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LONG TERM EFFECT OF PUBLIC SUBSIDIES ON START-UP SURVIVAL AND ECONOMIC PERFORMANCE: AN EMPIRICAL STUDY WITH FRENCH DATA

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Mots clés : Survie des entreprises, ACCRE, données appariées.

1. INTRODUCTION

Over the two last decades, economists have devoted more and more attention to the patterns of firm entry and exit in the modern economies. The theoretical approach to this phenomenon focuses on the process of creative destruction from an evolutionary perspective (Baldwin, 1995; Geroski, 1995; Jovanovic, 1982; Ericson and Pakes, 1995). It considers that firms are heterogeneous and that the shift in the distribution of firms by industry that takes place via firm turnover is mostly driven by technological progress. However, the ability of firms to survive and develop also depends on institutional and regulatory settings. In OECD countries, public and private institutions have set up a large range of services and

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‡ Lionel Desiège, a young and promising researcher, died in May 2011, Dominique Redor and Richard Duhautois dedicate this article to his memory.

forms of support to help start-ups and small firms to survive and develop (see Beason and Weinstein, 1996, for Japan; Gu *et al.*, 2006, for the USA; Oh *et al.*, 2009, for Korea; Wren and Storey, 2002, and Harris and Robinson, 2004, for the UK; Pfeiffer and Reise, 2000, and Caliendo and Künn, 2011, for Germany).

In this paper, we assess the impact of a program of public support (ACCRES, *aide aux chômeurs créant ou reprenant une entreprise*) on start-up survival in the French economy. We use a rich matched database of a cohort of French firms that were created in the first half of 1998. We follow these firms year by year over the 1998-2006 period. This database enables us to control not only for the characteristics of new firms, but also for entrepreneurs background (e.g., education, previous experience and position on the labor market before starting the new business). Because public support may not be randomly distributed, we use a propensity score matching method to control for selection bias and estimate the effect of public support on the probability of start-ups to survive and to develop.

Our results show that subsidized start-ups are more likely to survive than non-subsidized firms after their first two years of existence. We also distinguish different subgroups of firms, according to their initial capital and their funding sources. We find that this positive impact on firm survival is equally distributed among these different subgroups.

The paper is organized as follows. Section 2 reviews the literature on the effect of public support on firm survival and economic performance, and studies why should public authorities target some categories of people, and support them to start their own business. Section 3 analyzes how public authorities support start-ups in France. Section 4 describes the database and explains our econometric strategy. Section 5 presents and interprets our results. Section 6 concludes.

2. FIRM DEMOGRAPHY AND PUBLIC SUPPORT FOR NEW FIRMS

In all developed countries, firm demography is characterized by high entry and exit rates (Bartelsman *et al.*, 2003). Because these two phenomena tend

to offset each other, the static view of the enterprise demography is very different from the dynamic view. Among a cohort of new business, 90% survive the first year following entry (Déprez, 2010), 55% survive five years after entry, and approximately 45% remain seven years after entry (table 3 hereafter). This turnover is part of the creative destruction process: for a given market, a substantial proportion of firm entrants replace a similar proportion of those which exit. In the context of firms' ability to adapt to their economic environment, some are able to grow and survive, while the others are obliged to exit the market (Jovanovic, 1982). This process of creative destruction is analyzed through the heterogeneity among firm characteristics and behavior, which results in permanent changes in the composition of their population (Baldwin, 1995).

The importance of the creation and of the dynamics of new firms explain why assistance to start-ups has become an important part of the employment policy in developed countries. Gu *et al.* (2008) single out sixteen main programs in the U.S.: Nine are devoted to assistance (entrepreneurship and management training, consulting, services), two to loan supply and credit guarantee, two to grants, and three are jointly devoted to business assistance and loan supply. Most of these programs target people who are considered as disadvantaged in economic competition because of their ethnic origin, their gender or their geographical location.

Recent research use econometric methods that are designed to eliminate selection bias and evaluate whether the difference in the startup outcomes can be attributed to public support. Here after, we briefly review research which is focused on unemployed people who start a new business in Germany and in France where this sort of support is well developed.

Pfeiffer and Reize (2000) study the effect of public subsidies on the survival of firms created by unemployed people in eastern and western Germany. According to the Labor Promotion Law (August 1994), unemployed people who start a business may receive "bridging allowances" (BA). These allowances are subsidies which are granted for a period of six months to the new entrepreneur and which equal the benefits she or he would have received if unemployed. Unexpectedly, estimations show that, after their first year of existence, the firms created by unemployed

people that receive public support in eastern Germany have a lower probability of survival than others. The same pattern is not observed for western Germany. The authors explain this paradoxical result for eastern Germany by an opportunistic behavior or “cash and carry effect”: some people receiving public subsidies when creating their businesses only want to get the financial support and close their business soon after. However, Pfeiffer and Reize (2000) analyze business survival one year after creation and Almus (2001) studies the same sample of firms, but extends the period of research to five years. He finds that, in eastern Germany, firm survival and employment growth are positively related to the receipt of public subsidies. According to his conclusions, five years after firm creation, the effect of public support overcomes the cash and carry effect.

In addition, Caliendo and Künn (2011) study the effect of the “bridging allowance” (BA) program and another “Start-Up Subsidy” (SUS) program in Germany during a more recent period (2003-2008). The institutional rules of the BA program have not changed since the 90s (see above our comments on Pfeiffer and Reize’s research). The second program consists of a lump-sum payment which is granted to unemployed people who start a business. Participants in the SUS program are on average younger and lower educated individuals with less employment duration and lower earnings in the past than the participants to the BA program. Both programs proved to improve the unemployed people situation on the labor market. More specifically the outcome of the SUS program increased the probability of the participants to be employed or self-employed five years after the start of their business.

