Chapter 12
Entrepreneurial Human Capital: Essays of Measurement and Empirical Evidence

Emilio Congregado, Mónica Carmona and Concepción Román

Abstract The aim of this paper is to survey the evidence on the relationship between self-employment and human capital from two fields in particular, economics of self-employment and empirical research on growth, emphasising in the sensibility of results to proxies used to capture education. Although, the emphasis is very much on education, rather than on any broader concept of human capital -due to the difficulties to capture other mechanisms of human capital accumulation- other concepts are also considered.

12.1 Introduction

The aim of this chapter is to study the evidence on the relationship between self-employment and entrepreneurial human capital from two perspectives. In particular, signalling the main mechanisms when the accumulation of a specific kind of human capital –entrepreneurial human capital- occurs, and from an economics of self-employment perspective, emphasizing on the sensibility of the results obtained for different proxies used to capture the stock and its accumulation processes. Although the emphasis is very much on education, rather than on any broader concept of human capital -due to the difficulties to capture other mechanisms of human capital accumulation-, other mechanisms are also considered.

A priori, it seems that individuals with higher knowledge on consumer's preferences, markets, production sets, and even on business administration techniques, have an advantage, a higher capacity to identify profit opportunities, to reduce inefficiencies, to face up to incertitude and to innovate.[1] Thus, a potential entrepreneur will combine different types of knowledge in order to form a good

Emilio Congregado
University of Huelva
congregado@uhu.es

[1] There is a large theoretical literature studying the allocation of individuals and their effort among productive and unproductive entrepreneurial activities. Murphy et al. (1991, 1993) show empirical evidence for the hypothesis that talented individuals are more important for growth if they are engineers rather than lawyers. Similarly, Baumol (1990) uses historical evidence to support the idea that growth increases if society manages to direct more entrepreneurial talent to productive

or service that satisfies the preferences not captured yet, or will introduce some changes in order to use the resources in a more efficient way. This set of specific knowledge may be called entrepreneurial human capital. Hence, the possession of a large entrepreneurial human capital stock will operate in two senses: first, from an individual level, individuals with a higher stock will detect a higher set of profit opportunities, and probably those opportunities with the highest returns. In addition, a higher entrepreneurial human capital stock will be related to a higher decision making ability addressed to enhance the economy efficiency. Second, and from an aggregate perspective, the crucial question could be if individuals that belong to countries or regions more "entrepreneurial" and with high productivity match with countries or regions that are endowed with the highest entrepreneurial human capital stocks at the present.

As we can imagine, the origin of this type of knowledge can be diverse. Several individuals could have some innate abilities that favour their dedication to entrepreneurial activities, while others could acquire this kind of knowledge through experience, or through their participation in formal education processes. Even, and according to this view, a denser entrepreneurial network can generate a positive externality effect on entrepreneurial human capital accumulation. This same situation happens in economies that give great importance to formal education in entrepreneurship.

Hence, the key questions are how we can measure the stock of this specific kind of human capital, and how we can identify the sort of knowledge that must be fostered in order to enhance entrepreneurial human capital. Once this question is solved and their role as determinant for the decision to become entrepreneur and on the success is demonstrated, we must wonder about the most effective methods to accumulate this capital, including the role of the experience and the intergenerational transfers in this process.

The opportunity of this analysis is given by the role given to foster entrepreneurial skills by European authorities as one of the main strategic areas to boost entrepreneurship. However, *The Action Plan*,[2] is unbalanced towards measurements aimed to foster entrepreneurial attitudes (risk) regarding to the relatively scarce tools designed to foster entrepreneurial skills (entrepreneurial human capital).[3]

Focusing on this, we can have serious doubts about the level of effectiveness of some of these measurements on education policies designed to plan the offer

activities rather to rent-seeking activities. In an analogous way, Holmes and Schmitz (2001) focus on the role of the "steady of trade" on the extent of unproductive entrepreneurship.

[2] Action Plan: "The European Agenda for Entrepreneurship" (COM (2004), Brussels, 11.02.2004). In Europe, and after the debate opened by the Green Paper on Entrepreneurship, the Commission developed an Action Plan, in which a general framework to foster entrepreneurship has been established. The general diagnosis used as basis for government intervention is that the EU is not fully exploiting its entrepreneurial potential. The Action Plan outlines a series of key actions related to five strategic areas, being one of them the promotion of learning about entrepreneurship in the European education system.

[3] Some exceptions are given by: i) the introduction of entrepreneurship education in universities for students and researchers for all fields, specially in technical universities; ii) the integration of entrepreneurship education into all schools' curricula.

favouring some specific kinds of studies, a policy close to the idea of the "allocation of talent" between productive and unproductive activities. However, the only way to solve this debate is given by the propositions and empirical results derived from the economics of self-employment.

