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# Firm start-up strategies and performance in France: Survival and growth

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## **Firm start-up strategies and performance in France:**

### **Survival and growth**

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#### **Abstract**

Essential performance outcomes of the new firm, including survival and growth, are related to financial and operational factors of the firm. We present a model that shows that firm financing via debt has some influence on types of market outreach, survival, and also growth of new firms in France. Using a robust, longitudinal dataset of the population of firms throughout the country established, continuing, and closing over the period of 2002 to 2007 (available through the French government via the SINE Survey: Système d'informations sur les nouvelles entreprises), we show that for a given indebtedness of the new firm, the entrepreneurial behavior generally improves the survival and the growth of new ventures.

## Introduction

Many firms are launched with limited intentions and capabilities for growth. In the French case particularly there are issues of human capital and labor market fluidity that create disincentives for well qualified individuals<sup>1</sup> to commit their careers to entrepreneurship. Moreover, an economy characterized by an insufficient number of jobs created and a high level of persistent unemployment reinforces the setting-up of firms for predominantly constrained motives and discourages entrepreneurship with unconstrained (i.e., entrepreneurial) motives (Bonnet & Cussy, 2010).

Firm difficulties in accessing external financing may also result in a deterioration of the growth trajectory of the firm (Whited, 2006). The hypothesis of low credit rationing for example (Freimer & Gordon, 1965), recommends that in cases where the firm is denied the full credit it requests, higher costs of credit and sub-optimal operating decisions may result. Research has also shown that success in running small businesses, including survival of the new firm, may be influenced by financing liquidity constraints (Evans & Jovanovic, 1989) even if greater human capital diminishes credit constraints (Bates, 1990; Holtz-Eakin, Joulfaian & Rosen, 1994).

In this paper we develop complementary work in an area little explored: how a young firm's financial policy affects its ability to survive and to grow. An entrepreneur who holds capital can choose between holding liquid assets or transforming the capital into a production capacity. If the firm sets the capacity under uncertainty, holding illiquid assets allows it to benefit from favorable potential shocks promoting a growth oriented strategy, though in such a case the risk that part of the production will go unsold must be assumed. Therefore uncertainty about future profits may induce failure when the liquid position of the firm is insufficient.

At the firm level, the condition to achieve relative high growth rate post-founding is marked first by survival over time, most notably because high growth firms often have to implement market strategies that are risky. Beyond the founding conditions, the actual market and financial policies implemented matter and they can help the new firm to reach

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<sup>1</sup> "The ratio of entrepreneurs-engineers among the population of French active graduate engineers ranges between 5 and 7 per cent according to the socio-economical surveys conducted by CNISF (National Council of Engineers and Scientists of France)".

a path of high growth. Traditionally the failure and closing of a young firm, but also its growth potential, have to do with both financial factors (access to external sources of financing, cost of capital, bank loan repayments while building sales...) and operational factors (risks taken due to the entrepreneurial strategy, cost of production, uncertainty...). Several mechanisms through which financial decisions may affect operational decisions are known. In the industrial organization field a literature based on Brander and Lewis (1986) underscores a specific transmission channel: the linkage between the mode of financing (the debt/equity split) and the aggressiveness of a firm towards its competitors. In order to better understand the debt/aggressiveness link and its influence on survival and growth we build a model that shows that financing market strategies by debt may have some influence on a firm's market strategies, the survival and the growth pattern of the new firm. We then test hypotheses deduced from the model thanks to the SINE Survey, "Système d'informations sur les nouvelles entreprises" (*Information system on new firms*) for the last cohort made available (2002-2007).

Our findings show that a small subset of new firms in France have been at the origin of roughly 50% of jobs created six years later (2007). We find that globally, entrepreneurial behavior on the part of the founder/s increases the life span of new firms and is favourable for survivor firms to belong to the class of high growth firms existing at the end of the observation. Finally, our results reveal that when the firm has a high intensity of acquiring debt, it increases its probability to fail, but only for the maximal class of indebtedness. For this class, entrepreneurial behavior is not an efficient means to prevent the failure.

The paper is organized as follows. In section 1 we develop a simple model which underlines mechanisms through which financial decisions interact with product market strategies. We also specify the impact of the competitive strategy on the expected risk of exit. Section 2 explains the data base and the key variable measures: aggressiveness, intensity in acquiring debt, growth, and survival. Section 3 is devoted to methods and results. We end with discussion in Section 4.

## Section 1: A simple model of financial decision and product market strategies

Interactions between product market behavior and financing decisions of firms have been examined in industrial organization (for a survey see Maksimovic, 1995; Tirole, 2006). A leveraged firm led by an entrepreneur protected by limited liability is driven to follow a more aggressive policy in terms of quantities. The intuition behind this result is related to the fact that the entrepreneur of a leveraged firm maximizes expected profits defined only on the range of non-bankruptcy outcomes. In any other case, *i.e.*, when negative shocks occur and the firm goes bankrupt, all the operating profits are used for repaying the debt holders. As debt levels change, the distribution of revenues over the different states change, which in turn modifies the output strategy preferred by the entrepreneur. Therefore, a highly leveraged firm implies that the entrepreneur restricts attention on a small range of good states and selects a more aggressive production level.

### 1.1. Hypotheses

We consider the behavior of a firm (product market decisions and financial choices) evolving in a competitive environment. We restrict our attention to the case where the entrepreneur competes in a one period output market with a given financial structure. Once the debt is chosen, the entrepreneur decides on a production level. The entrepreneur is assumed to be risk neutral and consequently maximizes expected profit. The entrepreneur needs  $I$  as the investment for the business and has to decide whether to finance through personal funds ( $D=I-E$ ) and/or through a bank loan ( $D$ ) if  $E < I$ . At the end of the period, the investment project generates a gross random profit  $\pi$  (cf. figure 1).

Insert figure 1 about here

In a competitive environment, the firm  $i$  is a price taker and considers the market price ( $\bar{p}$ ) as given. The entrepreneur chooses an output level ( $q_i$ ), or equivalently the level of employment ( $l_i$ ), since we assume a production function:  $q_i = f(l_i)$  with

$f'(l_i) > 0$ . Uncertainty is of a simple form and directly impacts variable production cost. In order to construct as clear a model as possible, we use specific functional forms.

We assume a quadratic cost function:  $CT^i(q_i, z_i) = \alpha q_i^2 + q_i(\beta - z_i)$  with parameters  $\alpha, \beta > 0$ .  $z_i$  represents the exogenous cost shock. Higher values of  $z_i$  correspond to downward shifts in the marginal cost. This shock is uniformly distributed on the interval  $[-\bar{z}; \bar{z}]$  according to a density function  $f(z_i) = 1/2\bar{z}$ . Obviously, higher levels of  $z_i$  are associated with better states of the nature since  $\frac{\partial CT^i(\cdot)}{\partial z_i} < 0$  and

$$\pi^i(q_i, z_i) = \bar{p}q_i - CT^i(q_i, z_i)$$

With a probability  $\theta_i$ , the project is successful (i.e., positive states are realized) implying that revenues are sufficient to pay off the face value of the debt. If the project is not successful (i.e., negative states are realized), the revenue of the project is insufficient and the bank loan is not paid off. The interest rate on the debt is  $r$ , and at the end of the production game the firm must reimburse the amount:  $(1+r_i)D_i$ . Since profit is uncertain, it does not always cover the charge of the debt. In the cases where the firm goes bankrupt, the revenue is insufficient to fully cover the debt obligations since:  $\pi^i(\cdot) < (1+r_i)D_i$ . The owner-manager obtains zero and is protected by limited liability and the lender becomes residual claimant and is paid on the operating profits since the investment has no residual value.

We define a specific value of the random variable  $z$  at which the firm is just able to repay the debt obligation (see figure 2). This value is denoted  $\hat{z}$  and verifies implicitly the following condition:  $\pi^i(\hat{z}_i) = (1+r_i)D_i$

Insert figure 2 about here.

For values of  $z$  less than  $\hat{z}$ , the firm goes bankrupt (since its operating profits in the worst state of nature are insufficient to cover the debt payment) but in the opposite

case the firm remains solvent. The probability of exit of the firm,  $i$  ( $\theta_i$ ), can be evaluated:

$$\theta_i = F(z_i < \hat{z}_i) = \frac{\hat{z}_i + \bar{z}}{2\bar{z}}. \text{ At the first stage, the entrepreneur obtains debt capital } D \text{ and at}$$

the competitive stage we have:  $q_i^* = q_i^*(D_i)$  and the risk of cessation of activity is given by:  $\pi^i[q_i^*(D_i), \hat{z}_i]/(1+r_i) = D_i$  where  $r_i$  is the interest rate on the loan. The debt contract is risky since, for some values of the random shock  $z_i$ , the gross profit is insufficient to cover the charge of the debt. For a risky debt contract the owner-manager, protected by the limited liability status, receives:  $\text{Max}[\pi^i(.) - (1+r_i)D_i; 0]$ . We will assume that in case of bankruptcy the entrepreneur bears personal bankruptcy costs (BC) (Brander & Lewis, 1988). These bankruptcy costs increase with the size of the firm:  $BC = kq_i$  with  $k > 0$ .

Insert figure 3 about here.

The expected payoff to the entrepreneur under bank finance is given by:

$$VE^i = \int_{\hat{z}_i}^{\bar{z}} [\pi^i(q_i, z_i) - (1+r_i)D_i] f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i. \text{ In this case, with risky debt financing, the}$$

ex-post profit of the owner-manager is convex in  $\pi^i(.)$ .

