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Regional dynamics and start-ups: Evidence from French departments in 2011

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Abstract: This paper seeks to determine the exact role played by regional dynamics in the creation of companies. The notion that territorial dynamics influence entrepreneurial activity seems to be backed up, first of all, by the fact that it is at the regional level that the direct influence of the ecosystem of wealth and of material, human and organizational resources is strengthened through agglomeration effects. We empirically address this question considering the case of French departments in 2011. In order to take into account the role played by the neighbourhood and the resulting spatial dependence, we estimate the sensitivity of both the overall entry rate and the entry rate in the manufacturing industry using spatial econometric estimation techniques, an approach which enables us to control the effect of spatial autocorrelation. Our results show that the creation of companies highly depends on local factors and that the source of local dependence differs according to the entry rate used as an explained variable. Whereas a spatial lag applies at the overall level, the creation of companies in the manufacturing industry is more oriented by exogenous shocks so that a spatial error model is more appropriate.

Résumé : Ce papier cherche à déterminer le rôle joué par les dynamiques régionales dans la création d'entreprises. L'idée que les dynamiques locales influencent l'activité entrepreneuriale s'appuie sur le fait que les effets d'agglomération qui se produisent qui se produisent au niveau d'un écosystème local renforcent les effets directs des ressources locales que sont les revenus ainsi que les ressources matérielles, humaines et organisationnelles. Nous abordons cette question de manière empirique en considérant le cas des départements français en 2011. Afin de prendre en considération le rôle joué par le voisinage et la dépendance spatiale qui en résulte, nous estimons la sensibilité du taux de création d'entreprises global et du taux de création dans l'industrie en utilisant des techniques d'économétrie spatiale qui permettent de contrôler les phénomènes d'auto-corrélation spatiale. Nos résultats montrent que la cré »ation d'entreprises dépend fortement des facteurs locaux et que la source de dépendance locale diffère selon que l'on mesure le taux de création global ou le taux de création d'entreprises industrielles. Alors qu'un retard spatial intervient au niveau global, la création d'entreprises dans le secteur industriel est davantage influencée par les chocs intervenant au voisinage, si bien que le recours à un modèle avec erreur spatiale s'en trouve légitimé.

Keywords: entrepreneurship, entry rate, spatial dependence, French departments

JEL Codes: L26, R11, C21

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1. INTRODUCTION

Since the very beginning of the 1990s, a large number of policy initiatives have sought to promote business start-ups to foster both economic and job growth. The recent crisis has strengthened this tendency to facilitate firm creation with the implementation of a simplified regime for the self-employed people aiming at launching their own business. All these policies rest upon the idea that new firms contribute to the dynamism of the economy and that they are able to promote structural change, innovation and new job creation as well. However, despite the large number of papers, books and reports on this subject a lot remains to be done to understand better why and how potential entrepreneurs decide to take action (Markman et *al*. 2002).

From Bird (1988), scholars[2] agree that entrepreneurial intentions are the result of individual features (personality, motivation, skills and experience) combined with environmental characteristics (market situation, socioeconomic context). The limited empirical literature clearly shows that entrepreneurs exhibit geographic inertia (Keeble and Walker 1994; Sorenson and Audi 2000) and supports the assumption that 'regions matter' for entrepreneurship research. A key synthesis of this question has been proposed by Audretsch and Fritsch (1994) in their study about the local determinants of business creation in Germany. This paper inaugurated a long series of empirical studies aiming at enlightening the reasons why European regions or countries differ from an entrepreneurship point of view. Fritsch (1997) shows that the number of start-ups clearly depends on the industrial structure in the considered region. Armington and Acs (2002) also note that traditionally most studies on determinants of regional entry use variables such as unemployment rate and population density as explanatory variables. More recently, theories of new economic geography and endogenous growth theories (e.g. Krugman 1991; Aghion and Howitt 1998) provide significant contributions to explain the choice of location for an entrepreneur who is considering starting a new firm. These theories imply that spatial agglomerations and location generate advantages in terms of spillovers and co-operation between firms. More recently, Kibler (2012) also shows that individual and local characteristics are mutually reinforcing. These papers agree to consider that agglomeration and urbanization external effects are capable of boosting entrepreneurial spirit. These relationships may have different aspects: a specialized local labour market creating a large potential skilled labour force, the functioning of local entrepreneurs' networks making it possible to reduce risk and lack of information that

[2] Dejardin (2011) proposes a comprehensive review of literature on this topic.

may deter business creation (Acs *et al.* 2009). As these external and network effects are stronger in high-density areas, these agglomeration effects justify a higher entry rate in urban areas with a high economic and demographic density.

All these papers have in common the fact that they consider any area, all other things being equal, and without taking into account its neighbourhood. However, Plummer (2010) recently pinpointed the importance of spatial dependence in entrepreneurship research. This is all the more important since the data used are spatial in the sense that the location of the observations is observed. So, instead of focusing on the spatial heterogeneity of the entrepreneurship context as previous papers do, we seek at considering the spatial dependence that is equally underlined by theories of entrepreneurship (Shane and Venkataraman 2000)

This paper contributes to the empirical literature by applying spatial econometric techniques to take into account the spatial auto-correlation in the business creation process. It shows to what extent the entrepreneurial profile of an area not only depends on its own local characteristics but on the profile of neighbouring areas as well. Such a phenomenon, often intuited but barely demonstrated, is enlightened considering data computed at the "département" "level[3] to capture the local capacity to create new business and the local characteristics that may drive this entrepreneurial activity.

The remainder of the paper is structured as follows. Section 2 recalls the relationship between entry rate and geographic characteristics leading us to define an empirical model of business creation at the local level. Section 3 describes the French situation and the difference observed among the 93 mainland "départements" and presents the variables introduced in the model to depict them. Section 4 presents the econometric strategy and the results obtained. Section 5 concludes and proposes a knowledge building research agenda for this field of research.

2. THE LOCAL CONDITIONS OF BUSINESS CREATION

The literature tends to present entrepreneurship as a multifaceted phenomenon driven by three groups of explanatory variables: those relating to the newly founded firm, to the entrepreneur, and to the external factors embracing the geographical and industrial environment in which entrepreneurial phenomena occur (Schutjens and Wever 2000). In this paper we mainly focus on the third one as we aimed at explaining the local determinants of business creation.

[3] French « départements » correspond to the second level of the Nomenclature of the European Territorial Units for Statistics (NUTS).

The analysis of local differences in the entrepreneurial process began at in the very beginning of the 1990s with international comparisons aiming at explaining the difference in entry rates among countries. They concluded that economic conditions, large companies' restructuring, households' incomes, consumption, economic policy and technological change explain why some countries are more entrepreneurial than others (Keeble *et al*. 1993). They were rather soon replicated at a regional level. The main results were very similar. For instance, Reynolds and Storey (1993) and Reynolds *et al.* (1994) conclude that local demand approximated by demographic growth, the share of SMEs in the local productive system and the degree of urbanization drive business creation.