In any case, it seems a priori that education must have a crucial role, at least, in order to: i) encourage more people to become entrepreneurs, increasing required knowledge to search profit opportunities; ii) increase the probability of success (measured in terms of the permanence in self-employment); and, iii) foster economy growth, because the positive correlation between human capital and economic growth is a well-demonstrated effect in literature.

To help us to understand the way in which entrepreneurial human capital operates, we have divided this chapter in three parts clearly differentiated. The first part introduces a selective review of the literature with the aim to set the entrepreneurial human capital concept, and to describe the different ways the entrepreneurial human capital process can operate. The second part focuses on the microeconometric results obtained in the analysis of the occupational choice decision effect of education and their private returns, reviewing the theoretical essays on the connection between education and self-employment. This part also shows a detailed review of the evidence, focusing on the pertinence of proxies used to capture education. Additionally, the effect of education on entrepreneurial success is also considered.

On the other hand, the last part is devoted to provide some additional empirical evidence on the entrepreneurial human capital effects using a set of alternative available proxies to capture some mechanisms through the entrepreneurial human capital accumulation process in order to explore the sensitivity of the results for the proxy used.

12.2 Entrepreneurial Human Capital and Essays of Measurement

As for any other productive factor, the analysis of the offer determinants and of the economic agent willingness to perform their entrepreneurial role will provide us with some keys to understand the entrepreneurial human capital role at the time of deciding to become an entrepreneur.

At first sight, any agent has the chance to offer his effort time to perform the entrepreneurial role. To do so, each agent is endowed with certain capacities derived from abilities and knowledge, either innate or acquired. This knowledge will allow him to evaluate a set of profit opportunities, wider or more limited, depending on the stock owned.

To some extent, the entrepreneurial role is similar to a chemist labour when mixing substances, either to obtain a new compound or to modify an already existing one. Thus, to generate a new productive composition or to improve an already existing one, the entrepreneurial factor will need to use all the knowl-

edge about goods and services demand, factor markets, available technology and entrepreneurial management techniques, to be able to estimate the profit opportunities latent in the market, to generate productive combinations to capture such opportunities, to improve the efficiency of already established activities, or even to innovate.

We will agree that, to perform any of those tasks, to own specific knowledge related to them is crucial. We will refer from now on to this type of specific human capital which contributes directly to improve the way of carrying out any of the vectors playing a role in the performance of the entrepreneurial function, as entrepreneurial human capital.

As the reader will have probably noticed, mechanisms for the accumulation of this type of human capital may be diverse. On the one hand, part of this knowledge will be derived from inherent abilities, from the experience acquired through this participation in the productive process, the one obtained from formal education, that one obtained through intergenerational transfers, or even the experience derived from certain positive externalities, that is, through an informal diffusion of the entrepreneurial culture.

This knowledge arrangement may even become a requirement to become entrepreneur. As a society is becoming more developed in a technological sense, it is possible that the level of entrepreneurial human capital requested to capture profit opportunities increase, becoming, occasionally, a real obstacle preventing the access to the performance of the entrepreneurial role.

In the same way, the complexity of certain entrepreneurial organizations may cause, even during the design stage of a productive combination or a business idea, the necessity of creating work teams, whose members have a specialized human capital able to carry out the different functions of entrepreneurial role.

Thus, if we want to capture the entrepreneurial human capital in only one person, economy or sector, we should try to capture, somehow, both the stock of entrepreneurial knowledge and their processes of accumulation, bearing on mind the existence of several mechanisms, from which this knowledge may be generated.

12.2.1 Education in Entrepreneurship: How to Measure the Stock?

Several studies report that workers with higher levels of education are more likely to be self-employed -Evans and Leighton (1989) or Borjas and Bronars (1989)-. The key question is how can we approach the measurement of this stock?

When we try to measure this stock, we face to the same difficulties, which traditionally human capital measurement has coped with. Consequently, the most intuitive and common way of approaching the human capital stock measurement, in an extra level, is to operationalize entrepreneurship concept through self-employed people, and to quantify human capital stock through the academic level obtained by self-employed people.

Limitations for this way of proceeding are well known: i) the attainment level obtained is an imperfect proxy of the actual level of knowledge, because the knowledge acquired by people of the same level and sort of studies may be different, not only among individuals, but also in territories; ii) not all kinds of studies have the same effect over the productive activities,[4] iii) the formal educative processes are not the only mechanism through which human capital may be acquired; iv) they do not capture entrepreneurial human capital of an economy or sector, but the human capital of those who have already decided to choose this occupation.