Insert figure 4 about here.

Product market decisions and financial decisions are made ex ante, i.e. before knowing the exact value of the random shock. When the firm selects a product market decision (or equivalently the level of employment), it considers as given its level of debt. With this sequencing the debt influences the production equilibrium strategy selected by the entrepreneur. The decisions sequence of events is shown in figure 5.

Insert figure 5 about here.

## 1.2. Equilibrium strategy (production or employment) in a competitive environment.

The entrepreneur decides on production level  $q_i$  so as to maximize the residual earnings (share of the operating income that constitutes his payoff), taking into account the equity shares put into the firm. As the entrepreneur is a residual claimant protected by limited liability, the entrepreneur's chosen production strategy is obtained by setting:

$$\frac{\partial VE^i}{\partial q_i} = 0 \quad \text{where: } VE^i = \int_{\hat{z}_i}^{\bar{z}} [\pi^i(q_i, z_i) - (1+r_i)D_i] f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i$$

$$\text{and: } \pi^i(q_i, z_i) = \bar{p}q_i - CT(q_i, z_i)$$

The first order condition is then :

$$\int_{\hat{z}_i}^{\bar{z}} \left[ \frac{\partial \pi_i(q_i, z_i)}{\partial q_i} \right] f(z_i) dz_i - [\pi_i(q_i, \hat{z}_i) - (1+r_i)D_i] f(z_i) \frac{d\hat{z}_i}{dq_i} = 0$$

By definition of  $\hat{z}_i$ , the second term of this expression vanishes and the rule that gives the optimal level of production of the  $i$  firm indebted is given by:

$$\int_{\hat{z}_i}^{\bar{z}} \left[ \frac{\partial \pi_i(q_i, q_j, z_i)}{\partial q_i} \right] f(z_i) dz_i = 0$$

$$(\bar{p} - 2\alpha q_i^* - \beta)(\bar{z} - \hat{z}_i) + \frac{\bar{z}^2 - \hat{z}_i^2}{2} - k(\bar{z} + \hat{z}_i) = 0$$

$$(\bar{p} - 2\alpha q_i^* - \beta) + \frac{(\bar{z} + \hat{z}_i)}{2} - \frac{k(\bar{z} + \hat{z}_i)}{(\bar{z} - \hat{z}_i)} = 0$$

$$\text{With: } \theta_i = F(z_i < \hat{z}_i) = \frac{\hat{z}_i + \bar{z}}{2\bar{z}}, \text{ probability of exit of the firm } i.$$

$$\text{Consequently: } \frac{\bar{z} + \hat{z}_i}{\bar{z} - \hat{z}_i} = \frac{\theta_i}{1 - \theta_i} \text{ and } \hat{z}_i + \bar{z} = 2\bar{z}\theta_i$$

$$(\bar{p} - \beta) + (\bar{z} - \frac{k}{1 - \theta_i})\theta_i = 2\alpha q_i^*$$

$$\text{We note: } \Phi(\theta_i) = (\bar{z} - \frac{k}{1 - \theta_i})\theta_i$$

$$(\bar{p} - \beta) + \Phi(\theta_i) = 2\alpha q_i^*$$



Then:  $2\alpha dq_i^* = \Phi' d\theta_i$

We have:  $\Phi' = \bar{z} - \frac{k}{(1-\theta_i)^2}$

The impact of competitive aggressiveness on the firm duration is then given by the sign of the expression  $\Phi'$ .

Proposition 1 describes the comparative static effects of the entrepreneurial production strategy on entrepreneurial failure risk.

**Proposition 1 : in a competitive environment, the competitive aggressiveness improves the duration of the firm if the uncertainty is not too high:  $\frac{d\theta_i}{dq_i^*} < 0$  if**

$$\bar{z} < \frac{k}{(1-\theta_i)^2}$$

*Corollary 1: An entrepreneur who uses debt to finance investment is encouraged to adopt an aggressive strategy if:  $\bar{z} > \frac{k}{1-\theta_i}$ .*

We can first evaluate the firm valuation (VG) under two alternative scenarios according to financial choices. If we consider the case where the firm is fully equity financed, we have:

$$VG^i(D=0) = \int_{-\bar{z}}^{\bar{z}} \pi^i(q_i, z_i) f(z_i) dz_i - I = \bar{\pi}^{i,D=0}(\cdot) - I$$

Under bank finance, the joint net payoffs to the entrepreneur and to the bank are:

$$\begin{aligned} VG^i(D>0) = VE^i + VD^i &= \int_{\hat{z}_i}^{\bar{z}} [\pi^i(q_i, z_i) - (1+r_i)D_i] f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i - E \\ &+ \int_{\hat{z}_i}^{\bar{z}} [(1+r_i)D_i] f(z_i) dz_i + \int_{-\bar{z}}^{\hat{z}_i} [\pi^i(q_i, z_i)] f(z_i) dz_i - D \end{aligned}$$

Consequently:

$$VG^i(D>0) = VE^i + VD^i = \int_{-\bar{z}}^{\bar{z}} \pi^i(q_i, z_i) f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i - I = \bar{\pi}^{i,D>0}(\cdot) - k\theta_i q_i - I$$

From the equilibrium values, we derive:

$$\bar{\pi}^{i,D>0}(\cdot) = \frac{1}{4\alpha} ((\bar{p} - \beta)^2 - \phi_i^2) \text{ and } \bar{\pi}^{i,D=0}(\cdot) = \frac{1}{4\alpha} (\bar{p} - \beta)^2$$

Unambiguously we have:  $VG^i(D > 0) < VG^i(D = 0)$

*Corollary 2: in a competitive environment, debt financing deteriorates the overall value of the firm.*

An alternative approach is to put oneself in the position of the entrepreneur to assess interest in debt. In such a case we have:

$$VE^i(D > 0) = \int_{\hat{z}_i}^{\bar{z}} [\pi^i(q_i, z_i) - (1 + r_i)D_i] f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i - E_i$$

In order to make comparisons possible with the case of no debt in the financial structure, we consider that the investment expenditure is discounted at the rate of bank credit. This is equivalent to considering the rate of bank credit as the opportunity cost of capital of the entrepreneur.

Consequently we have:

$$VE^i(D > 0) = \int_{\hat{z}_i}^{\bar{z}} [\pi^i(q_i, z_i) - (1 + r_i)D_i] f(z_i) dz_i - \int_{-\bar{z}}^{\hat{z}_i} [kq_i] f(z_i) dz_i - \pi^i(\hat{z}_i) - (1 + r_i)D_i$$

While:  $VG^i(D = 0) = \bar{\pi}^{i,D=0}(\cdot) - (1 + r_i)I$ .

After some manipulations we obtain:

$$VE^i(D > 0) = \theta_i \{ \bar{z} [2\bar{z}(1 - \theta_i) + 2\theta_i - 1] - k \} q_i + \frac{1}{4\alpha} (\bar{p} - \beta)^2 - (1 + r_i)I$$

Consequently we can assert that:

*Corollary 3: debt improves the profitability of the capital provided by the entrepreneur if the following three conditions are met:  $\theta_i > 0.5$ , personal bankruptcy costs are sufficiently low ( $k < 2\bar{z}(1 - \theta_i)\bar{z} - (1/2)$ ) and the market price is sufficiently high ( $\bar{p} > \bar{p}^{\lim}$ ) with  $\bar{p}^{\lim}$  such as*

$$2(\bar{p}^{\lim} - \beta - \phi)(2\bar{z}[(1 - \theta_i)\bar{z} + \theta_i - (1/2)] - k) = \theta_i(k/(1 - \theta_i) - \bar{z})^2.$$

Now look at the link between debt and production strategy of the entrepreneur. The rule for determining the production of a leveraged firm is given by:

$$2\alpha q_i^* = (\bar{p} - \beta) + (\bar{z} - \frac{k}{1-\theta_i})\theta_i$$

Consequently we have:  $2\alpha dq_i^* = \frac{d\varphi_1}{d\theta_i} d\theta_i$  with :  $\frac{d\varphi_1}{d\theta_i} = \frac{1}{2\alpha} \left[ \bar{z} - \frac{k}{(1-\theta_i)^2} \right]$

The expected probability of bankruptcy of the leveraged firm results from the condition:

$$(1+r_i)D_i = B_i = \pi^i(q_i, \hat{z}_i). \text{ This equation implicitly defines the threshold value on the}$$

$$\text{random shock: } \hat{z}_i = \varphi_2(B_i, q_i). \text{ We then have: } d\hat{z}_i = \frac{\partial \varphi_2}{\partial B_i} dB_i + \frac{\partial \varphi_2}{\partial q_i} dq_i.$$

$$\text{since: } d\hat{z}_i = 2\bar{z}d\theta_i, \text{ then: } \frac{dB_i}{dq_i} = \frac{\frac{\partial \varphi_2}{\partial B_i}}{\frac{\partial \varphi_1}{\partial \theta_i} - \frac{\partial \varphi_2}{\partial q_i}}$$

$$\text{We know that: } \frac{\partial \varphi_2}{\partial B_i} = \frac{1}{q_i} > 0$$

**Proposition 2: Debt implies that the entrepreneur will favor an aggressive**

$$\text{production strategy if } \frac{2\bar{z}}{\frac{\partial \varphi_1}{\partial \theta_i}} > \frac{\partial \varphi_2}{\partial q_i}.$$

**Section 2: Database and key variable measures: growth, aggressiveness and intensity of acquiring debt.**

### **2-1. Database and selected sample.**

Data is drawn from a 2002 survey (SINE 2002-1) conducted by the French National Institute of Statistical and Economic Studies (INSEE) which includes French firms set up or taken over during the first half of that year. Businesses are required by law to complete the surveys and therefore the sample should be considered extremely robust. A follow-up survey, carried out in 2005 (SINE 2002-2), delivers information about the status of the same firms four years later (closed down or still active). We will integrate market policies and financial policies during the the years 2003-2005 into our discussion.

