or lawyers who develop a highly paid business activity causing this type of work is being overrated.

Theoretical arguments for expecting higher returns to education in salaried workers

But leaving aside, this set of explantions there exist a powerful argument for expecting the reversal effect, that is, for expecting higher returns to education among wage-workers with regard self-employed workers –at least with regard own-account workers–. By using the signaling hypothesis we can establish the following conjectures. As Wolpin (1977) suggests if the wage scheme corresponds to the signaling theory, the first group escapes the influence of individual signals because they themselves are allocated the wages, and in this case have perfect information about their productivity. On the other hand, the group of employees faces a labor market offering information to employers about their personal characteristics, which never reflect in a perfect way the marginal product of these in the vacancies. For this reason it is expected that those salaries are allocated from the signals, and therefore are higher.

Available evidence so far on the returns to education

The empirical evidence show that the effect of education on productivity is positive (Willis, 1986; Ashenfelter, 1999), and establishes that the returns of the years of education are between 5 and 15% (see Hartog and Oosterbeek, 2007). Van der

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[2] They report an estimated risk premium between 1 and 2% by using a sample of the UK, National Longitudinal Survey.

Sluis et al. (2008), conducted a meta-analysis for more than a hundred studies and propose that the returns to education are located at 6.1%. The literature on this purpose has addressed the issue of appropriate techniques for measurement. In this sense, the technique and the proxies used are decisive in the results (Blundell et al., 2004). OLS estimates have been criticized for failing to correct the endogeneity bias in their calculus, while the IV technique has been positioned in the centre of discussions to determine the returns to education (Card, 1994,1999). This technique is not free of problems, since the results are highly sensitive to the instruments used. Similarly, the literature has shown evidence of overvaluation of the returns to education measured through IV versus OLS (Ashenfelter and Zimmerman (1997) and Harmon et al. 2003, among others).

Available evidence so far on the returns to education in self-employment

The empirical evidence linking education and self-employment is ambiguous. On the one hand some findings points to that the returns to education are similar for entrepreneurs and employees, though somewhat higher for entrepreneurs in U.S. However other empirical studies showed that the returns to education are high for entrepreneurs and even higher than employees (Hartog et al, 2010 or previously Bates, 1990). Finally, and for some European countries Van Praag et al. (2010) and Mainar and Montuenga (2005), provide opposite results. While the firsts provide evidence on higher returns to education for self-employed workers, the seconds, for Spain and Portugal, find that higher education report higher returns to education in wage-employment.

Self-employment and macroeconomic variables

The last two essays of this thesis are devoted to reconsider the relationships between self-employment and some macroeconomic variables from an empirical point of view.

In particular, the between unemployment, GDP and self-employment has become one of the most controversial matters in the Economics of Entrepreneurship. Due to its complex, multifaceted nature, various scholars have found a large array of different results, so that the exact nature of these relationships are still not clear. An important element of this 'current state', is the existence of alternative and competing theoretical hypothesis. The natural way to solve these types of constroversies is by means of empirical evidence. The weakness of previous analyses due to the inavailability of adequate data for checking the robustness of some previous findings could be behind this situation. This thesis treats to shed new light by exploring new data sets exploring nonlinearities in the relationships.

Available evidence

Empirical multi-country analysis of the relationship between self-employment and macroeconomic variables such as unemployment or GDP, by using time series, started with the seminal work of Thurik et al. (2003, 2008), in which mixed evidence of the character of these relationships especially in terms of pull and push hypotheses is provided. From then a growing body of empirical studies had covered other countries applying other econometric approaches, such as cointegration and error correction models, instead of using the standard VAR analysis (Carmona et al., 2010, 2012). The weak evidence and the apparently contradicting results have leaded the search of new ways of testing empirically this relationship. One of these alternative strategies is the estimation of panel data models, which is made possible thanks to the recent availability of comparable international aggregate data on entrepreneurship rates (see, COMPENDIA, van Stel, 2005). However, and overall, these panel data models again provide an inconclusive picture of the empirical relationship.

Another source of controversy in the literature is the sensitivity of the relationship analysis to the sample countries and sampling period. Sometimes, opposite results are obtained in different periods even for the same country. This last result suggests that we should recognise the potential existence of nonlinearities or asymmetries in

the relationship. Indeed one of the most likely reasons to reject a linear relationship is that the relation is time-varying, i.e., the relation is different depending on different situations. In such cases, the estimation method should allow for nonlinearity in the relationship. Although relatively scarce, there are some contributions that deal explicitly with nonlinearities. However, these works searched for asymmetries but used individual time-series data. In contrast, in this thesis I extend the extant empirical analysis searching for asymmetries by using a panel threshold regression model that employs cross-sectional time series data the potential existence of asymmetries in the two relationships under study.

Contributions of this thesis

The nature of the contributions of the works contained in this dissertation with respect to previous empirical literature is threefold.

Returns to education

This thesis has the aim of testing the existence of differences in the returns to education between wage–workers and entrepreneurs in a wide range of countries and taking into account recently potential bias in previous estimates–see García-Mainar and Montuenga-Gómez (2005), van der Sluis et al. (2008) or van Praag et al. (2013)–. To this end, we report new estimates of Mincerian equations doing a comprehensive analysis with a sample of European individuals from 15 countries by using "adequate" instrumental variables and separating the return to education of the risk premium associated to entrepreneurial activities. However the most important contribution with regard to previous literature is that this kind of literature seems to have that previous entrepreneurship research seems to have overlooked the distinction between different types of entrepreneurs. In particular, we will argue that employers or job creators have more opportunities to take advantage of entrepreneurial activities than own account workers, in which case, one might expect the returns to education for employer entrepreneurs to be higher relative to the return to education for own-account entrepreneurs.

Overqualification

The second contribution of this thesis is the study of the overqualification or over-skilling phenomenon from a new perspective. In particular we provide evidence on how overqualification affects self-employment and jobs in the public and private sectors. Moreover, we examine the effects of overqualification on job satisfaction, on-the-job search, absenteeism and labour mobility, and examine whether these effects also apply when each employment status is individually analysed. *Third*, we analyse which exits are more successful routes out of overqualification by employment status, that is, which transitions are more likely to shift an overqualified individual away from overqualification. To this end, non-ordered discrete choice models (multinomial logit) are used. Given the panel data structure of our sample, standard errors are adjusted for intra-individual correlation in all specifications to control for possible unobserved heterogeneity across individuals.

Allowing for nonlinearities

A common source of controversy in previous literature on the relationship between self-employment and some macroeconomic variables such us unemployment or GDP is the literature is the lack of robustness or the sensitivity of the relationship analysis to the sample countries and sampling period, leading even sometimes, opposite results are obtained in different periods even for the same country. These apparently contradictory results have become in a source of controversy with powerful implications not only for our understanding of the exact nature of the relationships under study but also on the utility of entrepreneurship policy as an instrument of anti-cyclical policy or as an alternative of traditional active labour market policies, that is, as a way to combat unemployment.

One potential explanatory factor of these results could be caused by the potential existence of nonlinearities or asymmetries in the relationships under study. It has been one hypothesis recently explored by previous literature. In general previous contributions did not have to deal with nonlinearity. Some exceptions are the work

of Faria et al. (2010) used a STAR model with time-series data; Congregado, Golpe and Parker (2012) used a non linear version of the Jaeger and Parkinson model by using time series for the US and Spain; Congregado, Golpe and van Stel (2012) accounted for nonlinearity by applying the threshold cointegration model suggested by Hansen and Seo (2002); and Parker et al. (2012) used a Bai-Perron structural breaks approach for the UK (1998, 2003a, 2003b).

The rationale of this set of works is that a time-varying relationship could not be ruled out. In other words, one likely reason to reject a linear relationship is that the relation is different in different economic conditions. In such cases, the estimation method should allow for nonlinearity in the relationship.

However, these works searched for asymmetries but used individual time-series data. In contrast, this article extends the extant empirical analysis searching for asymmetries by using a panel threshold regression model that employs cross-sectional time series data for the cyclical components of entrepreneurship and two macroeconomic variables –GDP and unemployment–. These framework is used: i) to analyse how labour market dynamics determine changes in occupational decisions and therefore observe fluctuations in self-employment rates; and ii) to reconsider the role of the entrepreneurship over the business cycle, identifying whether the bidirectional relationship between entrepreneurship cycles and output gaps is asymmetric depending on the phase of the business cycle.

1.2. Measurement

Although entrepreneurship and self-employment is not the same thing, self- employment is often used as a way to operationalize empirically the concept. Following Blanchflower (2000) 'self-employment is the simplest kind of entrepreneurship'. In this thesis, and as in most previous studies, entrepreneurship is

operationalised in terms of self-employment, reflecting data availability at the time-series level (Parker, 2009).[3]

However, there is no agreement on the definition of self-employment, nor is there on how to measure the rate of self-employment. The self-employed are usually considered working on their own-account and they often own and control their own business and usually the number of self-employed individuals does not include agricultural self-employed. Because there is no consensus on what actually constitutes a self-employed, there is also no agreed method for calculating the number of self-employed. For instance, in the US, self-employed of large incorporated companies are not included because they are regarded as employees (of their own businesses); while in most European countries they are seen as self-employed. Sometimes only full-time self-employed are included, while other countries accept part-time self-employed as well.

A common strategy is the use of Labor Force Surveys, which follow common classification criteria. For instance, the European Labor Force Survey, allow us to have internationally comparable data by using the indicator of status in employment, which distinguishes between four categories of the total employed. These are: (a) wage and salaried workers (also known as employees or paid-employment); (b) self-employed workers; (c) contributing family workers (also known as unpaid family workers), and (d) no classifiable by status. In addition, the self-employed group admits three subcategories: (a) self-employed workers with employees (employers), (b) self-employed workers without employees (own-account workers), and (c) members of producers' cooperatives. According to the International Classification of Status in Employment (ICSE)[4], the basic criteria used to define the

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[3] In this respect, we are aware that entrepreneurship is a multifaceted concept and that any single measure of entrepreneurship is therefore a limited proxy (Iversen et al., 2008). Because we were unable to find an alternative measure of entrepreneurship for time-series analyses (Parker, 2009), the limitations imposed by data – that is, short time-series with low frequency – should be kept in mind in evaluating the scope of our results.

[4] See the website: *http:// www.ilo.org/public/english/bureau/stat/class/icse.*

status groups are the types of economic risk that they face in their work, the strength of institutional attachment between the person and the job, and the type of authority over establishments and other workers that the job-holder has or will have as an explicit or implicit result of the employment contract. Following this criteria we can distinguish: (i) Employees are all those workers who hold the type of jobs defined as "paid employment jobs", where the incumbents hold explicit or implicit employment contracts that give them a basic remuneration that is not directly dependent upon the revenue of the unit for which they work; (ii) Employers are those workers who, working on their own account or with one or a few partners, hold the type of jobs defined as "self-employment jobs" and, in this capacity, have engaged, on a continuous basis, one or more persons to work for them as employee(s); (iii) Own-account workers are those workers who, working on their own account or with one or more partners, hold the type of jobs defined as "self-employment jobs" and have not engaged on a continuous basis any employees to work for them; (iv) Members of producers' cooperatives are workers who hold "self-employment jobs" in a cooperative producing goods and services; (v) Contributing family workers are those workers who hold "self-employment jobs" as own-account workers in a market-oriented establishment operated by a related person living in the same household; (vi) Workers not classifiable by status include those for whom insufficient relevant information is available, and/or who cannot be included in any of the preceding categories.

However, the lack of a common definition is a limiting factor for comparative analysis. For this reason two exercises carried out in this thesis uses the *business ownership rate* (similar to self-employment rate) is the number of business owners divided by the total labour force for 23 OECD countries thanks to the development of a dataset internationally comparable for 23 OECD countries. These data are taken from EIM's COMPENDIA data base.

With regard, human capital measures must be analysed, this thesis follows the common practices usually adopted in the literature on human capital and education

(Blundel et al., 2004), taking into account if possible alternative proxies for capturing not only human capital endowments but also the quality of them. Educational attainment by levels or the years invested are two of these proxies joint to labour experience.

1.3. Unit of analysis and data sources

In our empirical exercises we use two main data sources. On the one hand and for the two first chapters we use individual data from samples taken from the micro-data of the European Community Household Panel. The ECHP is a panel of households in the EU-15 covering the period 1994-2001. Every year, all members of the selected households in each country are interviewed about issues related to demographics, the labour market, incomes and living conditions. The same questionnaire is used for all countries, which makes the information directly comparable. The information about the main activity of individuals is self-reported by interviewees. The main activity status may be: i) working with an employer in paid employment; ii) working with an employer in paid apprenticeship; iii) working with an employer in training under special schemes related to employment; iv) self-employment; v) working in Public Sector; vi) working in Private Sector; vii) unpaid work in a family enterprise; viii) in education or training; ix) unemployed; x) retired; xi) doing housework, looking after children or other persons; xii) in community or military service; xiii)Other economically inactive; xiv) working less than 15 hours.

With regard human capital, the ECHP distinguish different types of proxies of education. On the one hand, it allows know the educational level of individuals, given the level of education in compulsory education, upper secondary or university education. For the level 1 of the ECHP includes levels 1, 2 and 3, established by The International Standard League table of Education (ISCED) which determines the OECD, including compulsory education, which in most cases is the primary and lower secondary; for level 2 includes ISCED level 4 and 5, i.e., the upper secondary for 3 includes level 6 and 7, relating to higher education. On the other hand,

education is measured in years. Although the survey contains information from the years spent studying full time, does not appear in all years and in all countries. Therefore, alternatively, is used age when the highest level of general or higher education was completed.

Finally and as we mentioned above, the rest of our analysis is done by using the aggregate *business ownership rate* (similar to self-employment rate) taken from EIM's COMPENDIA data base. In particular, business owners are defined as the total number of unincorporated and incorporated self-employed individuals outside the agriculture, hunting, forestry and fishing industries – see Van Stel (2005, p. 108).

1.4. Econometric framework: an overview

Ww first perform estimates of the returns to education, later distinguishing into groups of self-employment and salaried workers, which will allow us to test the signal hypothesis against the human capital theory. To this end, the starting point is the analysis of the effect of education and experience on individual earnings, in the framework of mincerian's equations, estimated by using our sample of European workers. In this context, our approach must take into account the potential endogeneity bias due to the first the existence of unobservable factors such as innate ability or motivation at work. This assumption presents slant problems of the OLS estimates because the choice of education may not be random (Blundell et al. 2004). By using panel data, the econometric treatment to identify the most appropriate estimation method consists of discriminating between OLS estimates with fixed or random effects. In the presence of individual effects is recommended for fixed effects estimates. This case does not require strict exogeneity, so that the assumption is more realistic when individual factors on the performance of wages, this assumption implies that:

$$E(\alpha_{1i} / X_{i1},...X_{iT}) \neq 0$$

$$E(\upsilon_{1i} / X_{i1},...X_{iT}) = 0$$

Otherwise, it is recommended estimators under the model of Generalized Least Squares (GLS) to obtain more efficient estimators, if we can confirm that there is strict exogeneity, ie there is no relationship between individual factors and the error term:

$$E(\alpha_{1i} / X_{i1},...X_{iT}) = 0$$

$$E(\upsilon_{1i} / X_{i1},...X_{iT}) = 0$$

To check the appropriate estimation method is applied Hausman test (1978)[5].

Another possibility to circumvent this bias is the use of instrumental variables. On the one hand as proposed by Hausman and Taylor (1981) estimated under the assumption that random effects conditional on certain regressors remain fixed. The procedure assumes that some of the explanatory variables are correlated with the idiosyncratic error or random effect model of individuals m_i, but none of the explanatory variables is correlated with the standard error e_i.

$$E(\mu_{it} / X_{1t},...X_{iT}) \neq 0$$

$$E(\varepsilon_{it} / X_{1t},...X_{iT}) = 0$$

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[5] Haussman´s test (see Hausman 1978) head the relationship between the two alternatives by weighing the effect of the variances of the estimators, while penalizing those with greater variance estimator and ensuring that the best estimator has greater weight the final decision on the following assumptions:

$$(\beta_{IG} - \beta_{GLS})^{'}(Var(\beta_{IG}) - (Var(\beta_{GLS}))^{-1}(\beta_{IG} - \beta_{GLS}))$$

H0: No correlation between GLS and IG estimators. Failure to reject the null hypothesis, we recommend the use of GLS because it ensures that consistent estimators are efficient as well.

On the other hand for the treatment of random effects, the proposed Balestra and Varadharajan-Krishnakumar (1987) is the endogeneity of all explanatory variables, education or experience in the estimates of wages, and the resulting dependent variable correlated with the error). $\mathcal{J}_i$ (endogeneity of education).

$$E(\vartheta_{it} / X_{1t},...X_{iT}) \neq 0$$

$$E(\varepsilon_{it} / X_{1t},...X_{iT}) = 0$$

This specification isolated this endogeneity bias in the regression including the predicted values of education from a number of variables, called instruments[6], which guarantee the non-correlation with wages. Whereas if you are considered fixed effects estimates are made under the transformation of the estimator IG[7].

When we treat to capture the occupational choice determinants, specially the effect of education, given the qualitative nature of the dependent variable, the used model is the multinomial logit model (MNL). Toward this aim, discrete choice –ordered and non-ordered– and count models are used (ordered logit, zero-inflated negative binomial, binary and multinomial logit).

Finally the third econometric approach used in this thesis is the application of panel threshold models developed by Hansen (1999) to characterise the relationship between cyclical self-employment and the two macroeconomic variables considered in which parameters vary not only across individuals but also with time, allowing

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H1: There is a correlation between the estimators. In this case the GLS estimator is inconsistent.

[6] To test the validity of the instruments, in case of static models in two stages IV, performed an F test of significance of the parameters as a whole is validated the correlation between instruments and wages and ensures no correlation between the dependent variable and the error term by definition of OLS estimates of the second stage.

[7] For a review of the development of both econometric estimators see Wooldridge (2002). Likewise, review alternative techniques to MCO and IV through the techniques of Matching Methods and Function Control Methods.

for the presence of asymmetries in the self-employment dynamics over the business cycle or in the reverse relationship, where, the observations are divided into two or more regimes depending on whether the threshold variable is smaller or greater than the threshold parameter. The regimes are characterised by different regression slopes (effects).

1.5. Chapter overview

This thesis consists of three self-contained essays structured as follows. It mainly consists of three parts leaving aside this introduction. Part II includes chapters 2 and 3. They are devoted to the exploration of the differences in the returns to education among wage earners and the two types of self-employed workers. In particular, Chapter 2 looks for providing evidence, in comparative perspective, in the EU-15 countries, about differences in returns to education, especially among European countries in the Southwest over the rest using Instrumental Variables (IV) estimates and data from the European Household Panel (ECHP) in the period 1994-2001. The contribution of this chapter compared to previous work is not only to provide new evidence based on a comparable and wide sample of European individuals but also because extend previous analyses into two senses. As it is well known, two competing hypotheses are usually proposed by scholars in order to explain the earnings life cycle of individuals in relation to human capital. On the one hand, the Human Capital Theory proposes that the accumulation of human capital, due to education and experience or both, increases the individual productivity and consequently is the origin of higher earnings –Becker (1962), Becker and Chiswick (1966) and Mincer (1958, 1974)–. On the other hand, an attending to the signaling hypothesis, the links between education and productivity disappear –Arrow (1973), Spence (1973) and Stiglitz (1975)– and imperfect information about individual productivity make an uncertain hiring process being a potential source of wages higher than real productivity levels, at lest for employees.

In fact, one could argue that this last hypothesis does not apply for entrepreneurs. In order to check this argument, the first objective of this chapter is to check the

existence of differences in the returns to education between wage–workers and entrepreneurs –like some previous empirical studies suggested–. However this type of analysis, irrespective of the wide scope of our study, the EU-15, there is not a novelty with regard previous literature. Indeed there is a growing empirical literature on this question –see García-Mainar and Montuenga-Gómez (2005), van der Sluis et al. (2008) or van Praag et al. (2013) as three of the most influential works in this body of literature–.

In perspective, the work included in this chapter applies the general framework – estimates of Mincerian equations– usually employed by previous literature in a large sample of individuals belonging to 15 European countries, extending it, at least into two directions: i) firstly, doing a comparative analysis among European Countries taking into account some potential sources of bias in previous, such as the use of "adequate" instrumental variables or by using the –Hausman-Taylor estimator to circumvent this problem– and separating the return to education of the risk premium associated to entrepreneurial activities; ii) secondly, an importantly, this kind of literature seem to have that previous entrepreneurship research seems to have overlooked the distinction between different types of entrepreneurs. One could argue that the group of entrepreneurs who hire external labor –employers or job creators– have more opportunities to take advantage of this activity than entrepreneurs who work of their own –own account workers– because employers run larger ventures and so benefit from economies of scale. In which case, one might expect the returns to education for employer entrepreneurs to be higher relative to the return to education for own-account entrepreneurs. Our empirical estimates treat to shed light on these conjecture.

Related to the search of intersections between self-employment and human capital, Chapter 3 aspires to increase the understanding of the overqualification phenomenon by incorporating the distinction among different employment statuses (i.e., self-employed workers, private paid employees and public paid employees) into the analysis of its effects, dynamics and routes out, in order to contribute to the ap-

propriateness and effectiveness of policy intervention aiming human capital optimization, productivity increases and rises in social well-being.

Toward this aim, new empirical evidence is presented on the basis of discrete choice models –ordered and non-ordered– and count models (ordered logit, zero-inflated negative binomial, binary and multinomial logit) and microdata from the European Community Household Panel (ECHP), covering the period 1994–2001. Three sets of approaches are part of this work. *First*, by means of basic descriptive statistics, we document some empirical facts about how these different employment statuses –i.e., wage jobs in the public and private sector, and self-employment jobs– are affected by overqualification or overskilling (henceforth simply referred to as overqualification[8]). We also test whether the general pattern identified also emerges when distinguishing by gender, age-bands, educational attainment, business sectors and countries. *Second*, we examine the effects of overqualification on variables capturing job satisfaction, on-the-job search, absenteeism and labour mobility, and inspect whether these effects also applies when each employment status is individually analyzed.

Descriptive analysis show how overqualification affects to more than 52% of the working population in our sample; self-employed are about 12 percent less likely to feel overqualified than their paid employees counterparts; workers in the public sector are about 1% more likely to feel overqualified than those working in the private sector; higher prevalence of overqualification among women might be expected given certain persistence of barriers to women's career advancement; about 58% of the individuals in the age band of 18-35 are affected by feelings of overqualification, whereas this figure approximately reduces to 53%, 47% and 36% in the age bands 36-45, 46-55 and 56-65, respectively; individuals with tertiary education are about 23% more likely to be overqualified than those with basic

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[8] The ECHP uses an integrative approach when capturing whether the individuals feel overqualified/overskilled or not, by means of the answers to the following question

education, while concerning business sectors, higher chances of overqualification can be observed in the services sector (54.7%), followed by the industrial, construction and agricultural sectors (52.7%, 45.2% and 37.1%, respectively); finally as regards country-specific differences, the prevalence of overqualification varies from a 38.4% observed in The Netherlands to a 68.4% observed in the UK.

Our results confirm some of the existing results in the literature Thus, we observe how overqualification decreases job satisfaction and increases on-the-job search, absenteeism and labour mobility. About our analysis of the existing routes out overqualification (perhaps the main contribution of this work), our results support the view of overqualification as a phenomenon of permanent nature. Indeed, predicted chances to remain feeling overqualified after one year are about 94%. When distinguishing by different employment statuses, our main results can be summarised as follows. *First*, self-employed are the most likely workers to exit overqualification within their same jobs, probably by varying some aspects of their own jobs. *Second*, private paid employees are the most likely workers to exit overqualification by starting a new job within the same employment status, i.e., as private paid employees. *Third*, and finally, public paid employees are, together with self-employed workers, the most likely workers to exit overqualification in a new job outside their employment status.

From a policy perspective, increasing the share of graduates in the economy may not automatically lead to the expected returns of having a high-skilled workforce in terms of economic growth and competitiveness. On the *demand* side, governments may be well advised to establish programs stimulating companies to move into higher value-added product and service markets so that the levels of skills that they require, and the extent to which they use these skills, tend to increase. On the *supply* side, on the one hand, education institutions must be involved in fostering the skills that could shape the economies of the future. On the other hand, individual

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(PE016): *Do you feel that you have skills or qualifications to do a more demanding job than the one you have now?*.

flexibility of current and future graduates in terms of their willingness to change region, sector, employment status, occupation and/or job would significantly enhance the matching process (Battu et al. 1999). In coherence with this view, private paid employees are the most likely workers to exit overqualification by starting a new job (as private paid employees) whereas both public paid employees and self-employed workers are the most likely workers to exit overqualification in a new job outside their respective employment status. In this vein, reducing costs and other barriers associated with mobility helps employees to find suitable jobs and helps employers to find suitable workers (Di Pietro 2002).

Having obtained different results for these groups in terms of the intensity of some effects (such as job satisfaction), job turnover decisions and successful routes out of qualification-job mismatches, the risk of using a unique receipt from a public policy perspective when defining instruments to combat overqualification shows up. Self-employed individuals are not only the least likely workers to be affected by overqualification but also the most likely workers to exit overqualification within their same jobs. Given the performance of self-employed individuals is positively affected by the share of highly educated individuals in the (local) population, i.e., by the presence of an educated workforce and/or educated consumers in their environment (Millán et al. 2014), those measures based on the promotion of self-employment for (over)skilled paid employees are revealed to be in the right direction in order to tackle the overqualification phenomenon in line with previous research questioning the appropriateness of incentives that stimulate self-employment among the unemployed and stresses the need of highly selective policy incentives, if, as part of the entrepreneurship policy, these incentives are considered as an instrument to combat economic and jobs crises (Santarelli and Vivarelli 2007; Thurik et al. 2008; Congregado et al. 2010; Román et al. 2013).

Part III, starts with chapter 4, where we treat to identify whether the bidirectional relationship between entrepreneurship cycles and output gaps is asymmetric depending on the phase of the business cycle. To this end, we employ a panel thresh-

old regression model in which different relations can prevail in each regime, defined by the values of the threshold variable. The main motivation behind of this work is that, perhaps the lack of conclusive evidence is a result of the fact that the predominant approach has been to assume the presence of symmetric responses. The findings of this article shed new light on this debate, qualifying previous empirical results. In particular, our estimates provide support for the existence of different responses – both in terms of sign and magnitude – of cyclical self-employment to output growth and of output growth to cyclical self-employment, depending on the value of the deviation between the observed and natural rates of self-employment within a one-period lag, which is the threshold variable. The result is highly important for policy makers and practitioners given that whether they ignore the asymmetric impact that an entrepreneurship promotion policy action might have on the real economy, the action might lead to unexpected effects.

Finally chapter 5, try to test whether the relationship running from unemployment to entrepreneurship/self-employment – the so-called 'recession-push' hypothesis – is affected asymmetrically by dynamic labour market conditions. To this end, we employ a panel threshold regression model into which nonlinearities are introduced by allowing an exogenous variable – unemployment – to have a different impact on the endogenous variable – business ownership – in different regimes. Our estimates provide support for the existence of different responses of cyclical self-employment to cyclical unemployment, depending on the value of the deviation between the observed and natural rates of unemployment with a one-period lag – i.e., depending on the intensity of the unemployment problem – that is the threshold variable.

The study concludes in Part IV with a final chapter 6, containing some concluding remarks and the future research agenda. The following table summarizes the general structure.

Chapter	Objectives	Scope	Data and sources	Econometric Framework
2. Re-estimating the Returns to education by status: differences among self-employed groups	Signaling vs human capital hypotheses Measure differences in the returns to education among employees and the two types of business owners –own account workers and employers– once that differences dues to risk premium have been estimated and isolated.	EU-15	Samples of microdata taken from European community household panel, ECHP (1994-2001). Human capital indicator: Educational attainment achieved	Mincerian Equations, by using different econometric strategies: Blinder Oaxaca decomposition; IV estimation for avoiding endogeneity bias; Hausman Taylor estimator.
3. Effects, dynamics and routes out of overqualification in Europe: A comprehensive analysis distinguishing by employment status	Analyze the overqualification by a new perspective: by statuses in employment. Check if successful routes out of overqualification vary by individual employment status.	EU-15	Samples of microdata taken from European community household panel, ECHP (1994-2001).	Discrete choice –ordered and non-ordered– and count models
4. Self-Employment and Business Cycles: searching for asymmetries in a panel of 23 OECD countries	Identify whether the bidirectional relationship between entrepreneurship cycles and output gaps is asymmetric depending on the phase of the business cycle.	23 OECD countries	Pooled data 23 OECD countries, 1972-2009. EIM's COMPENDIA database (version 2009.1) OECD Main Economic Indicators	Panel threshold models developed by Hansen (1999).
5. How sensitive is the business ownership rate to unemployment fluctuations? Evidence of asymmetries in a panel of 23 OECD countries	*Recession-push hypothesis* Test whether the relationship running from unemployment to entrepreneurship/self-employment – the so-called 'recession-push' hypothesis – is affected asymmetrically by dynamic labour market conditions	23 OECD countries	Pooled data 23 OECD countries, 1972-2011. EIM's COMPENDIA database (version 2011.1) OECD Main Economic Indicators	Panel threshold models developed by Hansen (1999) and instrumental variables in order to deal with simultaneity bias.

1.6. Publications

Some chapters of this PhD thesis are based on papers presented in Meetings and Workshops or submitted to academic journal for evaluation. For this reason, chapters can be read independently of each other.

A very early version of chapter 2 was presented at the XI REM in 2011 (San Sebastián) and in some seminars.

An early version of Chapter 3 has been presented at the University of Valencia in March 2012. (Research Seminar at the Department of Applied Economics II, Universitat de València).

Chapter 4 is based on a work that was presented jointly with Emilio Congregado, Antonio Golpe and Monica Carmona at the International Workshop entitled Good Times, Bad Times: Entrepreneurship and the cycle held 29th November 2011 at the University of Valencia.

Finally chapter 5 is a reviewed version of a preliminar work started by Mónica Carmona, Emilio Congregado and Antonio Golpe and initially presented, as a draft, at the Spanish Applied Economics Meeting (Granada, 2012), which was reestimated by using alternative strategies, proxies and instrumental variables. This work was submitted for publication and is actually under second review.

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Part II: Self-employment and human capital

Chapter 2: Re-estimating the returns to education by status: differences among self-employed

The heterogeneity of the EU-15 countries have in their self-employment rates, education systems and, most notably, in the human capital of their business sector, are analyzed in order to determine whether the investment in education is profitable from than individual point of view, indirectly from the social point of view and to understand what kind of job present higher returns this investment in education. This chapter contributes to this subject providing evidence, in comparative perspective, in the European Union 15 countries (EU-15), about differences in education returns using the European Household Panel (ECHP) data in the period 1994-2001. The results reveal that differences corresponding to differences in individual education between public and private employees wages is not significantly different, despite the more income in the public sector, while education is more productive for employers regarding to employees, however own account workers has the lower returns for higher education. These results allow us to reject the idea education play a signalling role through the countries of the EU-15.

2.1. Introduction

As it is well known, two competing hypotheses are usually proposed by scholars in order to explain the earnings life cycle of individuals in relation to human capital. On the one hand, the Human Capital Theory proposes that the accumulation of human capital, due to education and experience or both, increases the individual productivity and consequently is the origin of higher earnings –Becker (1962),

Becker and Chiswick (1966) and Mincer (1958, 1974)–. On the other hand, an attending to the signaling hypothesis, the links between education and productivity disappear –Arrow (1973), Spence (1973) and Stiglitz (1975)– and imperfect information about individual productivity make an uncertain hiring process being a potential source of wages higher than real productivity levels, at least for employees.

In fact, one could argue that this last hypothesis does not apply for entrepreneurs. In order to check this argument, the first objective of this chapter is to check the existence of differences in the returns to education between wage–workers and entrepreneurs –like some previous empirical studies suggested– . However this type of analysis, irrespective of the wide scope of our study, the EU-15, there is not a novelty with regard previous literature. Indeed there is a growing empirical literature on this question –see García-Mainar and Montuenga-Gómez (2005), van der Sluis et al. (2008) or van Praag et al. (2013) as three of the most influential works in this body of literature–.