The indicators commonly used to measure this stock, usually derives from the exploitation of levels and types of studies in human population surveys, in which the occupation and professional situation of the individuals are known. Using the Labour Force Survey, it is possible to make exchanges between the employed people and the levels and types of studies, or between the different types of employed people, bearing in mind the professional situation or occupation and the levels or the types of studies. Any of these exchanges, provided that the design of the survey allows it according to sampling errors, let us capture the stock of knowledge only to a certain extent. The less accurate approach would be to measure the level of studies of the self-employed people, comparing it with that of the employees, calculating the percentage of employees or self-employed people with medium level or higher level studies. Obviously, following this procedure, we would not be capturing the set of entrepreneurial knowledge of the individuals of an economy, but *expost* verifying if those that have decided to become entrepreneurs have a higher or lower level of studies than those that have decided to become paid-employees.

A different approach, maybe more accurate, (though taking as starting point a priori elements and with some constraints of international comparison) would be to decide, according to the different types of study, the levels and types of study whose contents contribute more directly to the accumulation of entrepreneurial knowledge, and once established those ones, analysing the percentage of the population that has these types of studies with regard to those with a knowledge, whose contents are more distant from the entrepreneurial role performance.

In any case, and leaving aside comparison problems related to curricula differences among the countries, and even in the same type of studies in different educative institutions within the same country, the maximum we could capture using this indicator would be the added result of the accumulation of entrepreneurial human capital through the voluntary participation in formal educational processes, and this implies to consider that acquired capacities are the same among individuals for the same level and type of study.

But even in its role as indicator of the entrepreneurial human capital stock, focusing on the type of study would not allow us to reflect neither inherent entrepreneurial capacities or those acquired through other non-formal processes nor the differences among individuals which have reached the same level and type of study.

[4] This problem may be solved by analysing self-employed people by type of study, defining those with more proximate contents to those required for the entrepreneurial role performance.

The use of entrepreneurial abilities *tests* performed among individuals coming from different educational systems with the same level of studies (analogous to those performed to verify the knowledge acquired in different educational systems) could be a good solution to find more accurate indicators.[5]

If we make reference to literature, we will notice that it shows a wide variety of principles at the time of evaluating the effect that education has over the entrepreneurial network.[6] Studies such as those of Evans and Leighton (1989a, 1989b), Blanchflower and Meyer (1994) and Schuetze (2000), among others, conclude that there is a positive relationship between the educational level obtained and the probability of carrying out an enterprising activity.

In relation to this, Ucbasaran et al. (2006) analyse how the general human capital (both educational and labour experience) and the entrepreneurial human capital (experience as company owner, managing abilities and technical capabilities) have an effect on the searching and identification of business opportunities. They find that those entrepreneurs with a higher level of human capital identify and pursue a higher number of business opportunities. Also, the entrepreneurial human capital appears more strongly related to both variables than the general human capital.

Parker and Van Praag (2006) distinguish between the way of accessing to the entrepreneurial network and the decision of accessing itself. They consider two different ways to access to the entrepreneurial network: starting a new business or continuing an already existing one. This distinction is quite interesting, since policies have to be different if we want to foster the expansion of the entrepreneurial network or to keep the already existing one. They study the specific features which favour one or the other way of accessing and conclude that those people with a higher educational level and richness choose to access to entrepreneurial network through the first mechanism, that is, to start a new business, whereas based on the previous experience in managing roles, the necessary requirements to restart a business and the risk, they choose to continue with an already established business.

There are also studies in which earnings functions are analysed and conclude that formal education and qualifications increase the incomes. Van der Sluis et al. (2006)

[5] Recently, Van der Sluis and Van Praag (2006) have observed a positive influence of the general intelligence on the incomes obtained, and argue that such an influence in the labour activity performance is due mainly to the effect of intelligence on the acquisition of knowledge applicable in the working centre and in the reaction in complex situations. With regard to the specific abilities and capacities, they observed that both technical capability and managing capability have a deep, positive effect on the entrepreneurial results, whereas the effect of social capabilities is positively significant, but smaller.

[6] Reader will have notice the conscious omission of the impact of education on the entrepreneurial spirit. We think it is advisable to distinguish between the possession of knowledge about entrepreneurial techniques and abilities from the transfer, through formal education, of a social image of the entrepreneurial activity as positive model encouraging this way the enterprising spirit. We are interested in capturing, among other things, the role played by the educational system on the acquisition of abilities and capacities that allow to capture profit opportunities, not as a mechanism through which modifying attitudes towards risk. This last guideline is explicitly included in the Action Plan of the European Union.

study the human capital performance, particularly formal education influence, both for entrepreneurs and employees. They find the education performance is higher for entrepreneurs than for employees. This could be due to the smaller number of organizational limitations which the entrepreneurs face to when optimising the more profitable use of their education with regard to those of the employees. Firms provide with better chances of optimising the education of the individuals and their corresponding performance, so those entrepreneurs with higher educational levels are related to better entrepreneurial results in terms of benefits, incomes, growth and survival.

