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# Economic impacts of public subsidies on young innovating SME's performances: the case of the French National Competition for creation of New Technology-based Firms

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## **Abstract** (300 mots)

Faced with the technological changes and with the rise of international competition, the competitiveness of firms is based more and more on innovation. In this context, the new innovating firms are regarded as source of competitive dynamism. However, these firms encounter difficulties to finance their activities; it is thus widely acknowledged that there is a need for public support towards these innovating SMEs.

In this context, the French government launched in 1999 a National Competition for creation of New Technology-based Firms, which rewards some innovating projects in giving them a financial and managerial support to start and develop their activity.

Ten years after the creation of the competition, we propose to evaluate its economic effects: How did the Competition winners grow and survive? We thus analyse the characteristics of the firms that have won the competition and focus our study on the factors of survival of these firms.

To undertake our analysis, we use a database from the French ministry of research, composed of the prize-winning firms. This database is merged with the DIANE database, which gives financial information on firms. Our analysis is then based on three categories of indicators to characterise the survival rate and the factors of survival of new firms. We distinguish indicators related to the firms itself, the entrepreneur, and the environment of the firm.

Our results show that the firms that won the contest have a higher survival rate than other firms. We also show that the indicators to explain the survival rate are similar to the one found in the literature.

## Key Words

Innovation, new technology-based firms, public policy, competitiveness, France, survival rate

## JEL Codes

H59, M13, O25, O38

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This research was conducted for the French ministry in charge of Research.

## 1 Introduction

### 1.1 Context and set up of the Competition (1999)

Faced with the technological changes and with the rise of international competition, the competitiveness of firms is based more and more on innovation. In this context, the new young innovating firms are regarded as a source of competitive dynamism. The size and the specificity of the products or services these firms propose give them a great flexibility, often considered as an essential asset, insofar as it allows them for a better adaptation and a better reactivity to the requirements of the market.

However, these firms encounter difficulties to finance their activities. Indeed the traditional sources (banks or private investors) are reluctant to invest in projects for which the risk of failure and uncertainty are high. It is thus widely acknowledged that there is a need for public support towards these innovating SMEs (Veugelers, 2005 and Gault, 2005).

Initiated in 1999 by the French ministry in charge of Research, the National Competition for creation of New Technology-based Firms (hereafter called "the Competition") aims to detect, make emerge and to develop firm creation project, thanks to a financial support. The total budget of the contests amounted to 243 million Euros for over the period 1999 - 2007. The rates of selection of the national jury are on average of 62,5% (DGRI, 2008). Various types of projects can be presented, which can benefit from subsidies ranging from 39.000 to 450.000 Euros, according to their maturity and their proximity to the stage of actual creation of a firm. The ministry in charge of Research ensures the piloting of the contest and lays down its orientations. Anvar (the French agency for the valorisation of research), which became Oséo Innovation, is elected by annual convention to ensure the organization of the contest in area, the instruction and the payment of the assistances to the prizes winner.

### 1.2 Objectives of the article

Our research relates to the evaluation of this Competition, and is conducted for the French Ministry of research. We propose an analysis of the economic consequences of the Competition through the study of the survival rate and of the factors of survival of the award-winning firms: How did the Competition winners grow and survive?. We will carry out an analysis of the profile of the awarded firms, resting on a set of indicators we have selected from a review of literature. Our approach is based on a single- and bi-variable analysis of the indicators of our database, composed of the firms awarded by the Competition.

### 1.3 Setting of the Paper

This article presents a first milestone of our results, at the date of April 9, 2009. It is structured as follows: we present in a first section the most relevant indicators which come out from our review of the literature on the role of the subsidies and the creation of firms (success factors of the young innovative firms), the dynamics of survival and the factors of survival of the young innovating firms. Section 3 is dedicated to our statistical analysis: we specify our methodology, as well as our data and variables. We then present some descriptive statistics of our sample and the main results. We conclude finally on the limits of our study at the present date and the action to be taken for a potential econometric study.