In perspective, the work included in this chapter applies the general framework –estimates of Mincerian equations– usually employed by previous literature in a large sample of individuals belonging to 15 European countries, extending it, at least into two directions: i) firstly, doing a comparative analysis among European Countries taking into account some potential sources of bias in previous, such as the use of "adequate" instrumental variables or by using the –Hausman-Taylor estimator to circumvent this problem– and separating the return to education of the risk premium associated to entrepreneurial activities; ii) secondly, an importantly, this kind of literature seem to have that previous entrepreneurship research seems to have overlooked the distinction between different types of entrepreneurs. One could argue that the group of entrepreneurs who hire external labor –employers or job creators– have more opportunities to take advantage of this activity than entrepreneurs who work of their own –own account workers¬¬– because employers run larger ventures and so benefit from economies of scale. In which

case, one might expect the returns to education for employer entrepreneurs to be higher relative to the return to education for own-account entrepreneurs. Our empirical estimates treat to shed light on these conjecture.

To this end we use a sample of individual data taken from the ECHP, which allows a comparable analysis for the EU-15 countries from 1994 to 2001. While technical development and the advantages and particularities of the use of Instrumental Variable (IV) versus Ordinary Least Square (OLS) estimates has been widely showed in the literature (see, Wooldridge 2002; 2005, Heckman and Urzúa, 2010 or Larcker and Rusticus, 2010), we present an analysis about the proper technical approach to measure the education returns taking into account endogeneity bias, including the Hausman Taylor (1981) estimator are suitable against OLS estimations. Previously we test the existence of statistically significant differences in individual returns among groups of workers applying the Oaxaca-Blinder decomposition.

The results support previous empirical evidence on positive returns to education, with greater returns of tertiary education for employers (67.2%) than for employees (41.2%), despite of the fact that the group of entrepreneurs gets a lower average income than employees (-84.7%). Further, the risk premium fof higher education for entrepreneurs because is positive in 18%, while the rate in secondary education seems 12% more for this group. Decomposing the group of entrepreneurs, we found differences between the risk premium employers and own account workers. In employers group, higher education represents an additional return of 22.1% regard to employees, while secondary education does not reflect significant differences between employer and employees. However, the effect of education on the own account group is the opposite. While higher education is not significantly different between own account workers and employees and secondary education is 27.4% more profitable among which are own account workers.

The results can be interpreted in line that employers can catch the education return when they work on larger scales, or as a result of the more educated individuals are better able to manage their skills and pass it to their business, which translates on a larger scale and increased hiring. Meanwhile, the secondary education seems to be more profitable when individuals are own account workers. One possible explanation for this is the very specific job they developed through vocational training occupations, which would be profitable on themselves, without the possibility of scales and also whether as employees undertake just would capture their value added generated.

In sum, our results reveal that despite the higher income paid employment versus entrepreneurs and in the public sector versus private sector, don´t emerge significance differences between private and public employees and, in the case of entrepreneurs education is more productive for employers regarding employees, but not in the case of own account workers with tertiary education. In this sense, the utility of our results is in order to understand how the labour market rewards the investment in education, which largely determine the decision of individuals to put their talent in paid employment versus self-employment. Rejecting the signalling hypothesis between public and private sector and in the case of high educated employers, this would imply that a country's investment in education will not becomes a cost for society in this cases. However, when we attend the own account and employers returns of education analysis, our results reveal that better returns for secondary educated people appear in own account occupations.

Therefore, educational and entrepreneurs policies should be coordinated in order to promote that people endowed with higher levels of human capital decide to become job creators, eliminating any kind of barrier to the entry into self-employment and reducing the opportunity cost of self-employment. In this respect, not only schedules of economic incentives or disincentives to encourage/discourage the access to self-employment –including labour protection legislation– are important for promoting entrepreneurship but also promoting entrepreneurship education

among people who have the highest educational attainment, as a way to obtain higher returns to education not only individually but also socially.

2.2. Theoretical framework

The development of theoretical models and empirical applications of the influence that education has on the economy has resulted from the early 70's in the creation of the discipline known as the *Economics of Education*.[1] The development of the literature on *Economics of Education* has warned of the importance of the educational process in the accumulation of human capital stock. Given that spending on education that countries support in the European Union, more than 5% of GDP, the management of resources to train people is essential. In this sense, the *Economics of Education* focuses on contrasting models of human capital. To understand the implications of human capital investment by individuals and society is necessary to clarify the effect of the accumulation of human capital has on individuals and society may be different, while that may or may not generate increases in productivity of those who acquire it.

Human Capital Theories that are useful to address this issue are the traditional Human Capital and Signalling. As a synthesis of both, first the traditional human capital theory proposes that the accumulation of stock of human capital through

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[1] In this context, we should mention the contribution of the first authors who emphasized the importance of the human factor in productivity and have been the reference for the further development of this discipline, being the most notable those of Adam Smith (1725-1790) in the second book of the Wealth of Nations, where considered capital assets "acquired and useful abilities of all members of society inhabitants; Karl Marx (1818-1883) Das Kapital which stated that "skilled labor has a higher value than unskilled and skilled production work required under this form of education work"; or Alfred Marshall (1842-1924) in his work Principles of Economics cited the importance of education on worker performance.

education and experience increases individual productivity (Becker (1962), Becker and Chiswick (1966) and Mincer (1958.1974)). For its part, the signalling hypothesis breaks the assumption that links education and increases on individual productivity, arguing that the educational process to the individual is usefull as a filter to achieve a position associated with the desired level of income (Arrow (1973), Spence (1973) and Stiglitz (1975)).

2.2.1. Human Capital Theory and the Mincer Equation

The concept of human capital was developed in the beginning by Jacob Mincer, Gary Becker and Theodore Schultz, although it is the first one that offered an earnings function that allowed extensive development of subsequent empirical studies. This revenue function applied in studies of formation of individual wages and, more recently, its use has spread to many different research and problem analysis of wage discrimination by sex or race, or the influence of schooling on individual behavior in the society among others. The statistical earnings function proposed by Mincer model represents the most widespread of human capital theory in the literature and is expressed as follows:[2]

$$Y = \phi(X, S) + \xi$$

Where Y represents the individual productivity, that in the absence of productivity information, are assumed that a reasonably proxie of productivity is the individuals incomes (Raymond and Roig, 2006). This income is according to schooling (S) and experience (X), while ξ capture unobservable individual effects such as motivation or innate ability. The Mincerian earnings function of human capital can be expressed as follows:

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[2] The literature provides alternative theories to the Human Capital and signalling, as is the *competition for positions* or theories that accept integrated principles of Human Capital and Signalling (see Olcina et al., 1999).

$$W_i = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \xi_i$$

Where W represent individual incomes. In the model the correlation between income and education and years of experience X are positive, while including experience squared is a way of collecting the possible parabolic shape of the revenue function. Are included as independent variables schooling (S) and (X) experience. Schooling in human capital models is defined as the investment that an individual decides to get a certain salary throughout their working lives, considering the costs associated with this training (see Willis, 1986; or Hartog and Oosterbeek, 2007: that define schooling as life-cycle earnings contributed by each extra unit of education measured in years). The coefficient associated to education variable is β_1, which is constant, positive and provides an estimate of the education returns.

However, according this relationship proposed by Mincer earnings function between wages and productivity is incomplete because unobservable factors, such as innate ability or motivation, are not included in the model and, consequently, endogeneity bias emerge while an extensive empirical and theoretical works have development trying to solve this question[3] (see Willis, 1986; Card 1999; Blundel et. al., 2004; Pollacheck, 2007 among others).

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[3] This assumption presents slant problems of the OLS estimates because the choice of education may not b
e random. As is detailed in Blundel et al. (2004), if this is ignored and individuals who make the choice are simply compared with those who did not, the estimates would be biased. Using experimental data, Heckman et al. (1998) provide a very useful breakdown of this bias term:
bias ≡ E(yi0 | Sji=1) − E(yi0 | S0i=1) = B1 + B2 + B3.
The first two components in this equation arise from differences in the distribution of observed characteristics between the two groups: *B1* represents the bias component due to non-overlapping support of the observables and *B2* is the error part due to mis-weighting on the common support, as the resulting empirical distributions of observables are not necessarily the same even when restricted to the same support. The last component, *B3*, is the true econometric selection bias resulting from 'selection on unobservables in our notation, αi, bji and εi.

2.2.2. Signalling Hypothesis

Alternatively to the Human Capital theory, since the work of Spence (1973), the concern is to determine the productivity that is generated in the learning processes, while the employer can understand the individual educational level as a sign of ability, a fact which cannot be achieved if the education filters do not detect the most skilled individuals. In general, although both human capital and signalling theories represent positive correlation between education and income, the reasons for it are very different and their implications for social returns should be addressed.

Imperfect information is leading to a number of costs associated with procurement, such as learning, which makes the hiring decision uncertain. Employers are based on indexes and individual signals to determine as accurately as possible the marginal productivity of it, to assign wages. That is, what employers seek these signs is that workers who aspire to enter the labor market in a sample is not random, and thus as the most appropriate signal to put those with higher levels of education (see Arrow (1973) where he developed the theory of filter).
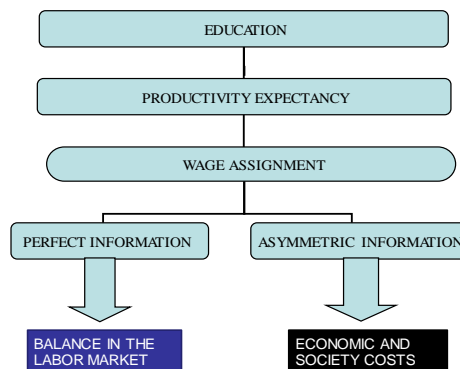
Figure 1: Asymmetric information and wage assignment

Credentials Hypothesis (Spence (1973)); the job search process imposes barriers to entry for individuals most able to discriminate the rest. These barriers to entry

that the employer determines are related to the educational level of the individual. In short, education becomes the signals that can offer individuals, on their capacity or ability to develop a work task without involving increases in productivity.

Self-selection process (Stiglitz (1975)); individuals, since they perceive the possibility of increasing profits through the information in their own abilities, try to increase the resources to provide this information. So these individuals, when deciding the level of education who want to complete, are establishing productivity than those who contract them believe that they have and so they are choosing the education level to gain the profits that they expect.

2.2.3. Empirical approach for testing Human Capital versus Signalling Hypothesis

Frequently the empirical approaches to discriminate Human Capital and Signalling theories consist in the analyses of the differences in education returns separating groups of workers (Layard and Psacharopoulos, 1974; Psacharopoulos, 1979; Riley 1979; Groot and Oosterbeek, 1994; Brown and Sessions, 1999).

Perhaps, more intuitive strategy is to study variations in life-cycle income of individuals in a country where changes occur in the years required to reach higher educational levels. These are called *natural experiments* based on the hypothesis that increases in the years of study should correspond to increases in the productivity of individuals and therefore in profits, as predicted by Human Capital theory.

ENTREPRENEURS VERSUS EMPLOYEES EDUCATION RETURNS

According to classical theory, entrepreneurs and employees should get the same education returns if they act in a competitive market. Information about employees is not perfect for employers and here is broken this premise, since for entrepreneurs earnings come from education and other important factors, just think for example in motivation or accountability in the job performance. In addition, as proposed in the work of Wolpin (1977), wages can be used as a motivator for employees and,

in this case, wages would be even further to represent the true productivity of individuals, generating education returns higher for employees in the case of signalling, while the case of business profits are not only wages but also come from the profits of his business. In sum, the first group is immune to this influence of individual signals because they themselves are allocated their salaries and wages are configured as the result of their productivity.

Theoretical arguments for expecting higher education returns in self employment
van der Sluis et al. (2008) argue that the highly educated individuals need to feel an attraction or a risk premium to undertake an entrepreneurial activity, compared to wages in case you decide would be wage earners, which is configured as a higher cost of for these individuals. Shane and Venkataraman (2000) introduced this idea through an analysis of who, how and what effects are created wealth and opportunity in the future. Then, Van Praag et al. (2013) conducted an exercise where the value of this estimated risk premium on education is between 1 and 2% for a sample of the UK (National Longitudinal Survey of Youth). Other arguments explaining higher education returns in self-employment are set by the type of entrepreneurs that is being studied, either because they include businessmen who work part-time, or because there is highly qualified professionals as doctors or lawyers who develop a highly paid business actvivity causing this type of work is being overrated.

Theoretical arguments for expecting higher education returns in wage earners
Wolpin (1977) proposes that if the wage scheme corresponds to the theory of signals, the group of entrepreneurs escapes the influence of individual signals because they are allocated wages themselves, and in this case they have perfect information about their productivity. On the other hand, the group of employees faces a labor market offering information to employers about their personal characteristics, which never reflect in a perfect way the marginal product of these in the job. For this reason it is expected that those salaries are allocated from the proceeds received signals are superior. Another argument appear in the

motivational effect that is sought to wages[4]. Finally, the self-employed earnings are undervalued (Hamilton, 2000, Parker, 2009 and Levitt and Durner, 2005) and some limitations should be considered when comparing the education returns for both groups, (Feldman and Slemrod, 2007).

However, these arguments are broken in the case where entrepreneurs come to the capital market, because, as proposed in the work of van Praag et al. (2013), wages may determine the likelihood of raising funds in this market and therefore, may be signalling their salary to increase these opportunities. Table 1.a contains a review of empirical evidence about education returns distinguishing between entrepreneurs and employees.

PUBLIC VERSUS PRIVATE EMPLOYMENT EDUCATION RETURNS

A seminal and remarkable contribution to the study of the signalling hypothesis was due to Psacharopoulos (1979) in which by using a sample consisting of separate individuals working in a competitive sector against other no competitive, that is, between public and private employees. In this sense, public enterprises operating in a market in which certain rules are favourable to them, protecting them from entry of new competitors or through laws giving it a privileged position compared to other companies. Meanwhile, in most cases the wages are assigned by legislation and independently of productivity, so that this is the area where it is more easily identify the signalling theory. Therefore, when analyzing the performance for these two groups is sensed that, in the case of signalling, yields on public sector workers are higher than the private sector. Table 1.b shows the most significant empirical work on the tools to test the signalling hypothesis, from different micro econometric approach and distinguishing public and private employees.

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[4] One problem associated with these estimates is to obtain reliable data on wages for self-employed. Hamilton (2000) and Parker (2009) argue that it should be noted that the wages associated with the self-employed do not consider issues such as assets. In addition to establishing a correct definition of exactly which individuals are self-employed, because this could be included as salaried executives that really may be entrepreneurs.

Table 1.a: *Micro-Econometric approach for testing Signalling Hypothesis*

	Applications			
	Notes	Authors	Data	Results
	Self Employment vs. Employees: *¨self-employed since they at least need not demonstrate their capabilities to prospective employers¨.*	Wolpin (1977) page 955.		The fact that self employed workers in nonprofessional occupations obtained about the same level of schooling as nonprofessional salaried workers was taken as evidence predominant screening interpretation against a predominant screening interpretation.
OLS and Probit		Rees and Shah (1986)	United Kingdom: 4762 individuals from the General Household Surveyf or 1978	There is positive selection bias in the observed earnings of employees, that the probability of self-employment depends positively on the earnings difference between the two sectors and that education and age are significant determinants of self-employment.
Heckman (1979) bivariate, and Lee (1983)		Brown and Session (1999)	1989 Banca d'Italia Survey of Household Income and Wealth (SHIW).	Evidence for weak but not strong screening in the Italian labour market
OLS and quantile regression	*Self-employment offers significant non pecuniary benefits, such as ''being your own boss.''*	Hamilton (2000)	1984 panel of the Survey of Income and Program Participation (SIPP)	Self-employment earnings differential reflects entrepreneurs' willingness to sacrifice substantial earnings in exchange for the nonpecuniary benefits of owning a business to be quite robust to a variety of alternative explanations.
OLS		Skalli (2001)	EU-15; Data base from National Statistics Institute and PHOGUE.	The country-specific results highlight a positive signalling value for womenin Austria and West Germany, for men as well as for women in Greece, and for men only in Spain and the UK.
OLS		Kawaguchi (2003)	Data for the years 1985 to 1998 were taken from NLSY79.	Self-employed workers are not necessarily a good 'control' group to test the Lazear contract, since not only the incentive effect of the Lazear contract produces the steeper wage profile of salaried workers, the difference of human capital investment does as well.
Heckman and Polachek (1974)		Harmon et al. (2004)	British Household Panel Survey (BHPS)	Signalling component rather small.
Heckman (1979)		Castagnetti et al. (2005)	Survey on Labor Market Transitions of University Graduates carried out in 2001 by the Italian National Institute of Statistic (ISTAT).	Support the strong screening hypothesis, with insignificant education returnsal performance for the self-employed and positive significant returns for employees.
OLS and IV (Hausman and Taylor, 1981)	Efficient Generalized Instrumental Variable technique	García-Mainar and Montuenga-Gómez (2005)	European Community Household Panel 1994-200.	Signalling premises seem to play a prominent role in determining individual earnings, but only for the higher education level, even though human capital influences cannot be excluded in both countries.
IV: 2SLS		van Praag et al. (2013)	National Longitudinal Survey of Youth (NLSY) 1979-2000.	Wages may determine the likelihood of raising funds in this market and therefore, may be signalling their salary to increase these opportunities.

Table 1.b: *Micro-Econometric approach for testing Signalling Hypothesis*

	Applications			
	Notes	Authors	Data	Results
OLS and IV for differents groups	*You can not direct measures of skill for endogeneity bias and because the tests tend to test it should refer to the ability to make money.*	Heywood and Weii (2004)		Review the empirical evidence of nearly thirty signalling tests, and conclude that virtually no generalizations can be drawn, however, in the labor market of Hong Kong education plays a signalling role.
OLS and IV	**Natural Experiments**	Harmon et al. (2004)	Labour Force Survey for England and Wales between 1993 and 2001.	No association between increasing years of education and increases in earnings, especially for higher levels of education in against signalling theory.
		Moral (2009)		Equilibrium could be re-established through changes in the firing and educational costs that reinforce the signalling mechanism. These changes, however, do not of minimum wage, since the negative effect on low skilled unemployment, on the spill-over alter, qualitatively, the main conclusions about the effects in wages, and on the discouraging effect on education persist.
Matching methods		Hopkins (2012)		Identifies the type of signal provided by the individual in relation to the type of company you want to work, distinguishing higher signals are directed to the most prestigious firms.
OLS	Full time MBA vs. Part tiem MBA and ability interactions	Hussey (2012)	Longitudinal survey of U.S. residents who registered for the Graduate Management Admission Test (GMAT).	While human capital accumulation may contribute to the returns to an MBA, the majority of the returns is derived from the signalling/screening function of the degree.
OLS	**Public vs. Private**; *¨The key to these test is the distinction between competitive and non-competitive sectors of the economy¨*	Psacharopoulos (1979) page 182.	GB General Household Survey 1975.	First, weak screening is not socially damaging, but it has a social information value in cases of hiring under uncertainty. Second, inconsistent with strog screening hypothesis, education is more valued in competitive sectors.
Endogenous switching regression model		Hartog and Oosterbeck (1993)	Netherlands; Dutch province of Noord- Brabant were sampled.	The earnings prospects of public sectors workers are better.
Times Series		Pérez and Sánchez (2011)	Germany, France, Italy and Spain) and the periods 1980-2007 and 1991-2007: European System of National Accounts (ESA-95); Eurostat (EU's statistical agency); The OECD Economic Outlook database.	Robust cross-country empirical evidence of mostly direct signals (intra-annual links) between both sector wages. Public sector wages play an important role in the determination of labor costs in the major euro area economies.

2.3. Trends in Human Capital and self-employment in the EU-15

This section will focus the analysis on the structure of education and labour market in the EU-15 countries. To do a comparative analysis in Europe, should be clear that despite the efforts to harmonize the European education systems is far to be an homogenous one, with wide differences in contents, durations, and this has to be treated with extreme caution when performing a comparative analysis, a matter to be considered in this section to the development of appropriate proxies.

2.3.1. Education in the EU-15

Education systems in the early 90 `s contemplated that the age at which they began to study a compulsory from age six, except in the cases of England, where he started school at 5 years and Denmark and Finland, which establishes the age in 7, although in most cases they include an optional previous year. In general, the design of education systems in Europe, if we consider compulsory education, the minimum years there were are similar across the countries and are about 9 and 11. On the other hand one could interpret the concentration of individuals in secondary school levels as a result of education systems with a strong component of professional training, a fact which explains the high concentration of individuals with this level of education in countries like Germany, Austria or Denmark.

In the last decade, since the Bologna process start, in the EU a homogenization process of educational systems emerged that aims to develop a common training scheme for access to the labour market in any region, however is still different. Figure 2 represents the percentage of the population aged between 25 and 64 years by educational level in 2001. Most of the population has levels of compulsory education, especially in Portugal, Italy, Spain and Greece. In the UK the population distribution is more balanced between the different educational levels. Finally, upper secondary education school choice is more representative in Germany,

Austria or Denmark and, with minor differences compared to other levels in France, Finland and Holland.
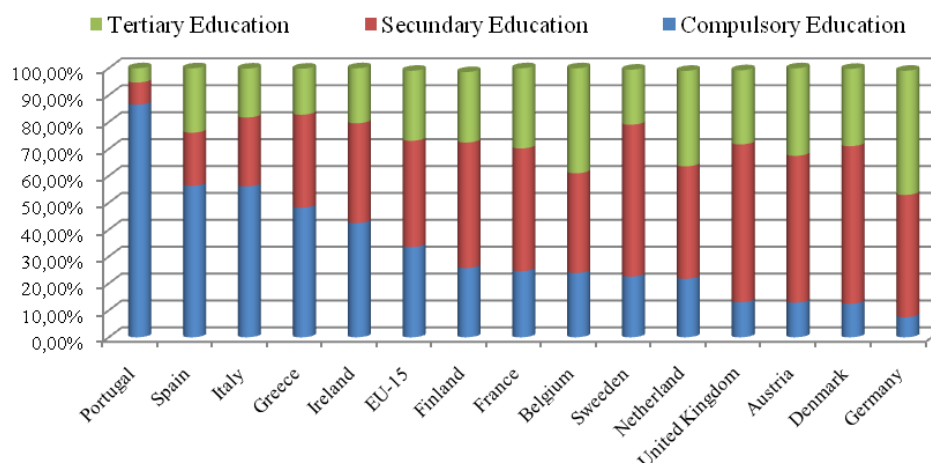
Figure 2: Population distribution by educational levels (2001) Source: Eurostat

Today the scenario is changing slightly, as show Figure 3 where appear the education levels for young people in 2010. The trend in the countries of the EU-15 seem to follow as described above, this is with low educated for the southwest Europe countries. However it appears that Ireland will be a change, while in countries like Austria and Germany appear a strong commitment to establish a well-developed vocational training, causing that the majority of its citizens choose this education category.

2.3.2. Human Capital for Self Employment in the EU-15

Self-employment rates represent very significant differences in the EU-15. Figure 4 represents the composition and show that countries with higher self-employment rates are Greece, Italy and Portugal, with a level that is below 35% in all cases. For its part, employees and self-employment with higher education in southern countries have an unskilled labour market, especially in self-employment. This scenario also shows that in countries where there is a greater proportion of this type

of employment, may engage in activities with low value added or related to the agricultural sector. The opposite case is Germany, Belgium or Luxembourg, where it appears a labour market with higher levels of education while self-employment rates are lower.
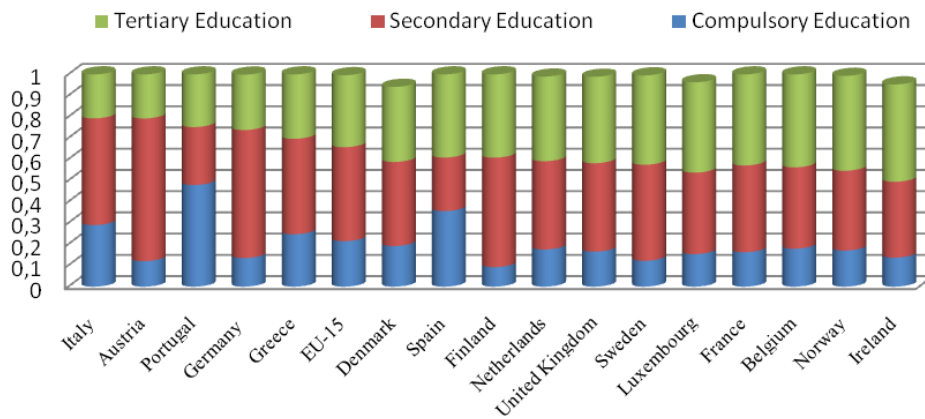
Figure 3: Levels of education for young people in 2010 (age 25 34). Source: Eurostat
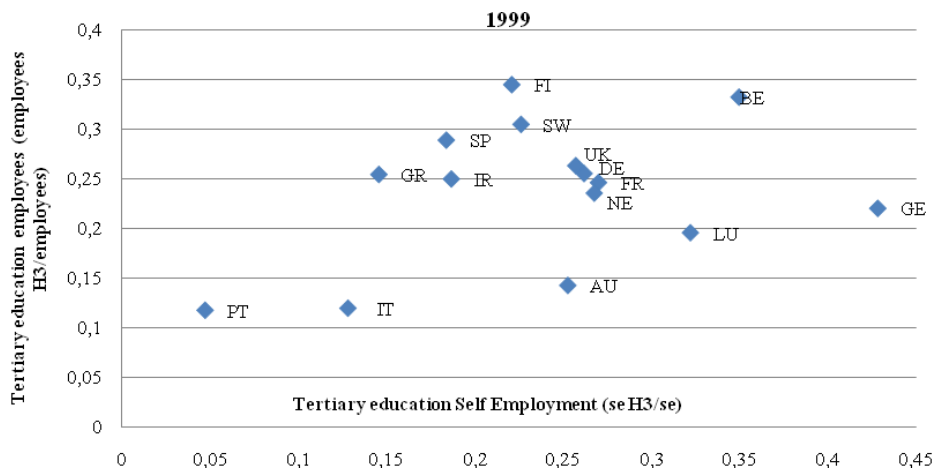
Figure 4: Rates of employees and entrepreneurs with higher education. Source: Eurostat

However, some other authors have provided evidence of a reversal of the trend towards less self-employment and small business presence in general (Carree et al., 2002). There are many potential reasons for this revival in Western economies such

as the important role that small firms play in the emergence of industries like software and biotechnology (Acs and Audretsch, 1987). [5] Finally, the composition of the self-employment rates and self-employment with the distribution of higher education has changed slightly in 2010 (Figure 5). While the countries of southern Europe continue to show high rates of self-employment, it seems that Portugal and Spain set their self-employment rates in the rest of the EU-15. However, the Human capital of self-employment in these countries has the lowest levels of the sample. Meanwhile, countries with a more qualified business sector are Germany and Luxembourg.
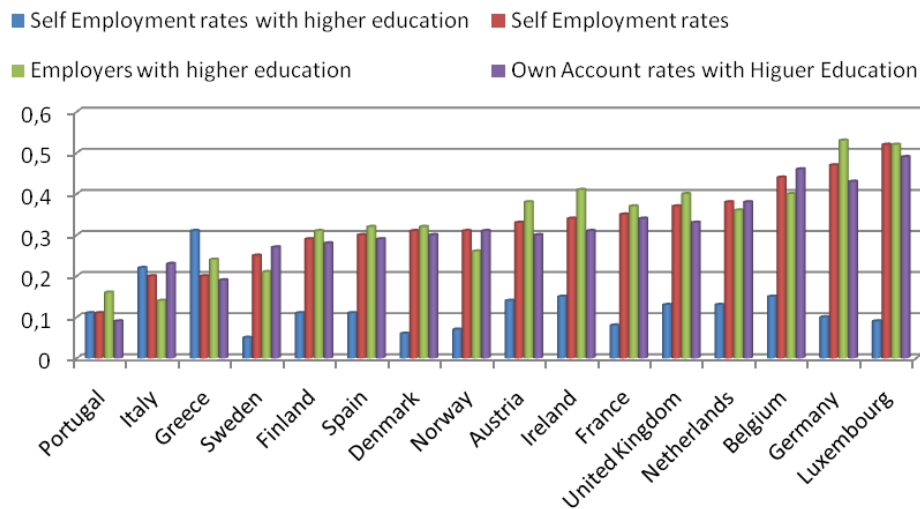
Figure 5: Self employment rates and the distribution of entrepreneurs with higher education in 2010. Source: Eurostat

2.4. Evidence for EU-15

2.4.1. Data, variables and sample design

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[5] See, Carree *et al*. (2002, pp. 274-275) for a detailed list.

The data used come from the ECHP. The ECHP is a panel of households in the EU-15[6], covering the period 1994-2001. Every year, all members of the selected households in each country are interviewed about issues relating to demographics, labour market, income and living conditions. The same questionnaire is used for all countries, which makes the information directly comparable[7]. The entire dataset includes about 60,500 nationally representative households (approximately 130,000 individuals aged 16 years and older).

Sample analysis

Our sample; to construct our sample, we exclude individuals who work less than 15 hours a week. Also exclude from the sample individuals who earn wages and income from self-employed activity.

Our subsamples; the subsamples that work in this chapter are distinguishing wage earners and the self-employed workers of one hand, and workers who are at the time of the interview in private sector jobs, including non-profit private organisations, and including para-statal in the case of public sector. The variables that filter these subsamples are pe004 for wage earners and self employment, pe008 which determines the individuals who have been declared as an entrepreneur in pe004 and declare the number of employees working in the company. So employers consider those cases where they declare that there is more of a worker. In the first case, the subsample are individuals who answer found in situations working with an employer in paid employment, as wage earner, and self-employment status, excluding individuals who answered working with an employer in paid apprenticeship, working with an employer in training under special related to employment, unpaid work in a family Enterprise. For its part, PE030 indicates if

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[6] Sweden has to be excluded from our analysis because these countries present missing values in relevant variables.
[7] See Peracchi (2002) for a review of the organization of the survey.

the individual is working in private or public sector. Append 3 describes the variables that are covered in the analysis.

Dependent Variable; the variable wage is defined as the natural logarithm of the net incomes from work. In ECHP losses from entrepreneur activity is not allowed. To ensure comparability across countries and time, incomes are converted into average € of 1996, being corrected by purchasing power parity (ensuring comparability across countries) and harmonised consumer price index (ensuring comparability across time).

Independents Variables; the empirical estimates include the education and experience. Potential experience (*X*) is obtained by subtracting the individual's age (*a*) the age at which reached its highest level (*S*) as proposed in Mincer (1974). Potential experience is calculated as follows:

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

Education variable; the measure of the education variable has been traditionally used by U.S. analysts has been the years of education using data collected in the Current Population Surveys from 1940 to 1990. The proxy of education is less significant when the analysis includes countries with different educational systems (Card, 2001; Blundel et al., 2004). So that the education variables used in the empirical analysis need to be checked for proper interpretation[8]. For instance, in the cases of Germany and France, where the years of secondary education are very different depending on whether the individual thinks going to college or not. Other example for rejecting the years of education variable appears when we consider the traditional theory of human capital, i.e. in the Scandinavian countries, the number of years of compulsory education is higher than other countries and might think that these students have been trained more than those of other countries, in this

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[8] Blundel et al (2004) warn about the importance of how to measure human capital through education, either as a discrete variable or as a continuous variable.

case could affect the outcome of the low education returns measured in years. Also, if the goal is to capture the effect of credentials is more appropriate to use educational levels, while the linearity assumption yields the years of education has been rejected (Hungerford and Solon, 1987; Heywood and Belman, 1991 and Park, 1999).

In our exercise, the interpretation of results should be in terms of each additional level of education. For the level 1 of the ECHP includes levels 1, 2 and 3, established by The International Standard League table of Education (ISCED) which determines the OECD, including compulsory education, which in most cases correspond to the education primary and lower secondary education, for level 2 includes ISCED level 4 and 5, and for 3 includes ISCED level 6 and 7, relating to higher education.

Control variables; and a set of explanatory variables related to demographic characteristics (gender and children under 14), employment characteristics (sector of activity, firm size, second language used at work and working hours). The first literature stream concerns the determinants of wages with early contributions of Becker and Chiswick (1966), Griliches and Mason (1972) or Mincer (1974) among all. In this sense the existence of wage differentials between men and women has been well documented for a number of countries, which now tend to accept the wage discrimination against women as a stylized fact of the labour markets (Altonji and Blank,1999 and Blau and Kahn, 2000). On the other hand, have seen wages as determinants of marital status and number of children in the empirical literature with different results (Hill, 1979; Krashinsky, 2004;, Ahituv and Lerman, 2005 between others). Finally, in relation to the characteristics of work, van Praag and Oosterbeck (1995) analyzed the differences in education returns between large and small firms. In this line, wage gaps between sectors of activity have also been studied, as shown in the work of Lee and Wolpin (2006) schooling increases the wages of white collar workers irrespective of sector, while education returns are

higher in the service sector. Finally, we introduce country dummies variables trying to capture differences across countries.