On the other hand, Bhattacharjee et al. (2006) show that the impact of education in the survival of new businesses is greater for firms created by individuals which have had a previous labour experience on their preferred activity branch, whereas it is limited for others. To constitute a firm may constitute a way of continuing working in the preferred activity sector, avoiding in this way the depreciation of human capital, which can be observed on those who are unemployed or working in a different sector not related to their abilities.

12.2.2 Other Entrepreneurial Human Capital Acquisition Mechanisms

If we have already stated that it is difficult to create indicators to measure the output of entrepreneurial human capital resulting from the investment process on education, it is even more complex to find indicators to capture other ways of acquisition. Thus, to measure the accumulation of entrepreneurial human capital not resulting from a voluntary decision, such as the one resulting from the learning by doing[7] or from intergenerational transfers of entrepreneurial knowledge, we will have to use different proxies derived from population surveys exploitations, where with different accuracy we can use data related to labour history of the individuals or even to indicators elaborated from the analysis of social and labour features of the ancestors. In this sense, the previous experience in the activity sector by the individuals changing to self-employment or the fact of having had previous experiences in this field are commonly used indicators trying to capture the concept of "learning by doing", whereas the data related to educational levels or professional situation of the ancestors or relatives have been used as proxies for the entrepreneurial human capital acquired through intergenerational transfers.

In this sense, experience, for instance, has been used to be proxied by a variable constructed as current age minus school-leaving age. This is an imperfect measurement since it takes no account of breaks from labor force participation in individuals' work histories. On the other hand, the previous experiences to self-employment,

[7] Perhaps we could also include here the concept of "learning by exporting" coined by Grossman and Helpman (1991).

or the experience of ancestors and relatives in self-employment have also been used to capture, to some extent, this type of mechanisms.

To act systematically, a good strategy to approach to the dimensions and aspects being measured and also to the essays of measurement of this type of human capital, may be through the review of the essays of measurement of entrepreneurial human capital and their accumulation processes, in the empirical analysis of self-employment.

12.3 Measurement Approaches and Results

As we have stated, the main problem this empirical literature faces to is how to approximate to different human capital variables with the available information. We have discussed, as starting point, about the concept and the dimensions considered in order to maintain (from different perspectives and depending on its origin) the entrepreneurial human capital stock and its sources, using the available statistical sources and indicators

The primary statistical sources to extract indicators on entrepreneurial human capital endowments are Human Population Surveys. In fact, Labour Force Surveys or households panels usually include some variables about educational attainment, the type of studies completed and the labour history of the individuals and their parents.

Making an abstraction of the precision of this type of indicators in our attempt to measure the entrepreneurial human capital, these indicators have been used to analyse the role of education from four types of studies: these indicators has been used to analyse the role of education in the decision to change to self-employment, in the analysis of the duration into self-employment, and in the study of education returns in self-employment. Although, more relatively poor, there are some essays devoted to the analysis of the contribution of entrepreneurship education to economy growth, from a macroeconometric approach, using aggregate data.

Our goal is to study in depth the exact role played by the entrepreneurial human capital, using the available indicators, both in the decision to change to self-employment and in its role for success, using alternative proxies to detect the accuracy of the results in relation to the proxies used.

To undertake this task, and from a microeconometric approach, using microdata from population surveys, we present some new evidences about the role of the formal education, the experience (training or learning by doing, proxied through previous experience or even by the duration in employment), and the role of intergenerational transfers of entrepreneurial abilities on the probability to change to self-employment and on the probability of survival in self-employment.

These exercises are designed with a double aim: first of all, as an optimum presentation strategy of the common problems which have to be faced to by this type of estimations due to the use of the proxies already mentioned to capture the human capital and to have an idea of the accuracy of the results in relation to the proxy used.

Specifically, we are interested in knowing the effect of the selection bias (abilities: innate or acquired), in discussing about the relevancy of the variables, which try to capture the entrepreneurial human capital, at least in four directions: i) first of all, because in the best case, the use of these proxies would allow us to capture the formal education effects; ii) knowing if all acquired knowledge is equally effective to develop the entrepreneurial function; iii) what is the role of study sector interacting with educational level?, and finally; iv) if educational levels cross country are comparables.

In previous literature, the effect of entrepreneurial human capital has been tested at least from four perspectives or approaches. First, there are studies that explore the effects of different human capital proxies (age, experience, level or type of education, or parental status as proxy of the intergenerational transfer of entrepreneurial abilities) on the probability of being or becoming self-employed. These are self-employment selection models. Second, there are papers that are also interested in the effects of those human capital variables in the duration on the self-employment. Other studies are focused on the returns of these variables. These are works on self-employment earnings functions. Finally, there are a more scarce literature exploring the relationship between economy growth and different mechanisms of the entrepreneurial human capital accumulation process. Taking into account our main aim, we will be focused on the first two approaches.