Using French data, Crépon and Duguet (2003) study the effect of subsidies from public administration and loans from banks on firms created in 1994 during the subsequent three years. The main public subsidy is a lump sum¹ that is granted to unemployed people who start a new business. They estimate a multinomial logit model of the financial structure of each new business distinguishing between public subsidies, bank loans and a combination of both. Then they use a matching process to compare firm survival according to their financial resources. They find a positive effect of

1 It amounts to 32,000 Francs or approximately 5,000 Euros.

this subsidy on start-up survival be they created by short-term or long-term unemployed people. In addition, bank loans reinforce the effect of public subsidies on firm survival.

Cabannes and Fougere (2013) evaluate the effect of the ACCRE program² on the start-up life duration using the SINE (Système d'Information sur les Nouvelles Entreprises) survey on the 1998-2003 period. They estimate a two equations model with random effects. The first equation formalizes the probability to participate in the ACCRE program, and the second the start-up life duration. The objective of this method is to eliminate the selection bias (government bodies may select "the best projects") and the auto-selection bias (some entrepreneurs may be well informed, others may not be). For those entrepreneurs who were unemployed for less than one year before starting their business, they find no effect of the ACCRE program on the life duration of this business. They conclude that the selection process by government bodies for this category of entrepreneur is effective. However, they cannot conclude for the entrepreneurs who were unemployed for more than one year before starting their business: "probably because of an inappropriate specification of the decision to participate in the program".

Thus, there is a general evolution in developed countries for public authorities to assist or (and) finance those people who create new firms especially when there are members of disadvantaged groups. How can these programs be justified from a theoretical point of view?

First, if the credit market is imperfect, or if banks are reluctant to finance start-ups, especially if their size is small, which is the case in general when disadvantaged people create a firm, financing by public authorities may be efficient. It removes the constraint originating from credit rationing for this category of firms. However, theoretically, only loan supplies or credit guarantee by public authorities are justified, but grants and subsidies are not.

Second, some groups may be discriminated on the labour market. Discrimination may emerge from the employers' "taste for discrimination"

2 In section 3 here after, we present the conditions of eligibility and support of this program.

(Becker, 1971). Moreover, employers may not observe the individual characteristics of people on the labour market, so their decisions are based on beliefs or prejudices about the average characteristics of the members of social groups (defined by their gender, their race, their age, their position on the labour market). In any case, discrimination has a negative effect on a nation's welfare, since people who are discriminated under-invest in their education. Scholarships in many countries can be interpreted as subsidies which are granted by public authorities to increase the return on education of discriminated people, and hence their investment in their own education. By the same way, public authorities may envisage to grant financial support to those groups of people who under-invest in their business for lack of personal financial resources, or lack of access to bank loans. In this respect, subsidizing the creation of new firms by disadvantaged people can be a good instrument to escape from discrimination on the labour market (Lofstrom, 2002). First, self-employed people create their own job, so they are free from any discrimination on the labour market from employers. Second, subsidies may counterbalance their individual lack of financial resources to start their business in a world where financial markets are not perfect.

3. HOW DOES PUBLIC ADMINISTRATION SUPPORT START-UPS CREATED BY UNEMPLOYED PEOPLE IN FRANCE?

In this paper we use a sample of new firms that is representative of all firms which were created in France in 1998. We study the effect of public subsidies on their survival. These public programs were especially targeted towards people who were not employed before starting their business.

The most important program was called the ACCRE (*Aide aux chômeurs Créant ou reprenant une entreprise*)³. This was a special program for people who were not employed and who started or took over a firm (table 1). 42.9% of this category of entrepreneurs received the ACCRE in 1998 (table 2).

3 Support to unemployed people who start or takeover a firm.

Table 1. Conditions of eligibility and support by the ACCRE program in 1998

Entry conditions: people who are eligible	-Unemployed people be they eligible to unemployment benefits or not. -Minimum social income recipients. For these two categories of people: approval of the business plan by the labor administration (ministry of labor at the local level) is required.
Support	-For those people who are eligible to unemployment benefits: if they are not paid by their start-up, they continue to receive their unemployment benefits for a maximum of fifteen months. If their business fails, their right to unemployment benefits is taken into account from the date when they started their business. If they are compensated by their new business they are exempted from social contributions for a one-year period. -Unemployed persons who are not eligible to unemployment benefits are also exempted from social contributions on their pay for a one-year period. -Recipients of minimum income (RMI, API) continue to receive their minimum income for one year after the creation of their business if they are not compensated. If they are compensated, they are exempted from social contributions on their pay during one year.

Source: Daniel, Mandelblat (2010).

Moreover people who started a new business were entitled to benefit from other programs which include different tax cuts and social contribution exemptions that were usually decided at the local or regional level⁴. Nine different programs are reported in our database, and each of them concerned a small percentage of the new entrepreneurs. This is the reason why we only focus our analysis on the ACCRE program, and the people who were entitled to receive it: the people who did not work before starting their business. Thus we have 4594 entrepreneurs in our sample, 42.9% of them participated in the ACCRE program (table 2). A small proportion (9.1%) of those who participated in the ACCRE program also benefited from other public programs. In 1998, the ACCRE was devoted to jobless persons who started a business, whatever the legal status of their new firm and the entrepreneur's personal status (according to French legislation, he or she can be a wage earner, a professional, or a self-employed person).

4 The most important of these taxes is the "taxe professionnelle", which is levied by local authorities.

Table 2. Subsidies to new firms in France (1998)

	Total	Percentage of those which received public subsidies ¹	Percentage of those which received the ACCRE
New firms in the sample: total	9359	36.0	22.5
The new entrepreneur was employed before starting his business	4765	20.5	3.0 ²
The new entrepreneur was not employed before starting his business	4594	52.0	42.9

1. This includes all forms of public subsidies: the ACCRE, tax and social contributions exemptions by local authorities.

2.3% of those who were employed participated in the ACCRE program. Indeed, according to the legislation, these persons were already dismissed by their employer, but still working for a short period (three months). They are excluded from our econometric analysis.

Sources: Our Sine and Ficus database, see section 4 here after.