2.4.2. Econometric framework

Econometric alternatives proposed in the literature to measure the education returns are very extensive, however the most used are the OLS estimates and IV try to solve the endogeneity derived from Mincerian equation.[9] In this section, we describe the econometric strategy to check differences in returns of education between groups of wage earners and entrepreneurs and, indirectly, check the Human Capital versus Signalling Hypothesis. Firstly, we propose the Oaxaca-Blinder decomposition to check differences in the groups of private and public employees and employees with entrepreneurs.

The Mincerian earnings function of human capital and establishes this relationship can be expressed as follows:

$$\log W_i = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \beta i C_i + \xi_i$$

Where W_i is individual income and is a proxy for individual productivity, Are considered as independent variables schooling (S) and experience (X). C_i represent a set of control variables about demographic, work and region.

Endogeneity bias

The key question concern to estimate earnings equation is the endogeneity bias for omitted ability variables arising in OLS estimations[10].

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[9] Table A1 in the appendix shows a summary of microeconometric approaches to test the education returns.

[10] ***Endogeneity of the dependent variable, wages.*** Individuals with higher innate ability are able to develop their skills more efficiently, therefore, are able to seize opportunities in the

To solve the endogeneity bias two approaches are frequently used; the IV approach and the control variable approach trough OLS approach. While using OLS estimations, the Random Effects model assumes exogeneity of all the regressors and the random individual effects. However, the FE model allows for endogeneity of all the regressors and the individual effects (Mundalk, 1978). As Baltagi (2002) expose, this *all or nothing* choice of correlation between the individual effects and

labor market and in their jobs (Card, 1994). On the other hand, Chevalier and Lydon (2002) argue that the wage level is related to job satisfaction, so that efforts to increase the motivation to be found in more skilled jobs and ultimately brings greater income.

Endogeneity of the explanatory variables, education and experience. The education variable is correlated with the innate ability while more educated individuals are, as a rule, the most skilled. Skip the innate ability, should affect the level of wages, the coefficient biases of OLS estimates to generate econometric problems by omission of relevant variables (Inchino and Winter-Ebmer, 2004 and Denny and Harmon, 2000). Note also that in addition to the potential experience include years of schooling is endogenous by definition (see Barceinas-Paredes et al., 2002). The exogeneity assumption is not met in the presence of these conditions, to illustrate Mincerian function is specified for panel data, individuals considering i t periods.

$$\log W_{it} = \alpha_{it} + X_{it}\beta_{it} + \upsilon_{it}$$

$$E(\alpha_{1i} / X_{i1},...X_{iT}) \neq 0$$

Following Blundell et al. (2004), after analyzing the problem of endogeneity, there is an alternative version of the initial model (1) which decomposes the error term into three components:

$$\xi_i = \mu_i + \vartheta_i + \varepsilon_i$$

Where μ_i captures unobserved individual components related to the individual, whether an individual's ability or motivation (endogeneity of wages), ϑ_i contains any errors that are generated by unobserved individual factors related to explanatory variables, especially education (endogeneity of education) and, finally, ε_i which is derived from the standard error of measurement errors of the variables included in the model. The following expression represents the Mincer model incorporating the errors generated by the unobserved components.

$$Y = \phi(X, S) + \mu_i + \vartheta_i + \varepsilon_i$$

the regressors encouraged Hausman and Taylor (1981) to suggest a model where some of the regressors are correlated with the individual effects.

Many studies showing the technical development and the advantages and particularities of the use of IV versus OLS estimates (see, Wooldridge 2002; 2005, Heckman and Urzúa, 2010 or Larcker and Rusticus, 2010). While in IV approach requires appropriate 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 family background or other instruments that are adequate to implement the IV approach (see Harmon et al., 2004, the works of Card, 1999 or Angrist and Krueguer, 1991 among others).[11]

Consequently, we propose the use of estimates IV following Hausman and Taylor (1981) and the control variable approach. On the one hand, the control variable approach includes proxy variables as additional regressors in the earnings equation to approximate the influence of unobserved ability. Numerous studies show that there exists a strong correlation of abilities between generations within a family. Intergenerational transmission of abilities may be attributed to family transmission of ambition, effect of family culture, and the observable and unobservable efforts of parents to assist children's human capital accumulation (see for instance Zhong, 2011).

On the other hand, IV approach by Hausman and Taylor (1981) estimated under the assumption that random effects conditional on certain regressors remain fixed. The procedure assumes that some of the explanatory variables are correlated with the idiosyncratic error or random effect model of individuals μ_i, but none of the explanatory variables is correlated with the standard error ε_i. This resulting estimator is based upon an instrumental variable estimator which uses both the

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[11] Table A2 in the appendix show a summary of instruments proposed in the litetarure.

between and within variation of the strictly exogenous variables as instruments[12]. The choice of the strictly exogenous regressors is a testable hypothesis. In fact, this is a Hausman test based upon the contrast between the FE and the HT estimators[13].

$$E(\mu_{it} / X_{1t},...X_{iT}) \neq 0$$

$$E(\varepsilon_{it} / X_{1t},...X_{iT}) = 0$$

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

$$\log W_{it} = \alpha + \gamma_1 D1_{it} + \gamma_2 D2_{it} + \gamma_3 D3_{it} + \gamma_4 X_{it} + \gamma_5 X_{it}^2 + \gamma_i C_{it} + \xi_{it}$$

Where *Di* are dummies 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. Under the same procedure creates the two dummies *D2* and *D3*, corresponding to the levels of upper secondary and higher education. Finally, C_{it} denote the set of demographic and work controls variables included as explanatory model.

2.4.3. Previous empirical evidence

Available evidence so far on the education returns

The empirical evidence show that the effect of education on productivity is positive (Ashenfelter, 1999), and stablishes that the yields of the years of education are

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[12] More specifically, the individual means of the strictly exogenous regressors are used as instruments for the time invariant regressors that are correlated with the individual effects, see Baltagi (2001).

[13] The standard Hausman test rejects the null hypothesis that the conditional mean of the disturbances given the regressors is zero, the applied researcher reports the HT estimator (.chi^2= 525.34, Prob>chi2 =0.0000). The results we present in the next section using 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, where the educational level just show variability pathway.

between 5% to 15% (see Hartog and Oosterbeek, 2007). Van der Sluis et al. (2008), conducted a meta-analysis for more than a hundred studies and yields fall by 6.1%. Using educational attainment as proxie education, the values found are higher, depending on the technique used, the analyzed group of workers and the country can be found values between 40% and 120% for higher education (see Mainar and Montuenga 2005, Raymond, 2011 or Walker and Zhu 2001).

However the technique and the proxies used are decisive in the results (Blundel et al., 2004). OLS estimates have been criticized for failing to correct the endogeneity bias in their calculus, while the IV technique has been positioned in the focus of discussions to determine the education returns (Card, 1999). This technique is not without problems, since the results are highly sensitive to the instruments used. Similarly, the literature has shown evidence of overvaluation of the education returns measured through IV versus OLS (Ashenfelter and Zimmerman (1997) and Harmon et al. 2001, among others).

Available evidence so far on the education returns in self-employmnent.

As warned in the introduction, the empirical evidence on the education returns in self-employment is recent. Although the empirical evidence linking education and self-employment is ambiguous as shown in the meta-analysis of van der Sluis et al. (2008), where among their conclusions find that the education returns are similars for entrepreneurs and employees, though somewhat higher for entrepreneurs in U.S. Other recent empirical study has shown that the education returns are high for entrepreneurs and even higuer than employees (Hartog et al, 2010; Bates, 1990). In this line, works that measure the education returns by type of employees in Europe are those of Van Praag et al. (2013) and Mainar and Montuenga (2005). In the first, the education returns are higher for self-employment and, in the second, with an analysis from Spain and Portugal they find that the optimal educational level is secondary in the case of the self-employed, while higher education reported higher yields in wage employment.

3.4.4. Results

In this section three sets of results are reported. First in Table 2 the corresponding results are shown to the Oaxaca-Blinder decomposition. In it, according to the groups of employees discriminated by the employees of the public sector and in the following three columns including the total sample and the groups discriminated by entrepreneurs, employers and self-employed. The last column includes only the entrepreneurs and decomposes by employer group.

The second set of results contains the estimates of the education returns through random effects and appear in Table 3. In columns, 7 sets of results are shown in the following order: Complete sample, employees. private employees, public employees, entrepreneurs, employers and own account.

To complete the results section, a third block contains the estimates using the Hausman-Taylor (1981) procedure in order to control the endogeneity bias, shown in Table 4. As a novelty compared to previous block of results, are included interactions of the type of occupation, public and employee entrepreneur with secondary and higher education in order to capture the net effect of education for each type of occupation. So the first column includes the results of the estimates where the self-employment dummy and its interaction with secondary and higher education are included. Similarly, the next two columns contain the same set of results for the case of employers and own account workers. Finally, the last column refers to the results of the dummy model that measures of public sector and their interaction with secondary and higher education levels.

The results obtained using the Oaxaca-Blinder decomposition allows check for significant differences between the estimated coefficients for all cases. These differences are negative in the case of public employees (-0.25) and employers of the self (-0.46). However, these differences are positive for entrepreneurs compared with employees (1.53), regardless whether they are employers (1.59) or

autonomous (1.59). However, the explained part of the differences appear to be due solely to the coefficients, except for the case of public employees and employers about employees and own account workers.

Table 2: Blinder-Oaxaca decomposition

Sample	Employees		All		All		All		Entrepreneurs	
Decomposition by:	*Public*		*Entrepreneurs*		*Employers*		*Own Account*		*Employers*	
	Coefficient	*z-stat*	*Coefficient*	*z-stat*	*Coefficient*	*z-stat*	*Coefficient*	*z-stat*	*Coefficient*	*z-stat*
Differential										
Prediction 1	9.28***	2056.2	9.325***	2302.7	9.084***	1698.1	9.167***	1782.3	7.577***	287.6
Prediction 2	9.53***	1532.46	7.792***	402.2	8.038***	282.46	7.57***	287.6	8.038***	282.4
Difference	-0.25***	-32.09	1.533***	77.44	1.045***	36.11	1.59***	59.23	-0.461***	-11.9
Decomposition										
Endowments	-0.09***	-6.7	0.088	0.99	-0.234*	-1.85	-0.012	-0.33	-0.224	-0.59
Coefficients	-0.14***	-14.11	0.923***	31.69	1.098***	36.19	0.708***	12.02	-0.112***	-2.66
Interaction	-0.02	-1.21	0.522***	5.7	0.181	1.43	0.894***	13.86	-0.125	-0.33
Number of observation	107663		126185		126186		126187		29140	

Meanwhile, in Table 3 the results show that the education returns are positive, regardless of workforce analysis. For the whole sample the returns of higher education is 53%, more than double that secondary education, a result that is repeated approximately in each of the samples studied. The estimates by groups of workers, it can be seen that returns of higher education of employees is 57%, higher among those working in the public sector (62%) than private sector workers (47%). Considering the last three columns, corresponding to yields entrepreneurs seem significantly higher than the group of employees, and this performance of higher education of 73%. However, this group differs from the group of employers and own account workers, as though they are above the wage-earners income, this difference appears to be mainly due to employers. For employers, the yields are 92%, higher than those observed for all groups, while in the case of these own account the tertiary education yields are the lowest among all groups, 42 %.

Attending experience, we can observe that plays a role in individual earnings, an increase of around 6% of wages per year of accumulated experience. The control variables included in the model reflect results that meet expectations according to previous empirical evidence. Mens gains more that women, while those individuals with children under 14 are less paid. With regard to industry, the results show that services and industrial sectors and larger companies offer better salaries to their

employees. Finally, use a second language in job allow get more wages in the case of employees, but not in the case of entrepreneurs.

The third block of results presents estimates of Hausman-Taylor (1981). Were included in the Mincerian model occupation dummies and interactions between education and occupation. In general, the results agree with those obtained in the estimation by GLS, with greater returns of tertiary education for employers (67.2%) than employees (41.2%). In the first column the effect of entrepreneurship on profits, despite the education returns are positive, the group of entrepreneurs get a lower income than employees (-84.7%). Although this result is relevant in the net effect of higher education for entrepreneurs because is positive in 18%, while the rate in secondary education seems 12% more for this group. These results should be studied in more detail and review the following two columns where the net effects of education for employers and self-employed are different. So, in employers group, higher education represents an additional returns of 22.1% regard to employees, while secondary education does not reflect significant differences between employer and employees. However, the effect of education on the own account group is the opposite. While higher education is not significantly different between own account workers and employees, secondary education is 27.4% more profitable among which are own account workers.

These results can be interpreted in line that employers can catch the education return when they work on larger scales, or as a result of the more educated individuals are better able to manage their skills and pass it to their business, which translates on a larger scale and increased hiring. Meanwhile, the secondary education seems to be more profitable when individuals are own account workers. One possible explanation for this is the very specific job they developed through vocational training occupations, which would be profitable on themselves, without the possibility of scales and also whether as employees undertake just would capture their value added generated.

Table 3: Estimated coefficients of the Mincerian earnings function by OLS (random effects)

Sample	All		Wage Earners		Private Employees		Public Employees		Entrepreneurs		Employers		Own Account	
Dependent variable: Personal net income (log)	Coefficient	z-stat	Coefficient	z-stat	Coefficient	z-stat	Coefficient	z-stat	Coefficient	z-stat	Coefficient	z-stat	Coefficient	z-stat
Secondary education [a] (*ref. Basic education*)	0.254***	12.27	0.265***	15.21	0.213***	10.32	0.336***	11.66	0.326***	4.67	0.430***	4.52	0.211**	2.29
Tertiary education [a] (*ref. Basic education*)	0.538***	22.3	0.576***	28.91	0.475***	19.05	0.621***	20.62	0.737***	8.19	0.969***	8.01	0.425***	3.5
Experiencie	0.051***	24.3	0.050***	27.82	0.045***	21.02	0.053***	18.97	0.072***	9.52	0.077***	6.99	0.062***	6.51
Experiencie^2	-0.092***	-19.93	-0.081***	-19.89	-0.073***	-15.18	-0.088***	-13.52	-0.110***	-7.63	-0.114***	-5.25	-0.100***	-5.63
Male [a]	0.507***	30.01	0.245***	17.49	0.248***	14.44	0.229***	11.86	1.475***	23.33	1.629***	17.98	1.391***	17.67
Number of children under 14	-0.017***	-2.21	-0.019***	-3.06	-0.008***	-1.01	-0.067***	-7.15	0.028	1.07	0.060	1.59	0.010	0.28
Second language	0.027	1.57	0.065***	5.13	0.083***	5.27	0.077***	4.23	-0.149**	-2.12	-0.159*	-1.71	-0.180*	-1.66
Services sector [a] (*ref. Primary sector*)	0.706***	24.91	0.496***	15.29	0.443***	12.12	0.547***	7.24	0.439***	6.59	0.509***	4.93	0.416***	5.13
Industrial sector [a] (*ref. Primary sector*)	0.680***	22.1	0.485***	14.59	0.464***	12.48	0.656***	7.88	0.417***	4.56	0.417***	3.32	0.475***	3.57
Constrution sector [a] (*ref. Primary sector*)	0.584***	17.05	0.361***	10.08	0.351***	8.84	0.445***	4.35	0.412***	4.51	0.432***	3.33	0.363***	2.92
Firm size [a] 1-4	0.485***	21.98	0.211***	4.69	0.257***	4.98	0.114	1.19	0.081*	1.82	-0.179	-0.45	*Omitted*	
Firm size [a] 5- 19	0.930***	38.54	0.405***	9.02	0.438***	8.46	0.196**	2.08	0.134*	1.68	-0.197	-0.49	*Omitted*	
Firm size [a] 20 - 49	1.119***	41.86	0.510***	11.22	0.550***	10.42	0.254***	2.69	0.582***	3.48	0.243	0.57	*Omitted*	
Firm size [a] 50 - 99	1.195***	40.83	0.573***	12.4	0.618***	11.52	0.288***	3.03	0.595**	2.19	0.287	0.6	*Omitted*	
Firm size [a] 100 - 499	1.244***	45.03	0.609***	13.32	0.662***	12.44	0.292***	3.09	0.523*	1.74	0.291	0.59	*Omitted*	
Big-sized [a] firm>500 [a]	1.288***	44.96	0.639***	13.85	0.720***	13.38	0.251***	2.66	0.290	0.74	*Omitted*		*Omitted*	
Working hours	0.012***	3.83	0.011***	3.66	0.021***	5.29	0.004	0.99	0.029***	3.73	0.040**	3.2	0.021**	2.14
Working hours squared	-0.0002***	-5.76	-0.0001***	-3.14	-0.0002***	-4.74	0.000	0.38	-0.0003***	-3.91	-0.0004***	-3.58	-0.0002**	-1.88
Country controls	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	6.242***	64.55	7.144	72.5	6.982	58.12	7.304***	36.4	4.460***	15.59	4.286***	7.23	4.837***	13
R^2 within	0.0024		0.0029		0.0021		0.0053		0.002		0.0021		0.0009	
R^2 betwen	0.2083		0.1392		0.1337		0.1542		0.1647		0.1448		0.1895	
R_2 overall	0.1663		0.1309		0.1273		0.1438		0.1512		0.1362		0.1732	
Number of observation / Number of groups	126185	44604	97045	35925	77187	28535	19858	8961	29140	10478	13606	5908	15534	6351

Notes: [a] Dummy variable. [b] In thousands of average euro of 1996, corrected by purchasing power parity (across countries) and harmonised consumer price index (across time).* $0.1 > p \geq$

0.05; ** $0.05 > p \geq 0.01$; *** $p < 0.01$. Robust standard errors .

Table 4: 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	0.143***	4.91
Tertiary education [a] (*ref. Basic education*)	0.672***	9.32	0.704***	10.67	0.726***	10.41	0.412***	11.13
Experiencie	0.089***	15.95	0.090***	17.13	0.097***	18.45	0.108***	26.64
Time Variant exogenous								
Experiencie^2	-0.160***	-13.60	-0.165***	-14.42	-0.179***	-16.02	-0.21***	-23.62
Entrepreneurs a (ref. wage earners)	-0.847***	-22.11						
Entrpreneurs * Secondary education	0.122**	2.17						
Entrpreneurs * Tertiary education	0.187***	2.81						
Employers a (ref. own account)			-0.738***	-19.36				
Employers * Secondary education			-0.064	-1.12				
Employers * Tertiary education			0.221***	3.33				
Own Account a (ref. employers)					-0.631***	-9.15		
Own Account * Secondary education					0.274***	4.54		
Own Account * Tertiary education					0.016	0.21		
Public Employee							0.12***	4.01
Public Employee* Secondary education							0.018	0.48
Public Employee* Tertiary education							0.019	0.46
Number of children under 14	-0.039***	-4.10	-0.039***	-4.47	-0.052***	-5.96	-0.066***	-9.830
Second language	0.017	0.88	0.040***	2.31	0.023***	1.27	0.090***	7.180
Services sector[a] *(ref. Primary sector)*	0.604***	17.77	0.567***	15.63	0.518***	15.95	0.431***	13.180
Industrial sector[a] *(ref. Primary sector)*	0.589***	16.47	0.553***	15.04	0.513***	15.19	0.436***	13.180
Constrution sector[a] *(ref. Primary sector)*	0.506***	12.85	0.457***	11.49	0.416***	11.17	0.302***	8.590
Firm size[a] 1-4	0.163***	6.66	0.171***	2.72	0.510***	8.15	0.291***	6.230
Firm size[a] 5- 19	0.374***	12.66	0.347***	5.50	0.707***	11.25	0.469***	10.040
Firm size[a] 20 - 49	0.504***	15.31	0.468***	7.28	0.802***	12.54	0.558***	11.790
Firm size[a] 50 - 99	0.566***	15.98	0.528***	8.10	0.860***	13.26	0.608***	12.680
Firm size[a] 100 - 499	0.606***	17.62	0.569***	8.80	0.895***	13.90	0.652***	13.700
Big-sized[a] firm>500[a]	0.630***	17.54	0.586***	8.93	0.921***	14.10	0.678***	14.090
Working hours	0.025***	7.01	0.023***	6.22	0.021***	6.07	0.024***	6.750
Working hours squared	-0.0002***	-7.28	-0.0002***	-6.95	-0.0002***	-5.23	-0.0001***	-6.050
Time Invariant exogenous								
Male[a]	0.507***	25.21	6.327***	42.02	0.407***	23.02	0.232***	17.590
Country controls	Yes		Yes		Yes		Yes	
Constant	6.015***	44.34	0.387***	21.48	5.870***	39.97	6.472***	51.530
Number of observation / Number of groups	126185	44604	110651	40635	112579	41418	107663	38926

Notes: [a] Dummy variable. [b] In thousands of average euro of 1996, corrected by purchasing power parity (across countries) and harmonised consumer price index (across time).* $0.1 > p \geq$

0.05; ** $0.05 > p \geq 0.01$; *** $p < 0.01$. Robust standard errors.

Finally, in order to discriminate the net effect of education groups, the last column show that differences in secondary and higher education are not significantly different between public and private employees, even though the income of the public sector are 12% higher. Therefore, in our attempt to test which hypothesis allow us to explain the wages composition for all EU-15, we can note that although there are differences between the wages of entrepreneurs and employees on the one hand, and public and private employees on the other, when we look at these net differences generated by education, only in the case of entrepreneurs appear to be significant, and not significantly different between public and private employees, rejecting the signalling hypothesis.

2.5. Conclusions

In a scenario where full integration in education and employment are essential, considering a broad and reliable comparative analysis from the ECHP databases, make it possible to know the implications of economic policies to the set of EU-15 countries. The data show a wide heterogeneity between the EU-15 countries in relation to rates of self-employment and the human capital of entrepreneurs. This has been analyzed from the perspective of the role that education has on the productivity of the different groups of workers belonging to labor market, public or private employees and employers or own account workers.

This chapter has presented a comprehensive review of the theoretical and empirical evidence on the effect of education on lifecycle earnings contributions. Thus, theories of human capital and signalling have been contrasted to determine which of them allow to answer the key question about investment in education; is more productive the individual receiving education or simply investment in education is a way to give a signal to the employer for obtain a more favorable contract and incomes? The answer is not easy because both theories can be observationally equivalent. However, following some

previous empirical proposals, the results revealed that among the groups of employees and employers on the one hand, and on the other public and private employees, not signalling indications appear in our approximation. Despite the higher income in the public sector, don´t emerge significance differences between private and public employees and, in the case of entrepreneurs education is more productive for employers regarding employees, but not in the case of own account workers with tertiary education.

In this sense, the utility of our results is in order to understand how the labor market rewards the investment in education, which largely determines the decision of individuals to put their talent in paid employment versus self-employment. Rejecting the signalling hypothesis would imply that a country's investment in education will not becomes a cost for society. Therefore, educational and entrepreneurs policies must be coordinated to guarantee that employers has a high level of education, while the own account workers obtain higher returns to education in the case of vocational training and, consequently, implementing education policy follow this direction.

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Appendix

Table A1. Micro-Econometric approach for testing Human Capital

	Notes	Applications		
		Authors	Data	Results
Least squares		Mincer (1974)	1960 US Census data	Returns toschooling were 10% with returns to experience of around 8%.
Instrumental variable methods*	Instruments (Solve the endogeneity bias but there is a wide discussion about the correct instruments)			
Dynamic Mincer equation (DME)	Wage of an individual is not equal to the monetary value of the individual human-capital productivity at any point in time.	Andini (2012)	Belgium, Denmark and Finland. European Community Household Panel (ECHP)	Earnings do not adjust to human-capital productivity as rapidly as assumed by Mincer (1974). This return is found to be lower that its potential level at the beginning of the working life
Control function methods	The control function specification points to significant selection on unobserved returns. When we do allow for these interactions, from the control function specification there no longer appears to be any remaining selection on unobserved returns.	Blundel et al. (2004)	The Brithish 1958 NCDS Birth Cohorst.	When we do not allow for such observable heterogeneity in returns, the control function specification points to significant selection on unobserved returns. When we do allow for these interactions, from the control function specification there no longer appears to be any remaining selection on unobserved returns.
Matching methods	Under the matching assumption, all the outcome-relevant differences between treated and non-treated individuals are captured in their observable attributes, the only remaining difference between the two groups being their treatment status.	Blundel et al. (2004)	The Brithish 1958 NCDS Birth Cohorst.	Matching on detailed early test scores and family background variables appears to perform well for the average return for the treated
Oaxaca -Blinder descomposition	Allows to discriminate the effect of education on other factors such as region, occupation or gender.	Oaxaca (1973) and Blinder (1973)	The U.S. 1958 Census	Wage gap between males and females wages.
Heckman (1979)	There are several effects on tratatmiento of the samples studied, in which we can be interested and some of the most analyzed the "Average Treatment Effect" (ATE), "Effect of Treatment on the Treated" (TT), the "Local Average Treatment effect "(LATE) and the" Marginal Treatment Effect "(MTE). Much of the empirical literature evaluation program assumes that the effect of "treatment" is not mixed so that the above distinction would be irrelevant.	Arazola and Hevia (2001) for an apliccation in Spain.	ECHP: Spain. Instruments: Changes in education Law, affecteds by the Civil War, spouse´s education	Existence of heterogeneity in the education returns and therefore theimportance of distinguishing effects of others in assessing, in general, any treatment and, in particular education.

Table A2. Micro-Econometric approach: IV*

		Applications	
Notes	Authors	Data	Results
Instruments:			
(Solve the endogeneity bias but there is a wide discussion about the correct instruments)			
Family Background	Hoogerheide et al. (2012)	2004 German Socio-Economic Panel	Confidence in the use of family background variables as instruments in income regressions.
Years of schooling of parents and spouse.	Iversens et al. (2011)	Integrated Database for Labor Market Research (IDA): Denmark	Evidence of significant non-linearities in the returns to schooling is robust
Number of siblings, years of schooling of the father, away to college,wages of blue collar unemployment rate of individuals with 17 years.	Carneiro et al. (2011)	National Longitudinal Survey of Youth of 1979 (NLSY).	Marginal expansions of schooling programs produce marginal gains that are well below average returns but well above OLS estimated returns (OLS selection bias). Different instruments define different parameters. (IV)
Fathers education, years of education, demographics and Hability Test	van Praag et al. (2013)	National Longitudinal Survey of Youth (NLSY) 1979-2000	Higher education returns in the self-employed because they have no restrictions on the performance of their duties
Family Background	Block et al. (2009)	Flash Eurobarometer Survey on Entrepreneurship 2007: 27 European countries and the US	Effect of education on the decision to become self-employed is strongly positive
Changes in years of compulsory education	Brunello et al (2009)	European Community Household Panel (ECHP) for the year 2001	Additional education reduces conditional wage inequality, and that education and ability are substitutes in the earnings function.
Changes in years of compulsory education and month of birth	Leight y Ryan (2006)	Household, Income and Labour Dynamics in Australia (HILDA) Survey, 12000 respondents since 2001	Australian rate of return to education, corrected for ability bias, is around 10%
Efficient Generalized Instrumental Variable technique	García-Mainar and Montuenga-Gómez (2005)	European Community Household Panel (1994-2001) Portugal and Spain	Returns are different across the two countries as well as across the two employment statuses.
Family Background and dummy that identify delays in the entry to school	Fertig y Kluve (2005)	Young Adult Longitudinal Survey 1991–1995/1996: East and west Germany.	The IV estimates suggest there is no effect of age at school entry on educational performance.
Family Background (education and employment), smoke under 16 and now	Harmon et al. (2004)	International Social Survey Programme (ISSP) and ECHP	Care should be taken in theinterpretation of IV estimated returns to schooling as an indicator of the return to all individuals
Second World War effects on population	Inchino y Winter-Ebmer (2004)	Austria: The Mikrozensus 1981, 1983, and 1985 Germany: SOEP (1984–86);Switzerland: Einkommens- und Vermoegensstichprobe survey (1982).Sweden: Swedish Survey of Household Market and Nonmarket Activities—HUS project (1984) and Swedish Level of Living Survey (1981).	War II led to a significant drop in the educational attainment of individuals who were of elementary school age during or immediately after the conflict
Three types: 1. schooling choice 2. Parental interest in the child's education at age 7. 3. Older siblings	Blundel et al. (2004)	The Brithish 1958 NCDS Birth Cohorst.	Basic pre-education informationwould not have been enough to identify gains in an unbiased way. Estimates of OLS education returns are lower than those obtained by IV.
Family Background, smoke at 16 and now.	Harmon et al. (2004)*	British Household Panel Survey (BHPS)	Care should be taken with the instruments used because may indicate unreliable education returns for all individuals, if they affect more of a particular group.
Measures of Risk Aversion	Brunello (2002)	Italian: Survey on the Income and Wealth of Italian households (1995)	Gap between the IV and the OLS estimates of the education returns is large
Changes in education law	Barceinas-Paredes et al. (2002)	Spain: Wage Structure Survey 1995 (ESS 95)	Educational Reform in 1970 in Spain benefits individuals by increasing their chances of employment, through increases in wage rate.
Family Background	Trostel et al.(2002)	28 countries: International Social Survey Programme data, 1985–1995.	No evidencefor a worldwide rising rate of return to education from 1985 through 1995. Indeed, IV are over 20% higher than OLS.
Quality of school infrastructure	Becker y Siebern-Thomas (2001)	Germany: The GSOEP data.	It is most important optimal allocation schools that spending on schooling infraestructures.

Table A3. Variables description

	Description
	Dependent variables
Log (annual wage)	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.
Main variable	**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 3-4).
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 who work in public sector and 0 for who work in private sector as salaried.
Demographic characteristics	
Male	Dummy equals 1 for males 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 works in industrial sector.
Construction sector	Dummy equals 1 for individuals who works in secondary sector.
Services sector	Dummy equals 1 for individuals who works in services sector.
Firm-sized firm 1-4	Dummy equals 1 for individuals who works in a firm with more than 1 employee and less than 5.
Firm-sized firm 5-19	Dummy equals 1 for individuals who works in a firm with more than 4 employees and less than 20 .
Firm-sized firm 20-49	Dummy equals 1 for individuals who works in a firm with more than19 employees and less than 50.
Firm-sized firm 50-99	Dummy equals 1 for individuals who works in a firm with more than 49 employees and less than 100 .
Firm-sized firm 100-499	Dummy equals 1 for individuals who works in a firm with more than 99 employees and less than 500.
Firm-sized firm>500	Dummy equals 1 for individuals who works 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.

Chapter 3: Effects, dynamics and routes out of overqualification in Europe: a comprehensive analysis distinguishing by employment status

This chapter aims to improve our understanding of overqualification by incorporating distinctions in employment status (i.e., self-employed workers, private employees and public employees) in the analysis of the effects, dynamics and routes out of overqualification. To this end, we apply discrete choice –ordered and non-ordered– and count models to the data obtained from the *European Community Household Panel* for the EU-15. Our results indicate that overqualification decreases job satisfaction and increases on-the-job search, absenteeism and labour mobility. Furthermore, this analysis suggests that overqualification is a permanent phenomenon and demonstrates that successful routes out of overqualification vary by individual employment status. The implications of these results for education and labour market policies are also discussed.

3.1. Introduction

There is consensus among academics and policy makers that education is a key instrument in promoting many desirable socio-economic outcomes, such as economic growth and competitiveness, individual development, access to work and a more equitable distribution of income.[1] The supply of high-skilled workers in

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[1] The key role of education as a major driver of economic growth and income equality has been extensively documented in academic publications (see, for instance, works by Kuznets 1955; Mincer 1974; Tinbergen 1977; Psacharopoulos 1994; or Barro 2001). Policy reports

Europe has increased substantially since the 1970s, and this expansion does not seem to have reached its zenith. Thus, the number of individuals with tertiary education qualifications as a share of the active EU-27 workforce rose from 21% in 2000 to 29% in 2011. Furthermore, as part of the *Europe 2020 strategy* (the EU's growth strategy for this decade), EU leaders have agreed on a target of 40% of young people completing higher education by 2020.

