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March 2016 - WP 2016-04

Working Paper

UNIVERSITÉ CAEN NORMANDIE

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Going into Business and Out of Business: The Role of Human Capital *

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February 2016

Abstract

An evaluation of the impact of an entrepreneur's human capital on her/his entrepreneurial ability is likely to suffer from a sample selection bias if performed on a sample of new entrepreneurs alone. Our theoretical model of entrepreneurial choice allows us to characterize this bias. It is shown to be positive (respectively negative) for individuals who were in a favorable (respectively adverse) situation in the labor market at the time at which they decided to become self-employed. Our empirical application measures the impact of the entrepreneur's education on the newly created firm's survival. It is found to be strong and significant for individuals who were previously employed in the new firm's branch of activity, whereas it is at best weakly significant for individuals who were previously unemployed or employed in a branch different from that of the new firm, so that they are more likely to have been poorly matched. These results suggest a very substantial sample selection bias in our sample.

Keywords: entrepreneurial ability, labor market, human capital, firm survival.

JEL Classification: L26, C41, J24.

*We should like to thank Robert Chirinko, Dietmar Harhoff as well as participants in the third IIOC conference Atlanta, April 2005, the CESIfo Area Conference on Applied Microeconomics, Munich March 2006, and seminar participants at the Université de Caen, CERGE EI, Université de Grenoble, Université du Maine, University of Verone, University of Melbourne, Australian National University and University of St-Andrews for helpful comments and suggestions. The fourth author thanks IUF for financial support.

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1 Introduction

To what extent does human capital constitute a key determinant of entrepreneurial ability? Such an ability is typically unobservable and can only be indirectly measured by observing the performance of newly created firms. As discussed below, there is for instance a literature on the impact of human capital on firm survival. However, entrepreneurial ability and human capital are also central in determining an individual's choice of going into business. Indeed, a higher human capital induces a higher opportunity cost of entrepreneurship because it means a higher expected income in a wage position. On the other hand, a higher entrepreneurial ability affords more favorable prospects associated with entrepreneurship. These roles of human capital and entrepreneurial ability in the entrepreneurial choice are likely to create some spurious correlation between the two variables, when focusing on a population of entrepreneurs. This paper characterizes this correlation using a simple entrepreneurial choice model. In particular, it is shown that it has very different implications depending on whether the entrepreneur's initial situation in the labor market when going into business was favorable or not. These results are then used to provide an interpretation of an empirical investigation of the impact of an entrepreneur's education on the new firm's survival depending on the entrepreneur's previous situation in the labor market.

The main argument underpinning our theoretical analysis is that the increase in the opportunity cost of entrepreneurship associated with a higher human capital varies depending on the labor market situation. When the individual is unemployed or poorly matched with her/his salaried position, the benefit of a higher human capital in terms of higher wages is likely to be smaller than for an individual holding a wage position to which s(he) is well matched. Hence, the opportunity cost is strongly correlated with human capital only in the latter case. For a well matched individual, the choice of self-employment constitutes a much more favorable signal about his/her entrepreneurial ability, if her/his human capital is high:

this is because s(he) must have some very favorable prospects as an entrepreneur in order to overcome her/his high opportunity cost (Gimeno et al., 1997). As a result, the positive correlation between human capital and opportunity cost translates into a positive correlation between human capital and entrepreneurial ability. This in turn creates an upward bias, when evaluating the impact of human capital on firm survival. For other entrepreneurs (either unemployed or badly matched), the correlation between human capital and the opportunity cost is at best weakly positive and therefore, we should not expect too much of an upward bias when measuring how new firms' survival is affected by human capital.

The above discussion emphasizes a potential positive correlation between human capital and entrepreneurial ability, which is most salient for entrepreneurs whose initial labor market situation was favorable. However, for those whose initial labor market situation was unfavorable, there is a potential for a negative correlation. This is because, when facing adverse labor market circumstances, an individual may expect that his/her human capital depreciates after some time. This concern is all the more acute that human capital is high. As a result, a higher human capital may be associated with a lower opportunity cost of entrepreneurship. If such a negative relationship arises, then the measure of the impact of human capital on firm survival will suffer from a downward bias.

When dealing with a population that exclusively comprises new entrepreneurs, comparing sub-populations for whom the opportunity costs is affected differently by human capital provides an indirect measure of the bias. This can be done by controlling for the previous situation of the individual in the labor market. It is however not possible to separably identify the positive bias for those who started off with a favorable situation in the labor market and the negative bias for those with an adverse original situation. Rather, a difference in the impact of human capital on new firms' survival across more or less favorable labor market initial situations only reflects the sum of these two biases in absolute value.

We propose a simple theoretical model of self employment to characterize the nature of

the bias introduced in the evaluation of the correlation between human capital and entrepreneurial ability by considering only entrepreneurs. We consider an individual who balances the opportunity cost of entrepreneurship, which depends on human capital, with the prospects from starting a new business, which depend on his/her entrepreneurial ability. Entrepreneurial ability is a key concept in many theories of occupational choice in the wake of Lucas (1978)[1]. In these papers entrepreneurial ability is not explicitly defined, but it encompasses all the qualities that can make a firm successful. By introducing a potential correlation between entrepreneurial ability and human capital, we highlight the possibility that such an ability may have some value in the labor market[2]. We assume some true correlation measured by the impact of human capital on the probability that entrepreneurial ability is high. We study how the probability of a high entrepreneurial ability, conditional on having chosen entrepreneurship, depends on the entrepreneur's human capital. We compare this relation to the true impact in order to characterize the bias. We find that this bias is strictly positive for individuals with a good labor market outcome prior to entrepreneurship because their opportunity cost increases with their human capital. By contrast, for those whose previous labor market outcome was bad, so that their human capital has at best a small positive impact and, possibly, a negative impact on their opportunity cost, the bias is smaller and may be negative.

In our empirical analysis we use a survey of French firms that were created in 1994 for which we have survival data up to the end of 1997. We also have information about the prior employment status of the entrepreneur as well as whether he/she previously worked within the branch of activity of the new business. The latter information allows us to consider four initial states: unemployed for less than a year, unemployed for more than a year, employed

[1] e.g. Kanbur, 1979, Jovanovic, 1982, Evans and Jovanovic, 1989, Fonseca and al., 2001, Astebro and Berhnardt, 2005, Cagetti and De Nardi, 2006.

[2] By contrast, in previous theoretical analysis, entrepreneurial ability is viewed as some specific human capital, which cannot be traded in the labor market.

without experience in the new firm's branch and employed with some experience in the new firm's branch. Presumably, only the last group may be considered as benefiting from a favorable labor market outcome before going into self employment. In particular, those who had a job but choose to switch to a different branch of activity when they started a business are likely to have been poorly matched in their previous occupation. We perform probit regressions as well as duration analysis on the firm's survival to obtain an indirect measure of the extent to which human capital enhances entrepreneurial ability. We find that a higher education of the entrepreneur enhances survival very significantly for those employed with prior experience in the new firm's branch of activity, whereas it has at best a limited impact on survival for the other three subpopulations: this impact is positive only for long-term unemployed individuals but with limited statistical significance. From our theoretical analysis, these results suggest that there is a positive bias in the measure of the impact of education on survival only for those entrepreneurs who benefited from a favorable labor market situation when they started their business. Furthermore, either the positive contribution of education to survival should be entirely attributed to this bias, or the estimated impact of education on survival for entrepreneurs with unfavorable initial labor market situations, which is by and large insignificant, is biased downwards.