Finally with the last survey of the cohort in 2007 (SINE 2007-3), we will consider the survival of the firms according to their strategies, and for the firms still alive, the growth of the firms at the final date of observation in 2007.

Insert table 1 about here.

In order to have a homogenized population of new firms representing private sector entrepreneurship in France, we consider independent ex-nihilo start-ups (subsidiaries and takeovers are excluded), in French regions (overseas departments have been excluded) under the limited liability status<sup>2</sup>. Theoretically, firms evolving under limited liability are more prone to exit because of the lower exit cost. This can be counterbalanced by the fact that this kind of status reflects a more business oriented enterprise. Effectively in our sample the duration of the limited liability firms is slightly superior overall (57.1 % against 55.1 %). Harhoff, Stahl and Woywode (1998) postulate that growth rates are higher for survivor firms with limited liability since these firms have undertaken riskier projects. In order to follow our theoretical development we focus on the independent new firms evolving under the limited liability status and that have invested during the years 2003-2005.

## **2-2. Definition of growth**

A commonly used variable to measure firm level growth is change in the labor force (Brüderl & Preisendörfer, 2000; Birch, 1997; Autio, Arenius, & Wallenius, 2000; GEM, 2005). Following the SINE database variables, we consider here the total salaried and non-salaried jobs of the firm to include the:

- Non salaried manager (business manager or co-business manager with majority part),
- Co-worker Spouse / family members giving assistance (full time or part-time),
- Salaried manager, not already designated above,

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<sup>2</sup> We confirmed that the limited liability status has a strong explanation for the total variance of the different classes of growth (cf. infra). So retaining only the limited liability status ensures a more homogenized population as regards growth.

- permanent salaried employment contract and fixed-term salaried employment contract, not already designated above,
- Other salaried people including trainee with a contract, apprentices, contracts of qualification, contracts of employment initiatives, not already designated above.

We now split the firm population into four sub-groups according to the rate of growth of labor of the firm during the first five years of life: High Growth (HG) = 100% growth and more; Average Growth (AG) = zero to 100% growth; Average Decrease (AD) = less than zero to 50% growth; and High Decrease (HD) = 50% and more decline (see annex 1 for more information).

Insert table 2 about here.

As Table 2 indicates, 3260 firms in the population fit our HG category (they represent 13.2% of the selected sample at the date of creation). With the employee size growing on average from 2 to 9 employees over time, these are not high growth firms by global standards, but by French standards, therefore we acknowledge they are relatively high growth in an international context.

If we consider firms that have invested, the sample is now reduced to 10,406 firms total including 2,727 HG firms (they represent 11.08% of the selected sample at the date of creation), 6,170 AG firms (25.1% of the selected sample at the date of creation), 364 AD (1.48% of the selected sample at the date of creation), and 1145 HD (4.65% of the selected sample at the date of creation).

Firms that will close registered 44.4% of all jobs in the 2002 cohort versus the HG firms which registered 9.1% of the jobs in 2002, yet 45.4% of the jobs in 2007.

### **2-3. Classes of entrepreneurial behavior**

A variable is constructed to express the strength of the firm's entrepreneurial behavior in its market based on five questions required by the SINE database registration process.

Insert table 3 about here.

Competitive dynamism can be expressed by a decrease in price or an increase of production level. It also refers to several modes of winning market share in a context competition (see Table 3). An entrepreneurial behavior (EB) score represents the summation of responses that indicate growth behavior: the higher the global index, the higher the EB index score ascribed to the firm. We assume the following: EB5=very high, EB4 = high, EB3=medium, EB2= weak, EB1=very weak; EB0 = no EB. We gather the EB classes 3-5 to distinguish aggressive firms against non- aggressive ones (EB2-0).

#### **2-4. Classes of intensity of acquiring debt**

In this paper, we build a qualitative variable, we name the “intensity of assuming debt”, which represents the financial policy of the firms which have invested during the first years of life. In contrast to previous studies that refer mostly to accounting data (Honjo, 2000; Prantl, 2003), our variable measures the willingness and the ability of the entrepreneur to go into debt.

The SINE 2002 survey allows us to describe the financial policy the entrepreneur has implemented during the years 2003-2005. The policy of indebtedness is estimated in a qualitative way. The mode of management of the cash requirement and the main financing mode of investments over the two years are combined to measure the propensity to indebtedness of the firm. In terms of the management of the cash requirement, we synthesize the information into three main financing modes as follows: the “Debt Mode” (DM) category represents the entrepreneur who exclusively resorts to one or several types of borrowing; the "Equity Capital Mode" (ECM), includes entrepreneurs/firms that exclusively finance the firm with one or several types of equity capital; and the "Mixed Debt and Equity Mode" (MDEM) represents joint debt and equity mode of financing. This variable then represents the propensity to resort to debt in

managing cash requirement and in financing investments. The priority has been given to the financing mode of investment in the construction of this variable. We then distinguish four main classes of intensity in acquiring debt.

Insert table 4 about here.

We consider that for firms financing their investments only through equity capital that the management of the cash requirement does not discriminate. On the other hand, when the firm always resorts to debt for financing its investments, we take this to mean that the firm has no reserves at all to finance its cash requirements.

An interesting point is then to investigate in which way the debt/entrepreneurial behavior combinations alter the firm's survival and growth's outcomes. We postulate that beyond the founding conditions of the firm, the role and the influence of firm founders is essential to achieve high growth (Nelson, 2003; 2007). This role is translated into actual policies that have an influence on the future of the new firm. This role is also constrained by the motives of the founder and the environment of the firm. Thus it becomes important to analyse the combination of the financial and the market policies the new firm implements to understand the conditions of efficient policies for growth.

## **2.5. Descriptive analysis**

Insert chart 1 about her.

Globally, entrepreneurial behavior and intensity in acquiring debt improves the survival rates of new firms. The maximal spread is observed for the medium intensity in acquiring debt (D2 class). Nevertheless when the intensity in acquiring debt is high, the spread is reduced because the survival rate of aggressive firms decreases while the survival rate of non-aggressive firms still improves (H2 holds). The D4 class (maximal intensity in acquiring debt) shows no difference according to the behavior of the firm.

Insert chart 2 and 3 about here

Among the more than 10,000 firms that survived to the end of the observation, we can see that firms which belong to the HG class are, on average, more aggressive than the other classes. Also, the share of aggressive firms is higher for the medium intensity in acquiring debt, except for the AD class; the AG class has the same pattern as the HG class but with some lesser degree of entrepreneurial behavior. AD and HD classes display a very low entrepreneurial behavior for the maximal intensity in acquiring debt.

### Section 3: Methods and results.

Two methods are used with the first being a duration analysis to measure the debt/aggressiveness link and its relationship to increasing the survival time of the firms to 2005 for firms that subsequently disappear by 2007. The second test is a multinomial logit analysis to analyse the growth of the firms that survive to 2007.

#### 3.1 Duration analysis

##### 3.1.1 Cox model

We use a proportional hazard Cox model to examine the impact of post-entry strategy on survival. The basic hazard function is not specified here, since the results of the non-parametric estimation (Kaplan-Meier) of the duration show that none of the known statistical laws can be adapted to our data.

Consider a firm sample of size  $n$ . The rate of discontinuation at date  $t$  is measured by the hazard rate function  $h(t)$ . For each firm  $i$ , the data provide information on its life span  $t_i$  measured in months<sup>3</sup>, its individual characteristics ( $x_i$ ), and also whether the firm is still alive in 2007. The latter information may be summarized by defining a binary variable ( $a_i$ ) that indicates the right censor as follows.

$$a_i = \begin{cases} 0 : \text{if the firm } i \text{ is still active at the time of the third survey in 2007} \\ 1 : \text{if the firm } i \text{ ceased its activity between 2005 and 2007} \end{cases}$$

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<sup>3</sup>  $t_i$  is the difference between the date of cessation of activity and the date of setting up of the  $i$  firm.



The proportional hazard rate expression is given by:

$$h(t; x\beta) = h_0(t) \exp(x\beta)$$

where  $h_0(t)$  is an unspecified function of  $t$  called the baseline hazard and  $\beta$  is a vector of the estimated parameters. Estimators are obtained by maximizing the following partial likelihood expression:

$$PL = \prod_{i=1}^n \left[ \frac{\exp(x_i\beta)}{\sum_{j=1}^n Y_{ij} \exp(x_j\beta)} \right]^{a_i}$$

where  $Y_{ij}=1$  if  $t_j \geq t_i$ ; and  $Y_{ij}=0$  if  $t_j < t_i$ . The  $Y$ s are a convenient method to exclude from the denominator those individuals who have already experienced the event and are thus not part of the risk set. The population expressed in the denominator has not ceased its activity before  $t_i$ . For censored individuals the exit time is not observed so that no probability of exit may be included in the partial likelihood. This is why  $a_i = 0$  for such individuals. The log of the partial likelihood is written as follows:

$$\text{Log} PL = \sum_{i=1}^n a_i \left\{ x_i \beta - \log \left[ \sum_{j=1}^n Y_{ij} \exp(x_j \beta) \right] \right\}$$

This expression is maximized with respect to  $\beta$  so as to obtain the maximum partial likelihood estimators  $\hat{\beta}$ . The estimation has been carried out using the “PHREG” procedure in SAS (see Allison, 1995).