This strategy implicitly assumes that there is unmet demand for higher education, which emerges from technological change (McGuinness 2006). However, demand for such graduates may be low (or unresponsive to changes in relative supply), which would lead to a situation in which not all workers can fully utilise their skills and are forced to hold positions for which fewer qualifications would suffice, i.e., some workers are overqualified (Dolton and Vignoles 2000, McGuinness 2006).[2] Indeed, according to estimates based on EU-LFS data for the period 2001-11, the average incidence of overqualification in the EU-27 is approximately 15% (European Commission 2012b, chapter 6). Estimates of the share of overqualified workers provided by Leuven and Oosterbeek (2011) raise this figure to 30%.[3]

This phenomenon suggests a sub-optimal allocation of graduates in jobs,[4] i.e., an inefficient allocation of skills in the labour market (Groot and Maassen van der

also place special emphasis on the role of education (see, for instance, European Commission 2012a).

[2] The qualification level of an individual is represented by aspects such as years of formal education and experience. Possessing these attributes can contribute to the development of several skills, including teamwork, communication, problem solving, and leadership. Since qualification elements are frequently understood as proxies for many of the aforementioned skills, henceforth, we will use the words *qualifications* and *skills* interchangeably.

[3] To reach this figure, the authors use meta-analytical methods of (unweighted) means of the reported shares of skill mismatch in a database constructed from a number of existing studies. The European sources focus on the following countries: Austria, Belgium, Czech Republic, Germany, The Netherlands, Portugal, Spain, Sweden and the United Kingdom.

[4] The *Assignment Theory* of job allocation (Sattinger 1993) describes an optimal allocation as one that allocates workers top-down according to their skills so that the most competent worker is assigned to the most complex job and the least competent worker is assigned to the simplest job. As a result, every worker is matched to a job in which, in relative terms, they perform better than all other workers do.

Brink 2000; McGuinness 2006; Baert et al. 2013), which might lead to various negative outcomes for individuals, firms and the economy.

At the individual level, overqualified workers are more dissatisfied with their jobs (see e.g., Hersch 1991; Allen and Van der Velden 2001; Belfield and Harris 2002; Cabral-Vieira 2005; Fleming and Kler 2008; Lobene and Meade 2013) and hence more likely to exhibit voluntary withdrawal behaviours, including withholding effort at work, lateness, absenteeism, on-the-job search and turnover (Tsang et al. 1991; Sicherman 1991; Sagie et al. 2002; Wolbers 2003; Wald 2005; Belfield 2010; Frei and Sousa-Poza 2012; Mavromaras et al. 2013).

On the one hand, overqualified workers may generate human capital spillovers for firms because their excess knowledge can enrich not only their own jobs but also those of colleagues (Battu et al. 2003).[5] On the other hand, if these positive outcomes are outweighed by the consequences of employee withdrawal, such as unfinished work and unmet commitments, selecting overqualified employees can eventually reduce productivity and profitability (Tsang 1987; Sagie et al. 2002; Jones et. al. 2009).

Finally, an aggregate consequence of an overqualified population may include that the full potential of economic productivity (and welfare) may not be reached (Buchel 2002; McGuinness 2006), which might increase equilibrium unemployment (Manacorda and Petrongolo 1998) and hinder a country's long-term growth prospects (Sianesi and van Reenen 2003). In addition, over-education can be considered a waste or misallocation of scarce public resources if revenues are wasted by providing individuals with non-productive education (Groot 1996; Chevalier 2003; McGuinness 2006).

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[5] Indeed, recent studies using linked employer–employee data reveal a positive relationship between the proportion of overqualified workers in the workplace and firm productivity (Jones et al. 2009; Kampelmann and Rycx 2012).

Therefore, once a certain level of educational attainment is reached, overqualification may reduce productivity at both the firm and economy levels, which implies the emergence of a *negative* relationship between education and productivity (Tsang and Levin 1985) and would have important implications. *First*, individuals may have to reconsider their investment in education because they may end up in jobs for which they are overeducated (and lose the expected returns of such an investment), i.e., there may be some *crowding out* (Teulings and Koopmanschap 1989; Dolado et al. 2000; Cockx and Dejemeppe 2002; Gautier et al. 2002). *Second*, firms may have to redesign their human resources management policies and procedures so that the selection of well-suited employees is set a priority in the recruitment processes.[6] *Third*, governments may have to rethink the further expansion of higher education (Dolton and Vignoles 2000) or, at least, consider the need for reform in the higher education system (Chevalier 2003).

Despite the vast implications, the extensive literature that has developed on this issue since the initial research conducted by Berg in 1970, Freeman in 1976 and Rumberger in 1981 has not yet solved some of the puzzles of overqualification. Understanding the individual level effects seems essential for comprehension of its consequences at higher levels, i.e., the firm and country levels. Indeed, important individual outcomes for employees such as job dissatisfaction and associated withdrawal behaviours, such withholding effort at work, lateness, absenteeism and turnover, are reasonably clear in existing research. Whether the effects differ by employment status –namely, whether there are differences across public sector, private sector or self-employment jobs– is insufficiently examined in this body of literature.[7] Additionally, it would be highly informative to account for status in analyses of the effect of overqualification on labour mobility, i.e., which type of

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[6] The recruitment of overqualified workers has been suggested to constitute a deliberate firm strategy in which they exploit cyclical downturns to improve the average skill level of their workforce (Bulmahn and Krakel 2002).

[7] To the best of our knowledge, the only exception is research by Bender and Roche (2013), which distinguishes between self-employed and wage employees when analyzing the effects of educational mismatch on earnings and job satisfaction.

employment is preferred when (and if) workers change their current employment status because of their overqualification. Of course, not all individuals are successful in avoiding overqualification when changing status, i.e., mobility does not always leads to an adequate match (e.g., Dolton and Vignoles 2000; Rubb 2003; Blázquez and Budría 2012). Hence, investigating successful routes out of overqualification, i.e., identifying which transitions are more favourable when (and if) overqualified workers change their employment status to escape overqualification, would also be very informative (perhaps even more so).

Addressing these questions (for which there is an urgent need for research) is the main aim of this work, that is, incorporating distinctions in employment status (i.e., self-employed, private sector and public sector employees) into the analysis of the effects of overqualification (on job satisfaction, on-the-job search, absenteeism and labour mobility), its dynamics and routes out of overqualification. A better understanding of the direction and magnitude of these effects and movements across (and within) employment status might contribute to the appropriateness and effectiveness of policy intervention for human capital optimisation, increasing productivity and improvements in social well-being. In particular, it would help to know whether there is an excess supply of graduates in many countries or whether misallocation exists. In other words, this study might contribute to unravel whether measures based on the reallocation of talented workers by promoting successful pathways out of overqualification are more accurate than are methods based on reduced public investment and promotion of education.

Toward this aim, new empirical evidence based on the microdata of the European Community Household Panel (ECHP) for the period 1994–2001 is presented using discrete choice –ordered and non-ordered– and count models (ordered logit, zero-inflated negative binomial, binary and multinomial logit). Our results confirm some previously published findings. We observe how overqualification decreases job satisfaction and increases on-the-job search, absenteeism and labour mobility. Our analysis of the existing routes out of overqualification (perhaps the main

contribution of this study) suggests that overqualification is a permanent phenomenon. Indeed, the predicted likelihood of still feeling overqualified after one year is approximately 94%. When distinguishing by employment status, our main results can be summarised as follows. *First*, self-employed are the most likely workers to exit overqualification within their same jobs, probably by varying some aspects of their own jobs. *Second*, private sector employees are the most likely workers to exit overqualification by starting a new job within the same employment status, i.e., as private paid employees. *Third*, and finally, public sector employees are, together with self-employed workers, the most likely workers to exit overqualification in a new job outside their employment status.

The remainder of this chapter is structured as follows. Section 2 reviews the literature and background from which our study emerges. Section 3 describes the data and methods used for the empirical analysis. Section 4 presents the main results, and section 5 discusses implications for academics and policy makers, addresses the limitations of this study and suggests avenues for future research.

3.2. Background

Previous research has employed several labour market theories to explain the overqualification phenomenon. These theoretical views of the labour market can be grouped into three categories: (i) theories based on labour supply, i.e., *Human Capital Theory* (Becker 1964) or the *Theory of Career Mobility* (Sicherman and Galor 1990); (ii) theories based on labour demand, i.e., the *Job Competition Model* (Thurow 1975), *Signalling Theory* (Spence 1973) or the *Educational Credential Hypothesis* (Van der Meer and Wielers 1996); and (iii) theories based on the balanced forces of labour supply and demand, i.e., *Assignment Theory* (Sattinger 1993). Empirical studies that attempt to test which theoretical perspective explains the impact of overqualification on wages or the permanent or transitory character of the phenomenon include Duncan and Hoffman (1981), Rumberger (1987),

Hartog and Oosterbeek (1988), Sloane et al. (1999), Battu et al. (2000), Dolton and Vignoles (2000), Linsley (2005), Frei and Sousa-Poza (2012) and Kiersztyn (2013). The rest of the section reviews the body of literature concerning the impact of overqualification on job satisfaction, on-the-job search, absenteeism and labour mobility and routes out of overqualification.

3.2.1. Impact of overqualification

This subsection focuses on the impacts of overqualification on workers feelings and behaviours. First, overqualification is expected to lower job satisfaction. The reasoning is straightforward: individuals with higher education levels expect to perform more challenging and interesting work duties and to receive more responsibilities and promotion prospects. If differences between actual and required qualifications emerge, expectations are unrealised and job dissatisfaction is more likely. The works of Burris (1983), Tsang (1987), Hersch (1991), Tsang et al. (1991), Battu et al. (1999, 2000), Johnson and Johnson (2000), Allen and Van der Velden (2001), Belfield and Harris (2002), Moshavi and Terborg (2002), Cabral-Vieira (2005), Bender and Heywood (2006), Fleming and Kler (2008), Verhaest and Omey (2009), Lobene and Meade (2013) and Mavromaras et al. (2013) support this hypothesis.

An important question is whether a poor match between actual and required qualifications produces real behavioural consequences for workers. Overqualified workers may lose interest in successfully completing their tasks and meeting their commitments and are expected to exhibit voluntary withdrawal behaviours, including withholding effort, lateness, absenteeism and on-the-job search and turnover, which may lead to positions that match their knowledge and skills more closely. Empirical evidence analysing the (direct) relationship between overqualification and tangibles measures of labour effort, such as absenteeism, is

scarce (Belfield 2010 is an exception).[8] However, more studies have focused on other effects of overqualification, such as on-the-job search behavior and turnover. Most previous studies observe that overqualified workers, compared to adequately qualified workers, more frequently look for another job (see e.g., Allen and Van der Velden 2001; Groot and Maassen van den Brink 2003; Wolbers 2003; Wald 2005; Di Pietro and Urwin 2006; Quintano et al. 2008; Rubb 2013) and have higher turnover rates (e.g., Tsang et al. 1991; Sicherman 1991; Alba-Ramírez 1993; Robst 1995; Sloane et al. 1999; Dekker et al. 2002; Pollmann-Schult and Büchel 2004; Rubb 2006; Verhaest and Omey 2006; McGuiness and Wooden 2009; Frei and Sousa-Poza 2012; Mavromaras et al. 2013). Some evidence suggests that overqualified workers are more likely to shift to occupations with higher human capital requirements, status or wages than adequately educated workers with similar educational backgrounds are (see e.g., Sicherman 1991; Robst 1995; Dekker et al. 2002; Pollmann-Schult and Büchel 2004; Rubb 2006, 2013).

To the best of our knowledge, an in-depth examination of the effects of overqualification (i.e., job satisfaction, on-the-job search, absenteeism and labour mobility) by employment status (i.e., self-employed workers, private and public employees) does not yet exist, which is one of the main contributions of this work. These results are discussed in subsection 4.2.1.

3.2.2. Overqualification persistence

Many workers seem to accept jobs with requirements below their educational attainment that turn out not to match their skills. Although most theories consider overqualification as a transitory phenomenon (e.g., *Career Mobility Theory*; Sicherman and Galor 1990), some frameworks predicts some more persistence in this situation (e.g., *Job Competition Model*; Thurow 1975). Empirical evidence aiming to test the validity of these theories typically use multivariate regressions

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[8] Testing the existence of indirect relationships, such as the mediating effects of job dissatisfaction, has been a more common type of analysis of this relationship.

explaining either (i) the probability of remaining overqualified, conditional on being overqualified at the starting point (e.g., Dolton and Vignoles 2000; Rubb 2003; Blázquez and Budría 2012; Frei and Sousa-Poza 2012; Carroll and Tani 2013); or (ii) the probability of being overqualified, with a dummy capturing whether the individual is overqualified at the starting point included among the independent variables (e.g., Mavromaras and McGuinness 2012; Kiersztyn 2013). In addition to, some works presents their results on persistence over the basis of simple univariate longitudinal analysis (although they also present some other results about overqualification based on multivariate analysis; e.g., Battu et al. 1999; Groot and Maassen van den Brink 2003; Frenette 2004; Verhaest and Van der Velden 2013).[9] Despite geographical, temporal and methodological differences, overqualification is revealed as a long-lasting problem in most (but not all) studies. For example, Rubb (2003) observes that 74% of U.S. workers are overqualified in a given year remain overqualified the next year, whereas estimates by Blázquez and Budría (2012) increase this figure to 86% of workers in Germany. Frei and Sousa-Poza (2012), however, observe that the portion remaining overqualified for at least another year is only 48% in Switzerland and that, close to 90% of the affected workers escape overqualification within 4 years of becoming overqualified.

To the best of our knowledge, an exhaustive analysis of the existing routes out of overqualification by employment status does not yet exist, which is likely to be the most important contribution of this study. These results are discussed in subsection 4.2.2.

3.3. Methods

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[9] Other methodological approaches to answer the question of whether overqualification is a persistent or a temporary phenomenon are used in Fernández and Ortega (2008) and Baert et al. (2013).

3.3.1. Data

We used data from the European Community Household Panel (ECHP) for the period 1994-2001.[10] The ECHP is a standardised multi-purpose annual longitudinal survey conducted at the level of the EU-15.[11] This survey was designed and coordinated by the Statistical Office of the European Communities (EUROSTAT). The target population of the ECHP consists of individuals living in private households in the national territory of each country. This survey offers information on 60,500 nationally representative households, which includes approximately 130,000 individuals aged 16 years and older. One attractive feature of the survey is a high level of comparability across countries and over time. All members of the selected households in the participating countries are interviewed about issues relating to demographics, labour market characteristics, income, and living conditions using the same questionnaire. Additional details about the ECHP data can be found in Peracchi (2002).

3.3.2. Sample

Our sample includes men and women aged 18 to 65 who are (i) self-employed workers, (ii) private sector employees or (iii) public sector employees for some particular period within our observation window. All part-time workers, that is, working less than 15 hours per week, are excluded from this analysis. The final dataset, after removing cases with missing data for any of the relevant variables, yields 299,444 observations (81,421 individuals) of which 54,632 (18.24%) refer to self-employed workers, 164,331 (54.88%) refer to private employees and 80,481 (26.88%) refer to public employees.

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[10] The ECHP data are used with the permission of Eurostat (contract ECHP/2006/09, held with the Universidad de Huelva).
[11] Sweden is excluded from our analysis because this country presents missing values in relevant variables.

3.3.3. Estimation methods

Three set of exercises are part of this study. *First*, we use basic descriptive statistics to document how overqualification or overskilling (henceforth, simply overqualification[12]) affects self-employment and jobs in the public and private sectors. We also test whether the general pattern identified persists when distinguishing by gender, age, educational attainment, business sector and country. *Second*, we examine the effects of overqualification on job satisfaction, on-the-job search, absenteeism and labour mobility, and examine whether these effects also apply when each employment status is individually analysed. Toward this aim, discrete choice –ordered and non-ordered– and count models are used (ordered logit, zero-inflated negative binomial, binary and multinomial logit). *Third*, we analyse which exits are more successful routes out of overqualification by employment status, that is, which transitions are more likely to shift an overqualified individual away from overqualification. To this end, non-ordered discrete choice models (multinomial logit) are used. Given the panel data structure of our sample, standard errors are adjusted for intra-individual correlation in all specifications to control for possible unobserved heterogeneity across individuals.

3.3.4. Measures

Dependent variables

Several dependent variables are considered in the empirical models to inspect the overqualification phenomenon:

1. JOB SATISFACTION WITH TYPE OF WORK. Individuals are asked the following question (PE033): *how satisfied are you with your present job in terms of type*

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[12] The ECHP uses an integrative approach to capture whether individuals feel overqualified/overskilled by answering the following question (PE016): *Do you feel that you have skills or qualifications to do a more demanding job than the one you have now?*

of work? This variable ranges from 1 to 6 and provides a scale of job satisfaction in terms of type of work.[13]

2. ON-THE-JOB SEARCH. Individuals are asked *whether they are looking for a job* (PS001). This variable indicates in a dichotomous fashion whether individuals are looking for a job.

3. ABSENTEEISM. The information with respect to absenteeism is derived from the following question (PE038): *Please think of the last 4 working weeks, not counting holiday weeks. How many days were you absent from work because of illness or other reasons?* This variable ranges from 0 to 28 and counts the number of days the individual has been absent from work during that period.[14]

4. LABOUR MOBILITY. Individuals are asked about (i) their main activity status (PE001): paid employment, entrepreneurship, unpaid work in a family enterprise, education or training, unemployment or inactivity); and (ii) whether their current job is in private or public sector (PE009). This information allows us to distinguish among three different employment categories of interest in this study: self-employed workers, private and public employees. From these categories, we construct three discrete, non-ordered variables to capture labour mobility within our sample:

   a. TRANSITIONS FROM SELF-EMPLOYMENT. This variable distinguishes among self-employed individuals who (i) continue operating the same business; (ii) start a new business; (iii) become private employees; or (iv) become public employees.

   b. TRANSITIONS FROM PRIVATE EMPLOYMENT. Analogously, this variable distinguishes among private employees who (i) remain in the same job in the private sector; (ii) become self-employed; (iii) obtain a new job in the private sector; or (iv) become workers in the public sector.

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[13] Individuals are also asked about other aspects of job satisfaction, such as earnings, job security, number of working hours, working times, (day time, night time, shifts, etc.), working conditions/environment and distance to job/commuting. However, type of work seems to be the most appropriate aspect of job satisfaction for our analysis.

[14] The underlying question is particularly suitable for an analysis of work effort because it is not restricted to illness-related absences.

    c. TRANSITIONS FROM PUBLIC EMPLOYMENT. Finally, this variable distinguishes among public employees who (i) remain in the same job in the public sector; (ii) become self-employed; (iii) become workers in the private sector; or (iv) obtain a new job in the public sector.

5. EXITS FROM OVERQUALIFICATION. The ECHP asks individuals whether they feel overqualified (or overskilled) through the following question (PE016): *Do you feel that you have skills or qualifications to do a more demanding job than the one you have now?* This self-reported (subjective) information and the variables capturing labour mobility just described allows the construction of a discrete, non-ordered variable that captures not only whether individuals exit overqualification but also the route followed to exit overqualification: (i) a new job outside her employment status; (ii) a new job within her employment status; or (iii) the same job.

Main covariates

As noted in subsection 3.3, this study examines the effects of overqualification on dependent variables 1 to 4 described in subsection 3.4.1. In these exercises, the measure of overqualification used as the main predictor is provided below:

1. FEEL OVERQUALIFIED. From the response to whether the individual feels overqualified (PE016), we construct a dichotomous variable.

As noted in subsection 3.3, we analyse the transitions that are more likely to move an overqualified individual into a position for which she is adequately qualified. To this end, dependent variable 5, which is described in subsection 3.4.1, is used. The main predictors in this exercise are three employment status dummies, which we construct from the information collected about (i) individuals' main activity (PE001) and (ii) whether their current job is in the private or public sector (PE009):

2. SELF-EMPLOYED.

3. PRIVATE EMPLOYEE.
4. PUBLIC EMPLOYEE.

Control variables

The analyses include a large number of individual-specific independent variables that have been used in prior research about the determinants of job satisfaction (Blanchflower and Oswald 1998; Hundley 2001; Benz and Frey 2004, 2008; Millán et al. 2013), on-the-job search (Allen and Van der Velden 2001; Wald 2005; Di Pietro and Urwin 2006; Rubb 2013), absenteeism (Frick and Malo 2008; Ziebarth and Karlsson 2010; Livanos and Zangelides 2013; Block et al. 2014) and labour mobility (Evans and Leighton 1989; Carrasco 1999; Blanchflower 2000; Georgellis et al. 2007; Román et al. 2011; Congregado et al. 2014). They include demographic indicators (gender, age, health status), family characteristics and structure (cohabitation status and number of young children), educational attainment (educational level and a control that captures whether the individual is currently enrolled in an education programme), employment characteristics (earnings, hours of work, job tenure and business sector dummies) and country and year dummies. Finally, dependent variables 1 and 2 (i.e., job satisfaction and on-the-job search) are also used as predictors in some robustness checks. Detailed definitions of our variables are presented in the Appendix.

3.4. Results

3.4.1. Descriptive analysis

Table 1 presents descriptive information about overqualification in the EU-15 according to the ECHP data. In particular, we observe that overqualification affects more than 52% of the working population in our sample.

Individuals who are self-employed are approximately 12 percent less likely to feel overqualified than their private and public sector employees counterparts. Given the autonomy and independence associated with being your own boss, the self-employed are expected to have more freedom to determine the type of work they do and, hence, do not feel overqualified. Workers in the public sector are approximately 1% more likely to feel overqualified than those working in the private sector. This is also somewhat expected because those working in the public sector are more likely to possess higher levels of education, which in turn leads to a greater likelihood of overqualification compared with other employment categories.

A higher prevalence of overqualification among women might be expected given the persist barriers to women's career advancement (more frequently secondary earners with more participation in family activities; Frank 1978: *theory of differential overqualification*). However, family roles and norms and the labour force itself has changed dramatically during the last decades and some gender-based stereotypes are no longer valid. Indeed, consistent with results obtained by Stephen (2014), our data indicate that females are 1% less likely to feel overqualified. This difference is stronger for self-employed (approximately 3.5%) and public employees (approximately 6%) and disappears for workers in the private sector.

Overqualification appears initially stable for the ages 18-25 to 26-35 and is then strongly inversely related to age. In particular, we observe that approximately 58% of the individuals aged 18-35 are affected by feelings of overqualification, whereas this figure is reduced to approximately 53%, 47% and 36% for the age ranges 36-45, 46-55 and 56-65, respectively. A similar pattern between overqualification and age is observed for workers in both the private and public sector, whereas the relationship is entirely inversely related with age for self-employed individuals. These figures are consistent with *Career Mobility Theory* (Sicherman and Galor 1990), which suggests that new entrants into the labour market may initially accept

jobs for which they are apparently overqualified whilst they gain experience and occupation-specific human capital through training to improve their future labour market prospects. Hence, this theory implies that job mismatches are more likely to occur as individuals begin their careers.

Table 1. Prevalence of overqualification – Descriptive statistics

	All workers (N=299,444)	Self-employed (N=54,632)	Private employees (N=164,331)	Public employees (N=80,481)
All observations	52.14%	41.93%	54.10%	55.09%
Gender				
Females	51.38%	39.34%	53.86%	52.03%
Males	52.55%	42.76%	54.21%	57.72%
Age bands				
Age 18-25	57.92%	51.57%	58.20%	59.18%
Age 26-35	58.46%	49.81%	59.70%	60.39%
Age 36-45	52.84%	45.30%	52.99%	56.96%
Age 46-55	46.72%	39.37%	47.28%	50.81%
Age 56-65	35.69%	28.48%	37.47%	43.78%
Education				
Basic education	40.43%	32.26%	42.81%	44.48%
Secondary education	58.27%	52.34%	60.28%	57.17%
Tertiary education	63.18%	57.90%	68.03%	59.90%
Business sector				
Agricultural sector [a]	37.09%	34.72%	41.51%	53.72%
Industrial sector [b]	52.75%	44.82%	53.43%	55.23%
Construction sector [c]	45.29%	42.37%	46.13%	47.40%
Services sector [d]	54.67%	45.35%	57.22%	55.18%
Countries				
Austria	59.42%	54.99%	60.73%	59.08%
Belgium	63.21%	51.75%	66.05%	62.31%
Denmark	60.89%	46.10%	62.34%	61.52%
Finland	62.57%	53.44%	67.76%	60.74%
France	50.83%	29.04%	53.81%	47.95%
Germany	64.89%	51.06%	66.60%	64.88%
Greece	52.31%	43.70%	58.93%	55.90%
Ireland	51.36%	38.41%	55.36%	53.70%
Italy	47.23%	37.98%	50.50%	49.81%
Luxembourg	43.83%	27.27%	44.05%	48.99%
Netherlands	38.37%	30.36%	37.59%	41.73%
Portugal	44.29%	36.30%	44.16%	53.32%
Spain	53.45%	42.44%	55.06%	59.88%
United Kingdom	68.42%	57.59%	68.79%	73.32%

Notes: Data source: ECHP 1994-2001; [a] NACE-93 codes A and B; [b] NACE-93 codes C, D and E;
[c] NACE-93 code F; [d] NACE-93 codes G to Q.

We observe that the higher the level of education, the higher the likelihood of feeling overqualified. Thus, individuals with tertiary education are approximately 23% more likely to be overqualified than those with basic education. This difference remains stable when distinguishing by employment status. If there is an excess supply of graduates, the higher the level of education, the higher the likelihood of being forced to accept a non-graduate level job (Freeman 1976).

A higher likelihood of overqualification can be observed in the services sector (54.7%), followed by the industrial, construction and agricultural sectors (52.7%, 45.2% and 37.1%, respectively). This result is closely related to education. Those business sectors whose participants obtain higher levels of formal education are more likely to be affected by overqualification. Similar results are observed when analysing self-employed individuals and workers in the private sector. For the public sector, distinctions by business sector must be analysed with caution because approximately 93% of workers of this status are employed in the services sector.

Finally, country-specific figures in the prevalence of overqualification vary from 38.4% in the Netherlands to 68.4% in the UK. Country-level idiosyncratic factors might explain these differences. Further, as observed for the full sample, we consistently observe lower rates of overqualification for self-employed individuals compared with their public and private employees counterparts across countries.

3.4.2. Multivariate analysis

3.4.2.1. Effects of overqualification

This subsection presents the main results of the empirical analysis of the effects of overqualification on job satisfaction, on-the-job search, absenteeism and labour mobility.

Job satisfaction

Table 2 presents the effects of overqualification on individual self-reported job satisfaction with their type of work (dependent variable 1). In four-columns format, this table presents ordered logit specifications for all workers (self-employed, private and public employees) in the first column, and self-employed, private employees and public employees separately in the second, third and fourth columns, respectively.

At the top of each column, the predicted probabilities of job satisfaction for the sample means are indicated for each level of job satisfaction (1 = not satisfied,..., 6 = fully satisfied). Below, the effects of the explanatory variables on the probability that individuals are fully satisfied with their job (job satisfaction equals 6) are presented in terms of marginal effects (not coefficients). These marginal effects are expressed in relative terms (with respect to the predicted probabilities for the sample means). Additionally, t-statistics associated with marginal effects are reported in each column. Finally, the number of individuals and observations involved in the estimations are reported at the bottom of each column.

Consistent with most previous studies, our results demonstrate that overqualification leads to lower job satisfaction. In particular, the predicted probability of being fully satisfied with the type of work decreases by approximately 18% for overqualified workers. When distinguishing by employment status, remarkable differences emerge. For private employees, the predicted probability of being satisfied with the type of work decreases by approximately 22%, decreases by 17% for public employees and approximately 6% for self-employed workers.[15]

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[15] Although not presented for brevity, we also estimated the effect of feeling overqualified for each level of job satisfaction, from 1 to 6. We observed that our main predictor increases the chances that job satisfaction equals values from 1 to 4 (i.e., increases the chances that job satisfaction reaches a low value) whereas decreases the likelihood that job

Table 2. Job satisfaction with type of work (Dependent variable 1) – Ordered logit estimations

	All workers		Self-employed		Private employees		Public employees	
Predicted probability (JS=1)	0.0154		0.0134		0.0179		0.0112	
Predicted probability (JS=2)	0.0377		0.0425		0.0409		0.0260	
Predicted probability (JS=3)	0.1076		0.1252		0.1145		0.0816	
Predicted probability (JS=4)	0.2837		0.2969		0.2974		0.2506	
Predicted probability (JS=5)	0.3803		0.3441		0.3775		0.4096	
Predicted probability (JS=6) (*y*) [a]	0.1753		0.1779		0.1518		0.2210	
Independent variables (*x*)	$\frac{dy/dx}{y}\%$ [b]	t-stat.	$\frac{dy/dx}{y}\%$ [b]	t-stat.	$\frac{dy/dx}{y}\%$ [b]	t-stat.	$\frac{dy/dx}{y}\%$ [b]	t-stat.
Main variable								
Feel overqualified [c]	-17.746	-23.45 ***	-5.782	-3.33 ***	-22.102	-21.3 ***	-17.044	-12.16 ***
Demographics								
Female [c]	-2.132	-2.13 **	0.273	0.11	-1.369	-1.01	0.576	0.32
Age (*18-65*)	-1.202	-4.10 ***	-1.763	-2.51 **	-1.569	-3.99 ***	-4.826	-7.66 ***
Age squared	0.024	6.66 ***	0.028	3.59 ***	0.028	5.73 ***	0.068	9.02 ***
Cohabiting [c]	5.283	4.91 ***	-1.396	-0.50	7.001	5.00 ***	4.875	2.42 **
Number of children under 14	-0.600	-1.18	-1.338	-1.13	-0.628	-0.92	0.098	0.11
Health status	-29.195	-50.3 ***	-24.541	-19.34 ***	-30.053	-37.82 ***	-30.879	-28.5 ***
Education								
Basic education [c] (*ref.*)								
Secondary education [c]	20.352	18.58 ***	26.432	9.79 ***	15.894	11.13 ***	12.007	5.67 ***
Tertiary education [c]	33.370	22.84 ***	48.484	10.99 ***	26.682	13.23 ***	22.093	9.52 ***
Currently attending education [c]	10.708	10.87 ***	23.436	7.16 ***	13.543	9.80 ***	11.292	7.23 ***
Job related aspects								
Self-employed [c]	19.337	9.25 ***						
Private employee [c]	-8.973	-6.18 ***						
Public employee [c] (*ref.*)								
Log (annual earnings)	2.399	14.87 ***	1.992	8.32 ***	3.648	14.72 ***	4.062	8.79 ***
Weekly working hours	-0.398	-1.72 *	1.916	5.27 ***	0.905	2.07 **	-3.732	-7.13 ***
Weekly working hours squared	0.010	4.68 ***	-0.011	-3.37 ***	0.000	0.10	0.043	7.10 ***
Job tenure	1.026	3.96 ***	-1.069	-1.73 *	1.548	4.44 ***	-0.500	-0.97
Job tenure squared	-0.022	-1.93 *	0.040	1.51	-0.033	-2.03 **	0.049	2.20 **
Business sector dummies (18 categories; *ref.* Construction)	Yes		Yes		Yes		Yes	
Country dummies (14 categories; *ref.* Spain)	Yes		Yes		Yes		Yes	
Year dummies (8 categories; *ref.* 1994)	Yes		Yes		Yes		Yes	
No. of observations (No. of individuals)	299,444 (81,421)		54,632 (16,012)		164,331 (50,694)		80,481 (23,465)	
Log pseudolikelihood	-430,787.7		-78,763.7		-238,131.2		-111,295.1	

Notes: [a] For brevity and focus, only the effects of the explanatory variables on the probability that individuals are fully satisfied with their job (job satisfaction equals 6) are presented.
[b] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[c] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

satisfaction equals 5 or 6 (i.e., decreases the chances that job satisfaction reaches its highest values).

The effects of other covariates are also analysed. Our findings indicate that the relationship between age and the probability of being satisfied is non-linear for all workers and exhibits a U-shaped pattern. Reporting poor health is negatively associated with job satisfaction. Those with secondary schooling or university education are more likely to be satisfied with the type of work compared with those with only primary education or no schooling at all. Similarly, being enrolled in any education or training programme increases job satisfaction. Turning our attention to job related aspects, we observe that the self-employed are more satisfied with their type of work than other workers are. In this line, being a worker in the public sector increases job satisfaction compared with being a private employee. Finally, higher incomes increase the likelihood of being satisfied with the type of work.