Existing evidence on the impact of human capital on entrepreneurial success is somewhat mixed. Even if it is usually found that a higher human capital of the entrepreneur results in better performances for the new firm (e.g. Bruederl et al., 1992, Cooper et al., 1994, Bates, 1990, 2005, Parker and van Praag, 2006), Unger et al. (2011), in a meta-analysis of human capital and entrepreneurial success, find "a significant but small relationship between human capital and success". They highlight the importance of contextual circumstances under which human capital is more or less critical. For instance, it is more relevant for young firms because they are more likely to face new business opportunities or challenges while older firms can more easily rely on "routine" management practices. Other authors find

that owners with a high human capital are more likely to discontinue their business because highly educated individuals have better opportunities in the labor market (Gimeno et al., 1997). Our empirical approach is somewhat consistent with some recent studies that also account for the potential bias introduced by the entrepreneurial motives in the evaluation of the impact of human capital on entrepreneurial performance. Fossen and Butner (2013) stress the importance of taking into account the necessity/opportunity motives for going into business when evaluating the returns to education in entrepreneurship. Baptista et al. (2014) find that, for unemployment-driven entrepreneurs, various forms of entrepreneurial human capital (work experience, industry experience and managerial experience) have no significant effect on early survival, although they do find some role for the level of education. Montgomery et al. (2005) use a sample comprising entrepreneurs as well as non entrepreneurs in a population of unemployed people to perform a joint estimation of the impact of human capital on entrepreneurial choice and performance. More education significantly increases the probability of attempting a start-up but significantly decreases the probability of succeeding.

As in Baptista et al. (2014) we use a sample entirely comprised of entrepreneurs and contrast the impact of education on entrepreneurial success depending on the prior labor market circumstances of the new entrepreneur. Our theoretical analysis allows us to characterize the exact nature of the bias induced by the entrepreneur's initial motivation to become self-employed.

The paper is organized as follows. Section 2 is devoted to the theoretical analysis of entrepreneurship as a signal of the entrepreneur's ability. The empirical application is presented in Section 3: probits on survival are discussed in Section 3.2 and duration analysis is developed in Sections 3.3 and 3.4. Finally Section 4 concludes.

2 A simple model of Entrepreneurial choice with labor market imperfections

2.1 Entrepreneurial choice and labor market inefficiencies

Consider an individual whose entrepreneurial ability, denoted V, is either high or low, $V \in \{H, L\}$, $H > L$. The individual knows V when deciding whether or not to become an entrepreneur. Let k be some measure of the individual's human capital. To capture the possible impact of human capital k on the distribution of the entrepreneurial ability V, assume that the probability that $V = H$ is given by $\mu(k) \in (0, 1)$. The probability $\mu(k)$ should be interpreted as the prior assigned to a high entrepreneurial ability when observing a person with human capital k. .

Beyond entrepreneurial ability, V is meant to capture all factors that the individual is aware of at the time of going into business that will affect the longevity of the new firm. It includes factors mentioned in the introduction such as a low risk aversion or any psychological trait that makes entrepreneurship more attractive. All such factors along with entrepreneurial ability will induce the entrepreneur to stay in business longer, either because the business is more likely to be successful or because entrepreneurship remains attractive despite some adverse financial circumstances. These determinants of the firm's survival obviously also positively affect the value of going into business in the first place. This value however may be affected by various other factors that are not directly related to the new firm's longevity. To account for such factors let the value associated with creating a new business be given by $V + \nu$, where ν is a random variable distributed independently from V, which the agent observes perfectly. This random term reflects any factor that affects the value of the new business at the start, but has no impact on survival. It could be some temporary luck in gathering appropriate financing or an initial consumer base to get the new firm off the ground. It could also be some passing optimism that entices the individual into

entrepreneurship. The cumulative distribution function and density of ν are denoted by F and f respectively. The distribution of ν is assumed to satisfy the increasing hazard rate property, which holds for most common distribution functions.

When deciding on whether or not to go into self employment, the individual may be in one of two states. Either s(he) is in an unfavorable initial state (state 0) that could be unemployment or a salaried position with a bad match, or s(he) is in a favorable state (state 1) that is a salaried position to which s(he) is well matched. Though the latter position is clearly preferable to the former, the agent may be unable to reach it immediately because of frictions in the labor market.

The current labor market situation (state 0 or 1) obviously affects the expected value of renouncing to becoming an entrepreneur right away. It may also possibly impact the value of returning to the labor market after a period of entrepreneurship. Both these values are affected by human capital as measured by k. Although entrepreneurial ability might also affect the value of the individual in the labor market, we assume that such ability is better rewarded by starting one's own business. This could be for instance because they are not perfectly observed by potential employers. Then V should be viewed as the additional reward afforded by entrepreneurship over what the labor market would yield. Let $Y_i(k)$ be the expected benefits from staying in state i, $i \in \{0, 1\}$ rather than starting a business right away, and $Z_i(k)$, the discounted expected value of returning to the labor market after a period of entrepreneurship. Both Y_i and Z_i are assumed to be increasing in k.

Entrepreneurship is then chosen if

$$V + \nu + Z_i(k) \geq Y_i(k) \tag{1}$$

or

$$V + \nu \geq Y_i(k) - Z_i(k) \equiv W_i(k).$$

We assume, as seems natural, that $Y_1(k) > Y_0(k)$ and that this difference become wider for

a higher human capital, because the impact of human capital on the labor market outcome is stronger if the individual faces favorable circumstances. The difference $Z_1(k) - Z_0(k)$ might also be positive but this difference is presumable much smaller than $Y_1(k) - Y_0(k)$. Indeed, the current state in the labor market should be much more relevant to the immediate value of being in the labor market than to the discounted value of returning to the labor market after a period of entrepreneurship. We therefore assume that $W_1(k) > W_0(k)$.

Because Y_i and Z_i are both increasing in human capital, it is *a priori* unclear whether W_i is increasing or decreasing in k. Because Z_i is a discounted value, it is natural to expect that the positive impact of human capital is stronger on Y_i than on Z_i. Yet, in the unfavorable state 0, the agent's human capital might depreciate. The negative impact of depreciation should be interpreted as resulting from the difference between the earnings that the agent will obtain in the future if s(he) does not start a business today, and the earnings s(he) will obtain returning to salaried employment after having been self-employed (having thus avoided depreciation). It is well documented that a substantial proportion of entrepreneurs return to a wage position. Evans and Leighton (1989) find that half of a cohort of entrepreneurs have returned to wage employment after seven years. If depreciation is a sufficiently significant phenomenon, it could result in an impact of k on post entrepreneurship labor market utility Z_0, which is stronger than the impact of k on the labor market utility if no business is started right away, Y_0: that is we may have $Z_0'(k) > Y_0'(k)$ implying that $W_0'(k) < 0$.

From the above discussion we have $W_1(k) > W_0(k)$ and $W_1'(k) > W_0'(k)$. The difference in slope is the result of the difference in the impact of human capital on earnings because the worker is most productive in state 1, but it also reflects the impact of depreciation for those who are in state 0; the higher the depreciation, the larger the difference in slope will be.

An agent in state i with entrepreneurial ability V will start a new business with proba-

bility

$$P_i(k, V) = \Pr\{\nu > W_i(k) - V\} = 1 - F[W_i(k) - V].$$

Because $H > L$ we have

$$P_i(k, H) > P_i(k, L), \tag{2}$$

for $i = 0, 1$ and for all k. Hence, individuals with a high entrepreneurial ability are more prone to entrepreneurship.

Next we use the above model to infer the individual's entrepreneurial ability from his entrepreneurial choice, conditional on his initial state being favorable or otherwise, and we study how this inference is affected by human capital k.

2.2 Impact of human capital on a new entrepreneur's inferred entrepreneurial ability

We now characterize the posterior distribution of entrepreneurial ability V as a function of the initial state and observed human capital, conditional on choosing self-employment. Because our prior assigns probability $\mu(k)$ to a high entrepreneurial ability, using Bayes' Law, the probability conditional on an individual in state i starting a new firm is

$$\mu_{e,i}(k) = \frac{\mu(k)P_i(k, H)}{\mu(k)P_i(k, H) + (1 - \mu(k))P_i(k, L)}$$

Thus $\mu_{e,i}(k) = 0$ if $\mu(k) = 0$, and $\mu_{e,i}(k) = 1$ if $\mu(k) = 1$. Entrepreneurship is a positive signal about entrepreneurial ability if and only if $\mu_{e,i}(k) > \mu(k)$, which is the case because of (2).

We now investigate how much the magnitude of the positive signal of entrepreneurial ability varies with the initial state of the entrepreneur. Simple calculations show that, $\mu_{e,1}(k) > \mu_{e,0}(k)$ if and only if

$$\frac{P_1(k, H)}{P_1(k, L)} > \frac{P_0(k, H)}{P_0(k, L)}. \tag{3}$$

The sign of the inequality (3) is *a priori* ambiguous. For a given level of actual human capital, the incentives to start a business are always higher in an unfavorable state than in a favorable state. Hence, both the numerator and the denominator in (3) are larger on the left-hand side than on the right-hand side. We now show that condition (3) follows from the increasing hazard rate property of the distribution of the random term ν.