### 3.1.2 Results

Insert table 5 about here.

First we examine the improvements following introduction of variables measuring the entrepreneurial behavior and the intensity in acquiring debt. From model 1 to model 2, the difference of the -2 Log Likelihood = 33.53. This difference is highly significant.

From model 1 to model 3 the difference is 18.24 which is also highly significant. From model 1 to model 4, the difference is 13.7 and is highly significant.

For the set of firms that did invest an entrepreneurial behavior strategy there was a lesser probability of exit (Model 2). We can observe that an aggressive strategy improves returns on investment, but only for the three lowest classes of aggressiveness. With the entrepreneurial behavior variable built in three modalities (Model 3), the lowest class of entrepreneurial behavior has a lower probability of survival in reference to medium entrepreneurial behavior.

When resorting very intensively to debt (Model 4) the firm is more prone to exit. Surprisingly, the class of weak intensity in acquiring debt also increases the probability of exit. We assume that these firms investing in physical assets of the firm offered collateral when investments were financed by the bank. One logic to explain the pattern of exit may be related to the firms inability to obtain debt, rather than their decision not to pursue debt.

To properly take into account the endogeneity of the entrepreneurial behavior with the intensity in acquiring debt (D) we ought to find an instrumental variable (Inst) that would be highly correlated with entrepreneurial behavior (A) but not with the life span of the new firm. Therefore:

1.  $\text{Duration} = f(A, X)$ , X encompasses explanatory variables included the debt variable (D).
2.  $\hat{A} = f(X, \text{Inst})$ , The instrumental variable explains the entrepreneurial behavior but is insignificant regarding the life span of the firm.
3.  $\text{Duration} = f(\hat{A}, X)$

We found two variables available in the 2002 survey registration that serve this idea. The data shows that when the entrepreneur manages the firm with his/her couple partner there is a negative effect on aggressive behavior. Further when the research market motive is internet based, there is a positive effect on aggressive behavior. Neither condition affects the survival duration of the firm. A third variable emerging from the

second survey on the firms in 2005 shows that the hiring of people with an occasional status from 2002-2005 has a positive effect on entrepreneurial behavior and no influence on survival duration. By taking into account the endogeneity problem (Grefe, Simonet, 2008) we find that entrepreneurial behavior improves the survival rate for the class of firms of medium intensity in acquiring debt (D2 class) and that an entrepreneurial behavior deteriorates survival when the resort to debt is maximal.

### **3.2 Multinomial analysis**

We use a multinomial logit analysis to consider the firms that survive to 2007. We use an unordered model (proc Catmod in SAS) because the test upon the same effects of the explanatory variables regardless of the dichotomization of the dependent variable doesn't hold.

Insert table 6 about here.

The values can be interpreted as the odds of appearance of the modality regarding the group considered and taking into account the reference class. Due to the quantity of information we present only the comparison between the class of HG firms, our class of highest interest, with the others.

For firms that survived to 2007, the greatest distinguishing elements for high growth firms versus average growth firms are observed for entrepreneurial behavior and among certain control variables: the entrepreneur has an average experience in a medium firm, the firm has been set-up with employees at the origin, or the firm belongs to the construction or transport branches of industry. Whatever the subpopulations, entrepreneurial behavior is a distinguishing mark of high growth firms (except for the highest class of aggressiveness, as predicted) and this variable is highly significant in the explanation of the total variance.

Insert table 7 about here.

If we consider now the intensity in acquiring debt, we can see that this variable is important in splitting the categories of HD and HG firms, with HD firms more prone to go into debt (the same result for maximal intensity in acquiring debt for AG firms against HG firms). Overall a weak intensity in acquiring debt is always the signal for not belonging to HG firms. It appears that the reference modality is the most favorable class of debt for HG firms.

Taking into account endogeneity (Lollivier, 2001), we find that entrepreneurial behavior improves the probability of a firm belonging to the category of high growth with a weak intensity in acquiring debt, for the indifference intensity in acquiring debt class, and when the intensity in acquiring debt is maximal.

We see these results as providing support for parts of our theoretical model as follows:

- A proactive strategy of the entrepreneur can contribute to improving the durability of a company if the uncertainty on the production cost is not too large (Proposition 1);
- For an increasing intensity of acquiring debt, the entrepreneur is led to promote an aggressive strategy toward competitors (Proposition 2).

The empirical results show that when the entrepreneur uses bank indebtedness rather than equity capital to finance its capital expenditures, the propensity to adopt an aggressive strategy is encouraged (corollary 1). And finally, that under certain conditions, debt improves the return on equity (corollary 3).

#### **Section 4: Discussion**

In 2002, the OECD conducted a survey based on data collected in France, Italy, the Netherlands, Spain, Germany, Sweden, Japan, the USA and the province of Quebec in Canada, (OECD, 2002). The authors notice that 2.5 to 10% of all firms identified were high growth firms and that 50 to 60% of jobs created over time may be attributed to these firms alone. What are the demographic factors and/or trends that could be taken into account in the design of policies to facilitate entrepreneurial development of

aspirationally high growth companies? With the data base SINE we have the possibility to examine in concrete terms, in the national French case, how new firms create jobs over six years. The challenge is important due to the weak entrepreneurship propensity in France (Abdesselam et al, 2004) and to the low capability of development of these new firms (Schane, 2009) despite strong national interest in promoting this sector of the economy.

Statistics show that approximately 80% of new start-ups begin without salaried employees other than the owner-manager. While 40,000 French start-ups have at least one salaried person, we look at this in comparison to the U.S. figure of 600,000. Considering that the U.S. has five times more inhabitants than France, all things equal, France could register 3 times more start-ups with employees, or 120,000. This assumes France reaches a similar propensity for entrepreneurship among its population as well as changes to the policy infrastructure that facilitates high growth venturing. Findings of studies such as this are critical for policies, educational, and training programs to be developed that provide wise information to individuals interested in building scalable, sustainable ventures.

Our study demonstrates that among firms that did invest, the proportion of firms that displayed entrepreneurial behavior is greater in the class of firms which have a medium intensity in acquiring debt (D2). The D2 class groups the firms which have access to the widest financing range (debt and equity capital) together. These firms did set up sizable investment projects on launch<sup>4</sup>. They can be identified in 2005 as the most dynamic firms. A reduction of the proportion of aggressive firms linked with an increasing intensity in acquiring debt can be noticed from D2 to D4. Two interpretations may be suggested for the higher leveraged firms: either these firms cannot afford to sustain an entrepreneurial behavior or they fear exposing themselves to a greater risk of exit in case of a high aggressiveness. Another explanation is to consider that the debt cost increases with the total amount of debt because of the counterpart risk for the bank and because of the behavior of the bank which consists in lending at a short term. Thus the scope for entrepreneurial behavior is reduced.

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<sup>4</sup> This class of debt groups the firms with the highest initial capital together. Indeed, 26.29% of the firms of this class had a capital superior to 40,000 euros for 21.18% in the total population. Furthermore, small projects (inferior to 7623 euros) are under-represented: 30.19 % in the class for 37.12 % in the total population.

Once the entrepreneurial decision is taken, a proactive attitude insures a net and clear prevalence of the probability to belong to the class of high growth firms. This entrepreneurial orientation can be related to some advantages, perhaps a better recognition of market opportunities that allows these firms to benefit from first mover advantages (better knowledge of the market, creation of entry barriers, reputational advantage.....). Nevertheless in some new fields there exists a true uncertainty about the acceptance by the clients of the new product/service or technology. Sometimes this increases the success odds for the second or the third entrant in the market. In that sense the companies that have a great chance of strong growth may be the most deviant, the most risk engaged, the firms better able to adapt to uncertainty; to improvise. Still financial means are crucial as they allow the entrepreneur to implement the firm's market strategy. However, as it also the case, when the firm is too much indebted, entrepreneurial behavior is difficult to achieve.

When we examine the French case we also note that growth in the entrepreneurial spirit at the individual level may be generational and may depend on a new training and outlook on entrepreneurship held by those entering and new to the labor market. The need to create a more favorable social climate for new businesses requires a change in state of mind but also improvements in the skills of European entrepreneurs and support from the infrastructure that includes government, large firms and other entrepreneurs. Development in these areas may eliminate the obstacles to the new firm creation and may build interest in the growth of companies. It is a question of filling the gap which exists between the perception of the desirability to become an entrepreneur and the real acting out to undertake the management of firms for growth.