On-the-job search

Using binary logit specifications, Table 3 displays the results for on-the-job search as the dependent variable (dependent variable 2). Four separate estimations are presented for all workers, self-employed, private employees and public employees. At the top of each regression, predicted on-the-job search probabilities for the sample means are indicated. Within each specification, relative marginal effects (with respect to predicted probabilities for sample means) and corresponding t-statistics are indicated. The number of individuals and observations involved in each specification is reported at the bottom of each column.

Consistent with previous studies, our results demonstrate that overqualification produces real consequences for on-the-job searches. [16] In particular, workers who feel overqualified are approximately 72% more likely to look for alternative jobs

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[16] We might consider that job satisfaction mediates the relationship between overqualification and on-the-job search behaviours. Using the KHB-method (Karlson et al. 2012; Breen et al. 2013), we tested for a possible mediating effect and observed that, although significant, this indirect effect is small. The inclusion of job satisfaction with type of work (dependent variable 1) as an additional predictor of on-the-job search activities does not significantly alter the observed effects of overqualification. These results are not reported but are available by request.

compared with those who do not feel overqualified. When separately exploring these effects on employment status, only small differences emerge. Thus, the on-the-job search behaviour of self-employed increases approximately 81% for overqualified workers whereas the increase is approximately 73% and 69% for public and private employees, respectively.

Table 3: On-the-job search (Dependent variable 2) – Binary logit estimations

	All workers		Self-employed		Private employees		Public employees	
Predicted probability (y)	0.0523		0.0266		0.0709		0.0382	
Independent variables (x)	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.
Main variable								
Feel overqualified [b]	72.081	40.32 ***	81.005	13.46 ***	68.529	33.64 ***	73.158	18.84 ***
Demographics								
Female [b]	-20.028	-10.84 ***	-54.344	-10.16 ***	-12.547	-5.65 ***	-31.188	-7.60 ***
Age (*18-65*)	9.117	13.98 ***	13.861	6.70 ***	8.732	11.08 ***	11.941	7.77 ***
Age squared	-0.143	-16.94 ***	-0.197	-7.98 ***	-0.142	-13.55 ***	-0.176	-8.96 ***
Cohabiting [b]	-16.328	-7.20 ***	-20.275	-2.55 **	-12.075	-4.70 ***	-25.913	-4.98 ***
Number of children under 14	0.205	0.20	0.342	0.11	1.178	0.96	-2.122	-0.97
Health status	21.485	18.93 ***	26.113	7.88 ***	21.314	15.70 ***	19.306	7.74 ***
Education								
Basic education [b] (*ref.*)								
Secondary education [b]	-3.806	-1.84 *	-12.651	-2.14 **	1.120	0.46	-0.555	-0.10
Tertiary education [b]	12.297	4.68 ***	-16.820	-2.35 **	16.559	5.03 ***	17.565	3.00 ***
Currently attending education [b]	23.738	11.18 ***	42.701	4.57 ***	21.531	8.41 ***	21.930	5.41 ***
Job related aspects								
Self-employed [b]	-17.972	-4.90 ***						
Private employee [b]	29.669	10.37 ***						
Public employee [b] (*ref.*)								
Log (annual earnings)	-3.700	-12.74 ***	-4.280	-6.59 ***	-3.296	-9.03 ***	-6.257	-7.74 ***
Weekly working hours	-5.516	-12.52 ***	-11.967	-13.58 ***	-7.145	-11.58 ***	-3.863	-3.54 ***
Weekly working hours squared	0.044	10.64 ***	0.087	11.46 ***	0.066	11.10 ***	0.039	3.37 ***
Job tenure	-10.637	-17.61 ***	-7.102	-4.05 ***	-10.448	-14.31 ***	-11.654	-8.66 ***
Job tenure squared	0.201	6.67 ***	0.086	1.04	0.206	5.45 ***	0.229	3.59 ***
Business sector dummies (18 categories; *ref.* Construction)	Yes		Yes		Yes		Yes	
Country dummies (14 categories; *ref.* Spain)	Yes		Yes		Yes		Yes	
Year dummies (8 categories; *ref.* 1994)	Yes		Yes		Yes		Yes	
No. of observations (No. of individuals)	299,444 (81,421)		54,632 (16,012)		164,331 (50,694)		80,481 (23,465)	
Log pseudolikelihood	-73,055.1		-8,697.8		-47,495.8		-16,295.9	

Notes: [a] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[b] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

When we focus on the effects of other predictors, we observe that females, cohabiting individuals and those reporting good health are less likely to search for alternative jobs. We also observe that age is positively associated with on-the-job search behaviours in its linear term and that there is a significant negative association in its squared term.

We observe that higher education levels have a positive and statistically significant effect for public and private workers whereas the effect is negative for self-employed individuals. However, being enrolled in any education or training programme consistently increases on-the-job search activities for all workers. We observe that the self-employed are the least likely to seek alternative jobs whereas private sector employees are the most likely to search. Finally, we observe that both earnings and job tenure reduce on-the-job search probabilities for all workers.

Absenteeism

To explain absence (dependent variable 3), Table 4 includes the results from four zero inflated negative binomial regressions for all workers, self-employed, private employees and public employees.[17] At the top of each regression, predicted durations of absence for the sample means are displayed. A combination of two models, as usual, is presented for each regression: a count model (duration equation) and a model predicting zeros (inflate equation). Within each equation, coefficients and corresponding t-statistics are displayed. Note that a positive coefficient in the duration equation captures a positive effect on duration of absence whereas a positive coefficient in the inflate equation indicates a higher probability that the individual is not absent at all (a negative effect on incidence). At the bottom of each regression, the numbers of individuals and observations included in each specification are reported.

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[17] We computed *Vuong tests* of zero inflated negative binomial vs. standard negative binomial. Because the z-value is highly significant in all regressions, the zero-inflated negative binomial is a better fit than the standard negative binomial.

Overqualification is expected to increase withdrawal behaviours, including absenteeism. The existing research usually analyses this relationship by testing for the existence of mediating effects of job dissatisfaction. However, we consider that the direct effect may be relevant by itself (and might coexist with indirect ones) and estimate our models consistent with this view. Our results for all models indicate that the estimated coefficients of the variable *feel overqualified* are negative and statistically significant in the inflate equations. However, the coefficients are not significant in any duration models.[18] These findings suggest that feeling overqualified increases the incidence of absence but does not affect duration. In particular, for an individual who feels overqualified, the odds of being absent are multiplied by a factor of $exp(-0.1429) = 0.8668$. In other words, the expected incidence of absenteeism during a four-week spell for a worker who does not feel overqualified is 0.8668 times the expected incidence of absenteeism for a worker who feels overqualified holding all other variables in the model constant. As can be observed from separate estimations for self-employed, private employees and public employees, the magnitude of the effects of feeling overqualified does not vary significantly when distinguishing by employment status. Additionally, an interesting (but expected) result is the shorter predicted durations of absence for self-employed workers (0.486 days per each 4 working weeks spell), compared to figures for other workers. In this sense, the figure of absenteeism for public employees is higher than that for private employees (0.850 vs. 0.725 days for each 4-week period).

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[18] We might consider that both job satisfaction (dependent variable 1) and on-the-job search behaviours (dependent variable 2) mediate the relationship between overqualification and absenteeism. Although not reported (but available by request), we tested for the existence of these mediating effects using the KHB-method and observed that they jointly represent approximately 30% of the total effect. Approximately one-third of these effects correspond to the mediating role of job satisfaction whereas the remaining two-thirds are associated with on-the-job search behaviours.

Table 4. Absenteeism (Dependent variable 3) – Zero-inflated negative binomial estimations

Independent variables	All workers Duration equation Coeff.	All workers Duration equation t-stat.	All workers Inflate equation Coeff.	All workers Inflate equation t-stat.	Self-employed Duration equation Coeff.	Self-employed Duration equation t-stat.	Self-employed Inflate equation Coeff.	Self-employed Inflate equation t-stat.	Private employees Duration equation Coeff.	Private employees Duration equation t-stat.	Private employees Inflate equation Coeff.	Private employees Inflate equation t-stat.	Public employees Duration equation Coeff.	Public employees Duration equation t-stat.	Public employees Inflate equation Coeff.	Public employees Inflate equation t-stat.
Predicted duration of absence	0.714				0.486				0.725				0.850			
Main variable																
Feel overqualified [a]	-0.0162	-0.97	-0.1429	-9.23 ***	0.0027	0.06	-0.1430	-3.6 ***	-0.0161	-0.72	-0.1390	-6.68 ***	-0.0145	-0.49	-0.1433	-5.02 ***
Demographics																
Female [a]	0.3152	16.13 ***	-0.2406	-12.94 ***	0.2700	4.66 ***	-0.0948	-1.90 *	0.3319	12.71 ***	-0.2354	-9.31 ***	0.2961	8.47 ***	-0.3263	-9.82 ***
Age (*18-65*)	-0.0489	-8.60 ***	0.0590	10.41 ***	-0.0295	-1.74 *	0.0791	5.32 ***	-0.0505	-6.70 ***	0.0560	7.47 ***	-0.0874	-7.57 ***	0.0505	4.23 ***
Age squared	0.0006	9.48 ***	-0.0004	-6.53 ***	0.0004	2.13 **	-0.0007	-4.18 ***	0.0007	7.49 ***	-0.0004	-4.39 ***	0.0011	7.86 ***	-0.0003	-2.34 **
Cohabiting [a]	0.1811	8.63 ***	-0.0898	-4.26 ***	0.1212	1.88 *	-0.0469	-0.79	0.1736	6.39 ***	-0.1255	-4.55 ***	0.1953	5.04 ***	-0.0291	-0.75
Number of children under 14	0.0631	6.36 ***	-0.0779	-8.20 ***	0.0307	1.19	-0.0347	-1.45	0.0568	4.27 ***	-0.0834	-6.43 ***	0.0878	4.95 ***	-0.0976	-5.68 ***
Health status	0.2920	34.88 ***	-0.6291	-60.39 ***	0.2591	11.33 ***	-0.5128	-19.82 ***	0.2871	25.76 ***	-0.6747	-47.93 ***	0.3163	20.34 ***	-0.6195	-32.87 ***
Education																
Basic education [a] (*ref.*)																
Secondary education [a]	-0.0482	-2.39 **	0.0963	4.97 ***	-0.0251	-0.41	0.0167	0.33	-0.0145	-0.55	0.1471	5.83 ***	-0.1132	-3.07 ***	-0.0147	-0.38
Tertiary education [a]	-0.1297	-4.90 ***	0.0966	4.03 ***	-0.0523	-0.61	-0.0047	-0.07	-0.1587	-4.20 ***	0.1620	4.80 ***	-0.1334	-3.15 ***	-0.0066	-0.16
Currently attending education [a]	-0.2274	-10.56 ***	-0.1994	-10.13 ***	-0.0905	-1.09	-0.2271	-3.46 ***	-0.2506	-8.39 ***	-0.2212	-8.00 ***	-0.2273	-6.65 ***	-0.1397	-4.38 ***
Job related aspects																
Self-employed [a]	-0.1619	-4.15 ***	0.2453	6.69 ***												
Private employee [a]	-0.0302	-1.10	0.1639	6.21 ***												
Public employee [a] (*ref.*)																
Log (annual earnings)	-0.0072	-1.72 *	-0.0127	-3.41 ***	-0.0166	-2.51 **	0.0002	0.03	-0.0015	-0.25	-0.0179	-3.14 ***	0.0072	0.67	-0.0137	-1.33
Weekly working hours	-0.0180	-3.36 ***	-0.0006	-0.13	-0.0104	-1.14	0.0256	3.14 ***	-0.0442	-5.40 ***	-0.0031	-0.38	-0.0068	-0.60	-0.0084	-0.75
Weekly working hours squared	0.0002	3.87 ***	0.0001	2.75 ***	0.0001	1.10	-0.0001	-1.73 *	0.0005	5.99 ***	0.0001	1.22	0.0001	0.94	0.0002	1.81 *
Job tenure	0.0492	8.74 ***	0.0025	0.47	0.0330	2.02 **	0.0218	1.52	0.0473	6.41 ***	-0.0020	-0.29	0.0440	4.04 ***	-0.0149	-1.44
Job tenure squared	-0.0022	-8.70 ***	-0.0001	-0.40	-0.0017	-2.41 **	-0.0013	-2.06 **	-0.0020	-6.00 ***	0.0004	1.12	-0.0019	-3.98 ***	0.0005	1.12
Business sector dummies (18 categories; *ref.* Construction)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Country dummies (14 categories; *ref.* Spain)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year dummies (8 categories; *ref.* 1994)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
No. of observations (No. of individuals)	299,444 (81,421)				54,632 (16,012)				164,331 (50,694)				80,481 (23,465)			
Log pseudolikelihood	-207,906.3				-29,313.5				-114,478.8				-63,564.5			

Notes: [a] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

For the other independent variables, we observe that being a female and having poor health both raise the incidence and duration of absence. Similar results are obtained for cohabiting individuals, those with children under fourteen living in the household and those with higher education. These last results, however, are not observed for self-employed workers. Our results for the three employment status dummies are consistent with patterns suggested by predicted durations of absence, that is, self-employed individuals present both lower incidence and duration of absence compared with public employees (the reference category) whereas private employees are more likely to be absent than their public counterparts but do not present higher duration of absence.

Labour mobility

The existing body of literature suggests that overqualified workers have higher turnover rates than adequately matched workers. To the best of our knowledge, an in-depth examination of the effect of overqualification on labour mobility by employment status does not yet exist, which is precisely the main aim of this subsection.

Using multinomial logit models, Tables 5, 6 and 7 present the results of labour mobility by employment status. The results for transitions from self-employment (dependent variable 4a) are presented in Table 5 whereas results for transitions from private and public employment (dependent variables 4b and 4c, respectively) are presented in Tables 6 and 7, respectively. Each table follows the same estimation strategy using four different final destinations at the next period: (i) same job or business; (ii) self-employment; (iii) private employment; and (iv) public employment. At the top of each final status, the predicted transition probabilities for the sample means are displayed. Further, within each final destination, relative marginal effects (with respect to predicted probabilities for sample means) and corresponding t-statistics are displayed. At the bottom of each

table, the number of observations in each model and the number of transitions for each final status are reported.

Transitions from self-employment

Table 5 presents our principal findings, which can be summarised as follows.[19] Self-employed workers who feel overqualified are approximately 1.2% less likely to remain self-employed in the same business the following year than self-employed workers who do not feel overqualified.

The likelihood of starting a new business the next year for currently self-employed workers does not seem to be affected by overqualification. However, the probability of becoming a private or public employee increases approximately 14% and 40%, respectively, for self-employed workers who feel overqualified.

For other covariates, we observe that self-employed females are more likely to continue operating the same business next year and, in particular, less likely to enter both private and public employment. We observe that the likelihood of operating the same business during the next period for self-employed workers is enhanced for those with secondary education compared with those with basic education. Further, transitions from self-employment to jobs in the private sector are less likely to occur for educated workers whereas the opposite occurs for transitions to public employment. Focusing on job related aspects, we observe that the earnings of the self-employed, which can proxy for the financial state of the

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[19] Although not reported, we also tested for the existence of mediating effects of job satisfaction (dependent variable 1) and on-the-job search behaviour (dependent variable 2) on the relationship between overqualification and labour mobility by using the KHB-method. The effect of overqualification on the likelihood of starting a new business for self-employed workers does not seem to be mediated by job satisfaction or alternative job seeking. However, the effects of overqualification on the likelihood of entering private and public employment for self-employed workers appears to be over 30% mediated by both job satisfaction and on-the-job search behaviour. Approximately one-fifth of this effect is associated with the mediating role of job satisfaction whereas the remaining four-fifths corresponds to on-the-job search activities.

business, significantly increase the likelihood of operating the same business during the next period and decrease the likelihood of becoming a private or public sector employee.

Table 5. Labour mobility: Transitions from self-employment (Dependent variable 4a) – Multinomial logit estimations

Final state	Self-employment (same business)		Self-employment (different business)		Private employment		Public employment	
Predicted probability (y)	0.9175		0.0128		0.0678		0.0019	
Independent variables (x)	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.	$\frac{dy/dx}{y}\%^{a}$	t-stat.
Main variable								
Feel overqualified [b]	-1.218	-3.19 ***	6.637	0.75	14.142	2.9 ***	39.734	2.35 **
Demographics								
Female [b]	2.150	4.79 ***	-18.591	-1.92 *	-25.362	-4.41 ***	-8.132	-0.44
Age (*18-65*)	0.880	5.92 ***	-5.844	-1.67 *	-10.856	-5.81 ***	1.811	0.30
Age squared	-0.009	-5.32 ***	0.046	1.04	0.120	5.38 ***	-0.015	-0.21
Cohabiting [b]	0.116	0.21	-3.728	-0.33	-0.721	-0.10	-5.369	-0.24
Number of children under 14	0.406	1.70 *	1.601	0.30	-5.369	-1.76 *	-15.474	-1.56
Health status	-0.231	-0.84	9.140	1.36	1.351	0.39	1.838	0.16
Education								
Basic education [b] (*ref.*)								
Secondary education [b]	0.995	2.07 **	-7.198	-0.71	-13.056	-2.14 **	34.900	1.46
Tertiary education [b]	0.793	1.27	-11.222	-0.85	-11.695	-1.50	113.136	2.55 **
Currently attending education [b]	-0.841	-1.36	13.400	0.88	7.782	1.00	39.112	1.39
Job related aspects								
Log (annual earnings)	0.211	4.11 ***	-1.262	-1.04	-2.495	-3.86 ***	-4.601	-2.16 **
Weekly working hours	0.359	4.21 ***	-1.101	-0.51	-4.326	-4.00 ***	-11.922	-4.08 ***
Weekly working hours squared	-0.002	-2.47 **	-0.002	-0.10	0.023	2.41 **	0.092	3.46 ***
Job tenure	3.264	22.68 ***	-23.844	-5.83 ***	-38.538	-21.89 ***	-41.313	-7.31 ***
Job tenure squared	-0.189	-24.24 ***	0.706	2.86 ***	2.357	25.42 ***	2.428	8.11 ***
Business sector dummies (18 categories; *ref.* Construction)			*Yes*					
Country dummies (14 categories; *ref.* Spain)			*Yes*					
Year dummies (8 categories; *ref.* 1994)			*Yes*					
No. of observations			23,259					
No. of transitions	20,440		563		2,077		179	
Log pseudolikelihood			-9,445.6					

Notes: [a] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[b] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

The role of weekly work hours is also analysed. Working hours are interpreted as a proxy for the demand that each business faces. Similarly to that obtained for earnings, the number of working hours reduces the probability that the worker

stops operating the same business by the next wave and, in particular, reduces the transitions to jobs in both the private and the public sectors. Finally, as expected, longer job tenures increase the probability that a self-employed worker continues operating the same business and reduces the likelihood of starting a new business or becoming a private or public employee.

Transitions from private employment

Table 6 summarises our main results, which we briefly describe below. Those private employees who feel overqualified are approximately 1.5% less likely to be observed as workers in the same job next year than those private employees who do not feel overqualified. Further, the likelihood of starting a new business next year for workers in the private sector appears unaffected by feelings of overqualification. Finally, the likelihood of beginning a new job in either the private or public sector increases approximately 16% and 9%, respectively, for workers in the private sector who feel overqualified.[20]

Concerning the effects of our control variables, our results indicate that females working as employees in the private sector are more likely to remain employees in the same job the next period and, in particular, are less likely to become self-employed or change jobs in the private sector. For health status, we observe that private employees reporting poorer health are more likely to switch jobs within the private sector but less likely to become self-employed by the next period. Turning

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[20] We also tested (not reported for brevity) the existence of mediating effects of job satisfaction (dependent variable 1) and on-the-job search behaviour (dependent variable 2) on the relationship between overqualification and the transitions from private employment by using the KHB-method. The effect of overqualification on the likelihood of starting a new business for workers in the private sector does not seem to be mediated by job satisfaction. On the contrary, alternative job seeking seems to mediate this relationship, but the total effect of overqualification on new business creation remains insignificant with the inclusion of this variable on the regression. The effects of overqualification on the likelihood of starting a new job as worker in either the private or public sector for private employees are approximately 70% mediated by both job satisfaction and on-the-job search behaviour. Approximately one-fourth of this effect is associated with the mediating role of job satisfaction whereas the remaining three-fourths corresponds to job seeking activities.

to education, we observe positive effects of formal education for private employees on both the likelihood of becoming self-employed and switching to public employment. The opposite occurs, however, for transitions to a different job within the private sector. The more formal education the private employee has, the less likely she is to change her job in the private sector.

Table 6. Labour mobility: Transitions from private employment (Dependent variable 4b)
– Multinomial logit estimations

	Private employment (same job)		Self-employment		Private employment (different job)		Public employment	
Predicted probability (y)	0.8926		0.0129		0.0806		0.0139	
Independent variables (x)	$\frac{dy/dx}{y}\%^a$	t-stat.	$\frac{dy/dx}{y}\%^a$	t-stat.	$\frac{dy/dx}{y}\%^a$	t-stat.	$\frac{dy/dx}{y}\%^a$	t-stat.
Main variable								
Feel overqualified [b]	-1.470	-6.68 ***	-6.348	-1.35	15.771	7.24 ***	8.857	1.97 **
Demographics								
Female [b]	2.321	9.27 ***	-60.513	-10.24 ***	-16.633	-6.82 ***	3.860	0.71
Age (*18-65*)	0.358	4.14 ***	2.011	1.15	-4.385	-5.04 ***	0.539	0.31
Age squared	-0.003	-2.18 **	-0.009	-0.43	0.030	2.54 **	-0.002	-0.11
Cohabiting [b]	0.440	1.61	17.099	2.75 ***	-6.187	-2.31 **	-8.331	-1.44
Number of children under 14	-0.023	-0.17	-4.368	-1.51	1.316	0.98	-2.058	-0.73
Health status	-0.628	-3.80 ***	-8.317	-2.36 **	7.976	4.84 ***	1.838	0.55
Education								
Basic education [b] (*ref.*)								
Secondary education [b]	0.810	3.05 ***	10.395	1.64	-13.550	-5.35 ***	16.925	2.71 ***
Tertiary education [b]	0.222	0.64	49.556	4.86 ***	-18.417	-6.06 ***	46.504	5.01 ***
Currently attending education [b]	-0.181	-0.63	-19.070	-2.98 ***	5.170	1.82 *	-0.562	-0.10
Job related aspects								
Log (annual earnings)	0.130	2.76 ***	-3.525	-3.35 ***	-0.953	-2.15 **	0.468	0.42
Weekly working hours	0.056	0.66	1.457	0.88	-0.412	-0.48	-2.587	-1.26
Weekly working hours squared	-0.001	-1.00	0.012	0.79	0.008	1.01	-0.005	-0.21
Job tenure	3.732	37.24 ***	-26.238	-13.56 ***	-30.135	-29.65 ***	-40.586	-20.51 ***
Job tenure squared	-0.164	-25.73 ***	1.933	16.65 ***	1.057	16.17 ***	2.638	23.70 ***
Business sector dummies (18 categories; *ref.* Construction)			*Yes*					
Country dummies (14 categories; *ref.* Spain)			*Yes*					
Year dummies (8 categories; *ref.* 1994)			*Yes*					
No. of observations			89,784					
No. of transitions	75,323		2,320		9,488		2,653	
Log pseudolikelihood			-44,915.3					

Notes: [a] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[b] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

Earnings as a private employee seem to increase the likelihood of remaining employed in the same job at the next wave and, in particular, to reduce entries into self-employment and the likelihood of switching jobs in the private sector. Similarly, we observe that longer job tenures reduce the transitions from private employment to the three alternative final categories considered in this analysis.

Transitions from public employment

Table 7 reports our main findings, which are similar to those observed for private employees. First, public employees who feel overqualified are approximately 1% less likely to be observed as workers in the same job the next period than public employees who do not feel overqualified. Furthermore, the likelihood of starting a new business the next year for workers in the public sector does not seem to be affected by overqualification. Finally, the likelihood of starting a new job in the private or public sector increases by approximately 10% and 18%, respectively, for public employees who feel overqualified.[21]

We now focus on the effect of other predictors. First, we observe that females employed in the public sector are as likely to remain in the same job next period as their males counterparts. Similarly, females do not exhibit significant differences with respect to males in terms of the likelihood to switch from public to private employment. On the contrary, compared with males working as public employees,

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[21] Using the KHB-method, we also tested (not reported for brevity) for mediating effects of job satisfaction (dependent variable 1) and on-the-job search behaviour (dependent variable 2) on the relationship between overqualification and transitions from public employment. Both job satisfaction and job seeking activities seem to mediate the effect of overqualification on the likelihood of starting a new business for workers in the public sector. However, the total effect of overqualification on new business creation is not significant when both variables are included in the regression. With respect to the likelihood of starting a new job in either the private or public sector for public employees, the effect of overqualification appears to be mediated approximately 65% by both job satisfaction and on-the-job search behaviours. Approximately one-fourth of this effect is associated with the mediating role of job satisfaction whereas the remaining three-fourths corresponds to on-the-job search behaviours.

females are more likely to change job within the public sector but clearly less likely to start a business.

Table 7. Labour mobility: Transitions from public employment (Dependent variable 4c) – Multinomial logit estimations

Independent variables (x)	Public employment (same job)		Self-employment		Private employment		Public employment (different job)	
Predicted probability (y)	0.9374		0.0014		0.0392		0.0220	
	$\frac{dy/dx}{y}$% [a]	t-stat.	$\frac{dy/dx}{y}$% [a]	t-stat.	$\frac{dy/dx}{y}$% [a]	t-stat.	$\frac{dy/dx}{y}$% [a]	t-stat.
Main variable								
Feel overqualified [b]	-0.825	-3.54 ***	0.907	0.05	9.792	2.23 **	17.657	3.00 ***
Demographics								
Female [b]	0.112	0.41	-105.995	-4.07 ***	-5.550	-1.05	11.966	1.81 *
Age (*18-65*)	0.371	3.60 ***	-5.001	-0.68	-9.320	-4.98 ***	1.106	0.40
Age squared	-0.004	-3.05 ***	0.095	1.07	0.112	4.84 ***	-0.036	-0.99
Cohabiting [b]	0.022	0.07	5.262	0.22	-2.020	-0.34	2.335	0.33
Number of children under 14	0.227	1.58	0.329	0.03	-5.217	-1.87 *	-0.390	-0.11
Health status	-0.017	-0.09	-4.171	-0.33	2.169	0.65	-2.886	-0.60
Education								
Basic education [b] (*ref.*)								
Secondary education [b]	0.860	2.59 ***	14.139	0.52	-26.199	-4.67 ***	9.119	0.94
Tertiary education [b]	0.879	2.41 **	76.197	2.37 **	-41.782	-6.50 ***	32.131	3.21 ***
Currently attending education [b]	0.602	2.24 **	5.121	0.23	-18.167	-3.63 ***	6.406	0.94
Job related aspects								
Log (annual earnings)	0.188	3.14 ***	-11.199	-2.87 ***	-2.291	-1.96 **	-3.218	-2.56 **
Weekly working hours	-0.134	-1.61	-3.201	-0.60	4.966	2.97 ***	-2.938	-1.74 *
Weekly working hours squared	0.001	0.72	0.039	0.83	-0.032	-1.91 *	0.028	1.55
Job tenure	3.091	28.68 ***	-45.098	-6.03 ***	-50.122	-24.83 ***	-39.538	13.97 ***
Job tenure squared	-0.150	-25.96 ***	2.378	6.22 ***	2.734	26.36 ***	1.372	8.63 ***
Business sector dummies (18 categories; *ref.* Construction)				Yes				
Country dummies (14 categories; *ref.* Spain)				Yes				
Year dummies (8 categories; *ref.* 1994)				Yes				
No. of observations				34,918				
No. of transitions	30,514		146		2,970		1,288	
Log pseudolikelihood				-12,912.4				

Notes: [a] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[b] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

Focusing on formal education, we observe that possessing tertiary education increases the chances of remaining a worker in the public sector in the next period in either the same job or another one. However, we also observe as formal

education reduces the chances to enter private employment from the public sector. Finally, we observe that both earnings as public employee and longer job tenures enhance the likelihood of remaining a public employee in the same job next period whatever final status.

3.4.2.2. Exits from overqualification

Using a multinomial logit model, Table 8 analyses the determinants of possible exits from overqualification (dependent variable 5). Conditional on feeling overqualified at the starting period, four different final categories for next period are considered: (i) feeling overqualified; (ii) feeling adequately qualified in a new job outside the current employment status; (iii) feeling adequately qualified in a new job within the current employment status; and (iv) feeling adequately qualified in the same job (by definition, in the same employment status). For each final status, the predicted probability of exiting for the sample means is indicated. Further, within each final status, relative marginal effects (with respect to predicted exit chances for sample means) and its corresponding t-statistics are displayed. At the bottom, the number of observations in the model and the number of transitions involved in each final status are reported.

Overqualification is a permanent phenomenon in light of the available empirical evidence. To the best of our knowledge, however, an exhaustive analysis of the existing routes out of overqualification by employment status does not yet exist. Addressing this issue is precisely the main aim of this subsection.

Consistent with the results obtained by most previous studies, our results support the view that overqualification is permanent phenomenon.[22]

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[22] Consistent with previous exercises, we included (not reported for brevity) job satisfaction (dependent variable 1) and on-the-job search behaviour (dependent variable 2) as predictors of exit from overqualification. Including these, however, does not significantly alter the observed effects of the employment status dummies.

Table 8. Exits from overqualification (Dependent variable 5) – Multinomial logit estimations

Final state	Feeling overqualified		Feeling adequately qualified					
			≠ job ≠ employment status		≠ job = employment status		= job = employment status	
Predicted probability (y)	0.9366		0.0113		0.0075		0.0446	
Independent variables (x)	$\frac{dy/dx}{y}\%$ [a]	t-stat.	$\frac{dy/dx}{y}\%$ [a]	t-stat.	$\frac{dy/dx}{y}\%$ [a]	t-stat.	$\frac{dy/dx}{y}\%$ [a]	t-stat.
Main variables								
Self-employed [b]	-0.785	-2.36 **	-11.012	-0.92	-50.564	-5.28 ***	27.715	4.65 ***
Private employee [b]	-0.176	-0.72	-27.617	-2.41 **	50.832	5.91 ***	2.197	0.57
Public employee [b] (*ref.*)								
Demographics								
Female [b]	-0.047	-0.30	-8.944	-1.49	-8.106	-1.57	4.610	1.74 *
Age (*18-65*)	-0.155	-2.88 ***	3.877	1.92 *	-3.241	-1.77 *	2.809	3.05 ***
Age squared	0.002	2.87 ***	-0.054	-2.12 **	0.026	1.04	-0.032	-2.71 ***
Cohabiting [b]	0.068	0.39	-2.319	-0.34	-13.016	-2.21 **	1.333	0.46
Number of children under 14	-0.283	-3.49 ***	-0.817	-0.26	8.213	2.77 ***	4.769	3.51 ***
Health status	-0.030	-0.30	5.606	1.45	8.406	2.28 **	-2.199	-1.31
Education								
Basic education [b] (*ref.*)								
Secondary education [b]	2.258	14.14 ***	-32.376	-5.15 ***	-35.367	-6.56 ***	-33.242	-12.37 ***
Tertiary education [b]	3.186	18.86 ***	-32.399	-4.78 ***	-43.077	-7.58 ***	-51.407	-18.34 ***
Currently attending education [b]	0.470	2.86 ***	-11.806	-1.87 *	3.884	0.68	-7.517	-2.67 ***
Job related aspects								
Log (annual earnings)	0.165	5.73 ***	-4.400	-4.44 ***	0.094	0.10	-2.360	-4.73 ***
Weekly working hours	-0.026	-0.63	-1.896	-1.16	-0.782	-0.52	1.150	1.69 *
Weekly working hours squared	0.000	0.31	0.014	0.86	0.013	0.94	-0.008	-1.27
Job tenure	-0.534	-11.46 ***	-14.535	-7.81 ***	-16.614	-7.80 ***	17.662	23.26 ***
Job tenure squared	0.056	24.80 ***	0.554	6.55 ***	-0.224	-2.08 **	-1.285	-34.05 ***
Business sector dummies (18 categories; *ref.* Construction)			Yes					
Country dummies (14 categories; *ref.* Spain)			Yes					
Year dummies (8 categories; *ref.* 1994)			Yes					
No. of observations			107,000					
No. of transitions	92,580		1,643		2,070		10,707	
Log pseudolikelihood			-4.4169.8					

Notes: [a] For continuous variables, *[(dy/dx)/y]%* captures marginal effects, but expressed in relative terms with respect to predicted probabilities for sample means. In the context of dummy variables, it reflects the impact for a discrete change of the dummy variable from 0 to 1.
[b] Dummy variable.
* $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$.