In this field of research, the most documented analysis has been proposed by Keeble and Walker (1994) who insist upon the diversity of local determinants of firm creation. They identify 31 factors possibly influencing entrepreneurship in a given area and show that the entry rate is inasmuch important as the banking system is developed, the local labour market is specialized, and cities are big. If entrepreneurial spirit also depends on the average size of already operating companies, the role of this factor differs according the industry: in the consumer goods industry, the entry rate positively depends on the share of small companies (seedbed effect) whereas in the services industries the higher the share of large companies, the greater the creation of new firms. From these extensive empirical analyses of the spatial differences in business creation it is possible to identify three major categories of factors able to explain why some areas are more or less entrepreneurial than others. Following Keeble *et al.* (1993) and Johnson and Parker (1996), one may differentiate between local demand factors, the supply of founders and the policy environment.

2.1. Local demand factors

One can expect start-up location decisions to be influenced by the market size and potential demand of the areas under consideration. The solvent demand in a given region depends on the number of companies and inhabitants in the area and their incomes. In this section we focus on households whereas inter-enterprise relations are discussed in the agglomeration section below.

- Income. Higher levels of income increase demand, but they also provide access to capital that a potential entrant needs in order to start a firm (Reynolds, 1994). But high levels of income also mean a high labour cost as in large cities. It is thus possible to consider that a high level of income might therefore also deter entry in industries that are sensitive to high labour costs. In any case, the literature broadly agrees that the demand effects dominate so that higher incomes in an area tend to facilitate firm creation.

- Population. If firms prefer to locate in regions with a large population, this may have a self-reinforcing effect. Areas experiencing a high entry rate tend to become more and more attractive for new entrepreneurs (Krugman 1998). On the opposite, the same self-reinforcing mechanism exists in areas where an already small population is also decreasing, deterring potential entrepreneurs from launching their business.

2.2. Incentives to create a business

Firm creation depends not only on personal characteristics, such as the fact that some people have a higher entrepreneurial spirit than others (Casson 1983), but also on their economic environment.

- Among the different reasons why an individual decides to act as an entrepreneur, difficulties in accessing a job due to a high level of unemployment in the area is a major one. This idea is developed by Storey (1991), according to whom high unemployment rates can cause higher entry rates since they force unemployed workers to start their own companies as an alternative to unemployment. This assumption has often been tested as recalled in the survey of literature proposed by Carree (2002). However, the results are quite unclear as they are highly sensitive to the nature of the data. Empirical studies using time series often confirm a positive relation between unemployment and firm creation, whereas cross-section studies find a negative relationship. Santarelli *et al.* (2009) investigate the relationship between regional unemployment and firm entry and exit in Italian regions. Taking into account the effect of unemployment on firm exit, in addition to that on firm entry, they do not find evidence for the 'unemployment push' hypothesis. Considering to what extent unemployment pushes people to create their own business we can, nevertheless, reasonably expect a positive relationship.
- The size structure of the productive system in a given area is expected to play a role in the propensity to create new companies. A high rate of large companies in a given area may then encourage or deter the creation of new business depending on the nature of the industry. In some activities characterized by economies of scale, a higher rate of large companies may deter new entrepreneurs from entering the market. On the opposite, in industries where entry barriers are low, starting a new firm is easier as incumbents do not have the possibility to erect barriers to entry thanks to a growth strategy (Shapiro and Khemani 1987).

- The level of education and skills have been identified as an important determinant of the probability for people to start a new firm. However, the sign of the relation highly depends on the period during which such a relation is estimated. Evans and Leighton (1990) suggest that the probability to start a new firm is higher for well-educated people who are supposed to be more able to identify and exploit entrepreneurial opportunities. However, and this is narrowly connected with the previous point, unskilled people have a higher probability to be unemployed and, thus, may find in business creation a solution to their exclusion from the labour market. Indeed, as brought up by Leger-Jarniou (2001) from a study on young French engineering and business schools students, the decision to become an entrepreneur is a second choice option since they prefer an ordinary job, which generates higher personal income and greater professional stability than being an entrepreneur. Lee *et al.* (2004) reconsider this question taking into account skills, the social context and the diversity of the population. They conclude that business creation is strongly associated with cultural creativity when controlled for the variables suggested in the literature.

2.3. Agglomeration effects

Based on Marshall’s (1920) suggestion about co-location, agglomeration effects refer to the advantages available to a firm when it is located close to other firms (Puga 2010). Three main reasons explain why companies in the same industry tend to locate near each other (Rosenthal and Strange 2004).

- Sharing: the enlargement of the market of input providers enables agglomerated companies to exploit economies of scale in their production process (average production costs decrease as the output increases). As they know they are able to sell a high quantity of goods, the providers of input may propose a supply adapted to the specific needs of their various customers. In this way, proximity increases the global profit in the economy.
- Matching: Lower transport costs and proximity to suppliers make it easier for different types of customers to find an appropriate seller. They lower consumers search costs increasing the likelihood of visitation, and thereby heightening the demand experienced by agglomerated firms. Agglomeration also helps improve matching on the labour market so that firms and workers are less likely to settle for unproductive matches. Moreover, a high density of employers and employees in the same area reduces time spent looking for suitable jobs and other transaction costs so that the labour market becomes more efficient and the productive process as well.

- Learning: agglomeration provides more opportunities for people and firms to learn from one another and from the environment around them. Thanks to geographical proximity, opportunities for face-to-face contacts, which facilitate knowledge exchange, increase. The learning process enhanced by agglomeration also increases the possibility of knowledge spill-overs and innovation.

These localisation economies give economic advantages to dense areas. The prevailing rule is that colocation of enterprises generates over-performance (Krugman 1991 ; Combes *et al.* 2009 ; Martin *et al.* 2010) because of the positive external effects. The different factors generating these effects may also play in favour of an increased entry rate (Joffre-Monseny *et al.* 2011). Dense areas should thus be characterized by a higher rate of entry because potential entrepreneurs foresee that they have better chances of surviving in such places.

2.4. The challenging problem of spatial auto-correlation

Spatial location of individuals is seldom considered as a determinant of entrepreneurs choices. When scholars consider this point, they examine the influence of region on entrepreneurship either by introducing dummy variables (Blanchflower and Oswald 1998; Fairlie and Meyer, 1996) or by adding regional characteristics as explained variables in the model to be estimated (Blanchflower and Oswald 1998; Glaeser 2007 and Glaeser and Kerr 2009). The main drawback of this technique lies in the high number of dummy variables introduced in the model. In addition, none of these studies allow for the determination of neighbourhood effects whereas they are more and more considered as key factors in explaining the entrepreneurial process.

Plummer (2009) and Plummer and Pe'er (2010) emphasise the spatial dimension of entrepreneurship. Drawing upon Cooper and Folta (2000), who demonstrated that start-up performance is sensitive to local resources, Plummer (2009) affirms that. "there is good theoretical motivation for expecting that many firms-level variables are more spatially dependent in the case of new firms rather than older firms." (p. 150) This requires thus on one hand the use of spatially oriented variables and on the other the adoption of econometric techniques capturing this spatial effect.