Recall that

$$P_i(k, V) = 1 - F[(W_i(k) - V]$$

for both high and low ability individuals so that the initial state only affects these probabilities, and hence the ratio in (3) through the values $W_i(k)$. For $\mu(k) > 0$, the derivative of this ratio with respect to W_i has the sign of

$$\frac{f(W_i(k) - L)}{1 - F(W_i(k) - L)} - \frac{f(W_i(k) - H)}{1 - F(W_i(k) - H)}$$

which is strictly positive because of the monotone hazard rate assumption. Finally, since $W_1(k) > W_0(k)$, $\mu_{e,1}(k) > \mu_{e,0}(k)$ for all k. Then, we have the following proposition:

Proposition 1 *The posterior distribution of entrepreneurial ability conditional on the favorable initial state puts more weight on a high entrepreneurial ability than the posterior conditional on the unfavorable initial state:*

$$\mu_{e,1}(k) \geq \mu_{e,0}(k)$$

with a strict inequality for $\mu(k) > 0$.

Let us now consider how the distribution of actual human capital, conditional on the choice of entrepreneurship, varies with human capital k. For this purpose, we consider the derivative of the posterior probability $\mu_{e,i}$ with respect to k. It is given by

$$\mu'_{e,i}(k) = \frac{P_i(k, H)P_i(k, L)\left[\mu'(k) + \mu(k)(1 - \mu(k))\left\{\frac{\frac{\partial P_i}{\partial k}(k,H)}{P_i(k,H)} - \frac{\frac{\partial P_i}{\partial k}(k,L)}{P_i(k,L)}\right\}\right]}{[\mu(k)P_i(k, H) + (1 - \mu(k))P_i(k, L)]^2} \tag{4}$$

By the increasing hazard rate property, the term in the curly brackets in the numerator

$$\frac{\frac{\partial P_i}{\partial k}(k,H)}{P_i(k,H)} - \frac{\frac{\partial P_i}{\partial k}(k,L)}{P_i(k,L)} = W_i'(k)\left(\frac{f(W_i(k)-L)}{1-F(W_i(k)-L)} - \frac{f(W_i(k)-H)}{1-F(W_i(k)-H)}\right)$$

has the sign of $W_i'(k)$ and the term in the square brackets

$$\mu'(k) + \mu(k)(1-\mu(k))\left\{\frac{\frac{\partial P_i}{\partial k}(k,H)}{P_i(k,H)} - \frac{\frac{\partial P_i}{\partial k}(k,L)}{P_i(k,L)}\right\} \tag{5}$$

is larger than (respectively smaller than) $\mu'(k)$ if $W_i' > 0$ (respectively $W_i' < 0$).

The above analysis suggests that, if $W_i' > 0$, the impact of human capital on the probability of a high entrepreneurial ability is larger when we only consider individuals who have chosen self-employment than it is for the entire population. This difference vanishes if $W_i' = 0$ and is reversed if $W_i' < 0$. Furthermore, because $W_1' > W_0'$, we expect this impact to be weaker for new entrepreneurs starting from an unfavorable labor market situation that for those who initial labor market situation was favorable. A complete analysis however requires studying how the full derivative $\mu_{e,i}'$ differs from μ' and how it is affected by the initial state. We do this assuming that entrepreneurial ability is relatively rare in the overall population (i.e. $\mu(k)$ close to zero). [3] Formally we can establish the following result.

Proposition 2 *Assume that $\mu(k)$ is sufficiently close to zero. Then*

1. *If human capital has a positive impact on the labor market outcome ($W_i'(k) > 0$, for all k), then the impact of human capital on the likelihood of a high entrepreneurial ability is larger for entrepreneurs than for the overall population ($\mu_{e,i}'(k) > \mu'(k)$, for all k);*

2. *If the impact of human capital on the labor market outcome is strictly higher in the favorable state than in the unfavorable state and if this impact is not too large in the unfavorable state ($W_1'(k) > \tilde{W} \geq W_0'(k)$ for all k for some $\tilde{W}$ close enough to 0),*

[3] Our empirical investigation below provides some support from this assumption (see section 3.4.3).

then the impact of human capital on the likelihood of a high entrepreneurial ability is larger for entrepreneurs with a favorable initial state than for the entrepreneurs with an unfavorable initial state ($\mu'_{e,1}(k) > \mu'_{e,0}(k)$, for all k).

Proof. Given (5), to prove the result in 1 it suffices to show that for $\mu(k)$ close enough to zero,

$$\frac{P_i(k,H)P_i(k,L)}{[\mu(k)P_i(k,H) + (1-\mu(k))P_i(k,L)]^2} \tag{6}$$

is larger than 1. This is true by continuity, because the above expression evaluated at 0 is $\frac{P_i(k,H)}{P_i(k,L)} > 1$.

To prove 2, first note that equation (6) gives the derivative of $\mu_{e,i}(k)$ with respect to $\mu(k)$. Further notice that it is strictly decreasing in $\mu(k)$ so that $\mu_{e,i}(k)$ is strictly concave in $\mu(k)$. Now we have $\mu_{e,1}(k) = \mu_{e,0}(k) = 0$ if $\mu(k) = 0$ and, from Proposition 1, $\mu_{e,1}(k) > \mu_{e,0}(k)$ for $\mu(k) > 0$. This implies that for $\mu(k)$ sufficiently close to 0, the derivative of $\mu_{e,1}(k)$ with respect to $\mu(k)$ must be strictly larger than the derivative of $\mu_{e,0}(k)$ with respect to $\mu(k)$. Hence the expression in (6) is larger for $i = 1$ than for $i = 0$. Now if $W'_1 > 0$, the expression in (5) for $i = 1$ is strictly larger than $\mu'(k)$ whereas for $W'_0 \leq 0$, the expression in (5) for $i = 0$ is less than $\mu'(k)$. Combining the two arguments shows that if $W'_1 > 0$ and $W'_0 \leq 0$, then $\mu'_{e,1}(k) > \mu'_{e,0}(k)$. By continuity, the inequality remains strict if $W'_0 > 0$ but remains in the neighborhood of zero. The result follows. ■

Proposition 2 shows that, if human capital affects the labor outcome positively, as should be expected for those individuals who are in a favorable state, then there is a positive correlation between human capital and entrepreneurial ability, even if human capital has no impact on entrepreneurial ability, (i.e. $\mu' = 0$). More generally, if entrepreneurial ability was directly observable, an estimation of how the probability of a high entrepreneurial ability is impacted by human capital would be biased upward if the sample is comprised of entrepreneurs alone. Rather than the impact of human capital on entrepreneurial ability, this bias reflects two

different effects. First, if a higher human capital means a better outcome in the labor market, the opportunity cost for entrepreneurship is higher for high human capital individuals than for low human capital individuals. It follows that the level of entrepreneurial ability required for the former to start a business is higher than for the latter one. Second, even if the labor market outcome is unaffected by human capital ($W_i'(k) = 0$), the impact of human capital on entrepreneurial ability would still be overevaluated when measured for only entrepreneurs. This is because entrepreneurship is a favorable signal about entrepreneurial ability and we assume that a high entrepreneurial ability is *a priori* sufficiently unlikely ($\mu(k)$ close to zero).

If the depreciation effect is sufficently high ($W_0'(k) < 0$), then the first effect is reversed and induces an under evaluation of the impact of human capital on entrepreneurial ability. As a result the sign of the bias is ambiguous. If the bias is negative ($\mu_{e,0}'(k) < \mu'(k)$), then entrepreneurship is a better signal of entrepreneurial ability for individuals with a low level of human capital (see appendix for an illustrative example). This is because individuals with a high level of human capital are drawn into entrepreneurship to escape depreciation regardless of their entrepreneurial ability.