## 2. Our indicators

We proceeded to a review of the literature on the role of the subsidies on firm creation (criteria of success of the new firms), the dynamics of survival and the factors of survival of the start-ups. A certain number of indicators came out from this exercise. We selected a few of them, which seemed particularly relevant to us, taking into consideration the profile of the firms that we study and the available data.

## 2.1. Most common economic indicators

The firm turnover and the number of employees come primarily as a direct signs of economic dynamism. It is acknowledged that the dynamism of the growth of the turnover of the firm constitute its main strength of survival.

Several studies show that high-tech SMEs grow faster than other SMEs. A study by Ernst & Young (2008) on 1046 high-tech SMEs in France reveals an average turnover growth of almost 5,3% between 2006 and 2007. This figure is to be compared with the average of 2,2% for the overall French economy, and of 4,1% for the CAC40 average. Fabre and Kerjosse (2006) also show that the more important the turnover of the firm is after 3 years, the more it has chances to reach its 5th birthday.

As we analyse young firms, the size (number of employees) can also be regarded as a sign of economic dynamisms. The size of the firm may evolve while its turnover does not, as a consequence of (not yet profitable) on-going projects and of confidence in the future (Guillon-Deshayes, 2007; Fabre and Kerjosse, 2007). Thus, the previous study gives us another illustration of the dynamism of high-tech SMEs: the growth rate of employment between 2005 and 2006 is 2,1% for the high-tech SMEs as compared to 1,6% for the overall French economy and 0,5% for CAC40 firms.

## 2.2 The survival rate as a sign of economic performance

The survival rate often represents the number of firms of the same cohort, which survived a certain number of years, expressed as a percentage of the total of firms that entered the market on the same year. We want to stress here that firm mortality is not systematically the consequence of a financial bankruptcy or a management failure. Parts of firms exiting the market are explained by the decision of the owner to benefit from a better employment opportunity. Indeed, some entrepreneurs decide to suspend their activity without any important financial losses, nor bankruptcy or insolvency, nor to anticipate economic failure, but for more personal and social reasons: retirement, the will to become salaried, or to start a new firm, or because they cannot find a successor (Fabre and Kerjosse, 2006).

Bartelsman et al. (2003) show that data covering the first part of the 1990s estimate the firm turnover rate (entry plus exit rate) to be between 15 and 20 percent in the business sector of most countries (i.e. a fifth of firms are either recent entrants, or will close down within the year). Market selection is pretty harsh: about 20 to 40 percent of all entering firms fail within the first two years of life. And, though failure rates decline with duration, only about 40-50 percent of total entering firms in a given cohort survive beyond the seventh year (they confirm the hypothesis that the survival rate decreases with the age of the firm). This process, however, involves only about 5-10 percent of total employment because existing and especially entering firms have a smaller than average size.

## 2.2 Factors explaining the survival rate

Over the lifespan of a firm, many factors influence its chances of survival. Those are indeed related in a positive way to the growth rate of the activity sector, the size of the firm (and this, as early as of its creation) and to the fact that the firms are actually involved in R&D activities. The competing environment is also important for the survival of the young firms. The higher the rate of creation of firms is in a sector, the more the life expectancy of the new units is weak, in accordance with the correlation between the rate of entry and exit. The results also show that the rate of survival is decreasing with the age of the firms (Legloan, 2007). Generally speaking, these factors can be gathered in three categories: those that relate to the entrepreneur, to the firm and to the environment.

### 2.2.1 The entrepreneur

The age, the experience and the diplomas of the firm founder are often called upon to explain the economic dynamism of the firm. The experience and the competences of the entrepreneur thus act positively on the length of life of the start-up. According to a study by INSEE (Fabre and Kerjosse, 2006), if the experience of the founder is more influent than his/her diploma, his/her age and gender have also their importance.

More precisely: “the individuals who choose free-lance work after 35 years have better chances of entrepreneurial survival” (Scott, 1995). A firm founder, in France, has two chances out of three to see its start-up survive three years if he is at least 50 years old, while his counterpart of less than 25 years has only one out of two (Lamontagne and Thirion, 2000).