Indeed, the predicted probability of remaining overqualified after one year is approximately 94%. On the contrary, the predicted probability of exiting overqualification in a job outside the current employment status by the next period is approximately 1.1%. The predicted odds of exiting overqualification in a new

job within the same employment status next wave are slightly less, approximately 0.75%. Finally, the predicted probability of solving a qualification-job mismatch within the same job after one year is approximately 4.5%.

When distinguishing by employment status, interesting differences emerge, which can be summarised as follows. First, we observe that the self-employed are approximately 0.8% less likely to continue feeling overqualified the next period compared with other workers. Public and private employees exhibit no significant differences in this respect. Second, workers in the private sector exhibit approximately 28% lower chances of exiting overqualification in a new job outside the current employment status, during the next period compared with both self-employed workers and public employees. In other words, compared to private employees who feel overqualified, self-employed workers and public employees who feel overqualified are more likely to solve their qualification-job mismatches outside their current employment status. Third, private employees are approximately 51% more likely to solve their qualification-job mismatches by beginning a new job within the same employment status the next year than are their public counterparts. Furthermore, compared with self-employed workers, public employees are approximately 51% more likely to exit overqualification by this path. Indeed, this path seems too risky for self-employed workers because changing job but not employment status entails starting a new business. Fourth, and finally, self-employed workers are approximately 27% more likely to stop feeling overqualified within their same jobs by the next wave compared with other workers. This is somewhat expected because self-employed workers have more freedom to determine the type of work they do and, hence, are more likely solve their qualification-job mismatches by varying aspects of their work. Summarising our results, (i) self-employed workers are the most likely workers to exit overqualification within the same job; (ii) private employees are the most likely to exit overqualification in a new job within the same employment status; and (iii) public employees (and self-employed workers) are the most likely workers to exit overqualification in a new job outside their employment status. Given that self-

employed workers are more likely to identify a route out of overqualification within the same job and private employees are more likely to exit overqualification within private employment, public employees appear to be more poorly equipped than other workers are to solve their qualification-job mismatches, and their best route out of overqualification is shifting to another employment status.

For the control variables, we observe that possessing more formal education decreases the likelihood of not feeling overqualified next year regardless of the employment transition. This result is consistent with the results of our univariate analysis in subsection 4.1: the higher the level of education, the higher the likelihood of feeling overqualified. Earnings seem to increase the likelihood of still feeling overqualified in the next period, and, in particular, reduce the chances of exiting overqualification by the next wave in either the same job or a new job outside the current employment status. Thus, it seems that individuals are less worried about overqualification and, hence, less willing to change jobs (or particular aspects of the job) if earnings are high. Finally, workers with longer job tenures (compared with their counterparts with shorter tenures) appear to be less prone to feeling overqualified the next year. They are less likely to resolve feelings of overqualification by changing jobs. On the contrary, they are more likely to solve their qualification-job mismatches within their jobs, i.e., by varying aspects of their jobs.

3.4.2.3. Summary of main results

The main results presented in Tables 1 to 8 can be summarised as follows. Our univariate analysis (Table 1) indicates that overqualification is an extended phenomenon that is more likely to occur in public sector jobs, followed by jobs in the private sector. This phenomenon is less likely to be present within self-employment.

Our multivariate analysis confirms some of the results reported in previous research, which increases confidence to our analysis. Thus, we observe that overqualification decreases job satisfaction (Table 2) and increases on-the-job search (Table 3), absenteeism (Table 4) and labour mobility (Tables 5, 6 and 7) for all workers regardless of employment status.

As one of its contributions, this study presents separate analyses for each employment status so that some differences in the magnitude of the observed effects can emerge. Interestingly, the job satisfaction of self-employed workers seems to be the least reduced by overqualification whereas their on-the-job search behaviour appears to be the most enhanced. Precisely the opposite occurs for private employees. We do not observe different effects of overqualification on absenteeism when distinguishing by employment status. Examining job turnover decisions, neither self-employed workers start new businesses nor paid employees become self-employed as the result of feeling overqualified. On the contrary, public and private employment sectors are more likely to be selected in situations of excess of qualification.

Finally, in perhaps the main contribution of this work, we analyse the existing routes out of overqualification by employment status. Our results suggest that the self-employed are the most likely workers to exit overqualification within the same job, which most likely occurs by varying aspects of their jobs. We also observe that private employees are the most likely workers to exit overqualification by starting a new job within the same employment status, i.e., as private employees. Finally, public employees and self-employed workers are the most likely to exit overqualification by obtaining a new job outside their employment status.

3.4.2.4. Robustness checks

We perform several robustness checks. First, although we only present final specifications in Tables 2 to 8, a stepwise regression approach (in which models

incorporate covariates one-by-one, which serves as a robustness check for the obtained results in previous models) was followed. Second, as noted in subsection 3.3, the standard errors are adjusted for intra-individual correlation in all specifications to control for the possible existence of unobserved heterogeneity across individuals. These approaches indicate no major changes relative to simple pooled regressions (not presented for brevity). Furthermore, the robustness of our t-statistics has been verified by re-estimating them from variance-covariance matrixes of the coefficients obtained by bootstrapping. Finally, dependent variables 1 and 2 (i.e., job satisfaction and on-the-job search) are also used as predictors in some robustness checks as noted in several footnotes in subsection 4.2.

3.5. Conclusions

Because several European governments agreed to a target of 40% of young people completing higher education by 2020 (as part of the *Europe 2020 strategy*), the appropriateness of such policies is likely to enter current policy debates. Nevertheless, more education is not necessarily better in light of the existing figures on overqualification and its associated negative outcomes for the individual, the firm and the economy. An improved understanding of some of these effects and, above all, precisely identifying the existing routes out of qualification-job mismatches seems crucial to improving the effectiveness of policy intervention in this area. Precisely toward this aim, this study incorporates distinction in employment status (i.e., self-employed workers, private and public employees) into the analysis of the effects of overqualification (on job satisfaction, on-the-job search, absenteeism and labour mobility), its dynamics and pathways out.

Our results support the view of overqualification as a phenomenon of permanent nature (approximately 94% of respondents remained overqualified after one year). This result challenges theoretical frameworks that consider qualification mismatches mostly temporary (e.g., *Career Mobility Theory*) and is consistent with

inefficient public (and individual) investments in human capital. From a policy perspective, and paraphrasing Baert et al. 2013, *the short-term benefits of policies that generate quick transitions into employment must be traded-off against the long-term costs of an inadequate job match*. Thus, increasing the share of graduates in the economy may not automatically produce the expected returns of a high-skilled workforce in terms of economic growth or competitiveness. Policy reports and academic publications emphasise the need to put skills to effective use and suggest responses on both the demand and supply sides of the labour market (see, for instance, OECD 2012 and Ghignoni and Verashchagina 2013). On the *demand* side, governments may be well advised to establish programmes stimulating companies to move into higher value-added products and services so that the skill level that they require and the extent to which they use these skills increase. On the *supply* side, on the one hand, educational institutions must be involved in fostering the skills that shape the economies of the future. On the other hand, flexibility of current and future graduates in terms of their willingness to change region, sector, employment status, occupation and/or job would significantly enhance the matching process (Battu et al. 1999). Consistent with this view, we observe interesting pathways out of overqualification, which require certain degree of flexibility. Private employees are the most likely to exit overqualification by starting a new job (as private employees) whereas both public employees and self-employed workers are the most likely to exit overqualification in a new job outside their employment status. Reducing the costs and other barriers associated with mobility helps employees locate suitable jobs and helps employers identify suitable workers (Di Pietro 2002).

Our results also confirm the need to account for employment status in analyses of overqualification. Because we observe different results for these groups in terms of the intensity of some effects (such as job satisfaction), turnover decisions and successful routes out of qualification-job mismatches, using a single public policy instrument to combat overqualification seems risky. By ignoring existing heterogeneity, current prescriptions might be beneficial, neutral, or even harmful

depending on employment status. Self-employed individuals are not only the least likely workers to be affected by overqualification but also the most likely workers to exit overqualification within the same job. The performance of self-employed individuals is positively affected by the share of highly educated individuals in the (local) population, i.e., by the presence of educated workers or consumers (Millán et al. 2014); therefore, measures based on the promotion of self-employment for (over)skilled employees are a step in the right direction to tackle overqualification (perhaps even more than others based on a reduction of public investment or promotion of education). Furthermore, these results reinforce previous research questioning the appropriateness of incentives that stimulate self-employment among the unemployed and stresses the need for highly selective policy incentives if, as part of the entrepreneurship policy, these incentives are considered instruments to combat economic and jobs crises (Santarelli and Vivarelli 2007; Thurik et al. 2008; Congregado et al. 2010; Román et al. 2013).

Finally, we cannot rule out the possibility that our results are affected by the adequacy of our measure of overqualification. More research is needed to determine whether alternative proxies reinforce the robustness of our results. We are also aware that a one-year perspective may not be sufficient to draw conclusions on the persistence of overqualification. A natural extension of this study would explore the length of overqualification spells, its determinants and pathways out possibly within a duration model framework. Despite some limitations, this study not only presents a comprehensive study of overqualification in the EU-15 but also stresses the importance of considering education and labour market policies (such as entrepreneurship incentives and employment protection legislation) in tandem with each other.

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Appendix

Table A1: Variable description table

Variable	Description
	Dependent variables
Job satisfaction with type of work	Variable ranging from 1 (not satisfied) to 6 (fully satisfied) provide a scale of job satisfaction with present job in terms of type of work.
On-the-job search	Dummy equals 1 for individuals searching for a job.
Absenteeism	Number of days, ranging from 0 to 28, the individual was absent from work because of illness or other reasons during the last 4 working weeks, not counting holiday weeks.
Transitions from self-employment	Variable equals 1 for individuals who are self-employed in period *t-1* and start a new self-employment spell (i.e., start a new business) in period *t*. The variable equals 2 for individuals who are self-employed in period *t-1* and become private employees in period *t*. The variable equals 3 for individuals who are self-employed in period *t-1* and become public employees in period *t*. Finally, the variable equals 0 for individuals who are self-employed in period *t-1* and continue operating the same business in period *t*.
Transitions from private employment	Variable equals 1 for individuals who are private employees in period *t-1* and become self-employed in period *t*. The variable equals 2 for individuals who are private employees in period *t-1* and obtain a new waged job in the private sector in period *t*. The variable equals 3 for individuals who are private employees in period *t-1* and obtain a new job in the public sector in period *t*. Finally, the variable equals 0 for individuals who are private employees in period *t-1* and remain in the same job as private employees in period *t*.
Transitions from public employment	Variable equals 1 for individuals who are public employees in period *t-1* and become self-employed in period *t*. The variable equals 2 for individuals who are public employees in period *t-1* and obtain a new waged job in the private sector in period *t*. The variable equals 3 for individuals who are public employees in period *t-1* and obtain a new job in the public sector in period *t*. Finally, the variable equals 0 for individuals who are public employees in period *t-1* and remain in the same job as public employees in period *t*.
Exits from overqualification	Variable equals 1, 2 and 3 for individuals who feel overqualified (or over-skilled) in period *t-1* and do not feel overqualified (or over-skilled) in period *t*. It equals 1 for individuals who find a new job outside her employment status (i.e., self-employment, private employment and public employment) in period *t*. It equals 2 for individuals who find a new job within her employment status in period *t*. It equals 3 for individuals who remain the same job (and hence the same employment status) in period *t*. Finally, the variable equals 0 for individuals who feel overqualified (or over-skilled) in both periods *t-1* and *t*.
	Independent variables
Main covariates	
Feel overqualified	Dummy equals 1 for individuals who feel overqualified or overskilled.
Self-employed	Dummy equals 1 for self-employed workers.
Private employee	Dummy equals 1 for employees in the private sector.
Public employee	Dummy equals 1 for employees in the public sector.
Demographic characteristics	
Female	Dummy equals 1 for females.
Age	Age of the individual, ranging from 18 to 65.
Cohabiting	Dummy equals 1 for cohabiting individuals.
Number of children under 14	Number of children aged less than 14 living in the household.
Health status	Variable ranging from 1 to 5; the scale refers to the level of health and equals 1 for individuals whose health is very good and 5 for individuals whose health is very

bad.

Education

Basic 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 recognised third level education (ISCED 5-7).

Currently attending education | Dummy equals 1 for individuals currently enrolled in any education or training programme.

Job related aspects

Log (annual earnings) | Net work incomes, either from paid employment or self-employment, earned during period *t-1*, converted to average euros of 1996, being corrected by purchasing power parity (across countries) and harmonised consumer price index (across time). Variable expressed in natural logarithms.

Weekly working hours | Hours of work per week, ranging from 15 to 96.

Job tenure | Number of years in present job.

Business sector dummies | 18 dummies equalling 1 for individuals whose codes of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE-93), are the following:
A+B Agriculture, hunting and forestry, fishing.
C+E Mining and quarrying + Electricity, gas and water supply.
DA Manufacture of food products, beverages and tobacco.
DB+DC Manufacture of textiles, clothing and leather products.
DD+DE Manufacture off wood and paper products; publishing and printing.
DF-DI Manufacture of coke, refined petroleum/chemicals/rubber/plastic and other non-metallic mineral products.
DJ+DK Manufacture of metal products, machinery and equipment.
DL-DN Other manufacturing.
F Construction
G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal/household goods.
H Hotels and restaurants.
I Transport, storage and communication.
J Financial intermediation.
K Real estate, renting and business activities.
L Public administration and defence; compulsory social security.
M Education.
N Health and social work.
O-Q Other community, social and personal service activities; private households with employed persons; extra-territorial organisations and bodies.

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.

Year dummies | 8 dummies equalling 1 for observations referring to each year covered by the sample: 1994, 1995, 1996, 1997, 1998, 1999, 2000, and 2001.

Part III: Self-employment and business cycles

Chapter 4: Self-employment and business cycles: searching for asymmetries in a panel of 23 OECD countries

The aim of this work is to identify whether the bidirectional relationship between entrepreneurship cycles and output gaps is asymmetric depending on the phase of the business cycle. To this end, we employ a panel threshold regression model in which different relations can prevail in each regime, defined by the values of the threshold variable. Perhaps the lack of conclusive evidence is a result of the fact that the predominant approach has been to assume the presence of symmetric responses. The findings of this article shed new light on this debate, qualifying previous empirical results. In particular, our estimates provide support for the existence of different responses – both in terms of sign and magnitude – of cyclical self-employment to output growth and of output growth to cyclical self-employment, depending on the value of the deviation between the observed and natural rates of self-employment within a one-period lag, which is the threshold variable. The result is highly important for policy makers and practitioners given that whether they ignore the asymmetric impact that an entrepreneurship promotion policy action might have on the real economy, the action might lead to unexpected effects.

4.1. Introduction

It is a well-known fact that interest in business cycles is itself cyclical (Mullineux and Dickinson 1992). This is why in periods of recession, such as the present one, we observe a renewed interest in the theory and empirics of business cycles, especially because some variables are not following the expected patterns during

the crisis. In this way, interest in re-examining the relationships between different macroeconomic variables – including entrepreneurship[1] – and business cycles has become a hot policy issue at the time of writing because the ineffectiveness of the traditional stabilisation policies and the lack of confidence in the old active labour market policies have led to the search for alternative solutions to combat both stagnation and unemployment.

In short, the re-examination of the relationship between business cycles and entrepreneurship has become a hot topic among scholars: i) because it is a way to test whether the (two-way) relationship between these two variables is acting like it has in the past and ii) because the loss of confidence in traditional stabilisation policy instruments and active labour market policies is leading to the exploration of alternative mechanisms and new solutions. From this last argument, it follows that any factor that is able to anticipate positive changes in output growth and employment is of critical importance in this regard.[2] Entrepreneurship is a promising candidate in this respect, particularly if researchers can provide not only theoretical propositions but also robust evidence for how positive shocks in entrepreneurship lead to an expansionary phase of the business cycle in which case policies to promote self-employment might become a key pillar of any anti-crisis strategy.

Theoretical modelsposit that entrepreneurship could be either pro-cyclical (Shleifer 1986; Bernanke and Gertler 1989; Rampini 2004; Caballero and Hammour 1994;

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[1] The terms self-employed, entrepreneurship and business owners (ownership) will be used interchangeably throughout the following pages, being mindful of the conceptual differences between them.

[2] Self-employment is considered to be a way to combat unemployment not only directly,because each self-employed person creates his own job, but also indirectly, because some of them create additional jobs (employers) – see, among others, the works of Dennis (1996), Pfeiffer and Reize (2000), Haltiwanger (2006), Shane (2009) and Congregado, et al. (2010). Moreover, entrepreneurship has also been linked to faster rates of economic growth (Audretsch and Keilbach 2004; van Stelet al. 2005) and lower levels of unemployment, which has been termed the 'Schumpeter effect' (Thuriket al. 2008).

Francois and Lloyd-Ellis 2003; Ghatak*et al*. 2007) or acyclical (the models of
Caballero and Hammour and Shleifer also allow for this possibility).[3] In addition,
arguments for counter-cyclicality are also possible: economic downturns can push
people into self-employment, not only because the lack of paid-employment
opportunities reduces the opportunity cost of this occupation[4] but also because of
the higher availability of second-hand capital equipment during recessions (Binks
and Jennings 1986). Thus, downturns might also induce increases in the rate of
necessity entrepreneurs – e.g., the emergence of worker cooperatives and other
marginal enterprises in recessions are two examples of this phenomenon (Ben-Ner
1988; Pérotin 2006) – although it might reduce the rate of opportunity
entrepreneurs (Thompson 2011).

All things considered, propositions derived from theoretical models tend to agree
with the basic prediction of pro-cyclicality but tend to diverge with regard to
whether the relationship is lagged (Bernanke and Gertler 1989; and possibly
Rampini 2004; and Ghatak, Morelli and Sjöstrom 2007), led (Francois and Lloyd-
Ellis 2003) or contemporaneous (Shleifer 1986; Caballero and Hammour 1994), as
well as on the definition of entrepreneurship. Accordingly, only Ghatak, Morelli
and Sjöstrom's (2007) model is properly defined in terms of occupational choice
decisions in the labour market. In this context, we must recognise the need to
discriminate among theories and propositions and shed new light on this
relationship. The availability of robust (and conclusive) empirical work on this
relationship would provide the ideal tool to solve any controversial matter of this
type.

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[3] See Parker (2012) for a recent and exhaustive survey about theoretical models and the
work of Parker *et al*. (2012, pp. 739-40) in which the nature of the relationship between
entrepreneurship and business cycles derived from alternative theoretical models is also
surveyed.

[4] The literature refers to this phenomenon by using different terms such as the 'recession-
push' effect (Giacomin*et al*. 2007, 2011), 'turning unemployment into self-employment'
(Baumgartner and Caliendo 2008), 'necessity-' driven entrepreneurs (Reynolds *et al*. 2001;
Block and Sandner 2009; Thompson 2011), the'refugee-effect' (Carree and Thurik 2003,
Thurik*et al*. 2008)or even as the entry into self-employment as a 'last resort' (Rissman
2003).

However, the relationship between self-employment and GDP cycles is unfortunately far from being solidly sustained by robust empirical results. On the contrary, researchers have tested the relationship in a variety of ways: from controlling business cycle effects in empirical works with individual data on the determinants of entry (survival) into self-employment (see Millán*et al*. 2012 or Román*et al.* 2013 for two recent studies) to time-series studies at the aggregated level. The latter include a handful of studies that have explored the relationship between output and entrepreneurship, relating the level of activity in the goods and services market to the level of entrepreneurship over the cycle.[5] Taken together, these works offers inconclusive evidence that does not in any way contribute to resolving the current puzzle about this relationship.

In general, most of the previous empirical literature uses linear models to evaluate the interaction between self-employment and output growth; they model the relationship with a linear reaction function that is, by construction, symmetric. However, controlling for asymmetries by using non-linear methodologies is an advisable strategy given that i) some theories and theoretical propositions suggest that different types of effects (in terms of intensity, sign or both) can be expected depending on the phase of the business cycle or on the situation of the self-employment sector[6]; ii) we should account for the possibility to calibrate the effect of an entrepreneurship policy action on the state of the economy[7] or the effect of

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[5]These works – whose originmay be in the work of Acs*et al*. (1994) – are selectively surveyed in the next section.

[6]Theoretical rationales in favour of this argument may be summarised in the prosperity-pull and recession-push hypotheses. Indeed, some scholars suggest that the greater is the entrepreneurial activity, the greater the economic growth (positive or pro-cyclical relationship), while others argue that the previous argument is valid only in expansions because economic downturnstransform unemployment into self-employment –i.e., counter-cyclical behaviour of entrepreneurship in recessions.

[7]Policy makers and practitioners ignoring the asymmetric impact that an entrepreneurship promotion policy action might have on the real economy depending on the phase of the business cycle where the action takes place might lead not only to ineffectiveness but could even have effects contrary to those desired.This makes the question of how asymmetric the responses of real output are to self-employment fluctuations a priority for the research agenda on the economics of entrepreneurship.

counter-recessionary policies on self-employment, depending on the situation of the self-employment sector; and iii) ignoring asymmetry when it is present produces not only bad forecasts but also erroneous inferences in hypothesis testing. For these reasons, the present work instead accounts for non-linearity by adopting a panel threshold regression model (Hansen 1999). In particular, the study analyses the asymmetric behaviour of self-employment rates by estimating a regime-dependent reaction function.

Our findings can be summarised as follows: the two-way relationships between the business and self-employment cycles are asymmetrical. In both cases, the results of the first likelihood ratio test suggest nonlinearity. In particular, for the relationship that goes from self-employment cycles to output growth, the Hansen's procedure suggests a model with two thresholds (three regimes), whereas for the reverse relationship – in which output growth is explained by the cycles of entrepreneurship – only a unique threshold is suggested. In both cases, one-period-lagged cyclical self-employment is the selected threshold variable.

The current study differs from the existing literature in three aspects. First, it accounts for non-linearity in the econometric model. Second, it derives regime-dependent entrepreneurship policy rules that account for the different phases of the self-employment cycle. Finally, it provides a qualitative analysis of the asymmetric impact of an entrepreneurship policy action on the real economy.

The remainder of this chapter is structured as follows. The next section briefly discusses the empirical evidence on entrepreneurship and the business cycle. The second section presents the different specifications and the estimation strategy. The third section describes the data and presents the results. The fourth section discusses the results. The final section concludes with a discussion of policy implications and some potential avenues for future research.

4.2. A selective review of empirical literature

This section provides a selective review of the recent contributions to the empirical literature on the evolution of GDP and self-employment. In general, most previous works focused on either examining the direction of the causality between business ownership and economic performance (usually tested by using Granger causality tests) or testing the two-way relationship between these two variables. Overall, the empirical results of this body of literature provide sometimes, conflicting results.[8] The lack of consensus on the existence of this relationship and its direction is due to the use of different data sets and alternative econometric approaches because the results do not seem to show any robustness to the use of alternative time periods, different lag structures, cyclical components (vs. trends) or proxy variables. In table 1, a selective summary of these empirical works is presented.

A general observation of the findings reported in this table enables us to state that the results have been mixed. On the one hand, in terms of the existence of the relationship, some studies reject it or provide weak evidence for the relationship, whereas others only focus on the causality between the two variables. Some works conclude that causality runs from entrepreneurship to economic growth (Hartog *et al.* 2010 and Koellinger and Thurik 2012), whereas others state that it runs from economic growth to business ownership (Carmona *et al.* 2012 and Aubrey *et al.* 2013); some studies suggest that there is no causality and in some cases even find bidirectional causality between these two variables (Parker *et al.* 2012). On the other hand, the sign of the estimated relationship seems to depend on whether the relationship is estimated in levels (i.e., estimations with trend components capturing a generally positive long-term relationship); when the estimation of the relationship is done by using de-trended components, negative relationships seem to prevail.

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[8] AsDejardin (2011 p.443) states, this relationship is still a matter of controversy in the entrepreneurship research.

Table 1. Summary of empirical studies on the GDP-Self-Employment relationship

Model	Type of data	Country level Vs. Multi- country	Econometric approach	Empirical analyses characteristics			
				Author(s)	Period/ Frequency	GDP-self-employment relationship	Non Linear
Time series	Levels	UK	Cointegration / Johansen (1988,1991)	Parker (1996)	1959 - 1991	Positive relationship	
		UK	Cointegration / Engle & Granger (1987)	Cowling & Mitchell (1997)	1972:2 – 1992:2	Positive relationship	
		EU-12	VAR forecast errors / Den Haan (2000)	Carmona et al. (2010)	1983-2008	Mixed evidence	
		Spain	VAR forecast errors / Den Haan (2000)	Carmona et al. (2012)	1980:1 - 2009:4	Positive relationship	
		22 metropolitan French regions	Granger causality / Engle & Granger (1987)	Aubry et al. (2013)	1993:1 -2011:4	No relationship	
	Cycles	EU-12	VAR & Granger and Instantaneous causality	Carmona et al. (2010)	1983-2008	Mixed	
		Brazil, Mexico, Argentina, Colombia	VAR models &Cointegration	Fies et al. (2009)	1985:1-2004:4	Self-employment is pro-cyclical	
		Spain and USA	State space models / Jaeger & Parkinson (1996) / Pérez & di Sanzo (2009)	Congregado et al. (2012a)	1987:2 – 2008:4	Negative relationship (Spain) No relationship USA	✓
		22 OECD countries	VAR + Granger causality	Koellinger&Thurik (2012)	1972-2008	Mixed results	
		Spain	VAR, Granger and Instantaneous causality	Carmona et al. (2012)	1980:1 - 2009:4	Y→S	
		UK	VAR + Granger causality + Bai-Perron Structural breaks	Parker et al. (2012)	1978:2 - 2010:3	S→Y, Y→S	✓
		Sweden	VAR + Granger causality + Bai-Perron Structural breaks	Box et al. (2014)	1850-2000	Y→S	✓
		22 metropolitan French regions	Granger causality	Aubry et al. (2013)	1993:1 -2011:4	Mixed results	
Panel	Levels	18 European countries	Pooled Data (Weighted Least Square)	Audrestch et al. (2002)	1993 - 1997	Positive relationship	
		23 OECD countries	Pooled Data (Weighted Least Square)	Carree et al. (2002)	1976 - 1996	Negative relationship	
		13 OECD countries	Static Panel Data	Robson (2003)	1965 - 1995	No relationship	
		12 OECD countries	Multivariate Panel Cointegration (FMOLS) / Pedroni (1999, 2000)	Parker and Robson (2004)	1972 - 1996	Positive relationship	
		German counties	OLS regressions	Audretsch&Keilbach (2004)	1998 - 2000	Positive relationship	
		36 Countries	OLS (Pooled data)	Van Stel et al. (2005)	2002	Positive relationship (in highly developed countries)	
		36 Countries	OLS (Pooled data)	Wennekers et al. (2005)	2002	Negative relationship	
		19 OECD countries	Multivariate Panel Cointegration / Maddala& Wu (2009)	Torrini (2005)	1979-2000	No relationship	
		23 OECD countries	Weighted Least Squares (pooled data)	Carree et al. (2007)	1972 - 2004	Negative relationship	
		21 OECD countries	OLS (Pooled data)	Wennekers et al (2007)	1976 - 2004	Negative relationship	
		39 countries	Two simultaneous equations model	Van Stel et al. (2007)	2000 - 2005	Positive relationship	
		36 countries	OLS cross section	Stam& Van Stel (2009)	2002 - 2005	Positive relationship (No relationship in poor countries)	
		21 Countries	Fixed effects	Carree&Thurik (2008)	1972 - 2002	Mixed relationship	
		20 OECD countries	Panel cointegration / Engle & Granger (1987)	Erken et al. (2009)	1971 - 2002	Positive relationship	
		21 OECD countries	Panel VECM / Johansen (1988,1992,1995)	Hartog et al. (2010)	1981 - 2006	S→Y	
		43 Belgian regions	Dynamic Panel Data / Arellano & Bond (1991)	Dejardin (2011)	1982-2006	Positive relationship	
		18 countries	Feasible least square (FGLS) and Two-stage least square (2SLS)	Acs et al. (2012)	1981 - 1998	Positive relationship	
		29 Chinese provinces	GMM	Li et al. (2012)	1983- 2003	Positive relationship	
		22 metropolitan French regions	Panel Granger causality /Dumitrescu&Hurlin (2012) / Panel cointegration / Pedroni (1999, 2004) and Kao (1999)	Aubry et al. (2013)	1993:1 -2011:4	Y→S No long-run relationship	
	Cycles	22 OECD countries	Trivariate VAR Granger causality + Panel GMM	Koellinger&Thurik (2012)	1972-2008	S→Y	
		19 OECD countries	Multivariate VAR Generalized Least Squares	Scholman et al.(2014)	2000:1 – 2007:4 1998 – 2008	Negative relationship in the short run and positive in the long run	
		22 OECD countries	Bivariate correlations	Lamballais et al. (2012)	2001 - 2011	Negative relationship	
		22 metropolitan French regions	Panel Granger causality Dumitrescu&Hurlin (2012)	Aubry et al. (2013)	1993:1 -2011:4	Negative relationship	

In general, it could be argued that when time-series analysis has been applied to a single data set, results seem to be mixed as shown by the works included in the upper part of the table devoted to time-series analyses. We can classify the first empirical attempts to study this relationship in this group: they were time-series analyses using short time series with low frequencies (see Parker 1996 or Cowling and Mitchell 1997). Later, thanks to the valuable work of some researchers and institutions,[9] the re-examination of this relationship became possible.

These efforts resulted in the availability of long time-series and comparable cross-country data, which allowed for the use of new econometric approaches (panel data models).[10] In this first generation of studies with panel data, the use of pooled regression and fixed effect models was prevalent.[11] Recently, dynamic panel data models have also been employed (Koellinger and Thurik 2012 and, Acs*et al*. 2012).

A common element in the studies reviewed until now is that they only analyse the relationship of the trend, not its cyclical components. However, the recent availability of longer and high-frequency time series has allowed for the analysis of the relationship between the fluctuations in output and the cyclical component of business ownership in both country-specific and cross-country studies (see Fiess*et al.*(2009); Carmona *et al*. (2010); Congregado *etal*. (2012a); Koellinger and Thurik (2012); Carmona *et al*. (2012); Parker *et al*. (2012); Scholman*et al*. (2014) and Aubry*et al*. (2013) as examples of the former). In a strict sense, only these works

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[9] We refer here to the OECD, Eurostat, or the pioneering effort inharmonisation carried out by van Stel*et al.* (2010) in the EIM.
[10] However, in some cases, the low frequency of panels and the short longitudinal dimension remained a limiting factor in the application of some econometric approaches.
[11] See Audrestch*et al*. (2002); Carree*et al*. (2002); Robson (2003); Parker and Robson (2004); Audretsch and Keilbach (2004); van Stel*et al*. (2005); Torrini (2005); Carree*et al*. (2007); Wennekers*et al*. (2007); Carree and Thurik (2008); Stam and van Stel (2009) and Dejardin (2011).

may be regarded as studies on the relationship between business creation and business cycles.[12]

Finally, and because of the sensitivity of the relationship analysis result to the sampling period even in country-specific studies, it is important to account for the possible existence of asymmetries in the relationship – i.e., allowing for nonlinearities in the relationship. Let us remember that ignoring asymmetry when it is present might produce erroneous inferences in hypothesis testing. Some studies have studied the possibility of a nonlinear relationship in country-specific analyses – see Parker *et al*. (2012) for the UK, Congregado *et al*. (2012a) for Spain and the US and Box *et al.* (2014) for Sweden. However, to the best of our knowledge, no cross-country studies that account for nonlinearity exist at the present time.

To fill this gap, the next section aims to shed new light on two important issues. First, it investigates whether self-employment rates have asymmetric responses to output gap, depending on the phase of the business cycle or on the dynamics of the labour market. Second, and as a corollary, it analyses whether a shock in the self-employment rate has a different effect on the real economy depending on the phase of the business cycle or the cyclical evolution of the self-employment sector. To this end, we perform a non-linear panel regression model estimation of the relationship between the cyclical components of business ownership and output by using panel data of annual observations from 23 OECD countries covering the period from 1972 to 2009.