The underlying conception of this support was that unemployment and inactivity may be negative signals on the labor market for those who look for a job. The general objective of the ACCRE program was to help jobless people by supporting their new business, and thus allow them to “create their own job”. In addition, the support was concentrated on the first year of existence of the new business, a period when the risk of failure is the highest (table 3). The ACCRE program was first created in 1977. The main provisions of this program have changed many times (Daniel and Mandelblat, 2010; Mouriaux, 1995). At the origin, this program was focused on registered unemployed people. The support was a lump-sum payment corresponding to the benefits they would have received if they had been unemployed instead of starting their business.

This program has been progressively extended to “disadvantaged persons”: unemployed people who were not entitled to benefits, people who received minimum income or allowances from public administration (table 1, RMI, API)⁵. If we consider the 1998 provisions (table 1), the support by the ACCRE

5 RMI is a minimum income which is roughly equal to half the minimum wage (450 Euros a month) and which also depends on the number of persons of the beneficiary's family. API is a special allowance for the single parent of young children.

program was not equally distributed among these different categories of recipients. People who received unemployment benefits before starting their business took the largest advantage of the ACCRE. According to this regulation, if they did not receive a pay from their new business, they kept their right to receive their employment benefits for a maximum of fifteen months. Unemployed people had an additional support (were they eligible to unemployment benefits or not): if they were compensated by their new business, they were exempted from social contributions on their pay during one year.

A second category of persons were entitled to participate in the ACCRE program: those who receive minimum social income from public administration. If they were not compensated by their start-ups they would continue to receive their minimum social income during one year. If they were compensated, they were also exempted from social contribution on the pay they received from their new business. A study by the French Ministry of Labor (Ould Younes, 2010) gives information about the people who were supported by the ACCRE program at the end of the 90s. 62% of them were registered unemployed and received benefits before starting their business, 11.7% were unemployed without benefits, 20.7% received minimum income (5.6% were included in 'other categories').

Those who were entitled to receive unemployment benefits for the first fifteen months of their business were a majority. In our database (section 4), the only available information concerns the entrepreneurs who participated (or not participated) in the ACCRE program. However, since according to the French legislation, unemployed benefits were proportional to the last wage paid before unemployment, the range of the subsidies which were granted to these people was presumably large.

4. THE DATA AND ECONOMETRIC STRATEGY

4.1. The Data Sources

In this paper, we match two data sources from INSEE (the French Institute of Statistics): an entrepreneur survey (SINE) and an administrative database (FICUS). The objective of the SINE ("*système d'information sur les nouvelles*

enterprises”) survey was to follow a generation of newly created firms over a period of five years. We concentrate on the 1998 cohort (for the firms which were created during the first semester). Our sample consists of 30,000 firms and is representative of all firms created during this period. Sample firms were surveyed three times: early in the entry process, three years and five years after their creation. The firms surveyed operate in the manufacturing, construction, trade and service sectors (except financial activities). SINE included micro-firms, in particular those in the service sector, which represented the majority of start-ups: nearly 60% of new firms were created in the trade and other service sectors (table A1 in appendix). 73% of firms in the sample had only one self-employed person or one wage-earner⁶, 90% of them had no more than two self-employed persons or employees. We only retained “ex-nihilo creations” in our sample – that is, firms that used new means of production.

The administrative dataset FICUS gives information for all firms that are subject to the two major French tax regimes. These regimes cover virtually the entire productive system, representing roughly 95 percent of taxable firms in terms of sales. The data we use concern the period from 1998 to 2006. For each year, we have a sample of approximately 2.5 million firms (including all firms producing goods or services, be they newly created or not).

4.2. The Matched Database

The French National Institute of Statistics and Economic Studies registers all type of new firms with an identification number (SIREN). This identifier is the same in the SINE and the FICUS database. This common identifier has been used to match the two databases. The matched database contains 9359 start-ups⁷ and an important amount of information, including both entrepreneur and firm characteristics (economic and financial variables). It also gives the opportunity to follow firms from birth to potential death, namely from 1998 to 2006. Some firms created in 1998 only appear

6 In France in 1998, there was no legal differentiation between firms with and without wage earners (in the latter case, there is only one self-employed person).

7 The robustness of our estimations to the attrition bias has been tested, see appendix B.

in FICUS in 1999 due to delays in administrative record keeping. In contrast, some firms are still recorded even after they have failed. We have deleted all such firms. We have focused our analysis on entry without considering takeovers or juridical transformations.

Table 3 presents the firm survival rate in our sample over the 1998-2006 period. It shows that 56.9% of firms survived five years, and 45.3% eight years after their creation. These results are consistent with the literature (Bartelsman *et al.*, 2003).

Table 3. Survival rates of different categories of firms created in 1998 (in %)

	Total number of firms in the sample, n = 9359 (1)	Firms created by persons who were not employed before starting their business, n = 4594 (2)	Among them (2), persons who received the ACCRE, n = 1960	Among them persons who did not receive the ACCRE, n = 2634
1999	90.3	88.6	90.8	85.9
2000	79.2	76.0	79.1	73.6
2001	66.7	62.0	68.6	57.0
2002	61.7	56.8	64.2	51.2
2003	56.9	51.9	59.4	46.3
2004	52.9	47.8	54.7	42.6
2005	47.9	42.9	50.3	37.4
2006	45.3	40.6	47.6	35.3

Survival rate in year t: ratio of the number of firms which are still in existence in year t divided by the number of firms which were operating at the end of 1998.

Source: 1998-2006 FICUS, and 1998 SINE Survey.

On average firms created by persons who were not employed before starting their business have a lower survival rate all over the period than those who were created by persons who were employed. In that sense, they belong to the group of these disadvantaged persons which is targeted by the ACCRE program. Those who were supported by the ACCRE program have a survival rate which is slightly higher than the average of the total number of firms, and is much higher than the rate of jobless people who were not supported. But at this stage of our analysis, it cannot be said that the ACCRE has reached its objective, since these results may be biased by the administrative selection process which grants the public support (see section 5).