### 2.2.2 The firm

The legal status and the initial capital of the start-up have a strong influence on its survival. It seems indeed that certain legal statuses are associated with growth: the major part of the limited liability companies (French SARL) and the joint stock companies (French SA) have higher growth rates. In the same way, firms resist much better than individual businesses (Fabre and Kerjosse, 2006; Demoscope, 2008). Unfortunately, we cannot test this hypothesis, as our sample does not allow us to draw statistical evidence.

Several studies by INSEE evoke the fact that the chances of survival increase with the initial capital (Fabre and Kerjosse, 2006; Lamontagne and Thirion, 2000; Thirion and Demoly, 2003): the more important it is, the more the risks of mortality are weak. Thus, in the overall economy, more than 80% of the entrepreneurs having invested at least 76 000 Euros at the start-up phase are still carrying on their activity three years afterwards (Thirion and Demoly, 2003). Having sufficiently invested at the start, and regularly afterward, helps the firm be maintained, even to be developed. It would even seem to some economists that the survival rate is in a narrower correlation with the volume of initial capital than with the competences of the entrepreneur (Lamontagne and Thirion, 2000).

Internationalization is also vital for the growth and the long-term survival of the small high tech firms. Small technological firms must go international very early in their life because of the limited size of the technological market for which they were created. Here again, as said for the legal status, the sample of the non-surviving firms that we obtain after merging with DIANE is too small to draw any consistent statistical evidence on both indicators.

### 2.2.3 The environment

The “environment” factors are the influences of the sector, and of the accompanying measures available for the firm founder, upstream or downstream from the creation of the firm.

The economic sector is an important discriminating factor. Lasch et al. (2005) assert for instance that the survival rate after 5 years is strongly different in non-innovative sectors (51%), medium innovative sectors (46,3%) and highly innovative sectors (38,5% in information technologies). It is easily understandable as each sector has a specific innovation pace, specific human capital and financial capital requirements (typically, biotech firms need more funds than computer-based firms), and generates different level of risk and incertitude. Bartelsman et al. (2003) confirm this assertion when explaining that firm turnover depends on market characteristics, but also on regulations and institutions affecting start-up costs and the financing of new ventures.

What clearly arises from the literature is that being well prepared, surrounded or advised is an important asset (Fabre and Kerjosse, 2006). For this reason, accompanying measures can be a factor of performance. These measures are as varied as being incubated, benefiting from R&D tax credit or other public financial support, management advisory services, aso. In France, the entrepreneurs who benefit from such measures during a long period live definitely much longer than those who do not benefit from it (Legloan, 2007).

## 3. Statistical processing

### 3.1 Methodology and data

Our statistical analysis aims at answering the following question: Do firms that are awarded these subsidies live longer than average? What can we tell on their factors of survival? Our approach

consists of a single- and bi-variable analysis for some selected indicators, based on our database of award winning firms. This database contains all of the 1044 firms that won the Competition. The word limit of this paper does not allow us to insert tables or figures, but any detailed table can be provided on demand.

We had to supplement the database regarding the actual operational situation of some of the firms (always operating? and if not so, when and why did they exit the market?). This information is very important to estimate the survival rate of the firms. We thus had to track down 295 firms in the official bulletins or the registers of the bankruptcy courts.

This database provides us with indicators characterising the firm (such as age, sector, legal status, still operating or not?), the entrepreneur (age, competences) and the public support environment (incubators, level of the subsidies for the award winning firms...).

In a second step, this database has been merged with the DIANE database, which gives financial and economics information on firms. These indicators allow us to compare the economic development of the firms (both turnover and size).

## 3.2 Main results

### 3.2.1 Characteristics of the firms

The firms are mainly created by entrepreneurs who have an engineering or PhD degree (63%) and are less than 45 years old (78%). These firms are mainly in the sectors of the manufacturing industry (20%), the information and communication sector (27,31%) and professional, scientific and technical services (40,77%). 76% of the firms have been created between 2000 and 2005.

They have received important and varied public support. Indeed, 51,63% of the firms was in an incubator. However, only 30% have received both of them and 26,34% of the winner firms did not receive any of these two types of supports.

