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DOCUMENT DE TRAVAIL

N° 14-2012

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September, 2012

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

[1] We thank , Robert Moore, Federal Bank of Atlanta and Georgia State University, and the participants to the Louis-André Gérard-Varet Conference in Public Economics held in Marseille, France in June 18-19-20 , 2012, for their report, comments and suggestions on an earlier version of this paper. We are responsible for any remaining shortcomings

Long Term Effect of Public Subsidies on Start-up Survival and Economic Performance. An Empirical Study with French Data.

This paper studies the effect of a public program which aims at supporting firms created by jobless people in France. The research follows a cohort of firms created in 1998 during an eight-year period. It uses a rich matched database which includes entrepreneurial characteristics and start-up economic variables. A propensity score matching method is used, and the analysis shows that: (i) subsidized firms have a higher survival rate than others after their second until their eighth year of existence, (ii) however for the same period their economic performance is not superior to non-subsidized firms (iii) the program increases firm survival whatever its initial capital, and whatever its funding sources (bank loan, personal financial resources).

Keywords: firm survival, matched database, propensity score matching, firm performance

JEL Classification: D21, H25, L38.

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 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 on start-up survival and economic performance in the French economy. We use a rich matched database of a cohort of French firms that were created in 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. However, we find no significant effect of public support on other performance criteria (value-added, employment, capital productivity, profitability). 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, 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 explains why assistance to start-ups have become a 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 sum[2] 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 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.

[2] It amounts to 32,000 francs or approximately 5,000 Euros.

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". 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 fight against discrimination. 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 and economic performance. 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)[4]

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 different tax cuts and social contribution exemptions that were usually decided at the local or regional level[5]. Nine different programs are reported in our database, and each of

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

[4] 3% of those who were employed received the ACCRE (table 2). According to the legislation, these persones were already dismissed by their employer, but still working for a short period (three months).

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

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).

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
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.

Source : 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 looked 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, 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)[6]. If we consider the 1998 provisions (table 1), the support by the ACCRE 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 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.

[6] 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.

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-earner[7], 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). The dataset mostly contains various economic performance indicators, e.g., employment, value-added, capital investment and profit.

[7] 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).

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-ups[8] 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 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.

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

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 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 1500 Euros) and with a large capital (more than 75000 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%)[9]. 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 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 and economic performance. 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 (the first year of existence of these firms). To evaluate firm performance we have selected the following indicators: employment, value-added, capital productivity (value-added divided by the value of the invested capital), profitability (ratio of the gross operating surplus of each firm divided by the value of the invested capital).

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

[9] This phenomenon is acknowledged and studied in details by Daniel and Mandelblat (2010).

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 and performance.

First, to control for these 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…..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 or economic performance 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 the third step of the estimation strategy).

The first outcome variable that 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 addition, we have computed and introduced the variations of the other outcome variables (employment, value-added, capital productivity, profitability) from the first year of firm existence (1998), until the end of the period (2006). For these estimations, the "difference-in-difference" estimates remove the unobserved permanent differences between firms (fixed effect) (Heckman et al., 1997, Heckman et al., 1998).

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 on the one hand, and their economic performance on the other hand.

Third, we distinguish different sub-groups of firms according to their initial capital and their financing sources, and implement the same econometric 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 and performance. 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 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).

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 A2 in appendix). Men have not a higher probability to participate than women. 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 a 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 1500 Euros), there is a wide range of projects (between 1500 and 75000 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 75000 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 A2 in appendix). 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 small[10].

Moreover people who start their business in the food or manufacturing industries or the business services or personal services have a higher probability to participate in the program than in the other sectors of activity. Finally, the participation in the ACCRE program is positively linked with the participation in other public program 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 firms survival and performance here after.

5.2. The effect of the ACCRE Program on Firm Survival.

Table 4 reports the firm survival rate after one to eight years of existence. We use the logit equation which is reported in A2 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 (table 1), 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.

[10] These estimations not reported here can be obtained from the authors upon request.

Table 4. 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	0.642	0.512	0.137***	0.015
unmatched	0.640	0.537	0.103***	0.019
ATT				
2001	0.686	0.570	0.116***	0.014
unmatched	0.684	0.599	0.086***	0.019
ATT				
2000	0.791	0.736	0.055***	0.013
unmatched	0.789	0.749	0.040***	0.016
ATT				
1999	0.907	0.870	0.037***	0.009
unmatched	0.907	0.889	0.018 (n.s)	0.012
ATT				
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.

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.

From a technical point of view, it must be mentioned that all the estimations (table 4, but also 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%[11].

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 estimations[12]

The standard errors on the difference between the averaged treatment on the treated and the controls which are presented in table 4 (and also 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.

5.3. Subgroups of start-ups according to their financial sources.

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 7000 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 7000 Euros. Moreover even if the ACCRE program is not coupled with other public subsidies, it has a positive impact on firm survival.