Indeed, the strong dependence on local elements linked to the behaviour of nearby firms is often omitted from the analysis of entrepreneurship resting upon simple OLS which is unable to integrate it. As mentioned by de Graaff *et al.* (2006) "The multidirectional nature of spatial dependence in the spatial-error model implies that generalized least squares estimators are inconsistent." (p. 95) As a result, there is a miscalculation of the effect on explanatory variables taken into consideration and, consequently, a misunderstanding of the entrepreneurial phenomenon.

Two challenges result from the spatial feature of entrepreneurship. The first one consists in detecting the spatial dependence affecting the "georeferenced" data used to estimate the propensity to create new business. The second one lies in determining the method to adopt in order to mitigate this spatial dependence in the context of linear regression. They are successively addressed in the next Section.

3. DATA, EMPIRICAL MODEL AND ECONOMETRIC STRATEGY

In this paper we use a dataset constructed from different sources made available by the French National Institute of Statistics and Economic Studies (INSEE). It merges various series representing local information, all of them being provided at the departmental level[4]. These different sources enable us to estimate different proxy variables to illustrate the explanatory factors presented above and to determine the entry rate in every *département*. These data are barely available yearly; we succeeded in getting the maximum number of them for 2011. This date is appropriate at it is a very recent one. In addition the majority of the data collected are no available for the subsequent years.

This Section presents the dataset used to determine to what extent local characteristics influence entry rate. We specify the empirical model and the econometric strategy adopted to estimate it below.

3.1. The empirical model

We assume that the entrepreneurial intensiveness of an area is given by the rate of new companies created a given year. It is defined as the number of new companies divided by the total number of companies operating in the same area over the same year. This definition is known to pay more attention to the growth rate or the renewal rate of the global productive sector. This makes a difference with the ratio (new companies/resident population) which, according to Garofoli (1994), allows for a more accurate appreciation of the local entrepreneurial spirit. We did not keep it in this paper as our main concern has more to do with the productive system than with the propensity to create new business.

Noted CREA, the entry rate is thus computed as:

$$CREA_{d,t} = NewEnt_{d,t} / ExistEnt_{d,t} \qquad (1)$$

where $NewEnt_{d,t}$ is the number of new firms created in *département d*, year *t* and $ExistEnt_{d,t}$ the number of already operating companies in *département d*, year *t.*

[4] French departments correspond to NUTS 3 level in the European nomenclature.

We compute the entry rate at a double level. The global entry rate (CREA below) compares then the total number of new firms to the total number of operating ones in every *département* whereas the entry rate in the manufacturing industry (CREAI below) only focuses on new and already existing firms in the manufacturing industry (levels B, C, D and E of the NAF Rev. 2, 2008). This double level analysis is motivated by the high level of spillover effects generated by industry (Bonaccorsi and Daraio 2013).

The different kinds of local variables identified by the literature as possibly influencing the rate of new business created in an area are inserted in an empirical model aiming at explaining the entry rate at the *département* level. The model reads as follows:

$$CREA_{d,t} = a\, DEM_{u,d} + b\, INCENT_{v,d} + c\, AGGLO_{u,d} \qquad (2)$$

where DEM_{ud}, a set of the u variables used to depict the demand addressed to companies in department d, $INCENT_{v,d}$, the set of v variables inserted into the model to approximate the local incentives to create a business, and $AGGLO_{u,d}$, the set of the u variables introduced within the model to take into consideration agglomeration effects in the *département d*.

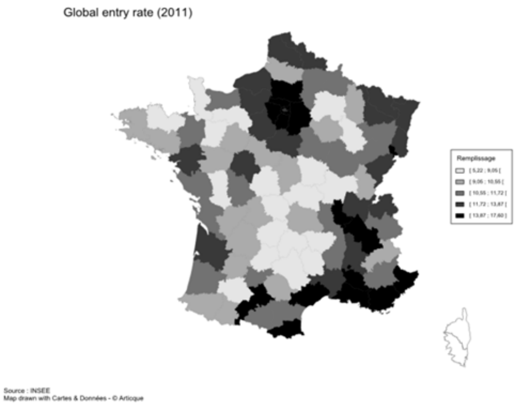
3.2. The explained and explanatory variables

Graph 1 presents the global and sectoral entry rate computed at the departmental level in 2011. The average global entry rate is about 11%. It is the highest in the departments of the Paris area (except the city of Paris itself) where it exceeds 16% and in Southern France with values around 15%. The lowest levels are observed in the departments *départements* located in rural areas and the center of France where the entry rate is below 7%. A similar geographical structure appears looking at the entry rate in the manufacturing industry. However, there is a major difference with the total entry rate as the number of new businesses almost always exceeds the number of operating manufacturing companies. This surprising phenomenon has a twofold origin. On one hand, the crisis accelerated the collapse of the manufacturing industry a slow decline long recognised in France (Askenazy 2012; Aubert and Sillard 2005). It explains the relatively low number of companies operating in each department. On the other hand, the closure of production sites and number of insolvent firms in the manufacturing industry has increased sharply over the last few years, pushing down the survival probability of these companies and, thus, increasing the value of the entry rate.

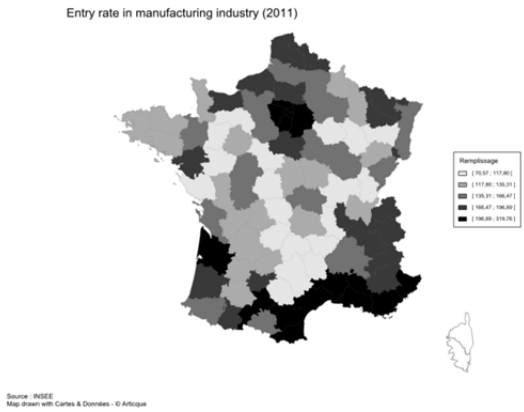
Looking at the maps, it is quite clear that the entry rate in a given department is not indifferent to the characteristics of its neighbours. Instead, hot and cold spots emerge. One may identify macro-areas characterised by uniformly high (low) entry rates. This phenomenon of consolidation leads us to suspect a spatial auto-correlation problem in our data.

Graph 1 – Firm creation at the department level in 2011

Global entry rate



Entry rate in the manufacturing industry



To illustrate the local demand characteristics we take into account the median value of households' income in department *d*. It is made available thanks to the annual population survey and depicts the market size and solvability in a given area. Its sign is expected to be positive.

The incentives to create a business depend firstly on the capacity to find a job. The different aspects of the relation between unemployment and firm creation are discussed in Audresch and Dhose (2010). Two opposite influences may be identified, the refugee effect on one hand, and the shumpeterian opportunity effect on the other. The refugee effect is strong inasmuch as regional economic business climate is poor and that people a led to consider firm creation as means to improve their skills, to accumulate experience and to be occupied (Aubry *et al.* 2013). Refugee effect tends to take precedence over opportunity effect during an economic slowdown. Due to the economic crisis France is still facing in 2011, the coefficient associated with the variable *UNEMPL* is expected to be positive.