As we have mentioned above, the main problem this empirical literature faces to is how to approximate the different human capital variables with the available information. In this sense, experience, for instance, is used to be proxied by a variable constructed as current age minus school-leaving age. This is an imperfect measurement, since it takes no account for breaks from labour force participation in individuals' labour histories. Education is usually measured either as years of education completed or as a set of dummy variables for specific qualifications. Neither of these proxies is perfect.

Using different proxies and different econometric specifications, as well as different data sources may explain the divergent results in this empirical literature. In this section, we review the main results obtained, and we present some new evidences, designed in order to prove some difficulties associated to the proxy or even to the sample used. We start with the effects of age, experience and education in self-employment selection and duration models, and finally we review the intergenerational transfer effects.

12.3.1 Entrepreneurial Human Capital as Necessary Condition to Become Entrepreneur: The Role of Formal Education

It is a common feature for first empirical jobs, in which the determinants of the transition to self-employment are analysed, the attempt to check the hypothesis that sets that older workers or those with greater previous experience have accumulated entrepreneurial abilities and business relationships and, therefore, the age

or experience should increase the probability of becoming an entrepreneur. The essays of Evans and Leighton (1989a), Blanchflower and Meyer (1994), Schuetze (2000), Clark and Drinkwater (1998), Rees and Shah (1986), Fujii and Hawley (1991), Robinson and Sexton (1994), Bates (1995), Boden (1996), Blanchflower (2000), Flota and Mora (2001), Lofstrom (2002), Clark, Drinkwater and Leslie (1998), and Moore and Mueller (2002), among others, find evidences that show the existence of a positive relation between the age and the probability of being an entrepreneur, though we will have to admit that the proximity between the indicator and the dimension to be measured is not too satisfactory.

Evans and Leighton (1989a) performed a logit analysis for USA using separate estimations for white men and white women. In both cases, the effect of age (measured as age, age squared and age cube in the men estimation, and as a set of dummy variables for each of eight age categories in the women case) on the probability of being self-employed is significant and positive, so age is considered a strong determinant of the self-employment rate. Also in both cases, the frequency of self-employment increases with the amount of education, measured as the proportion of each age cohort which had attained the following educational levels: less than high-school, high-school, less than college, college and graduate school. The results of this essay fit with those expected. Since it might be the case that older workers have accumulated entrepreneurial abilities, savings and business links making them more likely to be self-employed, it might be expected that older and more experienced people become entrepreneurs. Also it may be expected that higher levels of education promote entrepreneurship because people with higher education are better informed about business opportunities. In that sense, there are several essays that report the same findings. Also for USA, Blanchflower and Meyer (1994), using the US Survey of Income and Program Participation conducted by the US Bureau of the Census of the period 1983-1986, and with education proxied by years of schooling and Scheutze (2000), making use of US Current Population Surveys for the period 1983-1994, obtain the same results. The first essay also analyses duration and they found that older entrepreneurs are significantly more likely to succeed. The same results for UK are reported by Clark and Drinkwater (1998) with data from the General Household Survey from 1973 to 1995 and from the 1991 Census Sample of Anonymised Records.[8]

Despite these results being reasonable and expected, there are studies in which the results are different from those. There are works that report no significant age effects, but positive educational effects on the probability of being self-employed. This is the case of Evans and Leighton (1989b), who performed an analysis for USA with data of the National Longitudinal Survey for 1966-1981 and the Current Population Surveys for 1968-1987. They found that the probability to change to self- employment is roughly independent of age; that the years of wage experience

[8] Rees and Shah (1986), Fujii and Hawley (1991), Robison and Sexton (1994), Bates (1995), Boden (1996), Blanchflower (2000), Flota and Mora (2001), Lofstrom (2002), and Moore and Mueller (2002) are other essays with similar results.

are neither statistically nor substantively significant, but the probability of access is higher for individuals who have had prior self-employment experience; and that the relationship between educational attainment (years of education) and the probability of being or becoming self-employed is positive. Finally, they found that the probability of leaving self-employment decreases with duration in self-employment.

However, essays with the opposite results are more frequent. Blanchflower and Meyer (1994) use Australian Longitudinal Survey of 1985–1988 and report no education effects and non linear relationship between age and the probability of self-employment. In relation to duration, they found that unlike for the USA, in Australia, the probability of moving out of self-employment is not higher the younger the individual is. Those with lower levels of education and some of the most qualified were especially likely to leave self-employment. Taylor (1996) for UK uses the first wave of a large scale British panel data set, the British Household Panel Study and reports a clear relationship between age (age and age squared) and the probability of being self-employed, whereas education (degree, other higher qualification, A levels, O levels, other qualifications) plays a little role. Schuetze (2000) with data from the Canadian Surveys of Consumer Finances for 1983–1994 explains significant and positive relationship of age and self-employment and unlike what is typically found, the higher education had almost no effect on the probability of being self-employment for Canadian men. For UK, Clark and Drinkwater (2002) using the Fourth National Survey of Ethnic Minorities (199–1994), and the 1991 Census Sample of Anonymous Records obtain that for men and women, self-employment tendency increases with age, but a diminishing rate: But education (degree, vocational qualification, A levels, O levels, apprenticeship and no stated qualifications) is not a strong determinant of self-employment status. In this essay, education level is a much stronger predictor of whether an individual is in paid-employment versus unemployment, with those with higher qualifications more likely to be employeed.[9]