4.3. Descriptive Analysis

In table A1 in the appendix, we present descriptive statistics about the characteristics of the individuals who participated in the ACCRE program and those who did not. Among men 45.9% participated, against 35.7% for women. Those who were above 50 years of age (23%) participated less than those under 50 (44.7%). People with a basic level of education (31.9%), and at the opposite with post-secondary and university level of education (39.2), participated less than people with an upper secondary level of education (54.5%). If we consider occupational skills, before starting their business people with a semi-skilled or low skill occupations (foremen: 66.5%, blue collars: 56.6%, and white collars: 51.1%) participated more than highly qualified persons (managers: 42.9%), craftsmen and shopkeepers (25.6%) and former students (18.5%). It must be kept in mind (table 1) that the ACCRE program was mostly devoted to people who received unemployment benefits before starting their business, that is who were wage-earners before being unemployed.

If we consider the capital invested in the start-ups, only those with a very small capital (less than 1 500 Euros) and with a large capital (more than 75 000 Euros) had a relatively low level of participation in the ACCRE program (respectively: 29.3% and 32.7%). In addition, 58.8% of those who borrowed money to a bank participated in the ACCRE program. On average, the entrepreneurs who participate in the program had a firm with a smaller employment (1.3 job, including self-employed and employees), than those who did not participate (1.7 job). If we only take into account employees, the corresponding figures were 0.3 and 0.8 job on average. Moreover, participation in the program was higher for the manufacturing and building industries than for the service activities. At the geographical level, the percentage of participants in the district of Paris was particularly low (19.1%)⁸. And finally, among those who participated in other forms of public support to firm creation (section 3), 61.9% participated in the ACCRE program, and 38.1% did not. We shall have of course to take this last observation into account in our estimations (section 5).

To sum up, when examining the descriptive statistics, it does not appear that the ACCRE program was especially devoted to disadvantaged people (with a

8 This phenomenon is acknowledged and studied in details by Daniel and Mandelblat (2010).

low level of education, low capital investment) but rather to people who are close to the average of the characteristics of the population under survey. If we consider the occupations and skills, a majority of those who were foremen, technicians, blue collars and white collars and who were wage-earners before being unemployed participated in the ACCRE program. This result is linked to the legislation: unemployed people who received benefits before starting their business continued to receive these benefits if they were not compensated for the first 15 months of their firm existence. This was an attractive advantage for this category of entrepreneur.

4.4. Econometric Strategy and Treatment of the Selection Bias

In this paper, we evaluate the effect of the ACCRE program on firm survival. We define the rate of survival of the firms at the end of the year t as the ratio of the number of firms which survive in t divided by the number of firms which were in operation at the end of the year 1998. Entrepreneurs who received start-up subsidies may not be randomly distributed: we may hypothesize that public administration decided to grant subsidies based on entrepreneurs profiles and project prospects. It is possible that this administration chose those people who had the best prospect to survive and develop their business. Thus, subsidized start-ups faced a selection process that depended on observable and unobservable entrepreneurs' characteristics.

But, at the opposite, the ACCRE program may attract people who would not have started a business if they were not entitled to receive this subsidy. Since this support was devoted to disadvantaged people, it is possible that the beneficiaries had characteristics (education, professional skills, previous status on the labor market, invested capital) which, other things being equal, had a negative impact on their business' success. In other words, there may be a self-selection bias in the evaluation of the effects of subsidies on firm survival.

Different econometric methods have been used to try to eliminate these biases. In some research (Cabannes and Fougère, 2013, see above section 2, Wren and Storey, 2002), firm life duration is modeled by a hazard function. The advantage of this method is that the time unit is the number of days of firm life, rather than the number of years which are taken into

account in our survival approach. However, we did not use this life duration model for lack of relevant data (in our data base, we only know if firms are still working or not, at the end of each year).

Brown and Earle (2013) estimate the effect of the US SBA loan program on job creation using matching methods in the first step of their research. In the second step, they use a firm level panel data which includes those firms which received a loan from the SBA on the one hand, and the firms of the control group which have been selected by the matching process on the other hand. The panel regression uses a difference in difference method to eliminate the influence of unobservable variables. This method is very interesting but cannot be applied to our own research. Indeed, these authors exclude from their analysis start-ups because their method necessitates longitudinal data (at least two years before the reception of the SBA loan). For the same reason (no data before the start-up birth) we cannot apply this difference in difference method to our sample.

Other research which focuses on the efficiency of public subsidies on start-ups uses matching methods “à la Rubin” (Rubin, 1974; Rubin and Rosenbaum, 1983). This is the case of Crépon and Duguet (2003) who study the effect of the ACCRE program on the cohort of business which started in 1994, and Caliendo and Künn (2011) who compare the BA program and the SUS program in Germany (see section 2 here above). For reason of data availability, and of relevance of the method to the evaluation of public policy, we also use this method. Here after, we present the main characteristics of this method and its limits.

To control for the possible biases, we use a propensity score matching (PSM) method (Rubin, 1974; Heckman et al., 1999). The aim of this method is to build a control group from the population of entrepreneurs who do not participate in the ACCRE program and to ensure that this control group is as similar as possible to the group of entrepreneurs who gets start-up subsidies.

In our database there are n firms (with $i = 1, \dots, n$), we identify each firm participation in the ACCRE program in 1998 with a dummy variable AC_i . Thus, if a firm is treated by the ACCRE program: $AC_i = 1$. The impact of the ACCRE program on firm survival is measured with the outcome variable y_i . Each firm presents two possible results: $y(0)_i$ (if $AC_i = 0$) and $y(1)_i$ (if $AC_i = 1$). These two latent variables correspond to the potential results of

the firm depending on its participation (or non participation) to the program. They are never simultaneously observed for a firm i .