As education and skills have been identified as able to influence firm creation, we introduce the share of people having at least a bachelor degree in the labour force as an explanatory variable in the model. If the sign associated is positive, it means that skilled people are more able than other ones to detect business opportunities. If it is negative, it means that low skilled workers may face more difficulties finding a job and have a stronger incentive to create their own.

Average size and competition in a given area may either encourage entrepreneurs to carry out their projects or deter them from doing so. We consider that scale economies are the most powerful driving force in such a process. To capture them, we compute the share of employees working in plants employing 100 or more full time workers in the total number of employees in a department. Its effect is expected to be negative.

When the "net benefits to being in a location together with other firms increase with the number of firms in the location" (Arthur 1990: 237), the entry rate is supposed to be higher in areas where a large number of firms are already located. We adopt this perspective and, as in Ciccone et Hall (1996), we approximate agglomeration effects using the ratio, total number of employees in a given department divided by the area measured in square kilometres of this department. As an alternative measurement ratio, we also consider the number of plants located in a department divided by its area (square kilometres). Last but not least, the number of employees in industrial manufacturing compared to the total number of employees may also be introduced as a proxy for agglomeration effects. Whenever the sign is positive, one may conclude that new industrial business tends to locate in industrial areas; whenever it is negative it is possible to consider that entry and firm creation is a complement to industrial activities.

Table 1 - Measure and definition of the variables used in the model

Variables*	Definition	Mean	Std. Error	Min	Max
CREA	Entry rate = Number of entering firms in department *d* divided by number of firms in the same department	0.095737 (0.000)	0.024 (1.000)	0.044 (-2.137)	0.153 (2.273)
CREAI	Entry rate in manufacturing industry = Number of entering firms in manufacturing industry in department *d* divided by number of firms in manufacturing industry for the same department	1.237487 (-0.000)	0.448 (1.000)	0.506 (-1.649)	2.685 (3.029)
CHOM	Unemployment rate: Share of unemployed aged 16–64 in department *d* divided by population aged 16–64 in department *d*	9.16 (-0.000)	1.643 (1.000)	5.1 (-0.964)	13.2 (6.022)
INDUS	Share of employees in Manufacturing Industry compared to the total number of employees in department *d*	0.17 (0.000)	0.054 (1.000)	0.041 (-2.392)	0.274 (1.896)
GE	Share of plants employing 100 workers and more in the total number of employees in department *d*	0.34 (0.000)	0.078 (1.000)	0.176 (-2.189)	0.620 (3.500)
Dens-Etab	Agglomeration economies: Number of establishments in department *d* divided by the area in square kilometres of department *d*	75.29 (0.000)	473.933 (1.000)	2.142 (-0.154)	4518.11 (9.374)
Dens-Empl	Urbanisation economies: Number of employees in department *d* divided by the area in square kilometres of department *d*	315.29 (-0.000)	1749.17 (1.000)	4.68 (-0.178)	15910.27 (8.916)
Rev_med	Median total income of households in department *d*	18924.89 (-0.000)	1450.592 (1.000)	16600 (-1.603)	24520 (3.857)
Qual	Share of college-educated employees compared to the total number of employees in department *d*	17.47 (-0.000)	7.128 (1.000)	10.6 (-0.964)	60.4 (6.022)

* Values of normalised variables between brackets

As required by spatial econometric techniques, all the variables are standardized subtracting the mean and dividing by the standard deviation[5]. This reduces the problems with too large variance due to heterogeneity in department economic performance and demography. The characteristics of the variables used to run the estimations are presented in Table 1, Appendix 1 depicts the souces and the simple correlation matrices are shown in Appendix 2.

3.3. Econometric strategy

The spatial dependence or spatial (auto)correlation constitutes a real challenge in explaining entry rate at the local level. We thus pay major attention to this problem and, in accordance with the literature (Doh and Hahn 2008), we renounce the OLS estimator which has been proved to be inappropriate when a variable at one location is spatially dependent (Anselin and Bera 1998). Instead, we choose to estimate our model explicitly taking into consideration spatial dependence.

Following LeSage (2008) we consider two ways to introduce spatial autocorrelation in regression models. The first one is the spatial-lag model. It refers to a situation where a phenomenon in one region is affected by a similar one in nearby regions. Such a model is appropriate when there are spillover effects from neighbouring regions. The spatial error model assumes that one or more explanatory variables have been omitted from the model whereas they influence the dependent variable and are spatially correlated. It occurs when a random shock in a given area spreads to neighbouring regions.

Both approaches require the preliminary specification of a matrix of spatial weights (W). A spatial weight matrix W is a square N x N matrix with elements w_{ij} (where *i* and *j* are observation indexes), such that $w_{ij} \neq 0$ iff the observations *i* and *j* are neighbours. By definition, $w_{ii} \equiv 0$.

There are many possibilities for spatial weight specification identified in the literature (Anselin, 1992). In this paper we choose a contiguity spatial weight matrix[6]. In such a matrix (named W**1**), the same weight is attributed to all neighbours of an observation ($w_{ij} = 1$ if *i* and *j* are neighbours). We also scale the individual rows (or columns) of a spatial weight matrix by the row totals to avoid singularity problem. In such a row-standardized contiguity matrix the spatial weights of each observation *i* depend only on the number of its neighbours n_i:

[5] Proceeding this way grants then that each variable's mean is zero and that its standard deviation equals one.
[6] The first-order queen contiguity spatial weight matrix defines all observations that share common boundaries or vertices as neighbours. The first-order rook contiguity spatial weight matrix defines the observations that share common boundaries as neighbours.

$$\forall i, \quad \omega_{ij} = \begin{cases} \frac{1}{n_i}, if\ d_{ij} \leq r, \\ 0\ otherwise \end{cases}$$

and $\sum_{j=1}^{N} \omega_{ij} = 1$

To test the spatial autocorrelation we calculate Moran's I (Moran, 1950; Cliff and Ord, 1981) and Geary's C statistics (Geary, 1954). Moran's I statistic is a weighted correlation coefficient used to explore a specific type of spatial clustering. It helps determining whether high values are located in proximity to other high values or whether low values are located in proximity to other low values. Values range from -1 corresponding to a perfect negative correlation to +1 corresponding to a perfect positive correlation, whereas 0 implies no spatial correlation. We also calculate Geary's *C* (Geary, 1954). It is inversely related to Moran's *I*, but whereas Moran's *I* is a measure of global spatial autocorrelation, Geary's *C* is more sensitive to local spatial autocorrelation. The value of Geary's *C* lies between 0 and 2: 1 means no spatial autocorrelation; values lower than 1 demonstrate increasing positive spatial autocorrelation, whilst values higher than 1 illustrate increasing negative spatial autocorrelation.