Point 2 exploits the key difference between a favorable and an unfavorable initial state which pertains to the impact of human capital on the labor market outcome. Assuming that this impact is strongly positive when the labor market situation is favorable and very small or negative when the labor market is unfavorable, there is a strong positive bias in the measure of the impact of human capital on entrepreneurial ability for entrepreneurs with a favorable initial state, whereas this bias is small and possibly negative for entrepreneurs with an unfavorable initial state.

We now discuss how the above theoretical analysis may be used to analyze the impact of human capital as it is observed in the data on firm survival.

2.3 Empirical predictions on firm survival

Our empirical application concerns the impact of an entrepreneur's human capital variables, on the survival of the new firm. We also control for the entrepreneur's initial state in the labor market. A higher entrepreneurial ability is expected to positively affect firm survival. Furthermore, given our broad definition of entrepreneurial ability, any impact of human capital on survival should be interpreted as reflecting the impact of human capital on entrepreneurial ability. As a result, the biases we have identified above regarding the latter relationship for the sub-population of entrepreneurs should be reflected in some corresponding biases in the measure of how human capital impacts firm survival. Specifically, we expect that the positive influence of human capital on survival is greatly over estimated when restricting attention to entrepreneurs with a favorable initial labor market situation. Moreover, the corresponding measure should be much larger than what would be obtained by considering only entrepreneurs with an unfavorable initial situation in the labor market.

3 Empirical application

3.1 Data

The data is extracted from the SINE[4] 94 survey, which was conducted by the French National Institute of Statistical and Economic Studies[5] in 1994. It provides qualitative data on entrepreneurship and, more specifically, variables pertaining to the entrepreneur and the circumstances in which entrepreneurship occurred. A second survey carried out in 1997 (SINE 97) provides information on survival status of the same firms – closed down or still operating, and, when closed down, the date of the discontinuation. The surveyed units belong to the private productive sector in the field of manufacturing, construction, commerce and services. Since we wish to highlight the labor market motivations for entrepreneurship, we

[4] "Système d'informations sur les nouvelles entreprises" (Information system on new firms)
[5] Insee (Institut National des Statistiques et des Etudes Economiques).

only consider new firms set up by an individual and exclude takeovers from our analysis.[6] In order to ensure some homogeneity in labor force participation behavior, we also narrow down the sample further to French male middle aged (aged 30-50) entrepreneurs who started a business in metropolitan France.

The SINE 94 database provides information on whether the entrepreneur was employed prior to setting up the firm. We only keep entrepreneurs who belonged to the labor force when they started their business. For unemployed individuals it indicates whether the unemployment spell was short (less than one year) or long (beyond one year). For the employed, the data provides information about the entrepreneur's experience in the branch of activity of the new business. An individual who has had no such experience has necessarily changed his branch of activity when he became self-employed, which suggests that he is likely to have been poorly matched in his previous occupation. We therefore refer to this subgroup as mismatched individuals. The above information allows us to distinguish four initial states, out of which, only the first one is favorable: employed in the same branch, employed in a different branch, unemployed for less than one year, unemployed for more than one year. Our sample, comprises 36.67% who were employed with experience in the same branch, 9.38% who were employed and switched branch, 36.80% who were unemployed for less than one year and 17.15% who were unemployed for over one year.

Our measure of general human capital is the entrepreneur's education level that is either low, intermediate or high. A low level of education means that the entrepreneur has never earned any degree while a high level means that her highest degree corresponds to at least two years of higher education. We do not use data on experience because it only measures experience in the same branch of industry; it is however included as a control variable and

[6] Previous research suggests that entrepreneurial choice for takeovers may be somewhat specific. Bates (1990) points to some important reasons why a firm which is taken over is more prone to remain in business than a new one. Specifically, the new owner "may benefit from established managerial practises that are embodied in the firm"(p. 555).

its impact is discussed in section 3.4.1.

In order to allow for differences in the relationship between general human capital and entrepreurial ability according to the initial state of the entrepreneur, we use, in our duration analysis below, interactions between education level and variables pertaining to the initial state (see Table 1). This interaction defines twelve sub populations that are expected to differ in terms of labor market outcome (or equivalently opportunity cost of entrepreneurship) and hence, in terms of motivations for entrepreneurship. Such differences are reflected in differences in the properties of W_i in the theoretical setting.

Table 3 provides some descriptive statistics. These statistics concern human capital as well as explanatory variables that are used as controls in our econometric treatment; these variables are commonly included in survival analysis of new firms (see Table 2).

3.2 Survival probabilities

We start our econometric analysis of firm survival with some probit regressions on the survival probability after four years. The dependent variable indicates whether the firm was alive in December 1997.

We first run probits assuming that the impact of education does not depend on the initial state of the entrepreneur. The initial state is then one of the explanatory variables, along with education and control variables. Table 4 provides the estimated coefficients for education and the initial state. More education induces a higher survival probability (in line with Unger et al., 2011). The average survival probability for highly educated individuals is .05 above that of individuals with intermediate education, which in turn is .06 above that of entrepreneurs with low education. As for the impact of the initial state, entrepreneurs who were previously employed in the branch of the newly created business are more likely to survive than those who started off in one of the other three initial states, that are less favorable.

We then turn to analyzing the impact of education on the survival probability, while conditioning on the initial state of the entrepreneur (Table 5). For entrepreneurs who were working in the same branch of activity, the positive impact of education on survival is even stronger than what we found for the overall population. The change in survival probability is .07 from low to intermediate education level and .09 from intermediate to high. This is to be contrasted with results for the three unfavorable initial states for which, for the most part, education has no significant impact on survival: exceptions are a significant positive impact of a change from intermediate to high education level for entrepreneurs who started off working in a different branch of activity or were unemployed for over one year. From our discussion in Section 2.3, these results can be interpreted in the model provided that the marginal benefit of being educated, $W_i^{'}$ is much smaller in an unfavorable state than in a favorable state. We now confirm this finding by performing a duration analysis.

3.3 Duration analysis

3.3.1 Econometric modeling

We employ hazard regression models to study the impact of various explanatory factors (covariates) on exits of French firms. The SINE 94/97 provides a discontinuation date for all those firms that stopped business before December 1997, so that the duration of each firm's life is observed in months. If the firm was still alive at the end of the period, the corresponding duration data are right censored. The covariates, discussed and defined in Section 3.1 (see Table 2), include various measures of human capital, as well as controls for entrepreneur attributes, firm attributes and financial constraints. In addition, and in line with our theory, we consider a potentially important role for the previous occupation of the entrepreneur.

Since estimation is quite demanding, we estimate the discrete duration model for the full sample only and not for sub-samples based on initial state. However, we take into account

differential impact of education on survival by interacting the education variable with the initial state. We impose the restriction that, for variables other than education, the impact on survival does not differ across initial states[7].

We address the discrete (monthly) nature of our duration data by considering a grouped time version of the Cox proportional hazards model, also called the complementary log-log model or discrete PH model (Cox, 1972; Prentice and Gloeckler, 1978). Consider a sample of size n from the population of newly created firms. The conditional probability of exit at time t, given the vector of explanatory variables x, is measured by the hazard rate function $h(t|x)$. For each firm i, the data provides information on its life span t_i measured in months,[8] and its individual characteristics (x_i).

$$\ln\left[-\ln\left\{1-h_j\left(x;\beta\right)\right\}\right] = x'\beta + \gamma_j, \tag{7}$$

where the time intervals are indexed by $j = 1, 2, \ldots$, h_j denotes the discrete hazard rate in interval j (assumed constant over the interval) and β is a vector of regression coefficients. This discrete proportional hazards model assumes that latent continuous failure times have a proportional hazards specification but are grouped into intervals. Unlike the standard implementation of this model assuming a constant baseline hazard rate, we capture time variation in the baseline hazard function across periods by including the discrete time dummies γ_j. In other words, like the continuous time Cox proportional hazards model, we allow the baseline hazard function to change over time. Our empirical specification allows the baseline hazard rate to vary over the four yearly time periods in the sample. This model was estimated using the STATA software with yearly time periods, and the first column of Table 6 reports the estimation results.

In our analysis, education should be viewed not so much as a variable having a direct

[7]Nevertheless, our probit estimates in the previous section show that the impact of control variables on survival may be different according to the previous occupation of the entrepreneur.