The realized result which is observed can be formalized by the following expression:

$$y_i = AC_i y(1)_i - (1 - AC_i) y(0)_i$$

Only the couple (y_i, AC_i) is observed for each firm.

The causal effect is defined by Rubin as:

$$c_i = y(1)_i - y(0)_i$$

This is an individual effect which is unobservable. Thus the statistical distribution of this effect cannot be identified. However, under certain conditions about the joint distribution of the triplet $(y(0)_i, y(1)_i, AC_i)$, certain parameters of the distribution of the causal effect can be identified and, among them, the average treatment effect on the treated (ATT) (Heckman *et al.*, 1997, Heckman *et al.* 1999, Heckman and Navarro Lazano, 2004). One of these conditions is the conditional independence assumption (CIA), which states that conditional on observable characteristics (x_i) , the counterfactual outcome is independent of treatment.

Moreover, independence of potential outcome from treatment, conditional to the set of variables x_i , is equivalent to independence of the propensity score $P(x_i)$ which corresponds to a one-dimensional summary of matching variables and which estimates the probability of being exposed to treatment (Rubin and Rosenbaum, 1983).

This Propensity Score Matching (PSM) method is well adapted to the evaluation of the impact of the programs that support firm survival and development. It distinguishes those firms which have been “treated” by these programs and those which have not been (among the papers which use this method, see: Caliendo and Künn, 2011; Fajnzylber *et al.*, 2006; Girma *et al.* 2010; Oh *et al.*, 2009). However, theoreticians (Heckman and Navarro Lazano, 2004; Smith and Todd, 2005) point out that estimates based on PSM method are highly sensitive to the set of variables included in the score. They also stress that the CIA is crucial and the applicability of the

matching estimator depends heavily on it. The plausibility of this assumption must be studied on a case by case basis. In our research, thanks to the very detailed database that we use, we take into account the characteristics of the individuals which may influence their participation to the ACCRE program, as well as the economic and financial characteristics of their start-ups. We also distinguish different sub-groups of firms to check the robustness of the CIA (see sub-section 5.3. hereafter).

The outcome variable we introduce in our estimations is a dummy: the survival rate of each firm after its first year until its eighth year of existence. In the first step of our estimation strategy, we estimate a logit model which is the basis of the propensity score method. The dependant variable is the participation (or not) in the ACCRE program which is related to the characteristics of the firms and of the entrepreneurs who have created them. In the second step, we use matching methods to estimate the average treatment effect on the treated by the ACCRE program. We distinguish short term and long term effects on firm survival.

5. RESULTS AND INTERPRETATIONS

5.1. Participation in the ACCRE Program

The probability to participate in the ACCRE program is formalized by a logit model (table 4). The aim is to single out the factors of entrepreneurs' participation in this program. Two categories of factors are considered.

- a. The variables which are supposedly taken into account by Government bodies to decide (or not) to support entrepreneurs: legal status, means to finance the business (including loans by banks and other public subsidies), previous creation of firms (government bodies may be reluctant to finance multi-creators), number of jobs in the new business, and activity category.
- b. Entrepreneurs' personal characteristics may also determine their participation. Indeed the importance of the support by the program depends on the occupation of the entrepreneurs before starting their business and being unemployed (wage-earner or not) (section 3). Other personal factors which may influence the decision to participate are gender, age, and level of education.

Table 4. Entrepreneurs Participation in the ACCRE program (logit model) (ACCRE = 1 for the entrepreneurs who participate in the program, ACCRE = 0 for those who do not)

Nationality (refer: foreigner)		Capital investment to start (refer. less than 1500 euros)	
French	0.404***	From 1500 to 3500 euros	0.507***
Gender (refer : women)		From 3500 to 7000 euros	0.641***
Men	0.134	From 7000 to 15000 euros	0.466***
Age bracket (refer: 16 to 50)		From 15000 to 37000 euros	0.544***
More than 50 years	-0.624***	From 37000 to 75000 euros	0.602***
Education (refer: basic)		More than 75000 euros	0.343
Lower and middle secondary	-0.108	Legal status (ref. corporation)	
Professional upper secondary	0.369**	Self-employed	0.847***
Non Professional upper second.	0.348*	Number of jobs (self-employed and wage earners)	-0.634***
Post secondary and university	0.197	Means of financing the business (ref. with personal contribution and bank loan)	
Occupation before starting the business (refer. Executive)		With bank loan and no personal resources	-0.199
Businessman	-0.952**	With personal resources and no bank loan	-0.467***
Craftsman, shopkeeper	-0.576***	With no bank loan and no personal resources.	-1.748***
Foreman	0.768***	Activity (refer. Manufacturing industry)	
Technician	-0.200	Food industry	-1.53
Blue collar	-0.051	Building industry	0.105
White collar	-0.009	Trade	-0.359***
Student	-1.240***	Transportation	-0.572***
Others	-1.254***	Real estate	-0.477**
Number of previous creations (refer. No previous creation)		Business services	-0.053
one previous creation	-0.407***	Services to individuals	-0.121
two previous creations	-0.673***	Education and health services	-0.804***
more than two	-1.016**	Start-up located in the district of Paris (in %) (ref. outside the district)	
Collaboration (refer.: with former employer, a family member...)		In the district of Paris	-0.718***
No collaboration	-0.578***	Received another public subsidy (refer. Do not receive)	
Market research before starting the business (refer: yes)		Receive another subsidy	0.711***
No Market research	-0.374***	Constant	-0.226
Number of observations	4594	Log likelihood	-2427.70
Number of participants in the ACCRE program	1960	Pseudo R ²	0.225

Sources: FICUS 1998-2006 and SINE 1998.

Notes: Stars indicate statistical significance at the 10% (*) , 5% (**) and 1% (***) levels, respectively.