The spatial-lag model can be defined as:

$$CREA = \rho W.CREA + X\beta + \varepsilon \quad (3)$$

where CREA is an Nx1 vector of observations on entry rates, with N = 94; *W.CREA* is the spatial lag of business creation and ρ is the spatial autoregressive parameter; X is the $N \times k$ matrix of explanatory variables; β is the vector of regression parameters and ε is a vector of errors. It is worth noting that spatial dependency is similar to having a lagged-dependent variable as an explanatory variable.

We apply the spatial-error model as an alternative to the spatial-lag one. It is more relevant than the spatial-lag approach when the distribution of residuals in different departments displays spatial correlation. Residuals may be spatially correlated if there are unobservable risk factors concentrated across the areas. The spatial-error model is defined as:

$$\text{CREA} = X\beta + \varepsilon \quad (4)$$

$$\varepsilon = \lambda W\varepsilon + \mu \quad (5)$$

where λ is the spatial-autoregressive coefficient and μ is a vector of errors that are assumed to be independently and identically distributed. Note from equation (5) that errors depend on the weighted average of errors in neighbouring regions.

4. RESULTS AND DISCUSSION

In this Section we present the results of the estimations. The collinearity problems between skills (*N_Qual*), the share of employees working in large firms (*N_GE*) and the agglomeration effects measured by *N_Dens_empl* or *N_Dens_etab*, lead us to estimate three different models. The first one mixes qualifications, the share of manufacturing Industry and the rate of unemployment; the second one combines the share of manufacturing Industry, the rate of unemployment, the share of large companies, the number of employees per square kilometre and the median income; the third one combines the share of manufacturing industry, the rate of unemployment, the share of large companies, the number of plants per square kilometre and the median income. Three regression methodologies were adopted: conventional regression, spatial lag regression, and spatial error regression analyses. They are run to estimate CREA and CREAI. The results obtained are presented and discussed successively.

4.1. A spatial estimation of global entry rate

In order to decide which kind of estimation technique should be adopted in case of spatial autocorrelation, we perform firstly two tests for spatial dependence: Moran's *I* and Geary's *C* (Table 2). Both reveal a strong positive spatial autocorrelation. It is clearly attested by the value of Moran' *I* and confirmed by Geary's *C* which, when positive and close to zero, reveals a positive spatial dependence. This second test is more sensitive than Moran's to local rather than global spatial autocorrelation. They are complemented by Getis and Ord's *G* which identifies the type of cluster that exists. A statistically significant positive Z Score means high/larger values cluster spatially, i.e. larger values are found closer together than expected if the underlying spatial process was random. On the opposite, a statistically significant negative Z Score means that low/smaller values cluster spatially so that smaller values are found closer together than expected if the underlying spatial process was random.

Table 2 – Results of tests for spatial dependency for the variable *CREA*

	Value	E(I)	Sd(I)	Z	p-value*
Moran's *I*	0.543	-0.011	0.064	8.702	0.000
Geary's *C*	0.506	1.000	0.076	-6.478	0.000
Getis & Ord's *G*	-2.680	0.053	0.314	-8.702	0.000

**1-tail test*

Table 3 carries out three tests for spatial error dependence (Moran's I_λ, LM_λ, LM_λ^*) and two tests for spatial dependence (LM_ρ and LM_ρ^*). I_λ, LM_λ test for the null hypothesis that $\lambda = 0$, while LM_ρ tests that $\rho = 0$. As mentioned by Pisati (2001), I_λ, and LM_λ also respond to nonzero ρ; likewise, when testing for ρ = 0, LM_ρ also respond to nonzero λ. The robust tests LM^*_λ and LM^*_ρ have been designed to solve this problem (Anselin *et al.* 1996). The results of the tests lead us to accept H0 (no spatial dependence) in the test for spatial error and to reject it in the diagnosis of spatial dependence. We will thus only discuss the results obtained from the estimation of a spatial-lag specification in the remainder of this Section.

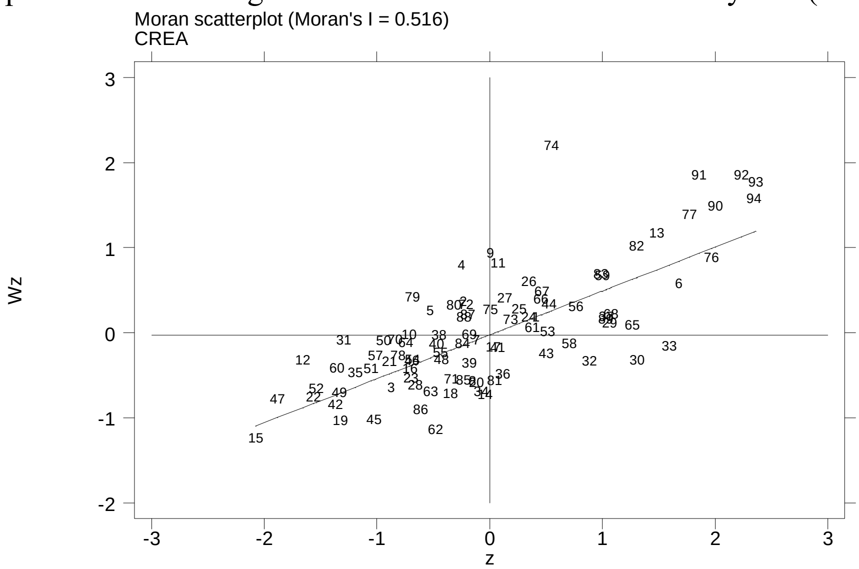
Table 3 – Identification of the source of spatial dependency for the variable *CREA*

Test	Statistic	df	p-value
Spatial error:			
Moran's I_λ	4.015	1	0.000
LM_λ	11.090	1	0.001
LM^*_λ	0.306	1	0.580
Spatial lag :			
LM_ρ	22.028	1	0.000
LM^*_ρ	11.245	1	0.001

Note: LM= simple Lagrange multiplier, LM*= robust Lagrange multiplier

Moran's diagram (Graph 2) compares normalized values of CREA in the 94 departments with the normalized neighbour's average, generating a two-dimensional plot of CREA versus W1, so we can visualize the spatial dependence of such a variable. The first quadrant, Q1, the high-high quadrant, shows high values for the variable for both the region and its neighbours. Q2, the low-low quadrant, shows low values for regions as well as their neighbours. If the region has low values, but is surrounded by neighbours with high values, it will be plotted in the Q3 quadrant (low-high) and regions with high levels surrounded by low levels regions will be in Q4 (high-low). It confirms the positive spatial dependence in the data.

Graph 2 – Moran's diagram for the normalized value of entry rate (*CREA*)



Preliminary OLS regressions show a R^2 adjusted equals to 0.42 for Model 1 and 0.77 for Models 2 and 3. This suggests that overall "regressors" have a significant effect on the dependant variable. Moreover, the Variance Inflation Ratio (VIF) is lower than 4. Our initial tests however indicate that the OLS model can be rejected in favour of the spatial lag model.

We estimate the spatial models using the maximum likelihood procedure developed by Pisati (2001) for Stata. Specifications of models 2 and 3 presented in Table 4 have a superior explanatory power than the one of the first model. We only comment on them[7]. In addition, the variable of interest introduced in this model is not significant, a fact which leads us to leads to infirm the existence of a relationship between skill and entry rate.