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# Figures and Tables



Figure 1: A one period model

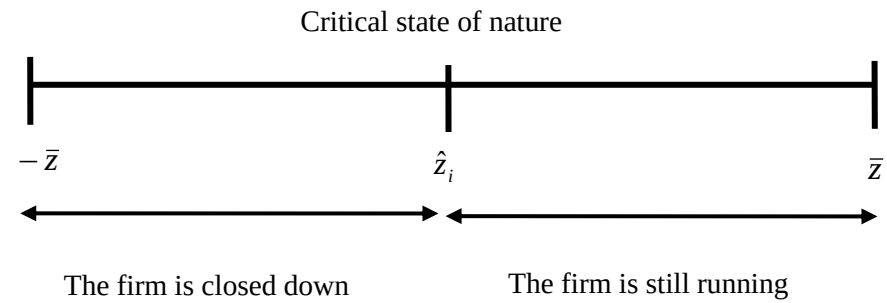


Figure 2: The bankruptcy risk exposal

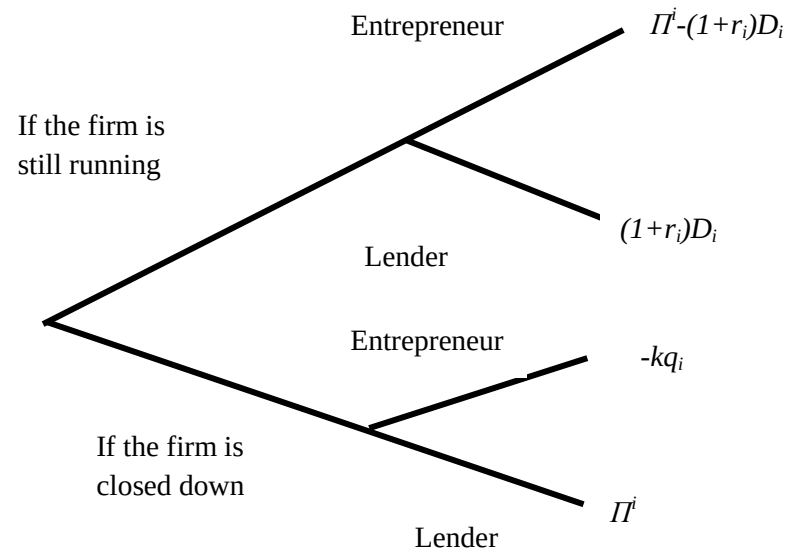


Figure 3: Scheme of payoffs

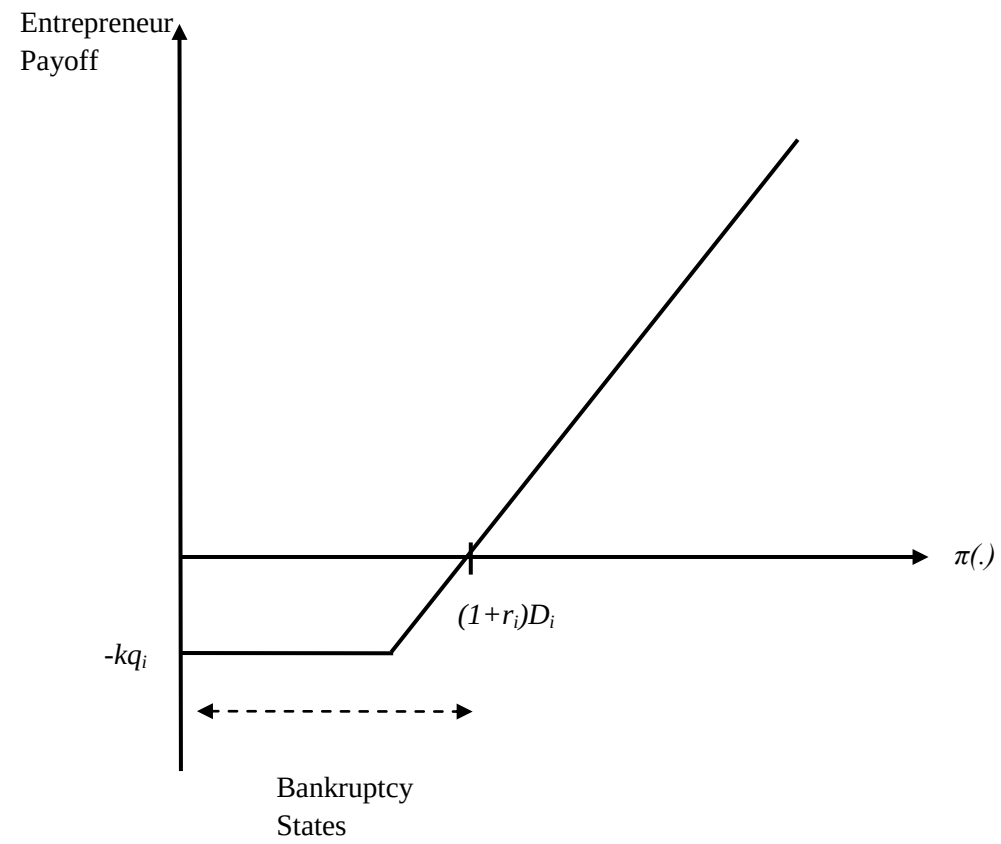


Figure 4: Entrepreneur's payoff

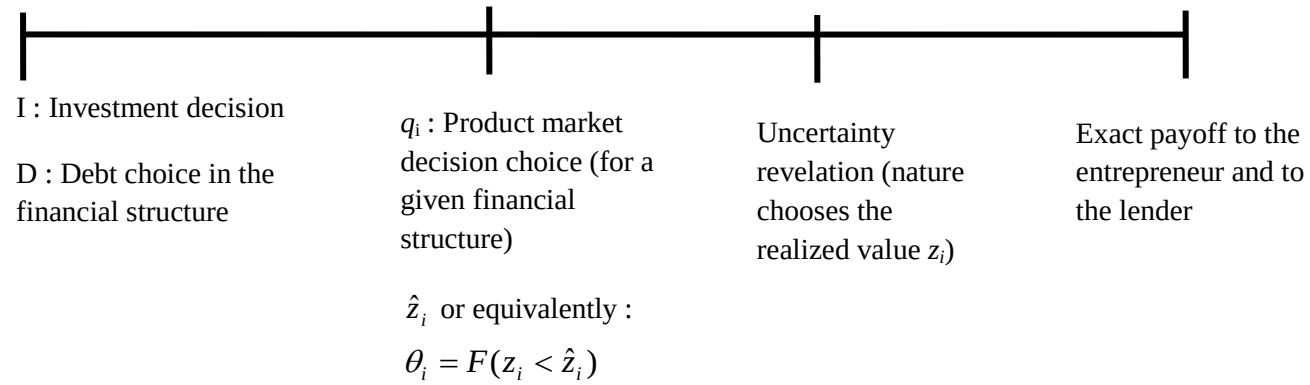


Figure 5: Sequence of decisions

| <i>Data base SINE</i>                                                                                                           |                                                                                                                                                                                        | <i>Rate of survival<br/>To 2007 (66-72<br/>months)</i>                                    |
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 87,492 start-ups or takeovers                                                                                                   | Registered during the first six months of 2002. The data base takes into account economic "reactivations" <sup>5</sup> registered after the 1 <sup>st</sup> of January 2002.           | 56.3%                                                                                     |
| 75,591 start-ups                                                                                                                |                                                                                                                                                                                        | 55.4%                                                                                     |
| 71,837 start-ups in the Metropole area.                                                                                         | We eliminate the overseas <i>départements</i> , (La Guadeloupe, La Martinique, La Réunion and La Guyane).                                                                              | 55.3%                                                                                     |
| 67,396 firms are new independent firms.                                                                                         | Subsidiaries of groups are removed. No financial participation of firms.                                                                                                               | 55.1%                                                                                     |
| 24,623 firms under limited liability status.                                                                                    | Harhoff, Stahl and Woywode (1998) suppose and verify that growth rates are higher for survivor firms with limited liability status since these firms have undertaken riskier projects. | 57.1 %<br>Rate of survival<br>of the 24,623<br>firms under<br>limited liability<br>status |
| At the follow-up survey (2002-2), 17,300 firms are still alive. Among them 12,542 firms have invested during the last two years | The rate of survival at maximum of 45 months of life is 70.3% of the chosen sample.                                                                                                    |                                                                                           |
| At the third survey (2002-3) in 2007, among the 12,542 firms which have invested, 10,406 are still in operation.                | The rate of survival for these firms at maximum of 28 months of life (between september 2005 and december 2007) is 82,96%                                                              |                                                                                           |

Table 1: The selected sample of new firms

<sup>5</sup> Economic "reactivations" that correspond to Sirene listed units had stopped their activity and then started up again (in the database these are only individual entrepreneurs –craftsmen or shopkeepers).

|                           | Ceased <sup>a</sup> | No Investment |                     | Investment |        |       |       |                     | Sum/Average   |
|---------------------------|---------------------|---------------|---------------------|------------|--------|-------|-------|---------------------|---------------|
|                           |                     | alive         | Ceased <sup>b</sup> | HG         | AG     | AD    | HD    | Ceased <sup>b</sup> |               |
| <b>Number of firms</b>    | 7 323               | 3,662         | 1,096               | 2,727      | 6,170  | 364   | 1 145 | 2,136               | <b>24,623</b> |
| <i>Proportion</i>         | 29.7%               | 14.9%         | 4.5%                | 11.1%      | 25.1%  | 1.5%  | 4.7%  | 8.7%                | 100%          |
| Employees <sup>1</sup>    | 17,214              | 7, 310        | 2,187               | 4,970      | 12,238 | 1,997 | 3 958 | 4,935               | <b>54,809</b> |
| <i>Proportion</i>         | 31.4%               | 13.3%         | 4.0%                | 9.1%       | 22.3%  | 3.6%  | 7.2%  | 9.0%                | 100%          |
| Employees <sup>2</sup>    | -                   | 9,806         | 2,858               | 17,099     | 15,768 | 1,761 | 2839  | 6,223               | <b>56,354</b> |
| <i>Proportion</i>         | -                   | 17.4%         | 5.1%                | 30.3%      | 28.0%  | 3.1%  | 5.0%  | 11.0%               | 100%          |
| Employees <sup>3</sup>    | -                   | 10,564        | -                   | 24,568     | 16,203 | 1,483 | 1 322 | -                   | <b>54,140</b> |
| <i>Proportion</i>         | -                   | 19.5%         | -                   | 45.4%      | 29.9%  | 2.7%  | 2.4%  | -                   | 100%          |
| Average initial size      | 2.8                 | 2.0           | 2.0                 | 1.8        | 2.0    | 5.5   | 3,5   | 2.3                 |               |
| Size at the second survey | -                   | 2.7           | 2.6                 | 6.3        | 2.6    | 4.8   | 2,5   | 2.6                 |               |
| Size at the third survey  | -                   | 2.9           | -                   | 9.0        | 2.6    | 4.1   | 1,2   | -                   |               |