Men have not a higher probability to participate than women (table 4). People with a basic or lower level of education, as well as those with a post-secondary and university level, have a lower probability to participate than those with an upper secondary level of education. Those who were wage earners (executive, foreman, blue and white collars) before being unemployed and starting their business have a higher probability to participate than those who were not wage earners (businessmen, craftsmen, students). Also those who entered into collaboration with other persons to run their business and who studied their market before starting have a higher probability to receive the ACCRE. If we consider the new business legal status, those who set up a company have a lower probability to participate in the program than those who start their own business.

We pay particular attention to the initial capital investment and the means of financing the new business. If we consider the former, compared with a very small capital investment (less than 1 500 Euros), there is a wide range of projects (between 1 500 and 75 000 Euros) which have a higher probability to be selected. But it is noteworthy that there is no significant difference in the probability to be selected among these projects. Finally, very big projects (initial capital higher than 75 000 Euros) had a probability to participate which was not significantly higher than the very small projects.

In addition the probability to participate in the ACCRE program is positively related to the existence of bank loans and financial personal resources by the new entrepreneurs. We have investigated in depth this question, and built interaction variables. These variables (bank loans interrelated with personal resources of the new entrepreneur) introduced in the logit estimation show that the effect of the bank loan on the probability to participate in the ACCRE program is higher than the personal resources of the new businessmen (table 4). Other interaction variables (between the initial capital and bank loans) show that businessmen who receive bank loans have a higher probability to participate even if their initial capital is small⁹.

Moreover people who start their business in the food or manufacturing industries or the business services or personal services have a higher

9 These estimations not reported here can be obtained from the authors upon request.

probability to participate in the program than in the other activities. Finally, the participation in the ACCRE program is positively linked with the participation in other public programs to support start-ups. We shall have to take carefully into account this fact in our estimation of the effects of the ACCRE program on firm survival here after.

5.2. The effect of the ACCRE Program on Firm Survival

Table 5 reports the firm survival rate after one to eight years of existence. We use the estimates of the logit equation which is reported in table 4 and that we have analyzed here above. Then we implement the Kernel matching method which introduces weighted averages of firms in the control group to construct the counterfactual outcome.

After matching, the impact of the ACCRE program on firm survival is positive. Only at the end of 1999, this impact is not significant (whereas it is significant with the unmatched data). Such a difference between the short-term and long-term effects of public support on start-up survival has already been found in research aiming at evaluating the efficiency of these policies in different countries (section 2). In France, if the new entrepreneurs' income is low, and if they receive unemployment benefits, it is their interest to close their business after their first twelve or fifteen months of activity. It is noteworthy that, for new entrepreneurs, the right to keep unemployment benefits, which is an incentive to start a new business, may also be an incentive to give it up after twelve or fifteen months, if they consider that their business income is low compared to the unemployment benefits they continue to receive after closing their business.

However, after two years of existence (2000), the impact of the ACCRE on firm survival is positive and significant. Between the fourth and eighth year (2002-2006), the difference is constant and very close to 0.1: in 2006, after matching, the survival rate of the control group is 0.376 and 0.474 for the treated group. This result is all the more important that it concerns the long term effect of the ACCRE, seven years after the end of this program.

Table 5. Estimates of firm survival rate for different periods before and after matching (Kernel matching method)

Period (end of each year)	Treated : participate in the ACCRE program	Controls	Difference	Standard error
2006				
unmatched	0.475	0.353	0.122***	0.014
ATT	0.474	0.376	0.097***	0.019
2005				
unmatched	0.503	0.374	0.129***	0.014
ATT	0.501	0.399	0.101***	0.019
2004				
unmatched	0.547	0.425	0.121***	0.014
ATT	0.545	0.451	0.095***	0.019
2003				
unmatched	0.594	0.463	0.131***	0.015
ATT	0.592	0.495	0.096***	0.019
2002				
unmatched	0.642	0.512	0.137***	0.015
ATT	0.640	0.537	0.103***	0.019
2001				
unmatched	0.686	0.570	0.116***	0.014
ATT	0.684	0.599	0.086***	0.019
2000				
unmatched	0.791	0.736	0.055***	0.013
ATT	0.789	0.749	0.040***	0.016
1999				
unmatched	0.907	0.870	0.037***	0.009
ATT	0.907	0.889	0.018 (n.s)	0.012
Number of observations	1960	2634		

Sources: FICUS 1998-2006 and SINE 1998.

Notes: Stars indicate statistical significance at the 10% (*), 5% (**) and 1% (***) levels, respectively.

5.3. Tests of robustness (see also appendix B)

From a technical point of view, it must be mentioned that all the estimations (tables 5 and 6) have been carried out using the Kernel matching method. This method has been chosen since it displays a higher common support than any other method. Only 0.6% of the observations are off the support.

The balancing test of these first results estimates the difference between the variables of the treated and the control samples before and after the matching process. It confirms the validity of the matching method which reduces the difference between most of these variables by more than 90%¹⁰.

We have also tested alternative matching methods: (i) We use a nearest-neighbor method with and without replacement. (ii) We also used a different definition of the distance between each pair of matched observations: the Mahalanobis distance. All these estimations give results which are very close to the Kernel estimations¹¹.

The standard errors on the difference between the averaged treatment on the treated and the controls which are presented in tables 5 and 6 have been computed using the standard method. These standards errors have also been computed using the bootstrap method. This last method displays results which are very close to the former.

Moreover following Black and Smith (2004) we define a “thick support” in our sample by dropping the treatment observations for which the score density is the lowest. Our estimations based on this support do not display important changes from the estimation with the full support (appendix B).

5.4. Sub-groups of start-ups according to their financial sources

Here after we single out sub-groups of firms according to their initial capital and their financing sources, and implement the same estimation method. In doing so, we have two objectives. First, we can hypothesize that the amount and the source of financing have an impact on new firm survival. It is interesting to estimate if the ACCRE program has the same effect whatever are the start-up amount and sources of financing. Second, these separate estimates are also a means to check the robustness of the CIA. Indeed, there may be unobservable characteristics of the firms or entrepreneurs in some sub-groups (for example the sub-group of firms

¹⁰ This balancing test is available from the authors upon request.