Table 4 – Regression results of models to estimate the global entry rate

		Model 1			Model 2			Model 3	
VARIABLES	N_CREA	N_CREA	N_CREA	N_CREA	N_CREA	N_CREA	N_CREA	N_CREA	N_CREA
Constant	2.78e-09	0.0138	-0.00721	2.98e-07	0.0112	9.37e-05	3.01e-07	0.0106	-0.00170
	(0.0785)	(0.0668)	(0.168)	(0.0512)	(0.0437)	(0.124)	(0.0514)	(0.0446)	(0.110)
N_Chom	0.410***	0.297***	0.367***	0.522***	0.389***	0.450***	0.530***	0.403***	0.457***
	(0.0823)	(0.0786)	(0.102)	(0.0661)	(0.0617)	(0.0661)	(0.0666)	(0.0607)	(0.0675)
N_Indus	-0.0773	-0.0595	-0.133	-0.263***	-0.227***	-0.177***	-0.252***	-0.216***	-0.184***
	(0.0927)	(0.0820)	(0.0981)	(0.0565)	(0.0502)	(0.0517)	(0.0563)	(0.0502)	(0.0534)
N_Qual	0.536***	0.337	0.341						
	(0.0931)	(0.213)	(0.213)						
N_GE				0.366***	0.335***	0.385***	0.339***	0.307***	0.364***
				(0.0696)	(0.0698)	(0.0857)	(0.0698)	(0.0706)	(0.0892)
N_Dens_empl				-0.334***	-0.372***	-0.353***			
				(0.0628)	(0.0359)	(0.0551)			
N_Rev_med				0.621***	0.459***	0.451***	0.621***	0.462***	0.458***
				(0.0862)	(0.114)	(0.135)	(0.0866)	(0.110)	(0.136)
N_Dens_etab							-0.319***	-0.346***	-0.307***
							(0.0609)	(0.0297)	(0.0440)
ρ		0.534***			0.431***			0.409***	
		(0.110)			(0.0888)			(0.0881)	
λ			0.628***			0.654***			0.600***
			(0.125)			(0.139)			(0.148)
Log likelihood		-93.77	-94.05		-52.64	-55.46		-54.26	-57.30
Wald test of rho=0: chi2=		23.502	25.323		23.552	22.017		21.552	16.523
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
LM test of rho=0 :		26.359	20.296		20.675	10.842		18.893	10.075
chi2=		(0.001)	(0.000		(0.000)	(0.001)		(0.000)	(0.002)
AIC	219.38	199.55	200.10	140.97	121.28	126.92	141.64	121.20	124.52
BIC	229.55	214.81	215.36	156.23	141.63	147.26	156.90	141.55	144.87
Observations	94	94	94	94	94	94	94	94	94
model	OLS	Spatial Lag	Spatial Error	OLS	Spatial Lag	Spatial Error	OLS	Spatial Lag	Spatial Error
R^2	0.439			0.767			0.765		
R^2 Adj./cor.	0.421	0.617	0.445	0.753	0.824	0.722	0.752	0.818	0.737
F	23.50			57.82			57.28		
Mean VIF	1.29			1.79			1.77		

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note:
Acceptable range for rho in the spatial error models: $-1.644 < \rho < 1.000$

[7] The results obtained estimating the first model strongly differ from the conclusion reached by Guesnier (1994) according to rate of graduate had a positive effect in the firm creation rate measured at the regional level. One may expect that the general increase in working force training that happened since the end of the 1990s causes this change.

Spatial Weights matrix (W) is first-order queen-continuity with 1 if departments i,j (i≠j) share common border and 0 otherwise ; estimated standard errors in parentheses.
OLS= ordinary least squares; LM = Lagrange Multiplier; AIC is Akaike's information criterion (Akaike, 1974) and BIC is the Bayesian information criterion or Schwarz criterion (Schwarz, 1978) estimated thanks to the Stata procedure.[8]

As expected, the coefficient associated with *N_Chom* is significantly positive confirming a refugee effect frequently mentioned in the literature. The effect of unemployment remains high in the third model which includes the density in establishments instead of employment. Despite a very different method applied to another period, Lasch et al. (2005) find a similar result. Our conclusion is, however, radically opposed to the result obtained by Baptista and Thurik (2007) according to whom this variable is weakly significant to explain firm creation in Portugal.

The coefficient associated with the variable *N_Indus* is negative and significant too. The propensity to create new firms observed in a department is thus negatively correlated to the share of manufacturing companies in a given department. This also confirms the findings of Lasch *et al.* (2005) and Moati *et al.* (2000) who also conclude that a higher manufacturing profile tends to deter new business creation. The effect of this variable remains roughly the same regardless of the model. The variable *N_GE* which depicts the degree of concentration of the productive sector in a given area has a positive influence on firm creation. We may thus conclude, as Lasch *et al.* (2005) do, that these large plants are considered as a solvent market by some new entrepreneurs and, in addition, that they may give some incentives to some of their employees to develop their own business. The role played by the demand size in the entrepreneurial process is confirmed by the positive and significant coefficient associated with *N_Rev_med.* It makes it possible to conclude that expectations about the capacity of the market to absorb an additional supply are taken into account by potential entrepreneurs when they decide to create their own activity.

The main counterintuitive results come from the two variables introduced to depict agglomeration effects. Indeed, *N_Dens-etab* and *N_Dens_empl* are both associated with negative coefficients. Considering AIC and BIC criteria, it appears that Model 2 should be preferred as it minimises the value of these criteria. However, the main result remains unchanged and agglomeration effects deter firm creation. This contradicts a study proposed by the French national institute of Statistics and Economic Studies over the changes in entry rates at the department level between 1993 and 1999 (Tellier, 2009). The results they reach

[8] AIC = -2*ln(likelihood) + 2*k and BIC = -2*ln(likelihood) + ln(N)*k, where k = number of parameters estimated and N = number of observations.

using an OLS model laid emphasis on positive agglomeration externalities and the share of employed people in the labour force living in the area. Our conclusions are radically different as, on the opposite, a higher density deters firm creation. Our results are however quite robust as the sign of the coefficient is almost the same in Model 2 and 3, a finding which lead us to consider that, for the studied year, agglomeration effects do not grant a high propensity to create new firms.

4.2. A spatial estimation of the entry rate in the Manufacturing Industry

A second level analysis, which is also a check for the robustness of estimates, rests upon the same models as in the previous Section with entry rate in the Manufacturing Industry as the explained variable. The tests reveal the same positive spatial autocorrelation as for the global entry rate (Table 5).