And also, there are studies with positive age effects and negative education effects. Clark, Drinkwater and Leslie (1998) used pooled years of the General Household Survey over the period 1973–1995 to study human capital earnings functions for the self-employed people. They found that regardless the ethnicity, older people and those without formal qualifications are more likely to be found in self-employment. Blanchflower, Oswald and Stutzer (2001) used International Social Survey Program data set for 1997–1998 for 23 nations, and reported that the probability of being self-employed is strongly increasing in age, whereas this probability is lower among high education educated workers.

All the above analysis has a common starting point. In all of them, and not taking into account the proxy used, the estimation strategy goes through the specification of discrete choice models, in which the probability of changing to self-employment -regardless the initial state considered- depends on a set of individual and economic environment characteristics, whose relationships derive from the traditional problem

[9] Other studies with the same type of results are Schiller and Crewson (1997) for USA and Maxim (1992) for Canada.

of occupation choice. However, in most of the referenced works, and in many cases due to the limitations imposed by the data base used, these models are estimated without bearing on mind that the factors, and even the way these determine the decision of changing to self-employment, may vary according to the initial state. In the same way, most of these essays do not consider the existence of variants between the different types of self-employment.

Focusing on the effects this estimation strategy could have on the significance, and even the sign of the proxies used to measure the effect of education on the decision of becoming an entrepreneur, in the table below we can see the result of estimations of the probability to change from paid-employment to the different types of self-employment using the 8 waves of the PHOGHE for the 15 countries of the EU in 1994–2001, showing some of the proxies traditionally used to capture the effect of the entrepreneurial human capital on the probability to change to self-employment. In this Table 12.1, from which we have excluded (to be clear enough) those explicative non-educational variables, we have evidences supporting the idea that there is a greater probability to change, whatever the type of self-employment considered as final state, among those who own a higher education. This probability is measured based on the level of the studies completed.

On the other hand, Table 12.2 above shows the effects of these same variables, but focusing now on the change from unemployment. As in the previous case, we find evidences about the existence of a strong positive effect of the education level on the change to self-employment.

However, the results obtained are conditioned by at least the following elements: i) we have to add the difficulties implied by the characteristics of our sample, including individuals from 15 countries with different educational systems, to the elements which limit the accuracy of the level of studies completed as a proxy of the stock of entrepreneurial human capital; ii) the results seem to indicate that the consideration of a single final state may affect the significance and magnitude of the effects.

Table 12.1 Effects of Education on the Change from Paid-employment to Self-employment

Final State	Self-employed	Employer	Own-account worker
Transition	Prob [SE t | PW t-1]	Prob [EMP t | PW t-1]	Prob [OA t | PW t-1]
Number of transfers	2931	1778	1153
	–8,0571	–9,8283	–7,3464
Constant	(–20,52)	(–19,22)	(–12,29)
Self-employed	0,4909	0,4909	0,3569
relatives	(8,89)	(8,36)	(3,94)
Secondary educa-	0,1054	0,1451	0,0692
tion (2)	(2,1)	(2,27)	(0,88)
University studies	0,4508	0,586	0,2704
(2)	(8,07)	(8,08)	(3,22)

Reference categories: (1) Non-cohabiting individuals, (2) No education or primary education, (3) Public sector, (4) Industrial sector, (5) Large or very large firm (>49 employees), (6) Non-indefinite contract, (7) Spain

Table 12.2 Effects of Education on the Change from Unemployment to Self-employment

Final State	Self-employed	Employer	Own-account worker
Transition	Prob [SE t | PW t-1]	Prob [EMP t | PW t-1]	Prob [OA t | PW t-1]
Number of transfers	836	342	494
Constant	–4,5783	–4,9024	–5,6494
	(–6,51)	(–4,42)	(–6,48)
Age	0,0957	0,0345	0,1391
	(2,99)	(0,72)	(3,43)
Age*Age	–0,0016	–0,001	–0,0021
	(–3,93)	(–1,62)	(–3,96)
Self-employed relatives	0,6983	0,6216	0,7528
	(6,93)	(4,1)	(6,11)
Secondary education (2)	0,4824	0,5365	0,4558
	(5,37)	(3,99)	(4,01)
University studies (2)	0,9613	1,1924	0,8373
	(8,57)	(6,92)	(6,07)

(1) Non-cohabiting individuals, (2) No education or primary education, (3) Spain

12.3.2 The Type of Study and the Intergenerational Transfer of Entrepreneurial Human Capital

It is an accepted stylised fact that workers who have self-employed parents are more likely to be self-employed than those who do not.[10] From this finding, they conclude that the transfer of human capital is the important channel to explain the intergenerational correlation of self-employment status.