¹¹ These results are available from the authors.

which received bank loans), which may bias our estimate across the whole sample. This bias may be eliminated if we consider separately different sub-groups (for example firms with bank loan on the one hand, and without bank loan on the other).

The first important result is that the ACCRE program has a positive effect on firm survival whatever can be the sources of their financing (bank loan or personal financial resources). In addition, even those who have no bank loan and no personal resources to start their businesses improve the probability of their firm survival if they participate in the ACCRE program. Another important result is that those who participate in the ACCRE program with a small capital investment (less than 7 000 Euros) have a significantly higher rate of survival than those who do not participate. The result is the same for the start-ups with a capital investment larger than 7 000 Euros. Moreover even if the ACCRE program is not coupled with other public subsidies, it has a positive impact on firm survival.

Table 6. Comparing participants and non-participants in the ACCRE program: firm survival rate for different subgroups of entrepreneurs (Kernel matching method)

Survival rate in 2006 after 8 years of existence (Matched data)	Treated : participate in the ACCRE program	Controls	Difference	Standard error
Means of financing the business,				
With personal resources (n=3256)	0.469	0.372	0.097***	0.021
Without personal resources (n=1338)	0.494	0.397	0.097**	0.039
With a bank loan (n=1470)	0.537	0.433	0.104***	0.033
Without a bank loan (n=3124)	0.421	0.344	0.077***	0.022
Without bank loan and without personal resources (n=739)	0.390	0.245	0.145**	0.063
Capital investment to start				
-Less than 7000 Euros (n=2108)	0.412	0.330	0.082***	0.026
-More than 7000 Euros (n=2486)	0.529	0.417	0.111***	0.026
Received other subsidies				
Yes (n=1128)	0.490	0.391	0.099***	0.036
No (n=3466)	0.464	0.366	0.097***	0.022

Sources: FICUS 1998-2006 and SINE 1998, n = number of firms in each sub-sample.

Notes: Stars indicate statistical significance at the 10% (*), 5% (**) and 1% (***) levels, respectively.

Finally, the ACCRE program has a positive effect on firm survival whatever can be their sources of financing, and whatever can be their initial capital investment. This is undoubtedly an important result since it shows that the effect of this program on firm survival is widespread across the new firm population. Since financial resources are taken into account in the decision process to support start-ups (table 4), this result means that public administration does not select the entrepreneurs' participation to the ACCRE program on the basis of their financial resources, their capital investment to start their business, and of their participation to other public subsidy programs.

Even if other factors of selection bias on unobservable characteristics of the entrepreneurs, or of their project, cannot be ruled out with our PSM method (section 4), our results suggest that the distribution of ACCRE depends at least partly on the legal rules of the ACCRE program rather than on economic variables. The self-selection process is working since some categories of entrepreneurs have little or no interest in participating in the program (section 3). For example, entrepreneurs who were wage-earners before being unemployed have a higher probability to participate in the ACCRE program than non-wage-earners (table 4). Indeed the latter are not entitled to receive unemployment benefits during the first year of their firm existence. From this point of view, it is interesting to note that until 2007 the decision to accept the participation of applicants in the ACCRE program was taken by the local labor administration (depending on the Labor Ministry). Officially this administration had to check that the applicants fulfilled legal conditions to benefit from the ACCRE program, and to check the consistency and economic prospects of their projects. However, since 2007, according to the new regulation, the local chambers of commerce are entitled to take this decision checking only that the first condition is fulfilled (Daniel and Mandelblat, 2010).

This change is the outcome of a long evolution of the ACCRE program which has been more and more devoted to those entrepreneurs who fulfill the legal conditions to apply, irrespective of the economic consistency and viability of their project.

6. CONCLUDING REMARKS

Using the PSM method “à la Rubin”, our results first show that the start-ups which participated in the ACCRE program had a higher survival rate after their second until their eighth year of existence than others. Thus, following official objective, this program has a positive effect to help jobless people to ‘create and keep’ their job in the long run. After eight years, according to our estimate, the survival rate for the firm which participated in the program was 47,4%, compared to 37,6% for those which did not participated.

So following other research, we find that the “founding conditions” determine the start-up long term survival (Geroski et al., 2007). Actually, this program mainly consisted of subsidies which alleviated the financial constraints of start-ups for a period of twelve to fifteen months. This was a very important advantage if we consider that most firms started with a very small initial capital investment. To start their activities, firms which had higher financial resources (other things being equal) were in a better position to survive.

Furthermore, using the same PSM method, and distinguishing different sub-groups of entrepreneurs according to their financial resources and the amount of their capital investment, we find that the effect of the participation to the ACCRE program is widespread across these different categories of entrepreneurs. Our results show that the distribution of ACCRE by public authorities depends at least partly on the legal rules of the ACCRE program, rather than on economic variables. The entrepreneurs self selection process is working since some categories of them have little or no interest in participating in the program.

As a counterpart the cost of the ACCRE program for government bodies consisted of unemployment benefits or social income which were paid to new entrepreneurs, or in the reduction of the contributions on wages (for those who were paid by the start-ups). However, a complete evaluation of the program should take into account the “displacement effect”, namely the firms which survived because of their participation in the ACCRE program and may have unseated other firms which did not receive this support.

We have also tested the robustness of our results. First we have checked that the attrition bias coming from the matching of the two data base is very limited. In addition, besides the Kernell matching method which is used in most of our estimations, we have introduced other matching methods (nearest neighbor with and without replacement, Mahalanobis) and find that the results of our estimations do not differ significantly.

Finally, the limitations and possible extensions of our study must be outlined. First we adopt a partial-equilibrium analysis. That is to say that we neglect substitution effects and crowding out effects. Only a general equilibrium approach could take into account these effects of the program. Using other econometric methods (discrete duration models, multinomial qualitative models) with more recent and detailed cohorts of the SINE survey (2002, 2006, 2010) would be another way to check the robustness of our results, and to individualize the factors, which, besides public support, determine start-up survival. Last, the legislation concerning start-up subsidies often changes in France. It would be useful to compare different start-up cohorts created by jobless people, at different periods, under different institutional settings.