Table 5 – Results of tests for spatial dependency for the variable *CREAI*

	Value	E(I)	Sd(I)	Z	p-value*
Moran's *I*	0.529	-0.011	0.063	8.543	0.000
Geary's *C*	0.466	1.000	0.083	-6.425	0.000
Getis & Ord's *G*	-2.613	0.053	0.312	-8.543	0.000

**1-tail test*

A major difference, however, arises when we run the tests to detect the origin of the spatial autocorrelation. The robust LM tests for spatially autoregressive error fail to identify such a scheme and confirm H0 (no spatial dependence). On the opposite, H0 is rejected for the spatial error test which examines spatial autocorrelation between the residuals of adjacent areas. This suggests that error terms are correlated across observations, i.e., the error of an observation affects the errors of its neighbours (Table 6). The source of correlation may come from unmeasured variables that are related through space. Correlation can also arise from aggregation of spatially correlated variables and systematic measurement error. For this reason we will only comment on the results of the estimations obtained running the spatial error models.

Table 6 – Identification of the source of spatial dependency for the variable *CREAI*

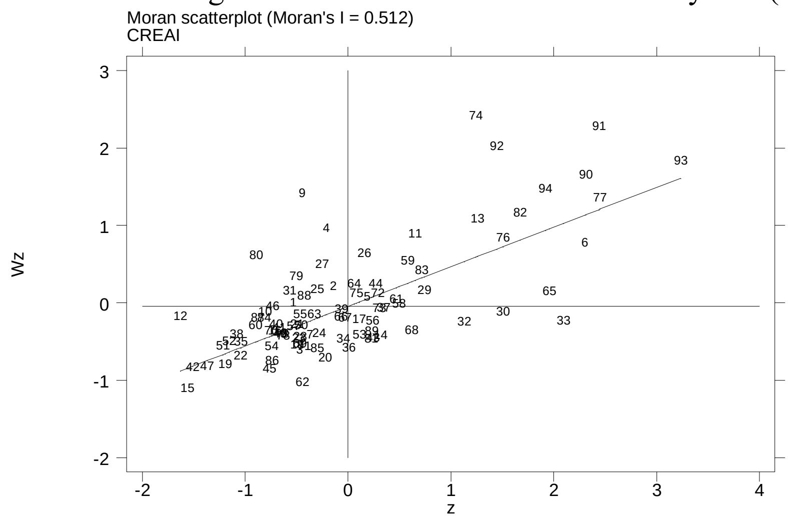
Test	Statistic	df	p-value
Spatial error:			
Moran's I_λ	1.135	1	0.256
LM_λ	0.373	1	0.542
LM^*_λ	2.875	1	0.090
Spatial lag :			
LM_ρ	16.863	1	0.000
LM^*_ρ	19.366	1	0.000

Note: LM = simple Lagrange multiplier, LM*= robust Lagrange multiplier

Moran's diagram (Graph 3) displays another configuration than the one characterizing the total entry rate. Instead, of being predominantly located in the HH area of the diagram, the majority of departments belong to the LL quadrant. The macroeconomic shock hitting industry and other invisible elements affecting the business climate may cause this phenomenon.

The values of AIC and BIC criteria obtained by estimating different models and using different techniques lead us to consider model 2 as the most reliable as these two tests exhibit the lowest value for this model (Table 7).

Graph 3 – Moran's diagram for the normalized value of entry rate (*CREAI*)



One main point differs, however. Indeed, whereas tests lead us to consider that *CREAI* is affected by a spatial dependence bias captured by the error term, *lambda* is not significant regardless of the model considered (Table 7). This unexpected result is robust as the different estimations we run converge. Two elements may justify it. Firstly, computing the entry rate in the manufacturing industry, one observes that it reaches its highest values in the *départements* of Southern France, a finding which contrasts with their orientation towards services. In some places, the number of new businesses even exceeds the number of existing companies. This spurious phenomenon finds its origin in the scarcity of large and stable industrial companies. This undersupply contrasts with the quite high number of creations which have more often to do with handicraft than with traditional plants. Secondly, the fact that different *départements* exhibit different industrial profiles (Carré and Levratto, 2011) means that they have not been evenly hit by the industrial crisis. As a consequence, the internal heterogeneity blurs the ratios.

Considering the other coefficients estimated in the spatial error model, one fails to detect any difference between the determinants of the firm creation rate in the manufacturing industry and the general case. Entry rate in manufacturing industry is positively correlated to the current unemployment rate, the share of establishments employing 100 employees or more and the median income.

Table 7 – Regression results of models to estimate the entry rate in the Manufacturing Industry

	Model 1			Model 2			Model 3		
VARIABLES	N_CREAI	N_CREAI	N_CREAI	N_CREAI	N_CREAI	N_CREAI	N_CREAI	N_CREAI	N_CREAI
Constant	-1.33e-07	-0.00219	-0.000370	1.60e-07	-0.000769	0.000107	1.68e-07	-0.000668	0.000419
	(0.0641)	(0.0632)	(0.0673)	(0.0412)	(0.0399)	(0.0399)	(0.0405)	(0.0392)	(0.0382)
N_Chom	0.297***	0.298***	0.301***	0.433***	0.434***	0.433***	0.442***	0.443***	0.441***
	(0.0672)	(0.0768)	(0.0772)	(0.0532)	(0.0572)	(0.0579)	(0.0524)	(0.0567)	(0.0575)
N_Indus	-0.436***	-0.436***	-0.435***	-0.570***	-0.569***	-0.570***	-0.563***	-0.562***	-0.564***
	(0.0757)	(0.0857)	(0.0842)	(0.0454)	(0.0530)	(0.0537)	(0.0443)	(0.0519)	(0.0525)
N_Qual	0.422***	0.417**	0.416**						
	(0.0760)	(0.195)	(0.202)						
N_GE				0.220***	0.434***	0.220***	0.196***	0.194***	0.196***
				(0.0559)	(0.0572)	(0.0730)	(0.0550)	(0.0708)	(0.0712)
N_Dens_empl				-0.288***	-0.569***	-0.288***			
				(0.0505)	(0.0530)	(0.0436)			
N_Rev_med				0.589***	0.434***	0.589***	0.596***	0.596***	0.597***
				(0.0693)	(0.0572)	(0.0743)	(0.0682)	(0.0734)	(0.0722)
N_Dens_etab							-0.291***	-0.289***	-0.291***
							(0.0479)	(0.0286)	(0.0282)
ρ		0.0785			0.0276			0.0239	
		(0.105)			(0.0750)			(0.0743)	
λ			0.0571			-0.0100			-0.0363
			(0.167)			(0.153)			(0.157)
Log likelihood		-81.32	-82.17		-37.04	-45.82		-37.72	-45.48
Wald test of ρ / λ =0: chi2=		10.679	12.432		12.96	0.317		10.835	0.155
		(0.000)	(0.000)		(0.000)	(0.574)		(0.001)	(0.694)
LM test of ρ / λ =0 : chi2=		17.78	12.40		16.86	0.373		14.89	0.195
		(0.000)	(0.000)		(0.000)	(0.542)		(0.000)	(0.659)
AIC	181.20	174.64	176.33	104.72	90.08	107.65	103.38	91.43	106.95
BIC	191.37	189.90	191.60	119.98	110.42	128.00	118.64	111.78	127.30
Observations	94	94	94	94	94	94	94	94	94
model	OLS	Spatial Lag	Spatial Error	OLS	Spatial Lag	Spatial Error	OLS	Spatial Lag	Spatial Error
R^2	0.626			0.841			0.854		
R^2 Adj./ Corr.	0.614	0.679	0.594	0.832	0.873	0.839	0.846	0.871	0.843
F	50.31			93.31			103.2		
Mean VIF	1.29			1.79			1.77		