[11] This balancing test is available from the authors upon request.

[12] These results are available from the authors.

Table 5. 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. According to these results public authorities do not try to select “the best” project which have the most favorable prospect to survive. But they have not the opposite attitude, and do not favor “disadvantaged entrepreneurs”. In other words, they do not try do counterbalance the handicaps of those who have a low probability to survive. This is the case for example of those entrepreneurs who have no bank loans and no personal contribution to finance their project and who nevertheless take advantage of the ACCRE program (table 5).

This result can be explained if we consider that the ACCRE is mainly granted according to administrative criteria. 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, Mandelblat, 2010). This change sanctions the fact that, according to public authorities, the ACCRE program, since the origin, has been mainly devoted to those who fulfilled the legal conditions to apply, irrespective of the economic consistency and viability of their project.

5.4. The ACCRE effect on Firm Economic Performance.

Even if subsidized firms survive longer, we do not know the effect of these subsidies on their efficiency and profitability. For example, it cannot be excluded a priori that subsidies may lead less productive firms to remain in the market.

First, using the same PSM method we have considered employment, value-added, capital productivity and profit rate as outcome variables in absolute level in 2006. Our results do not display any significant difference in economic performance between treated and non-treated start-ups after eight years of existence. However, since these outcome variables can be considered as continuous, we have introduced the variations of these variables between their first year of existence (1998), until the end of the period (2006) (table 6). This "difference-in-difference" estimation eliminates the unobserved fixed effect between these firms (Heckman et al., 1997, Heckman et al., 1998).

An important result emerges from table 6 with the difference-in-difference estimation of economic performance. There is no significant difference between the outcome indicators which are studied in the long run (8 years) between the treated and the non-treated start-ups. We have also checked that in the short run (1, 2, 3 years), the results are identical. This is in sharp contrast with our estimation of start-up survival.

First, for the eight-year period, only the number of employees of the firms which have survived are included in our database. Since many firms had no employees in 1998, we take into account the variation of employees in absolute number. Whereas in 1998, the average number of employees in 1998 was 0.34, this number increased by 0.96 until 2006 and thus reached 1.3 employee in 2006. According to table 6, the ACCRE program had no significant effect on the increase in the average number of employees per firm[13]. This does not imply that the impact of the ACCRE on job creation was negligible. Indeed, the survival rate of the firms

[13] The number of employees is taken into account and not self employed persons since only this first information is available in our data base for the year 2006.

which participated in the ACCRE program was significantly higher than those which did not participate (table 4). In addition, the average number of employees per firm increased between 1998 and 2006. If we consider table 4, the survival rate is 0.474 for the firms which participated in the ACCRE program, and 0.376 if they did not. So the probability of survival was increased by 0.098 ($\pm$ 0.037 at the level of confidence of 0.05). Since each firm which participated in the ACCRE program employed 1.3 persons in 2006, on average, the number of jobs created by 100 firms which participated in the program (compared with no participation) was comprised between 6.9 (6.1*1.3) and 17,5 (13.5*1.3).

If we considered the evolution of total employment (employees plus self employed people), it is confirmed that there is no significant difference between the treated and the non treated. In both cases employment increased roughly by 70% between 1998 and 2003[14].

Table 6. Comparing participants and non participants in the ACCRE program: variations of different indicators of firm performance (Kernel matching method).

Variation of each variable performance between 1998 and 2006, except for employment (1998-2003)	Treated : participants in the ACCRE program	Controls	Difference	Standard error
Employees (n=1863), variation in absolute number.	0.959	1.110	-0.151 (ns)	0.402
Employment (employees+ self employed): relative variation, (n=2452)	0.684	0.752	-0.068 (ns)	0.112
Value-added : relative variation (n=1798)	1.022	1.006	0.016 (ns)	0.028
Capital productivity : relative variation (n=1798)	1.20	1.11	-0.092 (ns)	1,50
Profit rate, relative variation (n=1780)	-1,47	0.62	-2,09 (ns)	1,50

Ns= not significant at the 0.1 level, n: number of firms in the sample

Sources: FICUS 1998-2006 and SINE 1998

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

[14] The variable : « total employment » , that is the number of self employed people and employees for each firm is only available for the years 1998, 2001 and 2003 (in the SINE data base, see 4.1 and 4.2. here above)

The other performance indicators show a rapid increase in the value-added (+100%) and capital productivity (value-added divided by capital investment: +120%) during the period under survey, but a stagnation of the profit rate (operating surplus divided by capital investment). These evolutions are not significantly different between treated and non-treated firms.