Table 2: Job creation and classes of growth for firms that have invested

<sup>1</sup>when setting up

<sup>2</sup>at the second survey

<sup>3</sup>at the third survey

<sup>a</sup> before the second survey

<sup>b</sup> between the second and the third survey

| Questions                                                                           | Modalities of reply             | Entrepreneurial Behavior index |
|-------------------------------------------------------------------------------------|---------------------------------|--------------------------------|
| <i>What has been your global approach towards your firm over the last two years</i> | Increasing the activity         | 1                              |
|                                                                                     | Maintaining the activity at its | 0                              |
|                                                                                     | Attempting to safeguard the     | 0                              |
| <i>Have you made advertising efforts over the last two years?</i>                   | Yes                             | 1                              |
|                                                                                     | No                              | 0                              |
| <i>Have you made efforts to prospect new clients over the last two years?</i>       | Yes                             | 1                              |
|                                                                                     | No                              | 0                              |
| <i>Have you made any effort on your prices over the last two years?</i>             | Yes                             | 1                              |
|                                                                                     | No                              | 0                              |
| <i>Have you been subcontracting work (to other firms) over the last two</i>         | Yes                             | 1                              |
|                                                                                     | No                              | 0                              |

Table 3: The construction of an entrepreneurial behavior score index

| Financing sources of investments | Management of cash requirement                         | Intensity in acquiring debt                                                  | Associations                                                                           | Classes*                                           |
|----------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------|
| "Equity capital" ( $EC_{INV}$ )  | "Equity capital"<br>.....<br>"Mixed" ( $M_{CR}$ )..... | The firm never resorts to debt or the firm resorts to debt only for its cash | $EC_{INV} + NO_{CR}$<br>$EC_{INV} + EC_{CR}$                                           | $D_1$ : <i>minimal intensity in acquiring debt</i> |
| "Mixed" ( $M_{INV}$ )            | "Debt" ( $D_{CR}$ )<br>.....                           | The firm finances its investments both through equity capital and debt       | $M_{INV} + NO_{CR}$<br>$M_{INV} + EC_{CR}$<br>$M_{INV} + M_{CR}$<br>$M_{INV} + D_{CR}$ | $D_2$ : <i>medium intensity in acquiring debt</i>  |
| "Debt" ( $D_{INV}$ )             | "No cash requirement" ( $NO_{CR}$ )                    | The firm always resorts to debt to finance its                               | $D_{INV} + EC_{CR}$<br>$D_{INV} + M_{CR}$                                              | $D_3$ : <i>high intensity in acquiring debt</i>    |
|                                  |                                                        | The firm always resorts to debt to finance its                               | $D_{INV} + NO_{CR}$<br>$D_{INV} + D_{CR}$                                              | $D_4$ : <i>maximal intensity in acquiring debt</i> |

Table 4: The four classes of intensity of the resort to debt



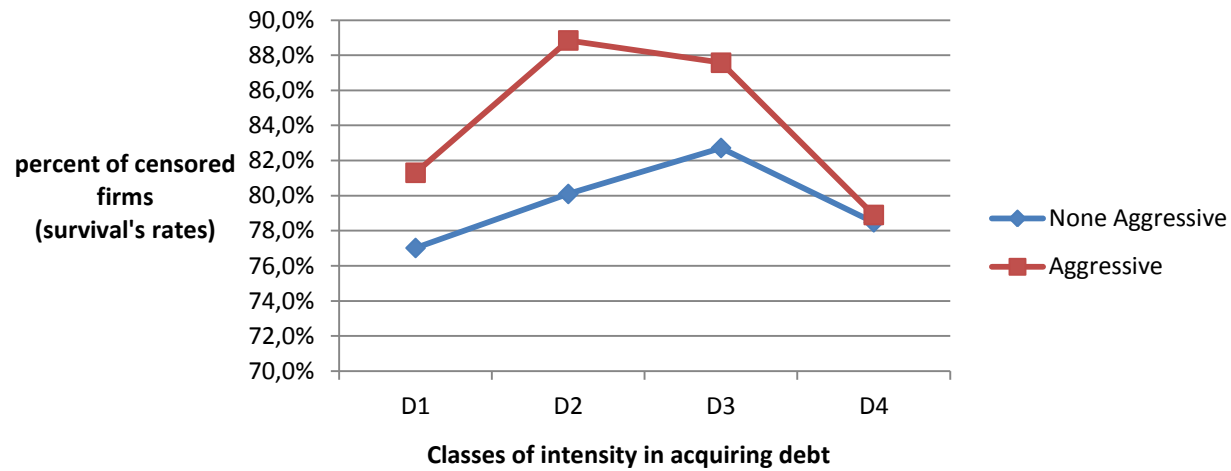


Chart 1: Survival rates by classes of intensity in acquiring debt according to the entrepreneurial behavior

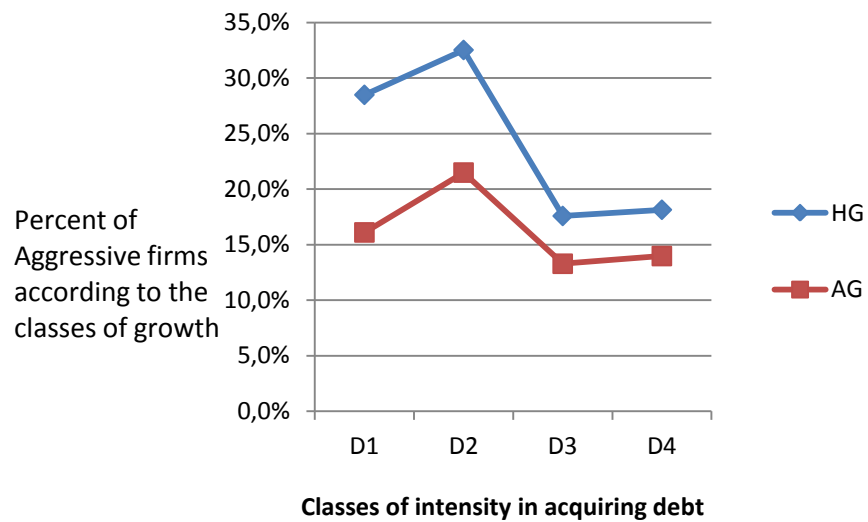


Chart 2: Percent of aggressive firms (in two classes) according to class of growth among firms that have experienced growth

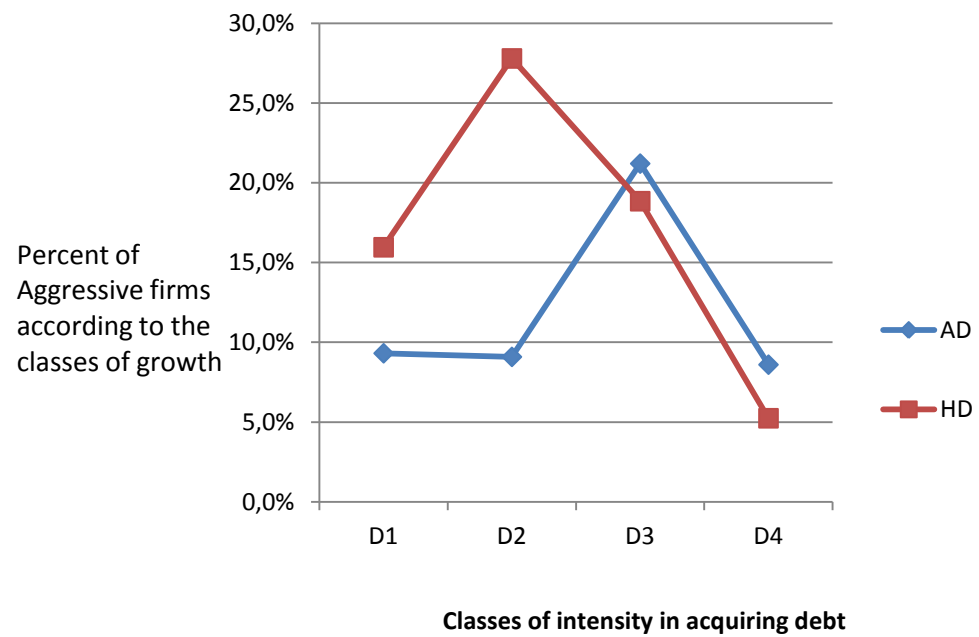


Chart 3: Percent of aggressive firms (in two classes) according to class of growth among firms that have experienced among firms that have experienced a decrease in growth

| Variables                                               | Modalities   | Model 1 | Model 2     | Model       | Model       |
|---------------------------------------------------------|--------------|---------|-------------|-------------|-------------|
| <b>Entrepreneurial behavior</b><br><b>Five classes</b>  | E.B.5        | X       | -10.05      | X           | X           |
|                                                         | E.B.4        | X       | -0.101      | X           | X           |
|                                                         | E.B.3        | X       | -0.36***    | X           | X           |
|                                                         | E.B.2        | X       | -0.23***    | X           | X           |
|                                                         | E.B.1        | X       | -0.12**     | X           | X           |
|                                                         | E.B.0        |         | <b>Réf.</b> |             |             |
| <b>Entrepreneurial behavior</b><br><b>three classes</b> | E.B.'3 (EB4. | X       | X           | 0.11        | X           |
|                                                         | E.B.'2 (EB2. | X       | X           | <b>Réf.</b> | X           |
|                                                         | E.B.'1 (EB0, | X       | X           | 0.200*      | X           |
| <b>Intensity in acquiring debt</b>                      | DEBT4        | X       | X           | X           | 0.14**      |
|                                                         | DEBT3        | X       | X           | X           | -0.08       |
|                                                         | DEBT2        | X       | X           | X           | <b>Réf.</b> |
|                                                         | DEBT1        | X       | X           | X           | 0.160*      |
| <b>-2LogL</b>                                           |              | 39500.6 | 39467.1     | 39482.      | 39486.      |
| <b>LR statistic</b>                                     |              | 427.30* | 460.83*     | 445.54      | 441***      |
| <b>Number of firms</b>                                  |              | 12542   | 12542       | 12542       | 12542       |
| <b>Percent Censored</b>                                 |              | 82.97   | 82.97       | 82.97       | 82.97       |