[8]t_i is the difference between the date of cessation of activity and the date of setting up of the i-th firm.

impact on survival but rather as providing partial information about entrepreneurial ability that remain unobserved. We therefore expect some unobserved heterogeneity in our hazard regression models, and the impact of education on survival will differ for each individual depending on the realization of entrepreneurial ability.

In other words, our theoretical framework has two basic implications for appropriate modeling of the impact of education on firms' survival. First, the impact of education is likely to be differentiated according to the entrepreneur's initial state, and second, entrepreneurial ability of the entrepreneur may be partly unobserved. While we address the first issue by estimating separate coefficients for the impact of education across the four prior labor market situations, the second issue, that of unobserved heterogeneity, can produce inconsistent estimates of the effect of the regressors (β) as well as the baseline hazard function, here captured by the dummies γ_j.

Specifically, we consider the grouped time proportional hazards model (7) and follow Jenkins (1995) in characterizing the frailty distribution by discrete mixtures of degenerate distributions in a sequence with increasing number ($r = 2, 3, \ldots$) of components:

$$\ln\left[-\ln\left\{1 - h_j\left(x_i; \beta, u_i\right)\right\}\right] = x_i'\beta + \gamma_j + \ln\left(u_i\right), \quad i = 1, \ldots, n,$$

$$\ln\left(u_i\right) \in \{m_1 = 0, m_2, \ldots, m_r\} = \begin{cases} m_1 & \text{with prob. } \pi_1 \\ m_2 & \text{with prob. } \pi_2 \\ \vdots & \\ m_r & \text{with prob. } \pi_r \end{cases}, \quad r = 2, 3, \ldots \tag{8}$$

A sequential estimation procedure is adopted, starting with $r = 2$ and increasing the number of components, r, progressively. The procedure is terminated when subsequent steps lead to degeneracy or no improvement in the maximized likelihood value. This methodology for approximating any arbitrary frailty distribution, first proposed in Heckman and Singer (1984), is very useful in that it approximates the nonparametric frailty distribution by an increasing sequence of parametric distributions. Further, in allowing an arbitrary frailty distribution, the method is robust to violations of the frailty distribution assumptions which

can be quite critical in practise; see, for example, Baker and Melino (2000). Maximum likelihood estimates of the covariate effects and the frailty distribution, based on the full sample data, are reported in the last column of Table 6.

3.4 Results

The estimates for the grouped data model are summarized in Table 6. In both these sets of results, a positive β means that the group under consideration exits more than the reference group, and vice versa. Table 6 also includes estimates of the grouped data proportional hazards model with unobserved heterogeneity. The data support a two support point frailty distribution. Table 7 reports tests of differences in the effect of education across various initial states.

Below, we first discuss effects of the included regressors – general human capital, followed by financing constraints, entrepreneur and firm characteristics, and finally unobserved heterogeneity.

3.4.1 General human capital

Results on the impact of education are consistent with the descriptive statistics of Section 2. Higher education reduces significantly the hazard rate for individuals employed in the same sector or unemployed for more than one year. It has no significant impact on the hazard rate for individuals employed in a different branch or unemployed for less than one year.

Note that these results on the impact of education are particularly robust and significant in all the specifications of our econometric model (Tables 6 and 7). In particular, education level has no significant impact on survival for mismatched and short term unemployed individuals in the grouped data model whether or not unobserved heterogeneity is accounted for (Tables 7*b* and 7*c*). Hence, this lack of significance may not be attributed to a bias caused by unobserved heterogeneity that is orthogonal to the covariates. Our theoretical analysis

suggests that this evidence can be attributed to some unobserved entrepreneurial ability that is correlated with education.

The significance of education for the long term unemployed individuals, although it is rather weak, is an interesting finding. In the context of our model, this reflects lack of concern for depreciation among those who are highly educated, and suggests that their human capital may already have depreciated - then the downward bias which is observed for short term unemployed has disapeared. It is well documented that unemployment duration exhibits negative duration dependence, in the sense that a longer unemployment spell decreases the rate of exit from unemployment (see Fougères, 2000, for a survey of studies on the French labor market). In any case, the positive impact of education on survival for the long term unemployed is much less significant than for those who were employed in the same branch (as can be seen for instance by comparing Tables $7a$ and $7d$). In this last sub-population, an upward bias exists and induces a strong correlation between education and entrepreneurial ability.

The theory also suggests that the impact of experience may differ depending on the entrepreneur's initial labor market state. The data only provides information about experience in the new firm's branch of activity. As in previous studies (e.g. Bates, 2005), we find that more sector specific experience significantly improves survival.

Experience acquired in a small firm where better entrepreneurial skills can be attained (because of a broader variety of tasks) also enhances the survival chances. Empirical literature (see, for example, Wagner, 2003, 2006, Baumol, 2004) links the acquisition of a wide variety of skills with the choice of becoming an entrepreneur; see also Lazear (2004, 2005) for a theory of entrepreneurship along the same lines. Our results may be interpreted as showing a link between the scope of acquired skills and success in entrepreneurship.

Our findings on the impact of previous entrepreneurial experience on survival are that such experience enhances the firm's viability which is in line with Taylor (1999) (see Cressy

(1996) for some contrasting predictions).

3.4.2 Entrepreneur and project attributes

We include several entrepreneur and firm level characteristics as control variables. By and large, our results confirm those of many other studies for such variables as age (Cressey and Storey, 1995) and sector (Taylor, 1999). Regarding the entrepreneur's motivations, we find that 'novel idea' reduces significantly the probability of exit after controlling for unobserved heterogeneity (Table 7). By contrast, if the main motivation is imitation of a relative or a friend (entourage example) then exit is as likely as for entrepreneurs who are motivated by evading unemployment which is the reference class. Hence the positive impact of an entrepreneurial milieu, which we find, cannot be attributed to a role model effect but rather to some social networking or work experience acquired in the family business (as emphasized by Fairlie and Robb, 2006). Another result on motivation is that, individuals who have a taste for entrepreneurship or benefit from an entrepreneurial opportunity set up firms with higher chances of survival.

Some firm characteristics also provide important insights into exit. We find that firms protected by limited liability survive better than those under unlimited liability. This is in contradiction with results reported in Harhoff *et al.* (1998). This may be because we do not distinguish between different competing risks: their results only pertain to unvoluntary liquidations so that the higher exit rate we find for firms with unlimited liability may be explained by voluntary discontinuations without losses for creditors (see also Bates, 2005). In our data, we have information about whether entrepreneurs have applied for a bank loan to start the project and if yes, whether they were granted the loan or not. It should be expected that those who started a business despite not getting a loan or those who did not even apply for such a loan are on average less financially constrained than those who started the project with the help of a bank loan. Our results on survival show that firms set up by

entrepreneurs who successfully applied for a loan survive longer. These results may reflect the superiority of debt contracts over labor contracts in eliciting private information.

Previous literature reports ambiguous results for both the impact of the initial size of the firm (in terms of initial labor force) and the impact of previous entrepreneurial experience. We find that a large initial size is detrimental to survival which is coherent with results in Das and Srinivasan (1997).[9] Finally, we find evidence that firms are more likely to survive if they are created in regions with a low entrepreneurial intensity, if the number of their initial customers were large or if the entrepreneur was previously in a managerial or executive position.

3.4.3 Unobserved heterogeneity

The results provide evidence of individual level frailty orthogonal to levels of human capital. In order to model these effects, we estimate grouped data proportional hazards models with discrete mixture frailty distributions (Table 6). The results show a significant impact of unobserved heterogeneity, and favor an estimated two support points frailty distribution. These two support points can be interpreted as representing high and low levels of entrepreneurial ability.[10]

The two point discrete mixture frailty distribution also offers an interesting perspective in relation to our theoretical analysis of entrepreneurial ability. Under this characterization, entrepreneurial ability can be thought of as being high for some entrepreneurs and low for others. The estimates suggest that 82 per cent of entrepreneurs draw the low value (resulting in a positive unobserved heterogeneity level of m_2), while the remaining 18 per cent draw a high value (resulting in a zero unobserved heterogeneity level). This low percentage of high entrepreneurial ability individuals lends some support to the assumption that a high

[9] However, other studies find a reverse relation between initial size and survival (Mata and Portugal, 1994, Audrestch and Mahmood, 1995).