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APPENDIX A. TABLES

Table A1. Selected descriptive statistics for persons who were not employed before starting their new business

1998	Persons who received the ACCRE	Persons who did not receive the ACCRE
Total of the population in the sample (in %)	42.7	57.3
Nationality (in %)		
French	43.9	56.1
Gender (in %)		
Men	45.9	54.1
Women	35.7	64.3
Age (in %)		
Less than 51 years	44.7	55.3
More than 50 years	23.0	77.0
Education (in %)		
Basic education.	31.9	68.1
Lower and middle secondary education.	36.4	63.6
Upper secondary education (professional school)	54.5	45.5
Upper secondary School (non -professional)	48.6	51.4
Post-secondary and university level	39.2	60.8
Occupational before starting the business		
Craftsman, salesman, Businessman	25.6	74.4
Manager	n.s	n.s
Foreman	42.9	57.1
Technician	66.5	33.5
Blue collar	44.4	55.6
White collar	56.6	43.4
Student	51.1	48.9
Others	18.5	81.5
	19.0	81
Capital investment to start (in %)		
-Less than 1500 euros	29.3	70.7
-From 1500 to 3500 euros	47.3	52.3
-From 3500 to 7000 euros	53.4	46.6
-From 7000 to 15000 euros	40.0	60.0
-From 15000 to 37000 euros	50.6	49.4
-From 37000 to 75000 euros	41.3	58.7
More than 75000 euros	32.7	67.3
Means of financing the business		
Bank loan (yes/no)	58.8	41.2
Personal financial resources(yes/no)	46.7	53.3

Average employment		
-number of self-employed and employees	1.3	1.7
-number of employees	0.3	0.8
Activity (in %)		
Food industry	41.2	58.8
Manufacturing industry	53.6	46.4
Building industry	53.6	46.4
Trade	42.1	57.9
Transportation	35.1	64.9
Real estate	18.0	82.0
Business services	38.7	61.3
Services to individuals	40.0	60.0
Education and health services	24.6	75.4
Start-up located in the district of Paris (in %)	19.1	80.9
Other type of public subsidies	61.9	38.1

Sources: 1998-2006 FICUS, and 1998 SINE Survey.

APPENDIX B. TESTS OF ROBUSTNESS

First our original data base SINE (section 4) has been merged with the FICUS data base. In the original data base, there are 12726 start-ups created by unemployed people. After matching with FICUS, there are 4594. This attrition comes from the fact that Ficus is an administrative data-base whereas SINE a statistical survey. To check a possible attrition bias, we have compared the results of some estimates before and after matching. In the SINE survey, we have information about the firms which survived five years after their creation (until 2003) but not after. We thus applied the PSM method to the SINE data base before matching (with the 12756 persons), the outcome variable being their survival (or not) in 1999, 2000, until 2003. The results of the estimation procedure are very similar to those that we obtain with the matched data base for the same outcome variable and the same period (table 6). So we can consider that if there is any attrition bias due to the matching of both data base, it is very limited.

Tests of robustness of the estimates of firm survival rate (2006)

	Treated : participate in the ACCRES program	Controls	Difference	Standard error
PSM, Kernel matching method, caliper = 0.0001, "thick support" (10%)	0.458	0.379	0.079***	0.018
PSM, Kernel matching method, caliper = 0.0001, "thick support" (33%)	0.446	0.371	0.074***	0.019

Sources: FICUS 1998-2006 and SINE 1998.

Notes: Stars indicate statistical significance at the 10% (*), 5% (**) and 1% (***) levels, respectively.

"Thick support: the common support is built by dropping respectively 10% and 33% of the treatment observations for which the score density of the control observations is the lowest.

Going back to the Kernel method, we have redefined the common support. Black and Smith (2004) show that a selection process on unobservables may have its largest effects for values of the propensity score in the tails of the distribution. The underlying idea is that when the probability to be in the treatment group is high, unobservable factors on average have a higher impact than when the probability is around 0.5. Thus Black and Smith introduce a "thick support", by dropping different percentages of the treatment observations (in the table of this appendix, respectively 10% and 33% of the treatment observations have been dropped) at which the score density of the control observations is the lowest. Our estimates based on this "thick support" are consistent with our previous results, and do not display important changes.

In addition we have used a fundamentally different econometric method to estimate the effect on start-ups survival of the participation in the ACCRES program. For this purpose, we have estimated a bivariate probit system¹². The first equation formalizes the selection process of the entrepreneurs who participate (or not) in the ACCRES program. The second probit equation concerns firm survival. Thus the dependant variable is a

¹² Heckman and Navarro (2004) study how the PSM method and the control function method eliminate the selection bias.

dummy which equals 1 if the firm has survived n years after its creation (with $n = 1, \dots, 8$) and 0 if it has not. The first equation includes the same variables as in the logit estimation which is the basis of the PSM method (table 4 in the text). The second survival equation takes into account the interrelation between the participation in the ACCRE program, bank loan and the capital investment to start the business. We thus get eight interrelated variables which are introduced in this equation. Also we successively used two instrumental variables: the location of start-ups in the district of Paris (or not), the entrepreneur's contribution (or not) to the capital investment. These two variables are significant determinants of the participation in the ACCRE program, but have no effect on firm survival.

The estimation of this biprobit model shows that the participation to the ACCRE program has a positive effect on firm survival from their second to their eight year of existence¹³. This confirms the general results that we have obtained with the PSM method (table 5 in the text). The results of the PSM method are also confirmed for different subgroups of firms: those with a large initial capital investment, as well as those with a low initial investment, those with a bank loan, as well for those with no bank loan (see table 6 in the text for the PSM method) have a higher survival rate if they take advantage of the ACCRE program.

¹³ These estimations are available from the authors upon request.