Table 5: Cox Model: 12542 Start-ups under limited liability status which have survived from 2002 at least until 2005 and which have invested during the years 2003-2005. Annex 2: explanatory and control variables; Annex 3, results for control variables.

<sup>a</sup> Reading of the table: ones reasons according to the referential class of each variable (except variables for which several modalities of answers are available –example of the motives of the start-up-). If  $\beta < 0$  and if  $\text{Pr} > \chi^2$  is inferior to 10 percent the variable significantly contributes to increase the life span of the firm.

<sup>b</sup> \*\*\*, \*\* and \* indicate significant at the 1 percent, 5 percent and 10 percent level, respectively.

<sup>c</sup> Results concerning control variables are available from the authors upon request.

| <i>Variables</i>                          | <i>Modalities</i> | <i>Comparison classes of growth</i> |              |             |
|-------------------------------------------|-------------------|-------------------------------------|--------------|-------------|
|                                           |                   | <b>HD/HG</b>                        | <b>AD/HG</b> | <b>AG/H</b> |
| Entrepreneurial behavior:<br>Five classes | E.B.5             | ns                                  | 0,49         | 1,01        |
|                                           | E.B.4             | 0,32***                             | ns           | 0,39**      |
|                                           | E.B.3             | 0,26***                             | 0,19***      | 0,35**      |
|                                           | E.B.2             | 0,30***                             | 0,41***      | 0,50**      |
|                                           | E.B.1             | 0,68***                             | 0,53***      | 0,66**      |
|                                           | E.B.0             | <b>Réf.</b>                         | <b>Réf.</b>  | <b>Réf.</b> |

Table 6: Results of the multinomial analysis of the four classes of growth in relation to entrepreneurial behavior. Included are 10,406 independent ex-nihilo start-up in French regions under the limited liability status that survived to 2007.

\*, \*\*, and \*\*\* represent respectively the 1%, 5% and 10% significance of the coefficients.

| <i>Variables</i>            | <i>Modalities</i> | <i>Comparison classes of growth</i> |              |             |
|-----------------------------|-------------------|-------------------------------------|--------------|-------------|
|                             |                   | <b>HD/HG</b>                        | <b>AD/HG</b> | <b>AG/</b>  |
| Intensity in acquiring debt | D4                | 1,32**                              | 1,140        | 1,38*       |
|                             | D3                | 1,45***                             | 0,873        | 1,072       |
|                             | D2                | <b>Réf.</b>                         | <b>Réf.</b>  | <b>Réf.</b> |
|                             | D1                | 2,36***                             | 2,05***      | 1,99*       |

Table 7: Results of the multinomial analysis of the four classes of growth in reference to intensity in acquiring debt. Included are 10,406 independent ex-nihilo start-ups in French regions under the limited liability status that survived to 2007.

## ANNEXES:

### Annex 1: Classes of growth

Considering that it is easier to register a high growth firm if the initial size is low, we correct the rate of growth according to the initial size of the firm. The correction is the following: for the category of high growth firms (HG), the rate of growth must be superior or equal to one if the initial size of the labor force is 5 or more employees, that is to say that the firm has to at least double its number of employees. If the initial size is 4 employees, the rate of growth must be superior or equal to 1.25 (from 4 employees to 9, at least). If the initial size is 3 employees, the rate of growth must be superior or equal to 1.33 (from 3 employees to 7, at least). If the initial size is 2 employees, the rate of growth must be superior or equal to 1,5 (from 2 employees to 5, at least). If the initial size is 1 employee, the rate of growth must be superior or equal to 2 (from 1 employee to 3, at least). These growth rates can be translated into compounded annual growth rates: 1 to 3 is equivalent to + 24.7% per year, 2 to 5 is equivalent to + 20.11% per year, 3 to 7 is equivalent to + 18.46% per year, 4 to 9 is equivalent to + 17.6% per year and finally up to 5 and more to double the initial size is equivalent to an annual growth of 14.87% per year.

## Annex 2: Explanatory variables

| <b>Variables</b>                        | <b>Modalities</b>                        | <b>Abbreviation</b> |
|-----------------------------------------|------------------------------------------|---------------------|
| <b>Motives of the start-up</b>          | <i>Motive new idea</i>                   | NEWIDEA             |
|                                         | <i>Motive taste for Independence</i>     | INDEP               |
|                                         | <i>Motive taste for entrepreneurship</i> | TASTE               |
|                                         | <i>Motive opportunity</i>                | OPPOR.              |
|                                         | <i>Example of surrounding</i>            | EXAMPL.             |
|                                         | <i>Unemployed, choice</i>                | UNEMPCHOICE         |
|                                         | <i>Unemployed, constraint</i>            | UNEMPCONSTR         |
|                                         | <i>Other motive</i>                      | OTHERMOTIV          |
| <b>Entrepreneurial Behavior</b>         | <i>High aggressiveness</i>               | E.B.3               |
|                                         | <i>Medium aggressiveness</i>             | E.B.2               |
|                                         | <i>Low aggressiveness</i>                | E.B.1               |
| <b>Type of Entrepreneurial Behavior</b> | <i>Global Approach</i>                   | GL. APPR.           |
|                                         | <i>Advertising effort</i>                | ADV. EFF.           |
|                                         | <i>Prospection effort</i>                | PROS. EFF.          |
|                                         | <i>Price Effort</i>                      | PRICE. EFF.         |
|                                         | <i>Subcontracting Work Given</i>         | SUB. GIVEN          |
| <b>Debt</b>                             | <i>Maximal intensity</i>                 | DEBT5               |
|                                         | <i>High intensity</i>                    | DEBT4               |
|                                         | <i>Medium intensity</i>                  | DEBT3               |
|                                         | <i>Weak intensity</i>                    | DEBT2               |
|                                         | <i>Minimal intensity</i>                 | DEBT1               |

| <b>Control variables</b>           |                                       |                  |
|------------------------------------|---------------------------------------|------------------|
| <b>Age</b>                         | <i>Less than 30 years old</i>         | LESS30Y          |
|                                    | <i>30-50 years old</i>                | 30_50Y           |
|                                    | <i>More than 50 years old</i>         | <b>Ref Class</b> |
| <b>Gender</b>                      | <i>Woman</i>                          | WOMAN            |
|                                    | <i>Man</i>                            | <b>Ref Class</b> |
| <b>Level of education</b>          | <i>No diploma</i>                     | NODIPLO          |
|                                    | <i>Less till the bachelor</i>         | LESSBAC          |
|                                    | <i>Bachelor and more</i>              | <b>Ref Class</b> |
| <b>Nationality</b>                 | <i>French</i>                         | FRENCH           |
|                                    | <i>Foreign from European Union</i>    | FOREIGEU         |
|                                    | <i>Foreign outside European Union</i> | <b>Ref Class</b> |
| <b>Experience Entrepreneurship</b> | <i>Never</i>                          | PRIMO            |
|                                    | <i>Has already start up a firm</i>    | <b>Ref Class</b> |