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note :
Acceptable range for rho in the spatial error models: $-1.644 < \rho < 1.000$
Spatial Weights matrix (W) is first-order queen-continuity with 1 if departments i,j (i≠j) share common border and 0 otherwise ; estimated standard errors in parentheses.
OLS= ordinary least squares ; LM = Lagrange Multiplier; AIC is Akaike's information criterion (Akaike, 1974) and BIC is the Bayesian information criterion or Schwarz criterion (Schwarz, 1978) estimated thanks the Stata procedure.[9]

On the opposite, the share of employees working in the manufacturing industry, as well as the employment density, negatively affects the birth rate of firm in the manufacturing

[9] See footnote 5.

industry. These results show that the new industrial companies instead of locating close to the operating ones are created in departments where the manufacturing industry is weakly represented. This suggests that new companies, even if they operate in the manufacturing industry, present specificities such as they do not benefit from any positive externality from the proximity to existing ones. One possible explanation lies in the fact that these new industrial companies do not work for a local market; instead, they are positioned on a broader one.

The negative value associated with the variable representing the industrial atmosphere is worthy of note as this result contradicts the conclusions presented by Keeble and Walter (1994) or Bryson *et al.* (1997). The period under study and the methods used are, however, so different that determining the source of this difference is not straightforward. Our estimations make it possible to consider that in the French departments, a high share of industry is no longer an advantage in the effort to boost the creation of industrial companies. New businesses are less launched to respond to a demand emanating from other industrial companies than to serve households demand. This is confirmed by the positive sign of the coefficient associated with *N_Rev_med*. In this way, our results are very similar to those obtained by Lash *et al.* (2005).

5. CONCLUSION

This paper aimed at identifying the variables determining the intensity of the entrepreneurial process measured by entry rates in the French continental departments. For that purpose, and this is one of the originalities of this research, we used a spatial econometric technique to take into account neighbouring effects which are believed to shape the profile of a given area.

The first result we obtain concerns the robustness of a direct relationship between the local context and the propensity to launch a new business in a given area. Essentially, this conclusion goes in the same way as most of the studies devoted to identifying the local determinants of firm creation in French regions (Binet *et al,* 2010; Moati *et al.* 2000).

Our second result is more original as using a spatial econometric technique to estimate our models enabled us to pinpoint the importance of the spatial dependence in explaining the entry rate observed in a given area. Easily visible on a map representing the rate of firm creation as computed in the different departments, the presence of hot (resp. cold) spots is demonstrated thanks to the implementation of spatial econometric modelling and estimation techniques.

Thirdly, we also showed that the spatial dependence differs according to the definition of the entry rate adopted. The distinction between the global entry rate covering all industry and the entry rate in the manufacturing industry only makes it possible to highlight the underlying spatial dependence leading to the apparent proximity mechanism. Indeed, whereas the global entry rate is significantly influenced by spillover effects coming from neighbours, business creation in the manufacturing industry mostly depends on the diffusion process of spatial shocks or, in other terms, on a complex set of shock spillovers. Behind the similar apparent spatial autocorrelation driving the two entrepreneurial processes hide thus specific features. This led us to adopt a spatial lag model to analyse the global entry rate and a spatial error model to determine the underlying mechanisms of the entry rate in the manufacturing industry.

Our fourth result concerns the negative effect of agglomeration effects. Indeed if concentration plays a role in the firm creation effect, this effect is, however, negative. We cannot exclude the possibility such an unexpected result, considering the usual theoretical framework and the empirical analysis, probably comes from the dataset used. Indeed, this result holds for 2011 only. The enlargement of the period under review and the introduction of spatial dependence in a fixed effect model for panel should be run to test the validity of such a result. This requires yearly available local data that remain to be computed. This challenging perspective offers a rich future research agenda.

APPENDIX 1 – DATA AND SOURCES

Variables (2011)	**Source**
Total number of companies created	Insee, Répertoire des entreprises et des établissements (Sirene) (champ : activités marchandes hors agriculture).
Entry rate in manufacturing industry	Insee, Répertoire des entreprises et des établissements (Sirene) (champ : activités marchandes hors agriculture). NA, 2008, associée à la NAF rév. 2
Total number of establishments /Total number of establishments in manufacturing industry	Insee, Clap
Rate of unemployment	Insee, taux de chômage localisés, lieu de résidence
Number of employees working in : - *establishments employing 100*	Insee, Clap : Établissements actifs au 31 décembre, hors secteurs de l'agriculture, de la défense et de l'intérim

- *employees or more establisment operating in Manufacturing Industry*	
Area	Total de l'effectif salarié (Insee)/superficie
Median total income of households in department *d*	Insee et DGFiP, Revenus disponibles localisés
Percentage of graduated people between 25 and 34 years old	*Insee, Recensement de la population exploitation principale*

APPENDIX 2 - CORRELATION MATRICES

	N_CREA	N_Chom	N_Indus	N_Qual	N_GE	N_Dens_empl	N_Dens_etab	N_Rev_med
N_CREA	1.000							
N_Chom	0.334^{***}	1.000						
N_Indus	-0.388^{***}	-0.127	1.000					
N_Qual	0.508^{***}	-0.160	-0.482^{***}	1.000				
N_GE	0.662^{***}	0.070	-0.097	0.621^{***}	1.000			
N_Dens_empl	0.166	-0.062	-0.330^{**}	0.764^{***}	0.349^{***}	1.000		
N_Dens_etab	0.117	-0.050	-0.306^{**}	0.717^{***}	0.278^{**}	0.986^{***}	1.000	
N_Rev_med	0.488^{***}	-0.431^{***}	-0.214^{*}	0.813^{***}	0.564^{***}	0.512^{***}	0.469^{***}	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	N_CREAI	N_Chom	N_Indus	N_Qual	N_GE	N_Dens_empl	N_Dens_etab	N_Rev_med
N_CREAI	1.000							
N_Chom	0.285^{**}	1.000						
N_Indus	-0.677^{***}	-0.127	1.000					
N_Qual	0.585^{***}	-0.160	- 0.482^{***}	1.000				
N_GE	0.537^{***}	0.070	-0.097	0.621^{***}	1.000			
N_Dens_empl	0.251^{*}	-0.062	-0.330^{**}	0.764^{***}	0.349^{***}	1.000		
N_Dens_etab	0.193	-0.050	-0.306^{**}	0.717^{***}	0.278^{**}	0.986^{***}	1.000	
N_Rev_med	0.500^{***}	-0.431^{***}	-0.214^{*}	0.813^{***}	0.564^{***}	0.512^{***}	0.469^{***}	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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