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[12] We are conscious of the existence of an extant body of empirical literature on the relationship between unemployment and self-employment cycles at the aggregated level (see, for instance, the seminal work of Thurik *et al.*(2008) or the recent works of Faria *et al*. (2010), Congregado, Golpe and van Stel (2012) or Koellinger and Thurik (2012), among others), but the study of this relationship is out of the scope of this article.

4.3. Model specification

As we mentioned above, in this section, we investigate not only whether cyclical self-employment influences subsequent output growth but also the reverse effect of business cycle fluctuations on cyclical self-employment.

The relationship between cyclical real output and self-employment rates involves estimating the following equation:

$$\Delta s_{it} = \mu_i + \beta \Delta y_{it} \qquad (1a)$$

or its reverse:

$$\Delta y_{it} = \mu_i' + \beta' \Delta s_{it} \qquad (1b)$$

Where Δs_{it} and Δy_{it} are the growth rates of self-employment and output, respectively, in period t for country i.

The previous two-way relationships described by equations 1a and 1b can be rewritten as a 'gap' specification in which output and self-employment are measured in terms of the cyclical components or deviations from long-term trends. In general, this empirical relationship can be represented by the following set of equations:

$$y_{it}^c = y_{it} - y_{it}^n \qquad (2)$$

$$s_{it}^c = s_{it} - s_{it}^n \qquad (3)$$

$$y_{it}^c = \mu_i + \beta s_{it}^c + \varepsilon_{it} \qquad\qquad (4a)$$

or, alternatively, by:

$$s_{it}^c = \mu_i' + \beta' y_{it}^c + \varepsilon_{it} \qquad\qquad (4b)$$

Where y_{it}^c captures the cyclical level of output (output gap), y_{it} is the log of the actual or current output, and y_{it}^n is the trend level of the output; correspondingly, s_{it}^c represents the cyclical self-employment rate (self-employment gap), s_{it} is the observed self-employment rate, and s_{it}^n is the natural self-employment rate. In contrast to equation (1), these two equations (4a and 4b) require information about self-employment and output trends, which are directly unobservable. Because it is the most common practice, we will consider the Hodrick-Prescott filter (Hodrick and Prescott, 1997).

An alternative specification for the baseline models (4a and 4b) is given by:

$$y_{it}^c = \mu_i + \beta_s s_{it-1}^c + \beta_u u_{it}^c + \varepsilon_{it} \qquad\qquad (5a)$$

$$s_{it}^c = \mu_i' + \beta_y' y_{it-1}^c + \beta_u' u_{it}^c + \varepsilon_{it} \qquad\qquad (5b)$$

where the new term u_{it}^c is included to capture the inertia of the series that is not captured by s_{it}^c and y_{it}^c, respectively.[13]

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[13] In Hartog *et al.* (2010), the effect of business ownership on GDP is contemporaneous, whereas the work of Carree and Thurik (2008) includes alternative lag structures. We argue that GDP growth may only have an impact on cyclical self-employment in future quarters/years. Because our analysis is focused on short-run impacts we will use a lag of one year for each variable in each equation for the lag structure. With regard to the reverse

Asymmetry

Although there is a substantial body of evidence supporting the notion that time series exhibit asymmetric behaviour over business cycles, the empirical literature concerning entrepreneurship and business cycles in which nonlinearities are taken into consideration is not too extensive. Certainly, most previous works model the relationship implicitly or explicitly by means of a linear reaction function that assumes, by construction, symmetric behaviour over the different phases of the business cycle.

For this reason, an exhaustive analysis of the relationship between cyclical output and the cyclical self-employment rate might take whether estimates are sensitive to the potential existence of asymmetries into account. There are two possible reasons why we should check for asymmetry. On the one hand, ignoring the existence of asymmetry when it is present leads to a mis-specified model, which produces bad forecasts and erroneous inferences in hypothesis testing. On the other hand, incorrect inferences delay the opportunity to obtain a correct calibration of policies. To avoid these problems, we are going to extend our benchmark equations by allowing for different effects among different regimes defined by the output growth data or the cyclical self-employment data.

For these two reasons, we apply a class of panel threshold models developed by Hansen (1999) to characterise the relationship between cyclical self-employment and output gap in which parameters vary not only across individuals but also with time, allowing for the presence of asymmetries in the self-employment dynamics over the business cycle or in the reverse relationship. The two models are now defined as follows:

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relationship, we will also argue that cyclical self-employment only has an impact on cyclical GDP after a certain amount of time since the start-up. We also assume a lag of one year.

$$y_{it}^c = \mu_i + \beta_{s0} s_{it-1}^c I(d_{it} \le k) + \beta_{s1} s_{it-1}^c I(d_{it} > k) + \beta_u u_{it}^c + \varepsilon_{it} \tag{6a}$$

$$s_{it}^c = \mu_i' + \beta_{y0}' y_{it-1}^c I(d_{it} \le k) + \beta_{y1}' y_{it-1}^c I(d_{it} > k) + \beta_u' u_{it}^c + \varepsilon_{it} \tag{6b}$$

Where μ_i is a fixed effect, d_{it} is the threshold variable, and k is the threshold parameter. I is the Heaviside indicator function, which equals 1 when the threshold condition is satisfied and 0 otherwise. In sum, in this model, the observations are divided into two regimes depending on whether the threshold variable d_{it} is smaller or greater than the threshold parameter k. The two regimes are distinguished by different regression slopes, β_0 and β_1.

However, there is no reason to impose only two regimes. A more general specification with r thresholds will take the form of:

$$\begin{aligned} y_{it}^c = \mu_i &+ \beta_{s0} s_{it-1}^c I(d_{it} \le k_1) + \beta_{s1} s_{it-1}^c I(k_1 < d_{it} \le k_2) + ... + \\ &+ \beta_{sr} s_{it-1}^c I(d_{it} > k_r) + \beta_u u_{it}^c + \varepsilon_{it} \end{aligned} \tag{7a}$$

$$\begin{aligned} s_{it}^c = \mu_i' &+ \beta_{y0}' y_{it-1}^c I(d_{it} \le k_1) + \beta_{y1}' y_{it-1}^c I(k_1 < d_{it} \le k_2) + ... + \\ &+ \beta_{yr}' y_{it-1}^c I(d_{it} > k_r) + \beta_u' u_{it}^c + \varepsilon_{it} \end{aligned} \tag{7b}$$

These two equations will be the benchmark for the estimates reported in the next section.

4.4. Estimation and tests

This section presents the empirical results for the bidirectional relationship between cyclical self-employment and output gaps represented by equations (7) and (7')

based on the two alternative threshold variables mentioned above. More specifically, we compare results from the use of lagged cyclical self-employment as the threshold variable with those based on the lagged cyclical output.

The obtained empirical results are presented in three steps. First, we report the results of the analysis of the stationary properties of the entrepreneurship and output cycles. Second, we look for threshold variables. Third, we report estimates of the relationship between entrepreneurship and output for the different subsamples – regimes.

Data

As already mentioned, our goal is to verify whether the two-way relationship between output gap and cyclical self-employment exhibits nonlinear or asymmetric behaviour. To this end, we use a sample of over four decades of annual time-series data from 23 OECD countries. In particular, we use data from Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland, the United States and the EU-15 for the period from 1972 to 2009.

As we mentioned, and as in most previous studies, entrepreneurship is operationalised in terms of self-employment, reflecting data availability at the time-series level (Parker, 2009).[14] The *business ownership rate* (self-employment rate) is the number of business owners divided by the total labour force. Business owners are defined as the total number of unincorporated and incorporated self-employed individuals outside the agriculture, hunting, forestry and fishing industries – see Van Stel (2005, p. 108). These data are taken from EIM's

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[14] In this respect, we are conscious that entrepreneurship is a multifaceted concept and that any single measure of entrepreneurship is therefore a limited proxy (Iversen*et al*., 2008). Because we were unable to find an alternative measure of entrepreneurship for time-series analyses (Parker, 2009), the limitations imposed by data – that is, short time-series with low frequency –should be kept in mind inevaluating the scope of our results.

COMPENDIA data base (version 2009.1). *GDP* is taken from OECD National Accounts and is measured in millions of US $ at 2000 constant prices.

Stationary properties

As a starting point, we study the stationary properties of the self-employment rate and GDP series. At this point, we use a battery of panel unit root tests.[15] The null hypothesis of non-stationarity cannot be rejected (except in Hadri's test in which it is accepted because the null is stationary).

Table 2: Unit root tests in panel data

Statistic	Self-employment		GDP	
	Without trend	Trend	Without trend	Trend
LLC	-1.008	0.902	-0.192	0.798
Breitung		5.263		7.448
IPS	0.978	3.824	5.311	2.738
Fisher-ADF	38.287	26.372	12.793	21.943
Fisher-PP	35.857	36.537	8.529	14.989
Hadri	13.425***	9.301***	17.670***	14.149***

Notes: LLC and IPS represent the panel unit root tests of Levin *et al*. (2002) and Im *et al*. (2003), respectively. Fisher-ADF and Fisher-PP represent the Maddala and Wu (1993) Fisher-ADF and Fisher-PP panel unit root tests, respectively.*** indicates statistical significance at the 1 percent level. Probabilities for Fisher-type tests are computed by using an asymptotic chi-square distribution. All other tests assume asymptotic normality. A time trend and an intercept are included in all underlying specifications. The modified AIC was used to select the optimal lag length.

Indeed, the findings – considering both cases, without and with a trend – reported in table 1 appear to be consistent: all of the tests suggest that entrepreneurship rates (self-employment) and output in these 23 OECD countries follow a unit root process. As a result, we can reach a non-stationary conclusion on the two variables.

Threshold variables

The next step should be the estimation of panel transition regression models (7) and (7b) in which the determination of the threshold variable plays a crucial role in

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[15] In particular, we report the statistics of the test proposed by Maddala and Wu (1999) (the Fisher-ADF and the Fisher-PP), Breitung (2000), Hadri (2000), Levin, Lin and Chu (2002) (LLC) and Im, Pesaran and Shin (2003) (IPS).

the strategy. We consider two potential candidates: cyclical self-employment and output gap lagged by one period.

On the one hand, in equation 7a (7b), it appears plausible that past cyclical self-employment influences regime switching: a higher cyclical self-employment rate (output growth) implies a different impact on cyclical output (cyclical self-employment) than a lower level if entrepreneurship exhibits decreasing marginal returns (Hartog *et al.* 2010). On the other hand, it is also possible that the transitions are induced by the phase of the business cycle, which is one of the main hypotheses to be tested in this work.

As usual in the estimation of panel threshold regression models, we discriminate between these two candidates according to a statistical criterion. In particular, we choose those variables that i) minimise the sum of squared residuals (Hansen, 1999) and ii) lead to the strongest rejection of the linearity hypothesis as threshold variables.

After selecting the threshold variables, the estimation of the panel threshold regression model defined by equations (7a) and (7b) involves i) checking whether the threshold effect is statistically significant relative to a linear specification and, if this is the case, ii) determining the number of thresholds. In particular, the null hypothesis is tested through a likelihood ratio test.[16] This sequential process stops when the null is not rejected.

In our case, the results of both the linearity tests and the determination of the number of thresholds for models 7a and 7b are reported in tables 3a and 3b, respectively. For the model described in equation 7a, the F_1 linearity test clearly leads to the rejection of the null hypothesis of the linearity of the relationship

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[16] In this test, the sum of the squared residuals of the specification with *r* regimes is tested against the specification with *r+1* regimes.

between cyclical self-employment and the output gap, regardless of the chosen threshold variable. This evidence corroborates the decision of estimating the relationship that runs from self-employment to output gap in a nonlinear form. The F_2 likelihood ratio test is also significant at the 10 and 1 percent levels for the lagged output gap and cyclical self-employment, respectively. This finding means that there are at least three regimes.

Table 3a. Linearity test and tests for threshold effects (Equation 7a)

	Threshold variables	
	y_{it-1}^{c}	s_{it-1}^{c}
Test for single threshold (two regimes)		
RSS	69.523	65.541
F_1	13.560	64.678
p-value	0.043	0.000
(10%. 5%. 1% critical values)	(10.968,12.957,17.203)	(12.056,16.900,49.628)
Test for double threshold (three regimes)		
RSS	68.783	64.158
F_2	8.902	17.850
p-value	0.099	0.003
(10%. 5%. 1% critical values)	(8.822,11.873,17.070)	(9.886,10.995,14.248)
Test for triple threshold (four regimes)		
RSS	68.596	63.697
F_3	2.257	6.001
p-value	0.700	0.280
(10%. 5%. 1% critical values)	(8.463,10.272,11.342)	(8.078,13.292,19.827)

Note: F_1, F_2 and F_3 are the likelihood ratio statistics. p-values are obtained with 300 simulations (Hansen, 1999). RSS: Residuals Sum of Squared.

Table 3b. Linearity test and tests for threshold effects (Equation 7b)

	Threshold variables	
	y_{it-1}^{c}	s_{it-1}^{c}
Test for single threshold (two regimes)		
RSS	0.210	0.209
F_1	6.765	14.825
p-value	0.347	0.001
(10%. 5%. 1% critical values)	(10.705, 13.591, 26.103)	(9.256, 11.719, 13.527)
Test for double threshold (three regimes)		
RSS	0.210	0.207
F_2	2.373	6.292
p-value	0.877	0.223
(10%. 5%. 1% critical values)	(9.349, 12.555, 15.696)	(8.519, 10.008, 14.185)

Note: F_1 and F_2 are the likelihood ratio statistics. p-values are obtained with 300 simulations (Hansen, 1999). RSS: Residuals Sum of Squared.

According to the procedure proposed by Hansen, it would be necessary in this case to estimate and test three thresholds, four thresholds and so on, until the

corresponding F-test is statistically non-significant. Following this strategy, the F_3 likelihood ratio test is not statistically significant. Moreover, the presence of a strong threshold effect is detected when lagged self-employment is selected as a threshold variable. Therefore, the selected model is the one with three regimes, whose optimal threshold variable is cyclical self-employment lagged by one period, which minimises the sum of squared residuals.

Estimated threshold values for this three-regime model and the parameter estimates with the corresponding *t-statistics* are reported in tables 4a and 5a, respectively. These parameters indicate when the switching between any of the three regimes occurs. For instance, if cyclical self-employment is greater than -0.641 and less than 0.516, the country concerned switches to the second regime. For cases in which the deviation between the observed and natural self-employment rates – in absolute values, i.e., extreme regimes – is higher, output gap and cyclical self-employment show a positive relationship.

Table 4a. Threshold estimates. Model (7a)

	Estimate	**95% Confidence interval**
$\hat{\gamma}_1^r$	-0.641	[-0.709, -0.611]
$\hat{\gamma}_2^r$	0.516	[0.300, 0.538]

Table 5a. Regression estimates of model (7a): two-threshold model

Regressor	**Coefficient estimate**
$y_{it}^c I\left(s_{it-1}^c \leq -0.641\right)$	15.957*** (2.166)
$y_{it}^c I\left(0.516 > s_{it-1}^c > -0.641\right)$	-2.266*** (0.585)
$y_{it}^c I\left(s_{it-1}^c > 0.516\right)$	4.171*** (1.512)
u_{it}^c	-0.030*** (0.012)

Note: Standard error in brackets. ***,** and * indicate significance at 1%, 5% and 10%, respectively

However, when the difference between the observed and natural self-employment rates is small in magnitude, the relationship becomes negative. In other words,

smoother recessions are associated with increases in self-employment, whereas smoother expansionary processes lead to substantial decreases in self-employment.

In light of these results, we note that the relationship between cyclical self-employment and cyclical output (15.957) is stronger in the lowest and highest regimes (4.171). Conversely, the link is weaker in the intermediate regime (-2.266).

According to the estimated threshold values, we can deduce the distribution of the countries among the different regimes (table A1 in the annex) and plot these transitions, taking time and countries into consideration (Figure 1). We observe that the majority of observations are in the second regime, which corresponds to a negative relationship. Observations from Portugal, Greece and Ireland are often in the extreme regimes. We may observe once again that thresholds allow for heterogeneity and time instability to be taken into account.

For the model described in equation 7b in which self-employment is the endogenous variable, the F_1 linearity test also leads to the rejection of the null hypothesis of linearity only in the case in which lagged cyclical self-employment is used as a threshold. As in model 7a, the test indicates the convenience of estimating the model in nonlinear form with two regimes. Therefore, the selected model is the one with two regimes in which the optimal threshold variable is the lagged cyclical self-employment.

Threshold values for this model and the estimates of the parameters for the two regimes are reported in tables 4b and 5b, respectively. If lagged cyclical self-employment is greater than –0.430, the country concerned switches to the second regime. If the deviation between the observed and natural self-employment rates is lower than –0.430, a higher output gap leads to a positive impact on cyclical self-employment. Consequently, effective counter-recessionary economic policies could encourage entrepreneurship. However, this effect only exists when cyclical self-employment is at its lowest levels.

Table 4b. Threshold estimates. Model (7b)

	Estimate	95% Confidence interval
$\hat{\gamma}_1^r$	-0.430	[-0.723, -0.392]

Table 5b. Regression estimates of model (7b): single threshold model

Regressor	Coefficient estimate
$s_{it}^c I\left(s_{it-1}^c \leq -0.430\right)$	0.014***
	(0.004)
$s_{it}^c I\left(s_{it-1}^c > -0.430\right)$	-0.004**
	(0.002)
u_{it}^c	-0.015***
	(0.001)

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Note: Standard error in brackets. ***,** and * indicate significance at 1%, 5% and 10%, respectively.

By contrast, when the difference between the observed and natural self-employment rates is small in magnitude, the relationship is negative. In other words, smoother recessions are associated with increases in self-employment (recession-push effect), whereas smoother expansionary processes lead to substantial decreases in self-employment. Based on these results, we note that the relationship between cyclical self-employment and cyclical output (15.957) is stronger in the lowest and higher regimes (4.171). Conversely, the link is weak in the intermediate regime (-2.266). In this case, the majority of observations are concentrated in the second regime, which corresponds to a negative relationship. The distribution of the countries among the different regimes and thresholds for different countries are presented in table A1 and figure 1, respectively.

4.5. Discussion

This chapter tested whether the relation between entrepreneurship cycles (business creation) and business cycles is nonlinear. To this end, we report estimates of a switching regime model for panel data, which allows us to take the asymmetry in the relationship between the self-employment cycle and output gap into account.

Estimating the two-way relationship and accounting for the possibility of nonlinear effects, the results qualify previous empirical studies and suggest that different types of effects prevail in different regimes.

In short, the panel regression estimates from these regimes confirm that the two relationships are time-varying. For the first model, the intensity and sign of the output growth effect on cyclical self-employment in the two extreme regimes indicates the existence of a positive relationship between cyclical self-employment and the output gap, whereas a negative relationship characterises the second regime in which most of the observations are included.

In terms of prior empirical literature, our findings are broadly consistent with previous studies which have related self-employment rates to aggregate economic performance (Fritsch and Mueller, 2004, Thurik *et al*, 2008, Koellinger and Thurik, 2009, Congregado *et al.* 2012, Parker *et al.* 2012). In particular, this chapter has contributed to clarifying, to some extent, the puzzle in the literature on the cyclicality of self-employment. Testing for the presence of asymmetries in the relationships, our results suggest that the interplay between entrepreneurship and business cycles differs depending on the state of the self-employment sector. Importantly, rather than rejecting previous evidence, our results serve to qualify its scope.

4.6. Conclusions

On the basis of our results some tentative recommendations can be advanced for practitioners.In this respect, our results should be considered not only as evidence in favour of the positive effects of entrepreneurship policy in combating stagnation and unemployment but also with regard to the issue of how counter-recessionary economic policy at the macro level helps to encourage self-employment.

Therefore, the favourable effects of entrepreneurship promotion policies on output growth are guaranteed when cyclical self-employment rates are notably lower than the equilibrium rates. This result is highly important in light of the current situation in many countries in which other policies are failing to combat unemployment and to recover sustainable growth paths.

In addition, the evidence provided also suggests that effective policies at the macro level are also good strategies for encouraging high-quality entrepreneurship in order to stimulate employment and innovation, but only when cyclical self-employment is in the two extreme regimes – i.e., when the deviation of the self-employment rate from its natural value reaches extreme values. Briefly, this article provided a complete guide for skilful entrepreneurship and/or economic policy management. A policy maker cannot neglect the specific regime in which the entrepreneurship policy action takes place.

Nevertheless, despite the importance of our findings, we should not forget that self-employment is not an unambiguously valid operationalization of entrepreneurship, given the multifaceted nature of entrepreneurship. This limitation should be borne in mind when interpreting the results. In this respect, the use of a behavioural –i.e. a risk-taking dimension of entrepreneurship– or an occupational definition of entrepreneurship[17] –i.e. usually adopted from an economic theory perspective– not only may lead different results in the relationship between entrepreneurship and some macroeconomic variables, such as unemployment or economic growth, but also may provide different recipes for entrepreneurship policies. In this way, a significant part of previous literature highlights how different types of entrepreneurship affect development. For instance, evidence provided by Acs and Varga (2005) or Acs (2006) suggests that necessity entrepreneurship has not effect

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[17] See, Naudé (2013) for details.

on economic growth while opportunity entrepreneurship has a positive effect[18] while Cowling (2004), Congregado *et al.* (2012a) or Parker *et al.* (2012) among others provide evidence on opposite cyclical effects for those entrepreneurs who hire external labor –employers– and for those entrepreneurs who work on their own –own-account workers–.In this article, the operationalization has been dictated by data availability considerations being aware that we only can aspire to capture a partial and incomplete representation of the entrepreneurship concept. With this caveat in mind, the empirical interpretability of our results is likely restricted to the specialized domain of entrepreneurship operationalized in terms of self-employment. Nevertheless, the availability of long time series of alternative indicators capturing the different elements that entrepreneurship involves is a major challenge for further research. A recent essay for filling this gap, is the so-called Global Entrepreneurship and Development Index (Acs *et al.* 2014), which offers a measure of the quality of the business formation not only based on the occupational perspective but also on the behavioural one –i.e. by focusing on entrepreneurial attitudes, entrepreneurial abilities and entrepreneurial aspirations–. The availability of long time series data of synthetic indexes like this will open new avenues for a better understanding of the relationship between entrepreneurship and economic development. In sum, this line of reasoning leaves the door open for new different empirical findings if entrepreneurship is operationalized differently in future research. Then, future work might fruitfully apply the methodology used in this article to a broader concept of entrepreneurship, and should also seek to apply it to the analysis of the impact of entrepreneurship not only on the economic growth but also on job creation or poverty reduction.

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[18]This type of individuals switch to self-employment as 'last resort' given the lack of salaried job offers. Opportunity entrepreneurship by contrast, refers to those who decide to become entrepreneurs based in the perception that an unexploited business opportunity exists.

4.7. References

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Appendix

Table A1: Data distribution between regimes and countries

	Model a			Model b	
	Lower	**Middle**	**Upper**	**Lower**	**Upper**
Australia	2	32	3	4	33
Austria	0	37	0	1	36
Belgium	0	37	0	0	37
Canada	1	33	3	3	34
Denmark	0	36	1	1	36
Finland	0	35	2	1	36
France	0	37	0	0	37
Germany	0	37	0	0	37
Greece	2	31	4	6	31
Iceland	1	31	5	4	33
Ireland	1	36	0	3	34
Italy	0	37	0	2	35
Japan	0	37	0	0	37
Luxembourg	0	37	0	0	37
The Netherlands	0	37	0	0	37
New Zealand	2	33	2	5	32
Norway	0	36	1	3	34
Portugal	7	22	8	8	29
Spain	1	36	1	2	35
Sweden	0	37	0	1	36
Switzerland	0	35	2	1	36
United Kingdom	1	33	3	5	32
United States	0	37	0	0	37

Note: The threshold variable is the cyclical self-employment lagged by one period

Australia   Austria   Belgium   Canada   Denmark   Finland

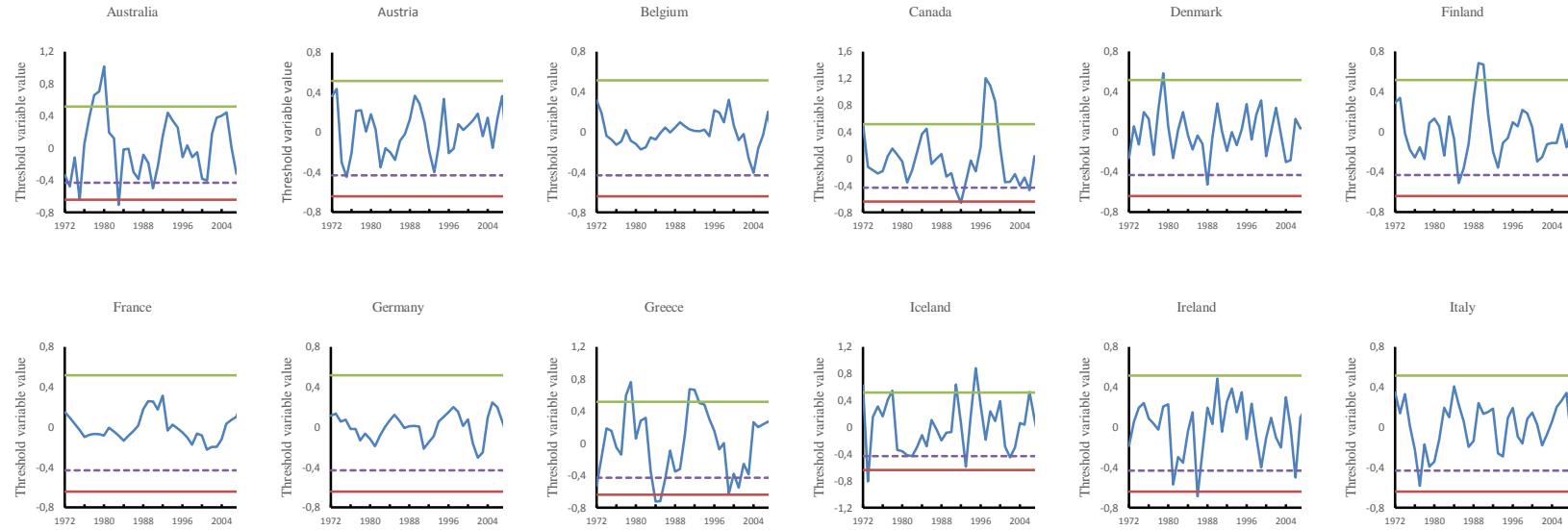France   Germany   Greece   Iceland   Ireland   Italy

Figure 1: Distribution of threshold variable in the 23 countries among the different regimes in model a (solid lines) and in model b (broken line)

Chapter 5: How sensitive is the business ownership rate to unemployment fluctuations? Evidence of asymmetries in a panel of 23 OECD countries

In this chapter, we try to test whether the relationship running from unemployment to entrepreneurship/self-employment – the so-called 'recession-push' hypothesis – is affected asymmetrically by dynamic labour market conditions. To this end, we employ a panel threshold regression model into which nonlinearities are introduced by allowing an exogenous variable – unemployment – to have a different impact on the endogenous variable – business ownership – in different regimes. Our estimates provide support for the existence of different responses of cyclical self-employment to cyclical unemployment, depending on the value of the deviation between the observed and natural rates of unemployment with a one-period lag – i.e., depending on the intensity of the unemployment problem – that is the threshold variable.

5.1. Introduction

Compared to paid employment, the resilience of self-employment during the crisis observed in a number of countries should not be surprising. Indeed, the self-employment sector experiences fewer fluctuations and lower volatility than the

paid employment sector. What reasons might underlie this phenomenon during times of crisis?

It can be argued that during crises, governments around the world typically intensify both the application of policies oriented toward the general promotion of entrepreneurship (to enhance innovation, employment, and growth) and programmes designed to turn unemployment into self-employment (intensively and successfully applied in Germany).[1] As a result, the self-employment sector can minimise, or even offset, the negative effects of an economic slowdown on business survival.

Another factor at play in this situation could be the national sectoral composition of self-employment. Some recent studies have provided theoretical arguments and empirical evidence on the self-perpetuation of self-employment (hysteresis).[2] It is generally agreed that because self-employment in some sectors – i.e., agriculture and professional services – is the most common occupational status, countries in which these sectors represent a significant portion of the economy will exhibit a higher rate of resilience.

Finally and even more importantly, some of the stylised facts of the development of self-employment in recessions may be the result of voluntary changes in occupational decision making given the deterioration of economic conditions and the consequent lower opportunity cost of paid employment. From an aggregate perspective, the study of the reasons that individuals choose self-employment, although important, is less relevant than information regarding whether unemployed persons who have been 'pushed' into self-employment (because of the lack of opportunities to obtain a job as a paid worker) cause positive fluctuations in the business ownership rate (as stated by the 'recession push' hypothesis) or whether the relationship between unemployment and self-employment is negative

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[1] Baumgartner and Caliendo (2008).
[2] Congregado, Golpe and Parker (2012) and Parker et al. (2012a).

(as stated by the 'prosperity-pull' hypothesis).[3]

From a theoretical perspective, the model of Ghatak et al. (2007) recognizes the existence of the two effects mentioned above. In particular, Ghatak et al's model – the most closely associated with occupational choice and hence the self-employment measure of entrepreneurship used in this article- implies two-way causality between entrepreneurship and unemployment. Faria et al. (2009) propose a similar mechanism yielding bi-directional pro-cyclicality à la Ghatak et al. (2007), in which the number of entrepreneurs increases in booms, reducing profits and causing a recession while the recession push effect leads the emergence of new self-employed, starting a new boom.[4]

Because both hypotheses may be equally valid, it is only possible to discriminate between them empirically. However, not accounting for the accuracy of the different estimation strategies and the quality of data used to analyse the validity of these hypotheses, it could be argued that any empirical approach can only aspire to capture the 'net' effect of the recession-push and prosperity-pull effects (see Parker, 2004, p.95 or Thurik et al., 2008, p.677).

As a result, scholars are far from obtaining a generalised consensus on the exact nature of the relationship between unemployment and entrepreneurship. Indeed, the existence of opposite theoretical arguments about the direction and sign of this relationship and the weak and sometimes contradictory empirical evidence are the

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[3] This hypothesis considers that during times of crisis (low paid employment) firms face a lower market demand. This reduces self-employment incomes, pulling out of self-employment those marginal entrepreneurs who cannot resist in these new economic conditions (see, the works of Ben-Ner (1988) and Pérotin (2006) on the emergence of marginal entrepreneurs in recessions). As a result, the relationship predicted by this hypothesis is negative.

[4] Nonetheless, we are aware that these propositions are the most likely empirical outcome if and only if one operationalizes entrepreneurship as self-employment. We have not stated this as a unambiguous hypothesis but it nevertheless provides a basis for cutting through the muddled picture painted by the various theories. This line of reasoning also leaves the door open for different empirical regularities if entrepreneurship is operationalized differently in future research.

origin of one of the most recurrent controversies in the Economics of Entrepreneurship field.[5]

In this paper, we will argue that the mixed results of earlier studies are partly attributable to the predominance of analyses of the long-term relationship in levels and the use of linear models, i.e., the potential existence of asymmetries in the relationship has been ignored. In addition, the scarce research that addresses nonlinearities has been carried out at the country level. Compared to previous studies, this article will use the panel threshold regression model proposed by Hansen (1999), which allows for nonlinearities by using the cyclical components of entrepreneurship and unemployment to test the two-way relationship between them in a panel of 23 OECD countries over the period from 1972 to 2009 to attempt to shed more light on this relationship.

A brief survey of previous empirical literature

Empirical multi-country analysis of the relationship between self-employment and unemployment, by using time series, started with the seminal work of Thurik et al. (2008), in which mixed evidence of the two competing hypotheses in 23 OECD countries, by using series in levels. Previously, a growing body of empirical studies had covered other countries (Thurik, 2003 for the UK; Verheul et al., 2006 for Spain; van Stel et al., 2007 for Japan, Baptista and Thurik, 2007, for Portugal) and applying other econometric approaches, such as cointegration and error correction models, instead of using the standard VAR analysis (Carmona et al., 2010, 2012). Table 1, summarises their findings. The weak evidence and the apparently contradicting results have leaded the search of new ways of testing empirically this relationship.

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[5] See Thurik et al. (2008), Parker (2009) and Congregado, Golpe and van Stel (2012) for detailed discussions on the interplay between unemployment and entrepreneurship.