[10] We estimated similar models for different sub-samples of the data; the results are in broad conformity, but it is somewhat difficult to draw strong conclusions because of lower sample sizes.

entrepreneurial ability is scarce, which is used to derive proposition 2.

4 Concluding remarks

Our theoretical analysis of the sample selection bias stresses the role of entrepreneurship as a response to labor market inefficiencies. We also find strong empirical evidence that, for the sample of new French firms considered in this paper, the positive impact of an entrepreneur's education on the new firm's survival varies significantly depending on the entrepreneur's initial state in the labor market. Specifically, the relationship is significant only for individuals who were employed and started a business in a sector in which they had some prior experience. Yet based on our model, we argue that the observed differential impact of education may be attributed to a sample selection bias such that entrepreneurial ability is positively correlated with education for entrepreneurs whose previous labor market status was favorable. We also have another bias for unemployed or bad matched entrepreneurs who may set up a firm in order to avoid a depreciation of their human capital. Then this negative bias may explain why human capital is not a good predictor of the survival of the new firm for this type of entrepreneurs.

Our analysis suggests other possible interactions between entrepreneurship and unemployment. The anticipation of high unemployment may deter individuals from starting a new firm because they expect it will be harder to get back into a wage position in case they fail: this may be particularly the case for individuals benefiting from a favorable labor market state who, as a result, give up entrepreneurship despite a high level of entrepreneurial ability. This suggests that on a cross section of different countries, it is unclear whether those with high unemployment should have higher or lower self employment rates. It should be expected however that the systematic differences in the impact of education on survival, across entrepreneurs with different initial states, is less salient in countries where the labor

market is more fluid than that of France.

This relationship between labor market rigidities and entrepreneurship also points to some possible policy recommendations. Decreasing labor market rigidities may encourage entrepreneurship of the "right type" corresponding to some ability that is not properly exploited by the labor market.[11] Short of reducing rigidities, financial aids aimed at entrepreneurs might be better applied if targeted at individuals returning to the labor market after a period of self employment.

Our data on survival of new firms does not allow us to discriminate between terminations that are true failures involving bankruptcies and situations where the entrepreneur chooses to sell a healthy business and quit, which occurs quite frequently as documented by various studies; see, for example, Bates (2005) and Bhattacharjee *et al.* (2009a and 2009b). Note however that such "successful" shut downs of firms often correspond to a move from self employment to a salaried position, suggesting that the latter situation is more attractive. This is consistent with our theoretical analysis where individuals choose self-employment whenever it is more rewarding than the labor market. Therefore, these entrepreneurs return to the labor market when their business yields insufficient profit as compared to what they could obtain in a salaried position. Still there might be some additional insights from looking at other measures of the firm's performance, which we intend to do in our future research. For instance, using more detailed financial information will enable us to better account for the role of financial factors in firm exit.[12]

We have argued that better educated individuals are more eager to move away from a bad labor market state and hence choose self employment independent of their entepreneurial ability, in particular because they might worry about the depreciation of their general human

[11] In the case of France it appears that the refugee effect (whereby the choice of self-employment is a way to cope with an unfavorable labor market situation) explains the dynamics of entrepreneurship in France over the 2000-2011 period (Aubry et al., 2015, Abdesselam et al., 2014).

[12] Bhattacharjee *et al.*, (2009a,b) find an important impact of financial markets instability on firm survival.

capital. This explanation in terms of differential benefits from starting a new business between educated and uneducated persons may however be only part of the story. It is likely that there is a difference in cost, to the extent that education provides the type of general human capital that is quite useful in overcoming the difficulties in starting and managing a new firm. Future research should explore the nature of entrepreneurial ability needed to start a business in different sectors and the implications for entrepreneurs with different initial states in the labor market.

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TABLE 1: Human Capital Variables

VARIABLES	MODALITIES
Education (educational level)	- High (diploma received after two years and more at University) - Intermediate[13]* (Professional diploma and Secondary School diploma) - Low (no diploma)
Employment, previous status (occupationbefore the setting-up of the new firm)	- Employed, same branch (salaried in the same branch of activity) - Different branch* (salaried in a different branch of activity) - Short term unemployed (less than one year) - Long term unemployed (more than one year)
Duration of experience in the same branch of activity	- Less than 3 years - 3 / 10 years* - More than 10 years
Size of the enterprise where this experience has been acquired	- Less than 10 employees - 10 / 100 employees* - More than 100 employees
Employment & Education (Educational level& Occupation before the setting-up of the new firm)	- Same branch, High education* - Same branch, Intermediate education - Same branch, Low education - Different branch, High education - Different branch, Intermediate education - Different branch, Low education - Short term unemployed, High education - Short term unemployed, Intermediate education - Short term unemployed, Low education - Long term unemployed, High education - Long term unemployed, Intermediate education - Long term unemployed, Low education
Previous setting-up of new firms	- Never - Once or more*

[13] * refers to the reference class in the estimates

TABLE 2: Control Variables

VARIABLES	**MODALITIES**
ENTREPRENEUR ATRIBUTES	
Age of entrepreneur	- 25/35 years - 35/40 years* - 40/50 years
Entrepreneurship "milieu"	- Yes* (relatives and close relationship - No
Main motivation (when the entrepreneur sets-ups its firm)	- New idea - Opportunity / taste for entrepreneurship - Unemployed* - Entourage example
FIRM ATTRIBUTES	
Initial size of entreprise	- Zero or one employee* - More than one employee
Initial demand (number of customers)	- 1/10 customers - More than 10 customers*
Legal status	- Limited liability - Unlimited liability*
Region of incorporation	- Low entrepreneurship - High entrepreneurship*
Industry	- Catering / Trade - Manufacturing - Construction, Transports - Services*
FINANCIAL CONSTRAINTS	
Initial capital invested	- Less than 15245 euros - 15245 / 76224 euros* - More than 76224 euros
Public financial aid, 1994	- Obtained aid - None obtained*
Bank loans, 1994	- Applied and refused - Applied and received - Not applied*

TABLE 3: Descriptive Statistics

	French male Entrep.	Sub-sample. by prev. employment			
		Same branch	Different branch	Short term unemployed	Long term unemployed
	(19213)	(7045)	(1802)	(7070)	(3296)
ENTREPRENEUR ATTRIBUTES					
Education					
– High	27.51%	37.03%	32.35%	20.61%	19.30%
– Intermediate	64.28%	55.87%	56.33%	71.33%	71.48%
– Low	8.21%	7.10%	11.32%	8.06%	9.22%
Main motivation					
– New idea	9.70%	11.14%	19.37%	5.93%	9.44%
– Opportunity	19.37%	23.95%	21.986%	18.06%	11.01%
– Need of independence	54.49%	57.93%	50.33%	56.38%	45.36%
– Example of the family or friend circle	3.31%	2.90%	5.77%	3.01%	3.46%
– Unemployed	13.14%	4.09%	2.66%	16.62%	30.73%
% of individuals who have acquired an experience in the same branch of activity	75.29%	100%	0%	76.89%	60.19%
% of individuals who have previously setting up a firm	22.40%	33.88%	26.58%	12.86%	16.05%
FIRM ATTRIBUTES					
Industry					
– Catering	2.81%	1.97%	5.38%	2.55%	3.76%
– Trade	28.18%	25.48%	44.01%	27.19%	27.46%
– Food Industry	1.34%	0.92%	2.28%	1.37%	1.64%
– Manufacturing	9.96%	9.60%	6.33%	11.47%	9.50%
– Construction	21.06%	18.42%	6.99%	26.68%	22.36%
– Transports	4.92%	4.39%	6.60%	4.64%	5.73%
– Services for households	8.67%	11.88%	11.38%	5.16%	7.86%
– Services for enterprises	23.05%	27.34%	17.04%	20.95%	21.69%
Initial capital invested					
– Less than 15245 Euros	69.24%	61.35%	63.37%	73.27%	80.70%
– Between 15245 and 76224 Euros	24.51%	28.42%	29.36%	23.64%	15.38%
– More than 76224 Euros	6.25%	10.23%	7.27%	3.10%	3.91%
Bank loans. 1994					
– Applied and refused	4.87%	3.17%	3.05%	6.05%	6.95%
– Applied and received	29.51%	32.26%	28.91%	30.23%	22.42%
– Not applied	65.62%	64.57%	68.04%	63.72%	70.63%