Moreover, 38% of the winner firms are connected to public research organisations. We observe that the probability not to be in an incubator is strongly link to the probability not to be linked to a public research organisation.

Finally, the winner firms received in average 153 715 Euros from the ministry. However, the dispersion is large.

### 3.2.2 The firms' performances

The average turnover of firms after 3 years is 331 000 Euros, with high standard error (648,9). After 5 years, it amounts to 863 000 Euros. The firms that survived increased their turnover, and the differences between firms become more important with time: the standard deviation of the turnover increases along time. We can infer that this illustrates the fact that firms chose dissimilar path of development.

The growth of turnover for surviving firms is confirmed by DGRI (2008), which calculates the turnover of the winner firms by cohort of creation year, in 2006. They found that the firms that survived experienced an increase in their activity.

However there are great differences according to the sectors. In the manufacturing industry, the average turnover after 3 and 5 years is much higher than the average of our sample. In the information and communication sector and professional, scientific and technical services, the average turnover after 3 and 5 years in our sample is inferior to the average.

A finer analysis of the sector in our sample shows that firms from electronic, signal and telecommunication have in average a much higher turnover than the other sectors. Their turnovers are 567 000 and 1 762 000 Euros after 3 and 5 years. It is the only case where we find a higher turnover than the average of the sample. This result could be linked to the fact that in this specific sector, new firms can provide new products but also many services.

We observe that the level of turnover after 3 years is partly correlated with the level of the subsidy. This correlation is not confirmed after 5 years. This could suggest that the subsidy plays an important role at the very early stages of the firm but that its effect disappears after a while.

The average size of the firm is of 6 employees after 3 years and 8 after 5 years. It is slightly different according to the sector. Indeed, in the information and communication sector and professional, scientific and technical services, we find almost the same figures. In manufacturing industry however, we note that in average the size of the firm does not change between the 3rd and the 5th year, with an average of 8,5 employees. This industry certainly needs a more rapid reach of a minimum critical mass of employees to undertake its activities.

The innovating firms have a higher size than the others (6 and 8 employees after 3 and 5 years vs. 3,5 and less than 5 for all young firms of the economy (SINE, 2003)).

If we compare the level of turnover and of employees after three and five years, by sector, it seems that they evolve in the same way. We can then conclude that the level of turnover and size are partly correlated, at least in the first years of the firms. But which is the way of the correlation? Does a higher turnover allow hiring new employees? Does a bigger size enable to generate a higher turnover?

### 3.2.3 Survival rate

The study of the firms' performances gives a first idea of their economic development. However, their strategy of development and their business plan can partly influence the level of the turnover, without reflecting their real performance. We particular think of the potential impact of an R&D strategy, which can delay the growth of the turnover.

Thus, we consider that the survival rate is an important and complementary indicator to evaluate the economic development of new firms. We then built a firms' survival rate, which we define as the percentage of the firms that were created after being awarded the Competition and that still exist in our sample at the present date.

To enrich this indicator, we built a variable that identifies the age of the firm when it exits the market. We prefer to use the age of the firm rather than a survival rate at 3 or 5 years, so that we can more finely observe the evolution of the mortality rate. It appears that the mortality age of the firms varies between 3 and 6 years in average. We can wonder whether the impact of the subsidies disappear after three years? We could also wonder if innovating firms manage the technology development but miss the commercial development.

The firms of our sample have a mortality rate of 16,83%, which means that only one out of six firms in our sample have exited the market. This figure is much less than that of the overall new firms. Indeed, Bartelsman et al. (2003) find that 20 to 40% of the new firms die in their first two years. Another study on French firms creation finds that 5 years after their creation, 49% of all firms have exited the market (cohort of 1998) (Fabre and Kerjosse, 2006). We can also compare our results to incubated firms, which have a mortality rate of 24% after 5 years (cohort of 2000) (DGRI, 2008). The innovating firms that receive support from the Competition manage to survive longer than other firms.

### 3.2.4 Factors of survival

We here try to identify which indicators influence this high level of survival rate. As presented in section 2, we analyse indicators relating to the entrepreneur, the firm and the environment.