How can we explain that the ACCRE program had a positive impact on start-up survival, but not on their economic performance? The main advantage of the ACCRE program was a subsidy for a maximum of 15 months which was devoted to people who were entitled to receive unemployment benefits, if they were not compensated by their start-ups. Their operating expenses were alleviated in comparison with former unemployed people who were not entitled to receive these benefits (students, part timers, persons with short period of employment for example). This was a very important advantage if we consider that most start-ups had a very small initial capital: 17% had an initial capital inferior to 1500 euros, and 50% less than 7500 Euros. And our estimations show that financial resources were one of the main determinants of the start-up survival (table 5). In the ACCRE program, there was no lump sum which was granted to new entrepreneurs, but there were operating resources which reinforced the financial structure of each firm. Start-ups which had higher financial resources (other things being equal) were in a better position to survive than those which did not participate in the program. Nevertheless, the selection process by the market was working. The weakest start-ups, and among them those which did not participated in the ACCRE program, were rapidly eliminated by the competition on the market. Thus after two years (table 4) the difference between the entrepreneurs which participated in the ACCRE and the others was stabilized. This selection process resulted in an equalization of the performance of firms, be they subsidized or not.

Moreover different tests of robustness of our estimations (test of the attrition bias, estimations based on a “thick support”, estimation of a biprobit system of equations) have been carried out. All these tests confirm our previous results (see our detailed estimations in appendix B).

6. Concluding Remarks.

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. So following other research, we find that the “founding conditions” determine the start-up long

term survival (Geroski, et al., 2007). However, for the firms which have survived eight years, economic performance (number of employees, value-added variation, capital productivity variation and profitability variation) was not higher than those which did not participate in the ACCRE program. 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. Nevertheless, the selection process by the market in which they operated was working, the weakest start-ups, and among them those which did not participated in the ACCRE program, were rapidly eliminated by competition. But also these subsidized firms were in competition with other firms created by people who were not unemployed before starting their business. This selection process resulted in an equalization of the performance of firms, be they subsidized or not.

Furthermore, using the same PSM method we find that the participation to the ACCRE program increased significantly the start-up survival whatever the amount and the sources of financing. 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. We also estimate that, for 100 firms which participated in the program, between 7 to 17.5 new jobs were created (compared with no participation 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 are 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 may have unseat 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, Kernel, Mahalanobis) and find that the results of our estimations do not differ significantly. Lastly, a fundamentally different econometric method, based on a biprobit model with a survival equation and a selection equation by the ACCRE program, also confirms our results concerning the effect of this program on firm survival.

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) 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 other 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,	25.6	74.4
Businessman	n.s	n.s
Manager	42.9	57,1
Foreman	66.5	33.5
Technician	44.4	55.6
Blue collar	56.6	43.4
White collar	51.1	48.9
Student	18.5	81.5
Others	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

Source: 1998-2006 FICUS and 1998 SINE Survey

Table A2. Estimation of the logit model : dependant variable : ACCRE (ACCRE=1 for the entrepreneurs who are participant 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)	-0.952**	With bank loan and no personal resources	-0.199
Businessman	-0.576***	With personal resources and no bank loan	-0.467***
Craftsman, shopkeeper	0.768***	With no bank loan and no personal resources.	-1.748***
Foreman	-0,200		
Technician	-0.051		
Blue collar	-0.009		
White collar	-1.240***		
Student	-1.254***		
Others			

Number of previous creations (refer. No previous creation)		**Activity (refer. Manufacturing industry)**	
one previous creation	-0.407***	Food industry	-1.53
two previous creations	-0.673***	Building industry	0.105
more than two	-1.016**	Trade	-0.359***
Collaboration (refer. : with former employer, a family member…)		Transportation	-0.572***
		Real estate	-0.477**
		Business services	-0.053
No collaboration	-0.578***	Services to individuals	-0.121
Market research before starting the business (refer : yes)		Education and health services	-0.804***
		Start-up located in the district of Paris (in %) (ref. outside the district)	
No Market research	-0.374***		
		In the district of Paris	-0.718***
		Received another public subsidy (refer. Do not receive)	
		Receive another subsidy	0.711***
		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.

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 database 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, and we have no information about their economic performance. 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 4). 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 ACCRE 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 pscore 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 ACCRE program. For this purpose, we have estimated a system of two simultaneous probit equations, namely a bivariate probit system[15]. The first equation formalizes the selection process of the entrepreneurs who participate (or not) in the ACCRE program. The second probit equation concerns firm survival. Thus the dependant variable is a dummy which equals 1 if the firm has survived n

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

years after its creation (with n=1.....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 A2 in appendix). 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 existence[16]. This confirms the general results that we have obtained with the PSM method (table 4). 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 5 for the PSM method) have a higher survival rate if they take advantage of the ACCRE program. Last but not least, for these estimations the residuals of the two probit equations are uncorrelated. Thus, these last estimations support the conception that there are no unobservable variables which influence simultaneously the firm participation in the ACCRE program and its survival.

[16] These estimations are available from the authors upon request.