|                                                                                                                             |                                                          |                       |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------|
| <b>Duration of experience in the same branch of activity</b><br><b>* Size of the firm where the experience was acquired</b> | <i>Less 3 years, Less 10 employees</i>                   | SMEXPSMSIZE           |
|                                                                                                                             | <i>Less 3 years, 10-250 employees</i>                    | SMEXPVSIZE            |
|                                                                                                                             | <i>Less 3 years, More 250 employees</i>                  | SMEXPBIGSIZE          |
|                                                                                                                             | <i>3-10 years, Less 10 employees</i>                     | AVEXPSMSIZE           |
|                                                                                                                             | <i>3-10 years, 10-250 employees</i>                      | AVEXPVSIZE            |
|                                                                                                                             | <i>3-10 years, More 250 employees</i>                    | AVEXPBIGSIZE          |
|                                                                                                                             | <i>More 10 years, Less 10 employees</i>                  | BIGEXPSMSIZE          |
|                                                                                                                             | <i>More 10 years, 10-250 employees</i>                   | BIGEXPVSIZE           |
|                                                                                                                             | <i>More 10 years, More 250 employees</i>                 | BIGEXPBIGSIZE         |
| <b>Types of innovation</b>                                                                                                  | <i>Introduction of innovative products, marketing</i>    | INOVPDS               |
|                                                                                                                             | <i>Introduction of new methods or processes</i>          | INOVTECHN             |
|                                                                                                                             | <i>Introduction of a new organization</i>                | INOVORGA              |
| <b>Innovative branch</b>                                                                                                    | <i>Belonging to Innovative branches of activity</i>      | INOV                  |
|                                                                                                                             | <i>Not belonging to Innovative branches of activity</i>  | <b>Ref Class</b>      |
| <b>Amount of money invested to set-up the firm</b>                                                                          | <i>Less than 8000 Euros</i>                              | INVEST <8000 €        |
|                                                                                                                             | <i>Between 8000 Euros and 40000 Euros</i>                | 8000 € <INVEST <40000 |
|                                                                                                                             | <i>More than 40000 Euros</i>                             | <b>Ref Class</b>      |
| <b>Obtaining a public financial aid</b>                                                                                     | <i>Public financial aid obtained</i>                     | PUBAID                |
|                                                                                                                             | <i>Public financial aid none obtained</i>                | <b>Ref Class</b>      |
| <b>Structure of capital</b>                                                                                                 | <i>80-100% of debt</i>                                   | STRMAXDEBT            |
|                                                                                                                             | <i>60-80%</i>                                            | STRDEBT               |
|                                                                                                                             | <i>40-60%</i>                                            | STREQUILIBRIUM        |
|                                                                                                                             | <i>20%-40%</i>                                           | STRCAPITAL            |
|                                                                                                                             | <i>-20%</i>                                              | STRMAXCAPITAL         |
| <b>Employees at the beginning</b>                                                                                           | <i>One salaried and more</i>                             | SALARIED >=1          |
|                                                                                                                             | <i>No employee</i>                                       | <b>Ref Class</b>      |
| <b>Craftsman</b>                                                                                                            | <i>Craftsman</i>                                         | CRAFST                |
|                                                                                                                             | <i>No Craftsman</i>                                      | <b>Ref Class</b>      |
| <b>Subcontracting work done</b>                                                                                             | <i>Subcontracting work done main source of turn over</i> | SUBCA                 |
|                                                                                                                             | <i>Subcontracting work done secondary source of turn</i> | SUBANNEX              |
|                                                                                                                             | <i>No Subcontracting work done</i>                       | <b>Ref Class</b>      |
| <b>Competition</b>                                                                                                          | <i>Weak Feeling of the competition</i>                   | WEAKCOMPET            |
|                                                                                                                             | <i>Medium Feeling of the competition</i>                 | MEDIUMCOMPET          |
|                                                                                                                             | <i>Strong Feeling of the competition</i>                 | <b>Ref Class</b>      |
| <b>Branch of industry</b>                                                                                                   | <i>Food industry</i>                                     | FOOD INDUSTRY         |
|                                                                                                                             | <i>Industry</i>                                          | INDUSTRY              |
|                                                                                                                             | <i>Transports</i>                                        | TRANSPORT             |
|                                                                                                                             | <i>Construction</i>                                      | CONSTRUCTION          |
|                                                                                                                             | <i>Catering</i>                                          | CATERING              |

|                 |                                                         |                  |
|-----------------|---------------------------------------------------------|------------------|
|                 | <i>Household services</i>                               | HOUSE. SERVICES  |
|                 | <i>Services for the Enterprises</i>                     | SERVICES ENT.    |
|                 | <i>Education, Health</i>                                | EDUCHEALTH       |
|                 | <i>Trade, Repair</i>                                    | <b>Ref Class</b> |
|                 | <i>Belonging to non entrepreneurial regions</i>         | PROVINCE         |
| <b>Province</b> | <i>Belonging to entrepreneurial regions (IDF, RHAL,</i> | <b>Ref Class</b> |

Table 8: Annex 2

Annex 3: Results for control variables for duration models<sup>6</sup>

| Control variables                                                                             |              |           |           |           |           |
|-----------------------------------------------------------------------------------------------|--------------|-----------|-----------|-----------|-----------|
| Variables                                                                                     | Modalities   | Model 1   | Model 2   | Model 3   | Model 4   |
| <b>Age</b>                                                                                    | LESS30Y      | 0.063     | 0,049     | 0.061     | 0.063     |
|                                                                                               | 30 50Y       | -0.054    | -0,057    | -0.054    | -0.049    |
| <b>Gender</b>                                                                                 | WOMAN        | 0.267***  | 0,276***  | 0.266***  | 0.265***  |
| <b>Level of diploma</b>                                                                       | NODIPLO      | 0.351***  | 0,345***  | 0.349***  | 0.347***  |
|                                                                                               | LESSBAC      | 0.245***  | 0,238***  | 0.236***  | 0.251***  |
| <b>Nationality</b>                                                                            | FRENCH       | -0.232*** | -0,219**  | -0.220**  | -0.238*** |
|                                                                                               | FOREIGEU     | -0.186    | -0,191    | -0.191    | -0.196    |
| <b>First start-up</b>                                                                         | PRIMO        | -0.182*** | -0,180*** | -0.179*** | -0.179*** |
| <b>Duration of experience*<br/>Size of the firm where<br/>the experience was<br/>acquired</b> | SMEXPSMSIZE  | 0.359***  | 0,381***  | 0.370***  | 0.364***  |
|                                                                                               | SMEXPAVSIZE  | 0.087     | 0,090     | 0.099     | 0.101     |
|                                                                                               | SMEXPBIGSIZE | -1.306**  | -1,295**  | -1.291*   | -1.295*   |
|                                                                                               | AVEXPSMSIZE  | -0.296*** | -0,294*** | -0.299*** | -0.296*** |
|                                                                                               | AVEXPAVSIZE  | -0.433*** | -0,402*** | -0.414*** | -0.416*** |
|                                                                                               | AVEXPBIGSIZE | -0.836*** | -0,846*** | -0.851*** | -0.849*** |
|                                                                                               | BIGEXPSMSIZE | -0.447*** | -0,447*** | -0.446*** | -0.440*** |
|                                                                                               | BIGEXPAVSIZE | -0.259*** | -0,257*** | -0.257*** | -0.254*** |

<sup>6</sup> We have checked that for all the variables (explanatory and control) included in the model we can accept the absence of correlation between variables. The test has been implemented in SAS for the different classes of growth and for the firms that exited before the last survey (Paul D. Allison, p.48-50).



|                                        |                  |           |           |           |           |
|----------------------------------------|------------------|-----------|-----------|-----------|-----------|
|                                        | BIGEXPBIGSIZE    | 0.001     | 0,016     | 0.022     | 0.004     |
| <b>What kind of innovation</b>         | INOV PDS         | 0.070     | 0,085     | 0.085     | 0.072     |
|                                        | INOV TECHN       | -0.034    | -0,026    | -0.020    | -0.025    |
|                                        | INOV ORGA        | -0.067    | -0,051    | -0.055    | -0.067    |
| <b>Innovative branches of activity</b> | INOV S           | -0.457*** | -0,467*** | -0.457*** | -0.479*** |
| <b>Amount of money invested at the</b> | INVEST. <8000 €. | 0.232***  | 0,216***  | 0.224***  | 0.219***  |
|                                        | 8000             | 0.126**   | 0,115*    | 0.118**   | 0.116*    |
| <b>Public Aid</b>                      | PUBAID           | -0.008    | 0,002     | 0.001     | -0.005    |
| <b>Structure of capital</b>            | STRMAXDEBT       | 0.069     | 0,069     | 0.071     | 0.070     |
|                                        | STRDEBT          | -0.021    | -0,011    | -0.013    | -0.013    |
|                                        | STREQUILIBRIU    | 0.105     | 0,112     | 0.115     | 0.102     |
|                                        | STRCAPITAL       | -0.225*   | -0,209    | -0.216*   | -0.213    |
|                                        | STRMAXCAPITA     | 0.130**   | 0,140**   | 0.142**   | 0.124**   |
| <b>One employ and more</b>             | SALARIED >=1     | 0.026     | 0,031     | 0.034     | 0.034     |
| <b>Craftsman</b>                       | CRAFST           | -0.562*** | -0,558*** | -0.567*** | -0.557*** |
| <b>Subcontracting work done</b>        | SUBCA            | 0.122**   | 0,124**   | 0.124*    | 0.129**   |
|                                        | SUBANNEX         | 0.004     | 0,029     | 0.016     | 0.016     |
| <b>Competition</b>                     | WEAKCOMPET       | -0.107    | -0,135*   | -0.126*   | -0.106    |
|                                        | MEDIUMCOMPE      | -0.121*** | -0,147*** | -0.139*** | -0.120*** |
| <b>Branches of activity</b>            | FOOD             | 0.468**   | 0,431**   | 0.442**   | 0.440**   |
|                                        | INDUSTRY         | 0.103     | 0,093     | 0.095     | 0.100     |
|                                        | TRANSPORT        | 0.557***  | 0,505***  | 0.528***  | 0.559***  |
|                                        | CONSTRUCTION     | 0.085     | 0,050     | 0.056     | 0.117     |
|                                        | REAL ESTATE      | -0.500*** | -0,493*** | -0.485*** | -0.502*** |
|                                        | HOUSE.           | 0.180**   | 0,144*    | 0.156**   | 0.176**   |
|                                        | SERVICES ENT.    | -0.001    | -0,034    | -0.026    | 0.015     |
|                                        | EDUCHEALTH       | -0.302    | -0,330*   | -0.322*   | -0.317    |
| <b>Province</b>                        | PROVINCE         | -0.079    | -0,077    | -0.078    | -0.078    |

Table 9: Annex 3