The entrepreneur who creates a firm after the age of 35 has a higher probability to keep his/her firm alive. This probability increases when he is more than 45. Our results confirm that of Scott (1995) and Lamontagne and Thirion (2000). This result is generally explained in the literature by the fact that the age could be a proxy of the experience of the founder of the firm. The older you are, the more



experienced you are. In particular, you develop various competences (such as networking, management...) that young people did not have time to develop yet.

It seems that the training of the entrepreneur also contributes to explain the survival of the firms. Indeed, firms created by engineers and PhD have a higher probability to survive. This latter is particularly high for PhD. This result can be explained by a higher level of education, but it could also mean that PhD have a higher capacity to organise their activities and to identify the persons they need for the development of their firms. We also note the good results of the technicians. It seems that diplomas also play a role in the category "Others", as this category has a higher probability to see his/her firm exit the market rapidly. This category essentially gathers people with a low education level. Thus, as showed in the literature, the entrepreneur's characteristics contribute to explain the rate of survival of the new firms.

The firms which belong to the manufacturing industry and the professional, scientific and technical services have a higher probability to survive than the firms that belong to the information and communication sector and to the business sector. This might be related to the Internet bubble around year 2000.

Accompanying measures are supposed to help the firm to survive. To test this hypothesis, we use as a proxy : to be (or have been) in an incubator Firms that benefit from this support have a higher probability to survive.

Moreover, the higher the subsidy from the Competition, the higher the probability of survival. Indeed, the firms that still operate received an average of 164 514 Euros, vs. 110 377 Euros for the one that have exited the market. The difference is even larger if we analyse the median. The existing firms have received 140 000 Euros, vs. 76 220 Euros for the ones who stopped operating. Public financial support and the follow-up during creation contribute to the development of firms. It is important at the first stages of the firms (Competition's subsidy) and during the first years. Our results confirm those of Fabre and Kerjosse (2006).

Finally, it would be interesting to compare the turnover of the firms after 3 and 5 years, to analyse the correlation with the survival rate. However, the sample of the "dead" firms is not usable, as after the merge with the DIANE database, it only contains 24 firms. We encounter the same difficulties with the number of employees. However, it seems that there is a positive correlation between the level of turnover when we observe the turnover after one year and the probability to survive. Indeed, firms that survive have in average a higher turnover than firms that disappear. This confirms the results of Fabre and Kerjosse (2006).

To conclude, our results show that the firms that won the contest have a higher survival rate than other firms. Is it a sign of the efficiency of the contest and of the subsidies? More investigation is needed. We also show that the indicators to explain the survival rate are similar to the one found in the literature.

## 4. Conclusion

### 4.1. Limits of our study

We operated a very limited selection of the indicators listed in the literature review as explanatory of the survival rate of the young innovating firms. For this reason, our results are limited and need to be complemented to explain the rate of survival of the prize-winner firms.

We particularly miss data on the activity of R&D of the studied firms, and on the impact that the activity of R&D can have on the growth and the dynamics of the firms (Stam 2008). Some indicators could be for instance: R&D expenditures, scientific personnel, number of patents, the share of turnover ascribable to innovation, co-operation in R&D (networks).

We could also go deeper regarding the contributions of public research: means of the laboratory (generally of the average materials and techniques), know-how, software and patents (Arundel and Bordoy, 2008; Mustar et al., 2006).

Another missing chapter would have been related to the localisation of the firm: is it anchored in an innovative cluster or in any sort of cluster, or is it isolated? This information is of importance, especially in France where the weight given to the policy on competitiveness cluster is strong. It would be also interesting to be able to rule on the « leverage effect » (Meunier and Mignolet, 2004) of the Competition on the dynamics of innovation (seeking for example to identify and estimate the second generation of innovating products...). Finally, it would be interesting to compare our results with a sample of innovating firms that did not benefit from the Competition (a control sample).

#### 4.2 Econometric follow-up

Our study shows the high survival rate of innovating firms, supported by the French ministry of Research and proposes different indicators to explain it. Further research is needed in order to evaluate the weight of each of these indicators on the survival rate. In that purpose, an econometric study (to come) will complete these first results.

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