Dunn and Holtz-Eakin (2000) undertake a study for USA with National Longitudinal Surveys of Labour Market Experience. They report no significant effects of age on self-employment, and also, no significant effects of education (considered as various educational levels: less than high school, high school, some college, college graduate and post college) in self-employment. Nevertheless, they found strong correlation (positive effect) of self-employment experience of the parents and the probability of being self-employed. Parents' self-employment experience has a very large and significant effect, just about doubling the probability of the son accessing to self-employment. Fathers have a strong influence and mothers have a weak and insignificant influence on son's self-employment. Having two self-employed parents have the strongest effect. The mother's effect is strongest for daughters,

[10] Some studies follow the same line. Thus, among the participants in the Eurobarometer, the children of the own-account workers were more prone to work by their own account than those of the employees, whereas the Global Monitoring Entrepreneurship reveals that those individuals trusting on their competencies and experience have a probability of creating a new company or manage it, which is two to seven times higher and, in the case of those who know someone who have created an enterprise recently, the probability is approx. three to four times higher. The British Household Survey shows a higher probability of seriously consider the creation of a business among those people who have been previously in contact with the entrepreneurial initiative (through friends, family or education).

although father's effect and the "both" effect are also strong and significant. The interpretation might be that entrepreneurial tastes or abilities are also transferred more strongly from parents to children of the same gender. They also report that the sons of more successful entrepreneurs are more likely to access self-employment than sons of less successful entrepreneurs.[11]

Although in the estimation presented for transfers to self-employment in Europe, and using the existence of self-employed relatives as a proxy of this mechanism of human capital accumulation, we have showed evidences of a strong and positive effect on the probability to change to the self-employment, we can try to search the use of more accurate proxies using an alternative sample.

Thus, Table 12.3 shows the results of the estimation of a probit, in which the probability to become an entrepreneur depends on a set of individual features and on a series of economic environment variables. The exercise, undertaken with the microdata of the second quarter in 2000 of the Spanish Labour Force Survey, will allow us to try a series of alternative proxies[12], since for interviewed people it is possible to know a set of additional socio-educational characteristics and, at the same time, to count with information about educational levels and professional status of the parents, regardless they are in the sample or not.

Although the use of this sample have the inconveniences of not allowing us the use of income proxies, of not observing transfers, but self-employed individuals and in spite of being limited to people between 16 and 35 years old, the estimation with this sample allow us to test other proxies and, at the same time, to check once

Table 12.3 Participation probit (EPA, II/2000)

Final State	Self-employment		Employer		.Own-account	
Human capital proxy	Coef.	p-value	Coef.	p-value	Coef.	p-value
Age	0,1916	0,000	0,1910	0,000	0,2006	0,000
Age2	–0,0020	0,000	–0,0020	0,000	–0,0018	0,012
Experience	0,0121	0,000	0,0110	0,000	0,0170	0,084
Experience2	0,0000	0,000	–0,0000	0,000	–0,0000	0,000
Secondary School	0,0092	0,922	–0,0493	0,626	0,2703	0,195
Higher School	–0,5568	0,000	–0,5432	0,000	–0,6436	0,029
Engineers and BusinessAdministration	0,2869	0,164	0,1761	0,457	0,6095	0,000
Lawyer, architects	–1,4160	0,012	–1,227	0,003	–22,50	0,118
Parents Higher School	0,1727	0,002	0,0503	0,564	0,6940	0,001
Father self-employed	0,1419	0,039	0,1963	0,009	–0,1054	0,500
Mother self-employed	0,1163	0,012	0,0215	0,797	0,5185	0,000

[11] Also, Laband and Lentz (1983) and Evans and Leighton (1989b) for USA, and Taylor (1996) for UK report positive and significant effects of having a self-employed parent on the probability of being self-employed.

[12] The choice of this period is due to the fact that in this period, together with the variables considered in each period, an additional module is added, consisting of all those individuals that in the referenced period leaved their studies for the first time. They are individuals with ages between 16 and 35 years old, who have leaved or interrupted their studies during more than one year.

more the effects of experience and level of studies on the probability to become self-employed.

The backward elements used in our estimation of a probit of participation in the self-employment involve variables included in the Spanish Force Survey about the level of studies completed and the type of studies and, at the same time, we incorporate both dummies to collect the effect of education and the type of occupation of the parents on the children's occupation choice.