TABLE 4: Estimates for d-Probit Model[14]

Variables	**Full Sample** dF/dx (*Std.Err.*)
HUMAN CAPITAL	
High education	0.051^{**} (0.0097)
Low education	-0.061^{**} (0.0139)
EMPLOYMENT, PREVIOUS STATUS	
Experience, same branch	0.0800^{**} (0.0148)
Short term unemployed	-0.0335^{*} (0.0159)
Long term unemployed	-0.0629^{**} (0.0173)
No. of firms	19,123
Log-likelihood	−11860

TABLE 5: Estimates for d-Probit Model

Variables	**By prev. employment**			
	Same branch	Different branch	Short term unemployed	Long term unemployed
HUMAN CAPITAL				
High education	0.0920^{**} (0.0141)	0.0211 (0.0330)	−0.0292 (0.0182)	0.0758^{**} (0.0277)
Low education	-0.0709^{**} (0.0239)	-0.1308^{**} (0.0416)	-0.0434^{+} (0.0231)	−0.0537 (0.0334)
No. of firms	7,045	1,802	7,070	3,296
Log-likelihood	−4128.1	−1024.7	−4333.2	−2092.2

[14] ** , * and $^{+}$: Significant at 1%, 5% and 10% levels respectively.

TABLE 6: Estimates for Grouped Time PH Model [15,16,17,18]

Variables	No frailty	Discrete mix. frailty
LOG BASELINE HAZARD		
– Year 1	-4.669^{**} (-48.1)	-18.202 (-0.5)
– [Year 2 − Year 1]	0.284^{**} (7.0)	0.352^{**} (8.1)
– [Year 3 − Year 1]	0.508^{**} (12.6)	0.644^{**} (12.8)
– [Year 4 − Year 1]	0.354^{**} (7.8)	0.590^{**} (8.4)
EMPLOYMENT X EDUCATION		
(Base) Same branch, High education	0.00	0.00
Intermediate education	0.308^{**} (4.8)	0.311^{**} (4.4)
Low education	0.606^{**} (5.7)	0.594^{**} (5.2)
Different branch, High education	0.620^{**} (6.4)	0.662^{**} (5.9)
Intermediate education	0.512^{**} (6.3)	0.522^{**} (5.7)
Low education	0.616^{**} (4.5)	0.785^{**} (4.2)
Short term unemployed, High education	0.609^{**} (7.9)	0.671^{**} (7.8)
Intermediate education	0.647^{**} (9.7)	0.695^{**} (9.4)
Low education	0.677^{**} (6.9)	0.753^{**} (6.7)
Long term unemployed, High education	0.519^{**} (5.4)	0.591^{**} (5.4)
Intermediate education	0.736^{**} (10.2)	0.823^{**} (10.1)
Low education	0.862^{**} (7.6)	0.920^{**} (7.0)
HUMAN CAPITAL		
Experience, same branch		
(Base = 3 − 10 years)	0.00	0.00
– Less than 3 years	0.183^{**} (3.9)	0.169^{**} (3.1)
– More than 10 years	-0.287^{**} (-7.2)	-0.324^{**} (-7.4)
Size, prev. same branch firm		
(Base = 10 − 100 employees)	0.00	0.00
– Less than 10 employees	-0.355^{**} (-9.4)	-0.406^{**} (-9.6)
– More than 100 employees	0.081 (1.6)	0.087 (1.6)

[15] z-ratios are reported in parentheses.

[16] ** , * and $^{+}$: Significant at 1%, 5% and 10% levels respectively.

[17] The results reported for the model with frailty are the best in terms of maxmised likelihood. These correspond to a two-point discrete mixture frailty distribution.

[18] LR test rejects the null hypothesis of "no frailty" at 1% level of significance.

TABLE 6: Estimates for Grouped Time PH Model (contd.)

Variables	No frailty	Discrete mix. frailty
HUMAN CAPITAL		
Previous professional status		
(Base = Worker)	0.00	0.00
– Manager/ Executive	-0.095^{*}	-0.108^{*}
	(-2.2)	(-2.3)
– Craftsman/ Middle mgmt.	-0.012	-0.016
	(-0.3)	(-0.3)
– Student	0.151^{*}	0.268^{**}
	(2.0)	(2.9)
Previous setting up of new firms		
(Base = Once or more)	0.00	0.00
– Never	0.228^{**}	0.247^{**}
	(5.6)	(5.4)
ENTREPRENEUR ATTRIBUTES		
Age of entrepreneur		
(Base = $35-40$ years)	0.00	0.00
– $25-35$ years	0.021	-0.005
	(0.5)	(-0.1)
– $40-50$ years	-0.069	-0.096^{+}
	(-1.6)	(-1.9)
Entrepreneurship "milieu"		
(Base = Yes)	0.00	0.00
– No (relatives/close reltns.)	0.101^{**}	0.132^{**}
	(3.1)	(3.5)
ENTREPRENEUR ATTRIBUTES		
Main motivation		
(Base = own job creation)	0.00	0.00
– New idea	-0.082	-0.144^{+}
	(-1.3)	(-1.9)
– Opportunity	-0.192^{**}	-0.252^{**}
	(-3.5)	(-4.1)
– Taste for entrepreneurship	-0.156^{**}	-0.198^{**}
	(-3.4)	(-3.8)
– Entourage example	0.130	0.072
	(1.6)	(0.8)
FIRM ATTRIBUTES		
Initial size of enterprise		
(Base = Max. 1 employee)	0.00	0.00
– More than one employee	0.157^{**}	0.114^{**}
	(4.5)	(2.8)
Number of customers		
(Base = >10 customers)	0.00	0.00
– Between $1-10$ customers	0.125^{**}	0.129^{**}
	(3.6)	(3.3)
Legal status		
(Base = Unlimited liability)	0.00	0.00
– Limited liability	-0.395^{**}	-0.364^{**}
	(-10.1)	(-8.4)

TABLE 6: Estimates for Grouped Time PH Model (contd.)

Variables	**No frailty**	**Discrete mix. frailty**
FIRM ATTRIBUTES		
Region of incorporation		
(Base = High entrepreneurship)	0.00	0.00
– Low entrepreneurship	-0.065^{*}	-0.045
	(-2.1)	(-1.3)
(Base = Trade)	0.00	0.00
– Service sector for Households	-0.428^{**}	0.474^{**}
	(-6.9)	(6.8)
– Service sector for Enterprises	-0.271^{**}	-0.348^{**}
	(-5.7)	(-6.5)
– Manufacturing Industry	-0.445^{**}	-0.489^{**}
	(-7.9)	(-7.7)
– Food-processing Industry	-0.004	0.022
	(-0.1)	(0.2)
– Construction	-0.606^{**}	-0.687^{**}
	(-12.5)	(-12.5)
– Transport	-0.524^{**}	-0.588^{**}
	(-7.1)	(-7.1)
– Catering	-0.084	-0.095
	(1.0)	(1.0)
FINANCING CONSTRAINTS		
Initial capital invested		
(Base = 15245 – 76224 Euros)	0.00	0.00
– less than 15245 Euros	0.342^{**}	0.383^{**}
	(8.2)	(8.2)
– more than 76224 Euros	-0.517^{**}	-0.534^{**}
	(-5.4)	(-5.3)
Public financial aid, 1994		
(Base = None)	0.00	0.00
– Obtained aid	-0.343^{**}	-0.405^{**}
	(-9.0)	(-9.1)
Bank loans, 1994		
(Base = Not applied)	0.00	0.00
– Applied and refused	0.093	0.153^{*}
	(1.5)	(2.0)
– Applied and received	-0.304^{**}	-0.364^{**}
	(-7.7)	(-8.1)
MIXTURE FRAILTY DISTBN.		
$m_1 \equiv 0$	–	0.00
m_2	–	13.80
		(0.4)
π_1	–	0.180^{**}
		(5.9)
$\pi_2 = 1 - \pi_1$	–	0.819^{**}
		(27.0)
No. of firms	19,213	19,213
No. of exits	7,882	7,882
Log-likelihood	-24582.6	-24574.1

TABLE 7: Tests of differences between coefficients for the impact of Education[19,20]

7a- Employed, same branch

	Low	Intermediate	High
Low		0,007**	0,000**
Intermediate	0,002**		0,000**
High	0,000**	0,000**	

7b- Employed, different branch

	Low	Intermediate	High
Low		0,149	0,443
Intermediate	0,45		0,278
High	0,976	0,314	

7c- Short term unemployed

	Low	Intermediate	High
Low		0,55	0,460
Intermediate	0,700		0,723
High	0,485	0,574	

7d- Long term unemployed

	Low	Intermediate	High
Low		0,415	0,027*
Intermediate	0,168		0,030*
High	0,005**	0,017*	

[19] Tables report $p-values$ for the difference between coefficients tests. Values below the diagonal correspond to the no frailty model and values above the diagonal correspond to the frailty model.