Table 1. Summary of empirical studies on the relationship between unemployment and self-employment using aggregated data

Model	Type of data	Country-level vs. Multi-country	Econometric approach	Applications in Applied Entrepreneurship Research				
				Authors	Frequency	Period	Unemployment-self-employment relationship	Non-Linear
Time series	Levels	UK	OLS regression	Thurik (2003)	Annual	1970-1998	Pull hypothesis	
		Spain	Bivariate VAR	Verheul et al. (2006)	Annual	1972-2004	Pull hypothesis	
		Japan	Bivariate VAR	Van Stel et al. (2007)	Annual	1972-2004	Pull hypothesis	
		Portugal	Bivariate VAR	Baptista and Thurik (2007)	Annual	1972-2004	Weak pull hypothesis	
		EU-12	Den Haan (2000) VAR forecast errors	Carmona et al. (2010)	Annual	1983-2008	Mixed, Differs across countries (weak)	
		Spain	Den Haan (2000) VAR forecast errors	Carmona et al. (2012)	Quarterly	1980:1-2009:4	Pull hypothesis	
		Spain	Threshold co integration Hansen and Seo (2002)	Congregado et al. (2012)	Quarterly	1976:3-2004:4	Recession-Push hypothesis (only in economic crisis)	✓
	Cycles	US, UK, Ireland, Spain	Generalised fractional processes	Faria et al. (2009)	Annual	1972-2004	Two-way relationship	
		Australia, Japan, US, UK, Ireland, Germany, France, Italy and Spain	STAR-EXT	Faria et al. (2010)	Annual	1972-2004	S→U, U→S	✓
		EU-12	VAR, Granger and Instantaneous causality	Carmona et al. (2010)	Annual	1983-2008	Mixed Differences across countries	
		Spain	VAR, Granger and Instantaneous causality	Carmona et al. (2012)	Quarterly	1980:1 - 2009:4	S→U, U→S	
		UK	VAR, Granger causality, Bai-Perron (1998, 2003a, 2003b) Structural breaks	Parker et al. (2012b)	Quarterly	1978:2 - 2010:3	S→U, U→S	✓
Panel	Levels	17 OECD countries	Static Panel Data	Staber and Bogenhold (1993)	Annual	1972 - 1989	Push hypothesis	
		23 OECD countries	Static Panel Data	Blanchflower (2000)	Annual	1966 - 1996	Mixed relationship	
		13 OECD countries	Static Panel Data	Robson (2003)	Annual	1965 - 1995	No relationship	
		12 OECD countries	Multivariate Panel Cointegration Pedroni Test (1999) FMOLS estimates	Parker and Robson (2004)	Annual	1972 - 1996	No relationship	
		19 OECD countries	Multivariate Panel Cointegration Maddala and Wu test (1999) OLS and DOLS estimates	Torrini (2005)	Annual	22 years	Pull hypothesis	
		23 OECD countries	Weighted Least Squares (pooled data)	Carree et al. (2007)	Annual	1972-2004	Push hypothesis	
		17 Spanish regions	Bivariate Weighted VAR (with population as weighting	Golpe and van Stel (2007)	Quarterly	1979:4-2001:4	Pull and Push hypotheses (Pull in the whole sample, push effect only in lower income regions)	

		variable)				
	23 OECD countries	Bivariate Weighted VAR (with population as weighting variable)	Thurik et al.(2008)	Annual	1974-2002	Pull and Push hypothesis (pull stronger than push effect)
Cycles	22 OECD countries	Trivariate VAR Granger causality Trivariate Panel One-step system GMM	Koellinger and Thurik (2012)	Annual	1972-2008	S→U Recession-push hypothesis
	19 OECD countries	Multivariate VAR Generalised Least Squares	Scholman et al. (2012)	Quarterly Annual	2000:1-2007:4 1998-2008	No relationship
	22 OECD countries	Bivariate correlations	Lamballais et al. (2012)	Annual	2001-2011	Pull hypothesis

Note: X ·Y means that causality runs from X to Y. The finding of causality in both directions implies bidirectionality. Two-way relationship means a relationship between U and E but with no estimated sign.
Microeconometric analyses with individual data have been intentionally excluded from this summary of aggregated studies.

One of these new methods to empirically investigate this relationship is the estimation of panel data models, which is made possible by the recent availability of comparable international aggregate data on entrepreneurship rates (see, COMPENDIA, van Stel, 2005). The works of Staber and Bogenhold (1993), Blanchflower (2000), Robson (2003), Parker and Robson (2004), Torrini (2005), Carree et al. (2007), Golpe and van Stel (2009) or Thurik et al. (2008) are examples of panel data estimates of the relationship between unemployment and entrepreneurship. Overall, these panel data estimations, which are based on non-dynamic panel data specifications, again provide an inconclusive picture of the empirical relationship.

In contrast to previous studies, Koellinger and Thurik (2012) opt to use a GMM estimation of a dynamic panel data model in a cross-country panel of 22 OECD countries for the period from 1972 to 2007, providing evidence of a positive effect of the unemployment cycle on the entrepreneurial cycle at the national level (suggesting the presence of a 'refugee' effect).

Another potential source of the apparent ambiguity of previous results may be the fact that most of the empirical analysis on the relationship between self-

employment and unemployment has only studied the relationship of the trend – i.e., the long-term relationship – rather than its cyclical components, with the exception of the works of Sholman et al. (2012) for 19 OECD countries; Faria et al. (2010) for a sample of 9 OECD countries; Faria et al. (2009) for 4 OECD countries; Carmona et al. (2010) for the EU 12; Carmona et al. (2012) for Spain; Congregado, Golpe and Parker (2012) for the US and Spain; Parker et al. (2012b) for the UK; and Koellinger and Thurik (2012) and Lamballais et al. (2012) for 22 OECD countries.

Importantly, another source of controversy in the literature is the sensitivity of the relationship analysis to the sample countries and sampling period. Sometimes, opposite results are obtained in different periods even for the same country. This last result suggests that we should recognise the potential existence of nonlinearities or asymmetries in the relationship. Indeed one of the most likely reasons to reject a linear relationship is that the relation is time-varying, i.e., the relation is different in different economic conditions. In such cases, the estimation method should allow for nonlinearity in the relationship. Although relatively scarce, there are some contributions that deal explicitly with nonlinearity: Faria et al. (2010) used a STAR model with time-series data for 9 countries; Congregado, Golpe and Parker (2012) used an augmented version of the Jaeger and Parkinson model for the US and Spain; Congregado, Golpe and van Stel (2012) accounted for nonlinearity in this relationship by applying the threshold cointegration model suggested by Hansen and Seo (2002); and Parker et al. (2012) used a Bai-Perron structural breaks approach for the UK (1998, 2003a, 2003b).

However, these works searched for asymmetries but used individual time-series data. In contrast, this article extends the extant empirical analysis searching for asymmetries by using a panel threshold regression model that employs cross-sectional time series data for the cyclical components of entrepreneurship and unemployment to analyse how labour market dynamics determine changes in occupational decisions and therefore observe fluctuations in self-employment rates.

The remainder of the article is organised as follows: the empirical methodology is outlined in Section 2, and the empirical tests and estimates are performed in Section 3. Finally, the main conclusions are summarised in Section 4.

5.2. Model specification

As previously mentioned, the aim of this article is to investigate whether cyclical unemployment influences subsequent cyclical self-employment.

As the starting point, determining the cyclical relationship between unemployment and self-employment rates involves the estimation of the following equation:

$$\Delta s_{it} = \mu_i + \beta \Delta u_{it} \qquad (1)$$

where Δs and Δu are the growth rates of the self-employment and unemployment rates, respectively, in period t for country i.

We can also consider a 'gap' specification in which the Hodrick-Prescott filter (1997) is used to produce the trend components. In this specification, unemployment and self-employment are measured in terms of cyclical components or deviations from long-term trends. In general, the empirical relationship can be represented by the following set of equations:

$$u_{it}^c = u_{it} - u_{it}^n \qquad (2)$$

$$s_{it}^c = s_{it} - s_{it}^n \qquad (3)$$

$$s_{it}^c = \mu_i + \beta u_{it}^c + \varepsilon_{it} \qquad (4)$$

where u_{it}^c captures cyclical unemployment (output gap), u_{it} is the log of the actual unemployment rate and u_{it}^n is the natural or trend level of the unemployment rate; correspondingly, s_{it}^c represents the cyclical self-employment rate (self-employment gap), s_{it} is the observed self-employment rate and s_{it}^n is the natural self-employment rate.[6] In contrast to equation (1), equation (4) requires information about unemployment and self-employment trends or equilibrium rates, which are unobservable.

Equation (4) can be extended by adding lagged cyclical self-employment $-s_{it-1}^c$- to the equation to remove the serial correlation that arises in equation (4).

$$s_{it}^c = \mu_i + \beta u_{it}^c + \delta s_{it-1}^c \varepsilon_{it} \qquad (4')$$

In the equation, the deviation of the business ownership rate in country i in year t from the equilibrium rate is the variable to be explained. Cyclical unemployment (a push factor for business ownership) and lagged self-employment (factor included for capturing the inertia) are the two explanatory variables included in the benchmark specification. The expected sign of the parameter β is positive if the recession-push hypothesis holds.

Asymmetry

There are several reasons that we should test for asymmetry. The most important is that ignoring asymmetry when it is present leads to the misspecification of models, which produces not only bad forecasts but also erroneous inferences in hypothesis testing. To circumvent this problem, we will augment our benchmark equation by allowing for different effects between different regimes.

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[6] In a broad sense, we can think of this natural rate in terms of an equilibrium rate of business ownership. Based on the work of Carre, van Stel, Thurik and Wennekers (2002), this rate is a function of the stage of economic development.

To this end, we apply a class of panel threshold models developed by Hansen (1999) to characterise the relationship between self-employment and unemployment, in which parameters vary not only across individuals but also with time, allowing for the presence of asymmetries in the self-employment dynamics depending on the labour market dynamics. The model is now defined as follows:

$$s_{it}^c = \mu_i + \beta_0 u_{it}^c \mathbb{I}(d_{it} \leq k) + \beta_1 u_{it}^c \mathbb{I}(d_{it} > k) + \varepsilon_{it} \quad (6)$$

where μ_i is a fixed effect, d_{it} is the threshold variable and k is the threshold parameter. $\mathbb{I}$ is the Heaviside indicator function, which equals 1 when the threshold condition is satisfied and equals 0 otherwise. In summary, in this specification, the observations are divided into two regimes depending on whether the threshold variable d_{it} is smaller or greater than the threshold parameter k. The two regimes are distinguished by different regression slopes β_0 and β_1.

However, there is no reason to impose only two regimes. A more general specification with r thresholds takes the following form:

$$s_{it}^c = \mu_i + \beta_0 u_{it}^c \mathbb{I}(d_{it} \leq k_1) + \beta_1 u_{it}^c \mathbb{I}(k_1 < d_{it} \leq k_2) + \cdots + \beta_r u_{it}^c \mathbb{I}(d_{it} > k_r) + \varepsilon_{it}$$
(7)

As a general strategy and once the threshold parameter is estimated, the next step is to check the null hypothesis that describes the linearity, i.e., $\beta_0 = \beta_1$, via a likelihood ratio test. Once the threshold effect is proved, the same procedure is sequentially applied to test a specification with r regimes versus $r+1$ regimes.

5.3. Estimation and results

This section presents the empirical results for relationship represented by equation (7) based on two alternative threshold variables: lagged cyclical self-employment and lagged cyclical unemployment.

The obtained empirical results are presented in several steps. First, we discuss the stationary properties of the entrepreneurship and unemployment series. Second, we check the null of linearity, and if rejected, we look for the 'best' threshold variable. Third, we report estimates of the relationship for the different regimes defined by the selected threshold variable.

Data

The sample is composed of annual data from 23 OECD countries for the period from 1972 to 2011. As mentioned above, and similarly to most previous studies, entrepreneurship is operationalised in terms of the *business ownership rate*, i.e., the number of business owners divided by total labour force.[7]

The second time series is the *Harmonised Unemployment rate*, whose source is the OECD Main Economic Indicators.

Stationary properties

Initially, we are interested in studying the stationary properties of the self-employment rate and GDP series. At this point, we use a battery of traditional panel unit root tests: the Fisher-ADF and the Fisher-PP, proposed by Maddala and Wu (1999), and the tests proposed by Hadri (2000) and Breitung (2000) or those proposed by Levin et al. (2002) and Im et al. (2003). The null hypothesis of non-

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[7] These data are taken from EIM's COMPENDIA database (version 2011.1). Business owners or self-employed workers are defined as the total number of unincorporated and incorporated self-employed people outside the agriculture, hunting, forestry and fishing industries, who carry out self-employment as their primary employment activity – see Van Stel (2005, p. 108).

stationarity – except for Hadri's test, in which the null is stationarity – cannot be rejected. As a result, we can reach a non-stationary conclusion on the two variables.

Table 2: Unit root tests in the panel data

Statistic	Self-employment		Unemployment	
	Without trend	Trend	Without trend	Trend
LLC	-0.024	1.452	-0.007	2.325
Breitung		5.423		1.654
IPS	1.453	4.429	-0.473	2.315
Fisher-ADF	37.907	23.923	48.624	25.048
Fisher-PP	36.409	56.667	46.656	22.588
Hadri	10.302***	8.105***	5.395***	7.042****

Notes: LLC and IPS represent the panel unit roots test of Levin et al. (2002) and Im et al. (2003), respectively. Fisher-ADF and Fisher-PP represent the Maddala and Wu (1993) Fisher-ADF and Fisher-PP panel unit root tests, respectively.*** indicates statistical significance at the 1 percent level. Probabilities for Fisher-type tests are computed by using an asymptotic chi-square distribution. All other tests assume asymptotic normality. A time trend and an intercept are included in all underlying specifications. The modified AIC was used to select the optimal lag length.

Threshold variables

Once the time series are de-trended, we must check the null of linearity and determine the 'best' threshold variable. We consider two potential candidates: cyclical self-employment and cyclical unemployment, which is lagged by one period.

On the one hand, it seems logical for past cyclical self-employment to influence regime switching: a higher cyclical self-employment rate implies a different impact on future self-employment rates – inertia. On the other hand, it is also possible for a higher cyclical unemployment rate, defined as the lack of job offers for a period of more than one year, to cause changes in initial occupational decisions (deciding to become entrepreneurs as a last resort) rather than a lower cyclical unemployment rate.

As is usual in the estimation of a panel threshold regression model, we discriminate between these two candidates according the following criteria: we select the variable that minimises the sum of squared residuals (Hansen, 1999) and leads to the strongest rejection of the linearity hypothesis as the threshold variable. After selecting the threshold variable, the estimation of the panel threshold regression model involves checking whether the threshold effect is statistically significant relative to a linear specification and determining the number of thresholds. In particular, the null hypothesis (linearity) is tested by a likelihood ratio test in which the sum of the squared residuals of a specification with r regimes is tested against a specification with $r+1$ regimes. The process stops when the null is not rejected.

Table 3. Linearity test and tests for threshold effects

Regimes	Threshold variables	
Test for single threshold (two regimes)	S_t^i	u_t^c
RSS	51.086	50.947
F_1	8.527	10.755
p-value	0.160	0.020
(10%, 5%, 1% critical values, respectively)	(6.909, 8.431, 12.090)	(6.919, 8.490, 13.630)
Test for double threshold (three regimes)		
RSS		50.867
F_2		1.557
p-value		0.860
(10%, 5%, 1% critical values, respectively)		(7.637, 9.249, 11.826)

Note: F_1 and F_2 are the likelihood ratio statistics, p-values are obtained with 300 simulations (Hansen, 1999). RSS: Residuals Sum of Squared.

The results of the linearity tests and the determination of the number of thresholds are reported in table 3. The F_1 likelihood ratio test clearly leads to the rejection of the null hypothesis of linearity of the relationship only when lagged cyclical unemployment is the selected threshold variable. This evidence supports the decision of estimating the model in non-linear form and means that there are at

least two regimes. According to Hansen's procedure, it would be necessary to estimate and test two thresholds, and so on, until the corresponding F-test is statistically non-significant. Following this strategy, the F_2 likelihood ratio test is not statistically significant at the 10 percent level for lagged cyclical unemployment. Therefore, the selected model is the one with two regimes in which the optimal threshold variable is cyclical unemployment lagged one period.

Tables 4 and 5 report the threshold values for this two-regime model, the estimates of the parameters of the panel transitions regression model and the corresponding *t-statistics* based on standard errors and corrected for heteroscedasticity.

Table 4. Threshold estimates

	Estimate	**95% confidence interval**
$\hat{\gamma}_1^T$	0.411	[-1.268, 1.181]

The threshold estimate indicates when the transition between the two regimes occurs. For example, if cyclical unemployment is greater than 0.411, the concerned country switches to the second regime. Hence, the first regime would occur when the cyclical component of the unemployment rate is below 0.411. As we can see, this is the usual regime (see table 6). In contrast, the relatively unusual regime would occur when the level of cyclical unemployment exceeds 0.838.

Table 5. Regression estimates: single threshold model

Regressor and Regime	**Coefficient estimate**
$u_{it}^c I(u_{it-1}^c \leq 0.411)$	-0.036***
	(0.013)
$u_{it}^c I(u_{it-1}^c > 0.411)$	0.025**
	(0.013)

Note: Standard error in brackets. ***,** and * represent significance at 1%, 5% and 10%, respectively.

The estimated two-regime threshold panel regression model is reported in Table 5; significant effects appear in both regimes[8].

In the cases in which the deviation between the observed and natural unemployment rates is higher than 0.411, the relationship between cyclical self-employment and cyclical unemployment is positive, i.e., a value of the unemployment gap above 0.411 produces upward pressure on the self-employment rate in the subsequent year. In contrast, when cyclical unemployment is below the threshold (i.e., the most usual regime), a negative shock in the employment rate causes a reduction in the self-employment rate.

The interpretation of the previous findings is as follows. When cyclical unemployment is very high, negative shocks in employment cause upward pressure on the self-employment rate. Job offers become scarcer because of the decline in economic activity; hence, more people start their own businesses, facing the lack of opportunities of jobs in the salaried sector. However, we observe the opposite phenomenon when the cyclical unemployment rate is above the estimated threshold value. These results suggest that the recession-push hypothesis is only valid when economic circumstances are poor, i.e., when cyclical unemployment rates are high. However, when the difference between the observed and natural unemployment rates is small in magnitude, the relationship is negative. In other words, the smoothest negative or positive shocks on employment rates cause substantial decreases in self-employment rates, as stated by the pull hypothesis.

According to the estimated threshold values, we can deduce the distribution of the countries among the different regimes (table 6) and plot these transitions, taking time and countries into consideration (Figure 1).

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[8] Could argue that a potential problem of reverse causation can emerge. In order to overcome this problem, we have also run a different version of the model by introducing one and two lags of the explanatory variable as instrumental variable. Estimates – available upon request- are roughly identical.

Table 6. Data distribution between regimes and countries

	Lower (first)	**Upper (second)**
Australia	28	12
Austria	35	5
Belgium	24	16
Canada	28	12
Denmark	26	14
Finland	29	11
France	26	14
Germany	26	14
Greece	32	8
Iceland	34	6
Ireland	22	18
Italy	32	8
Japan	32	6
Luxembourg	34	6
The Netherlands	25	15
New Zealand	29	11
Norway	28	12
Portugal	26	14
Spain	23	17
Sweden	24	16
Switzerland	32	8
United Kingdom	25	15
United States	28	12

Note: The threshold variable is the cyclical unemployment lagged by one period.

We observe that the majority of observations are in the first regime, which corresponds to a negative relationship. However, observations from Ireland, Portugal, Spain and the UK are often in the second regime. Importantly, in 2011, the last year considered in our sample, only six countries were in the first regime (Austria, Germany, Japan, Luxembourg, Portugal, and Switzerland).

In sum, according to our results, the null hypothesis on the existence of a linear relationship is rejected in favour of an asymmetric relationship characterised by a two-regime model in which two opposite relationships characterise the dynamic adjustment path of the self-employment rate to unemployment shocks, depending

on the magnitude of cyclical unemployment. Only the most severe job destruction processes will case positive shocks on self-employment rates.

5.4. Conclusions

There is an extended body of empirical literature on the relationship between unemployment and self-employment, but the exact nature of the relation is still a matter of debate. The absence of conclusive findings, given the lack of robustness of a great part of the extant research, may be caused by data availability limitations with regard to the use of self-employment time series. In fact, time-series analysis of self-employment has traditionally been one of the least developed areas in the Economics of self-employment field due to the low frequency and limited availability of long time series and harmonised data for multi-country studies.

In addition, previous findings on the relationship seem to be highly dependent on the examined time span. This fact should make the possibility of a time-varying relationship central to the research agenda. Therefore, we must look for econometric approaches that should allow for nonlinearity in the relationship.

In that sense, the availability of a relatively long panel allows for the application of a panel threshold regression model to look for 'potential' asymmetries in the relationship, thereby exploiting the two dimensions of our database.

Estimating the relationship with annual data from 23 OECD countries over the period from 1972 to 2011, we find that the recession-push hypothesis is only valid when the cyclical unemployment rate is higher than 0.411. In other words, in times of high unemployment, individuals are pushed into self-employment due to the lack of alternative sources of income. Therefore, we can argue that the magnitude of the recession-push effect is non-linear and depends on the labour market cycle, i.e., the effect only exists when unemployment is above the threshold.

Our results reflect that unemployed individuals are more inclined to start their own businesses when unemployment levels are high compared to periods of low unemployment. An obvious factor influencing starting a business in times of recession is the lower job offer arrival rate, which results in too much difficulty finding a paid job – especially among those with the lowest educational attainment. Given the current international crisis, the high unemployment regime may be particularly relevant in present times in most countries.

As with any research, there are limitations to this study. In particular, any aggregate study results should be interpreted with caution given that the composition of self-employment may be extremely different between countries, not only in terms of the type of business – SMEs versus large companies – but also in terms of the relative weights of employers and own-account workers in business ownership. In addition, sectoral diversity between countries likely also plays an important role in explaining differences in entrepreneurship equilibrium rates and the interplay between entrepreneurship and unemployment.

On this basis, an important avenue for future research should be to identify differences between different types of self-employment by decomposing the aggregate self-employment rate into its constituent parts (employers, own-account workers, and members of producer cooperatives) to determine whether the recession-push effect is being driven by one or more of these elements.

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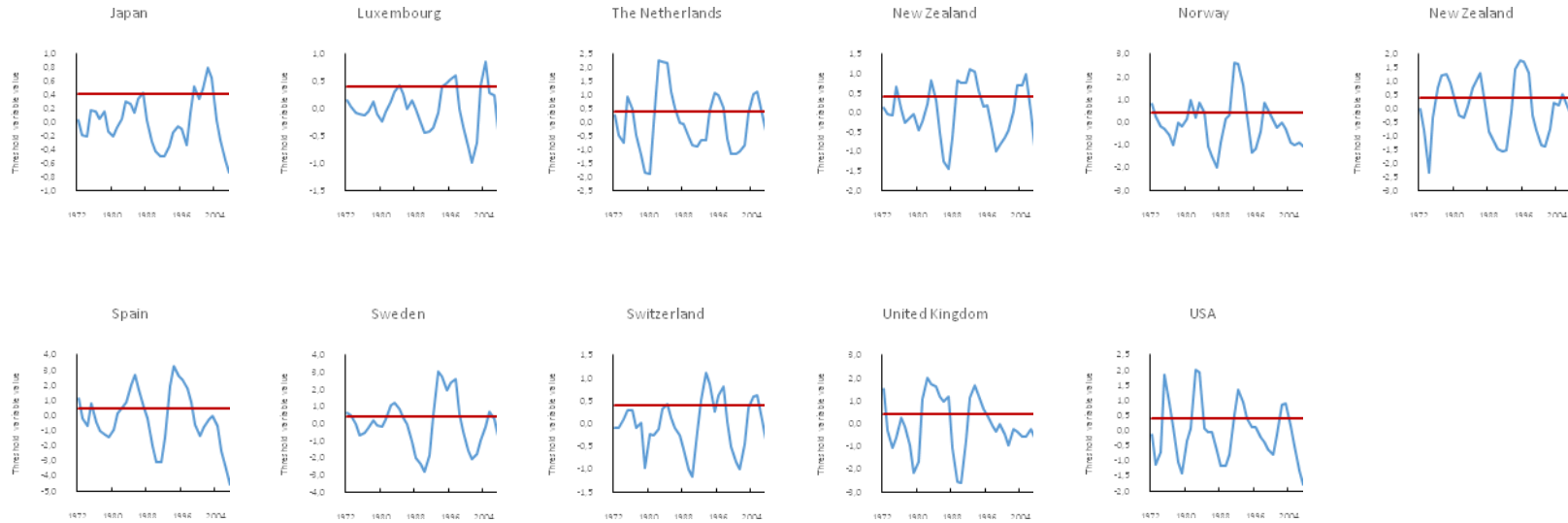
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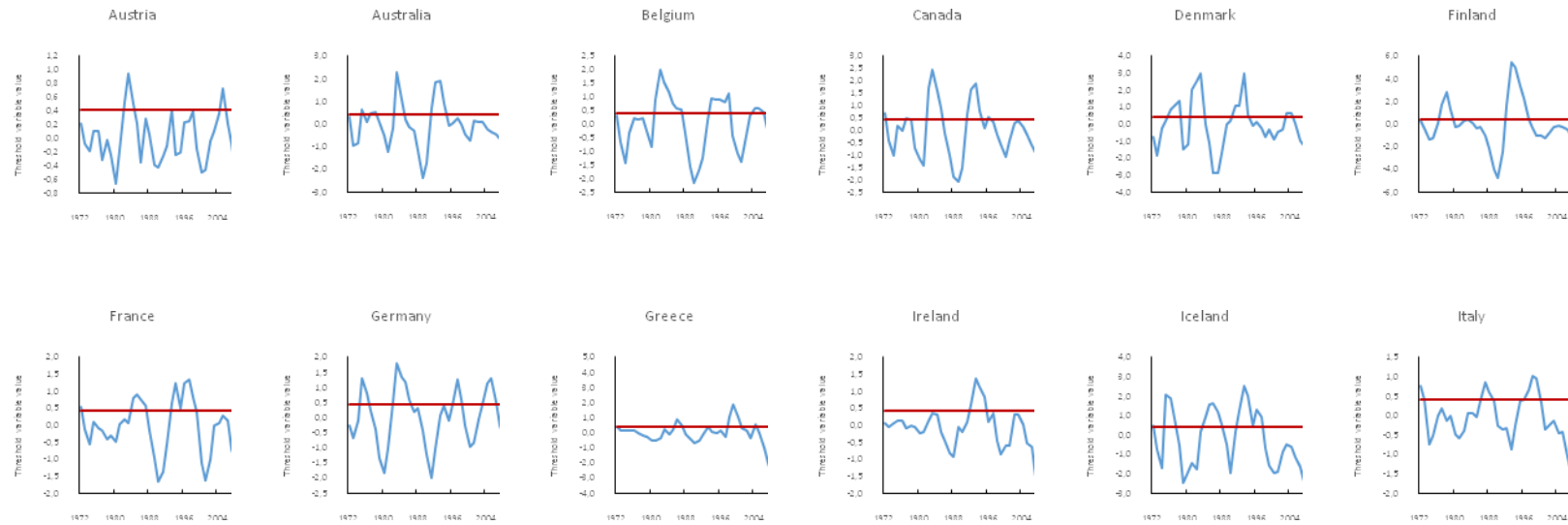
Figure 1: Distribution of threshold variables among the different regimes in the 23 countries.

Part IV: Concluding remarks

Chapter 6: Conclusions and Future Lines of Research

This dissertation provided new empirical evidence on returns to education and on overqualification by statuses across the EU-15, extending previous literature into two directions: i) exploring the differences between the two groups of entrepreneurs and exploring the role of self-employment as a way to avoid overqualification. Furthermore, this work studied the relationships between self-employment and two macroeconomic variables, unemployment and GDP.

Based on these analyses our first results points to the existence of net differences in the return on education across different status in employment. For this reason educational and entrepreneurs policies should be coordinated in order to promote that people endowed with higher levels of human capital decide to become job creators, eliminating any kind of barrier to the entry into self-employment and reducing the opportunity cost of self-employment. In this respect, not only schedules of economic incentives or disincentives to encourage/discourage the access to self-employment –including labor protection legislation– are important for promoting entrepreneurship but also promoting entrepreneurship education among people who have the highest educational attainment, as a way to obtain higher levels of productivity, employment and innovation.

Turning our attention to the overqualification problem, and in line with previous studies, we observe how overqualification decreases job satisfaction and increases on-the-job search, absenteeism and labour mobility. About our analysis of the ex-

isting routes out overqualification (perhaps the main contribution of this work), our results support the view of overqualification as a phenomenon of permanent nature. Indeed, predicted chances to remain feeling overqualified after one year are about 94%. When distinguishing by different employment statuses, our main results can be summarised as follows. First, self-employed are the most likely workers to exit overqualification within their same jobs, probably by varying some aspects of their own jobs. Second, private paid employees are the most likely workers to exit overqualification by starting a new job within the same employment status, i.e., as private paid employees. Third, and finally, public paid employees are, together with self-employed workers, the most likely workers to exit overqualification in a new job outside their employment status.

From a policy perspective, increasing the share of graduates in the economy may not automatically lead to the expected returns of having a high-skilled workforce in terms of economic growth and competitiveness. On the demand side, governments may be well advised to establish pro-grams stimulating companies to move into higher value-added product and service markets so that the levels of skills that they require, and the extent to which they use these skills, tend to increase. On the supply side, on the one hand, education institutions must be involved in fostering the skills that could shape the economies of the future. On the other hand, individual flexibility of current and future graduates in terms of their willingness to change region, sector, employment status, occupation and/or job would significantly enhance the matching process. In coherence with this view, private paid employees are the most likely workers to exit overqualification by starting a new job (as private paid employees) whereas both public paid employees and self-employed workers are the most likely workers to exit overqualification in a new job outside their re-spective employment status. In this vein, reducing costs and other barriers associated with mobility helps employees to find suitable jobs and helps employers to find suitable workers.

One of the most interesting results obtained within this dissertation perhaps refers to the asymmetrical character of the relationships between self-employment and two macroeconomic variables.

In particular we have provided evidence about a different magnitude of the recession-push effect. It is non-linear and depends on the labour market cycle, i.e., the effect only exists when unemployment is above the threshold. This result points to the fact that unemployed individuals are more inclined to start their own businesses when unemployment levels are high compared to periods of low unemployment. An obvious factor influencing starting a business in times of recession is the lower job offer arrival rate, which results in too much difficulty finding a paid job – especially among those with the lowest educational attainment.

In addition, the evidence provided also suggests that effective policies at the macro level are also good strategies for encouraging high-quality entrepreneurship in order to stimulate employment and innovation, but only when cyclical self-employment is in the two extreme regimes – i.e., when the deviation of the self-employment rate from its natural value reaches extreme values. Briefly, this article provided a complete guide for skilful entrepreneurship and/or economic policy management. A policy maker cannot neglect the specific regime in which the entrepreneurship policy action takes place.

As with any research, there are limitations to this study. In particular, any aggregate study results should be interpreted with caution given that the composition of self-employment may be extremely different between countries, not only in terms of the type of business – SMEs versus large companies – but also in terms of the relative weights of employers and own-account workers in business ownership. In addition, sectoral diversity between countries likely also plays an important role in explaining differences in entrepreneurship equilibrium rates and the interplay between entrepreneurship and unemployment.

Nevertheless, despite the importance of our findings, we should not forget that self-employment is not an unambiguously valid operationalization of entrepreneurship, given the multifaceted nature of entrepreneurship. This limitation should be borne in mind when interpreting the results. In this respect, the use of a behavioural –i.e. a risk-taking dimension of entrepreneurship– or an occupational definition of entrepreneurship –i.e. usually adopted from an economic theory perspective– not only may lead different results in the relationship between entrepreneurship and some macroeconomic variables, such as unemployment or economic growth, but also may provide different recipes for entrepreneurship policies. In this way, a significant part of previous literature highlights how different types of entrepreneurship affect development.

On this basis, an important avenue for future research should be to identify differences between different types of self-employment by decomposing the aggregate self-employment rate into its constituent parts (employers, own-account workers, and members of producer cooperatives) and distinguishing between necessity versus opportunity entrepreneurs to determine whether these effects is being driven by one or more of these elements.