From the results obtained, and together with the positive effect of the previous experience, it seems a bit surprising the lack of significance of the dummy of secondary education and the negative effect of the completion of a higher education. It seems that, among those who access for the first time to the labour market upon completing their studies, the level of studies allow them to issue a signal, which makes easier the receipt of paid-employment offers and decreases the choice of self-employment as occupation.

The second hypothesis we would like to check is if those types of studies more related to the learning of entrepreneurial abilities (mainly technical studies and business administration studies) foster the choice of self-employment as occupation among those who abandon studies for the first time. Although the result is not significant for all self-employed people, it seems to be a clearly positive effect of the bachelors in Engineering and those in Business Administration on the chance of becoming employer with employees, being this an effect not observed neither for lawyers nor architects. However, this last type of study seems to be positively related to the chance of becoming an own-account worker.

Finally, and according to the analysis of the mechanisms of knowledge intergenerational transfers, the educational level of the parents, and specially those having parents who are self-employed, seems to have a positive effect on the probability to become also self-employed.

12.3.3 Entrepreneurial Human Capital in Duration Models

However, most empirical studies have focused on the decision to access to self-employment. These essays contribute to detect and explain the variables, which make an individual to make the decision of accessing to self-employment, but not necessarily the variables which make an individual to be successful in self-employment. One clear trend in the literature analyses the determinants of firm's survival (see, for example, Segarra and Callejón (1999), Esteve, Sanchis and Sanchis (2004a, 2004b), Esteve and Máñez (2004) Esteve et al. (2005) for Spain, and Jorgensen (2005), for Denmark).

However, to the best of our knowledge, just a few exceptions have been working in order to explore the determinants of the individual success within self-employment measured in terms of survival on this state. The essays of Evans and Leighton (1989), Bates (1990), Holtz-Eakin et al. (1994), Holmes and Schmitz (1996), Taylor (1999), for the UK, Carrasco (1999), for Spain, Johansson (2000),

for Finland, or Falter (2002), for Switzerland, or Reize (2004), for Germany, can be considered as examples in which the duration in self-employment can be considered as an indicator to measure success.

The starting point of this type of works is the analysis of the duration in self-employment. Let T, the number of years the individual is self-employed. The distribution of this variable can be characterized by means of the following hazard function or exit rate:

$$\varphi(t) = P(T = t \setminus T \geq t) \tag{12.1}$$

where, $\varphi(t)$ is the probability of being self-employed, for exactly t years relative to the group of individuals who have been self-employed for at least t years (given survival up until time t).

In this line, by using a panel data sample from the European Community Household Panel (ECHP, EU-15) for the period 1994–2001, we estimate some single and competing risk duration models, to study the underlying determinants of self-employment success, measured in terms of survival on this state. In general our results support the fact that formal education is positively associated with the probability to survive in self-employment. We interpret this result as an indicative of how education enhances an individual's human capital and enable the discovery and exploitation of more efficiently business opportunities. The probability to survive in self-employment, *conditional on not having left self-employment before 1994* increases with duration in self-employment (decreasing hazard rate), for employers (vs. own-account workers, perhaps due to the existence of higher exit costs), for individuals endowed with higher education levels (vs. medium, basic and no education), and with previous experience in self-employment.

12.4 Conclusions

To summarize, we can observe that empirical literature on entrepreneurial human capital has different results, either in models of self-employment choice and duration or in earnings functions models. That is, the results are highly weak and sensitive to changes in the proxies used to approximate the different variables, in the econometric specifications and in the samples used.

The use of different proxies and different econometric specifications, as well as the different data sources, may explain the divergent results in this empirical literature.

Perhaps, inverse results are conditioned by problems associated to samples. Estimations include only transfers within a small period and we consider only new entrepreneurs characteristics.

In any case, we can infer from our study that it is required studying in depth the development of proxies, which allow to capture the entrepreneurial human capital and its accumulation processes. In this sense, import and adaptation of the measurement methods of the human capital reveal as an appropriate strategy. Thus,

the problems which measurement of human capital must face to are shared by the measurement of this specific type of human capital. The use of self-employment data, by education level, by sector of study, or by experience, can be a first strategic approach to the entrepreneurial human capital measurement. However, in order to move forward in the international analysis and comparisons, we must to progress in the development of international quality Education Surveys, emphasizing on entrepreneurial abilities, and on the field of comparable international series.

We have also to progress in the definition of those types of studies and abilities which we consider specifically related to the performance of the entrepreneurial role and also in how to measure the entrepreneurial capital, not only for self-employed, but for any individual.

Finally, once this measurement is achieved, we would need to focus on the analysis of the matching between the entrepreneurial human capital and professional human capital, that is, between the adequacy of the type of human capital requested to employees by the entrepreneurial network of a specific sector.

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