[20] ** , * and $^{+}$: Significant at 1%, 5% and 10% levels respectively.

Appendix : illustrative example

We consider an individual whose entrepreneurial ability (V) is either high ($H = 5$) or low ($L = 0$). We denote by $\mu(k)$ the probability that the individual has high entrepreneurial abilities depending upon his human capital and we assume $\mu(k) = k$.

Initially, the individual may be either in an unfavorable initial state (denoted by 0) or favorable state (denoted by 1). Conditional to the initial state, $W_i(\mu(k))$ represents the earnings of the individual if he stays in the labor market today. Alternatively, if the individual with entrepreneurial abilities V decides to become an entrepreneur he obtains $V + \nu$, where ν is a random variable with a cumulative distribution function F.

The probability to set up a firm is given by:

$\Pr[\gamma > W_i(\mu(k)) - V] = 1 - F(W_i(\mu(k)) - V) = 1 - F(W_i(k) - V)$.

Assuming a logistic distribution of the random term we have:

$P_i(k, V) = \Pr[\gamma > W_i(k) - V] = \frac{e^{V - W_i(k)}}{1 + e^{V - W_i(k)}}$

Using Bayes' Law, we evaluate the probability of high entrepreneurial abilities given that an individual in state i has started a new firm :

$$\mu_{e,i}(k) = \frac{k \times e^{5 - W_i(k)}(1 + e^{-W_i(k)})}{k \times (e^{5 - W_i(k)} - e^{-W_i(k)}) + e^{-W_i(k)} \times (1 + e^{5 - W_i(k)})} = \frac{e^5[1 + e^{-W_i(k)}]k}{e^{(5 - W_i(k))} + (e^5 - 1)k + 1}$$

We now make ad-hoc assumptions on the expression $W_i(k)$ depending on the initial state i.

$$W_i(k) = \begin{cases} (k+1)^2 - 1 & \text{if} \quad i = 1 \\ k - k^2 \text{ for } k < 1/2 & \text{if} \quad i = 0 \\ 100k - 100k^2 - 24.75 \text{ for } k \geqslant 1/2 & \end{cases}$$

The probability for the new entrepreneur to have high entrepreneurial abilities when he comes from state 1 is then:

$\mu_{e,1}(k) = \frac{e^5(1 + e^{1 - (k+1)^2})k}{e^{6 - (k+1)^2} + (e^5 - 1)k + 1}$

When the individual comes from state 0, this probability is given by:

$$\mu_{e,0}(k) = \begin{cases} \frac{ke^5(1 + e^{(k^2 - k)})}{e^{(k^2 - k + 5)} + (e^5 - 1)k + 1} & \text{if} \quad k < 1/2 \\ \frac{ke^5(1 + e^{(100k^2 - 100k + 24.75)})}{e^{(100k^2 - 100k + 29.75)} + (e^5 - 1)k + 1} & \text{if} \quad k \geq 1/2 \end{cases}$$

$\mu_{e,0}(k)$ and $\mu_{e,1}(k)$ are represented in Figure 1.

The dotted curve represents the function $\mu_{e,0}(k)$ and the solid curve refers to $\mu_{e,1}(k)$.

Insert Fig.1 : Beliefs on entrepreneurial ability of new entrepreneurs

The position of the two curves in figure 1 clearly indicates that $\mu_{e,1}(k) > \mu_{e,0}(k)$ for all $0 < k < 1$.

Assuming that $W_1'(k)$ is significantly larger than $W_0'(k)$ and that $W_0'(k)$ may even be negative allows for a situation where $\mu_{e,1}$ is steeper than $\mu_{e,0}$ for a large range of values of μ and $\mu_{e,0}$ is decreasing in k on some interval. Figure 2 depicts the slopes of the two curves and shows that $\mu_{e,1}$ is steeper than $\mu_{e,0}$ for $k < 0.67$. We also observe that $\mu_{e,0}$ is decreasing on the interval $[0.54, 0.64]$. Within this interval, for entrepreneurs starting from an unfavorable state, higher human capital implies lower entrepreneurial ability (or equivalently a lower expected probability of success).

Insert Fig.2 : Comparisons of the slopes of $\mu_{e,0}(k)$ and $\mu_{e,1}(k)$

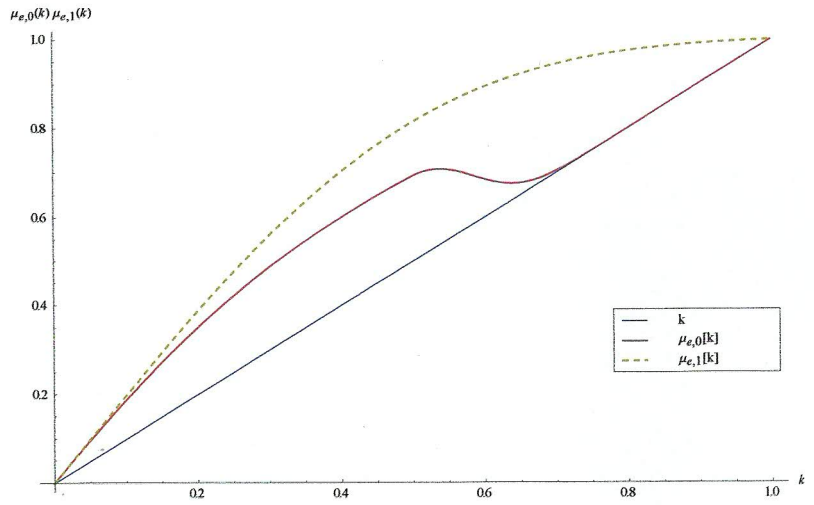

Figure 1 : Beliefs on entrepreneurial abilities of new entrepreneurs

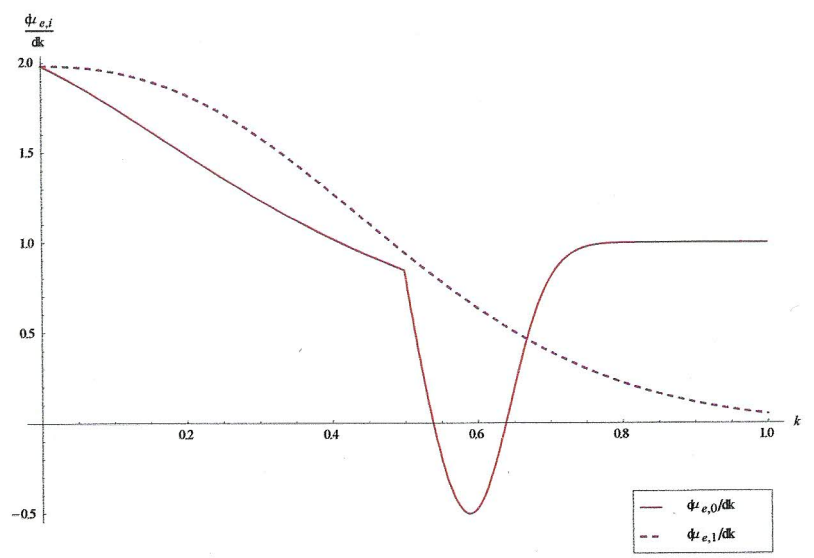

Figure 2 : Comparisons of the slopes of $\mu_{e,0}(k)$ and $\mu_{e,1}(k)$