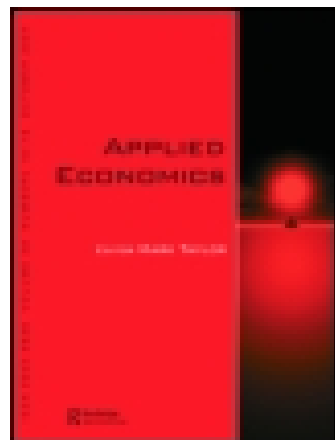


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Typology of the French regional development: revealing the *refugee* versus *Schumpeter* effects in new-firm start-ups

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In this article, we analyse the relationships between unemployment rates and new-firm start-up rates in France. Using a quarterly data basis covering the period 1993 to 2011, we identify, thanks to data analysis methods, different classes that show different types of development among the French regions. For each of these classes, the existence of *refugee/Schumpeter* effects both in the short run and in the long run is revealed. At the national level, it appears that the *refugee* effect explains the dynamics of entrepreneurship in France over the period 2000 to 2011. Necessity is the key motivation for new French firms.

Keywords: new-firm formation; business cycle; *Schumpeter* effect; *refugee* effect; data analysis methods; panel data

JEL Classification: L26; E32; R11; C23; C38

I. Introduction

The aim of this article is to identify the existence of *refugee/Schumpeter* effects (Thurik *et al.*, 2008) in the process of new-firm start-ups. According to the *refugee* effect, unemployment can lead to new-firm formation,¹ while the *Schumpeter* effect conveys the fact that new-firm formation reduces the rate of unemployment.² By concentrating on a single country, the present study should allow better understanding of the regional dynamics of the renewal of the productive system. Regional specificities must be taken into account. Indeed, every region can be characterized in particular by a specific sectorial development, a level of urbanization and qualification of the population. Moreover, specific trajectories of regional development also exist, in which new-firm start-ups

neither have the same effects nor answer the same determiners, for complex reasons of specialization and attractiveness as well as functioning of the labour market, different local financial constraints (Bonnet *et al.*, 2005; Michelacci and Silva, 2007) and varying entrepreneurial culture, which manifests itself through different attitudes to entrepreneurship (fear of failure, perception of the opportunities of creation and faith in one's own entrepreneurial capacities) (Bosma and Schutjens, 2011). The long persistence of regional entrepreneurial culture is proven in Germany (Fritsch and Wyrwich, 2012). Thus, a global analysis can hide the regional specificities; *refugee/Schumpeter* effects may apply differently in individual regions. According to the similar characteristics of regions, we proceeded to the gathering of these ones by using data analysis methods, especially classification

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¹ People who are unemployed choose to create their own job.

² In an entrepreneurial society, most of the new jobs are created by new-firm start-ups.

methods. This approach allows us to propose a typology of French regional development relative to classes of new-firm start-ups and unemployment rates. Moreover, in order to better characterize classes and the different kind of development of the regions, we introduce variables representative of regional socio-economic development as supplementary variables.

Because the *refugee*/*Schumpeter* effects are inter-temporal dynamic relations, the studies estimating contemporaneous relations confused in the past, except Thurik *et al.* (2008) and Koellinger and Thurik (2012), what are essentially two different relations, each playing in an opposite sense. In this article, we analyse interactions in the short and long run between regional new firm's formation and the regional rate of unemployment in France during the period 1993 to 2011. In the short run, tests of causality and calculations of crossed correlations between the cyclic components of the series are developed to identify the existence of leading, lagging or simultaneous relationships between variables. In the long run, a study of cointegration is led both in a time series and in a panel framework. The use of panel data has two advantages: first, panel data have two dimensions, temporal and individual promoting a simultaneous study of the dynamics and heterogeneity of agents' behaviour; moreover, this dual temporal and individual dimension overcomes the difficulty inherent in time series: the low power of unit root and cointegration tests with small sample size. We use state-of-the-art advances in panel data methods and we apply techniques never before employed on such data. Thus, the study is conducted at the level of the total panel representing the 22 French metropolitan regions, like at the level of given homogeneous classes compared to unemployment and new firm's formation rates. An analysis based on homogeneous classes allows for taking into account individual heterogeneity (Banerjee and Zanghieri, 2003).

The main results of the article are twofold. First, we are able to conceptualize the regional development according to new-firm start-ups and unemployment rates, and we can identify four types of development. Second, we show that in the short run, we can identify *refugee* and *Schumpeter* effects that differ according to the different classes of regions obtained. In the long run, at the global level, the *refugee* effect dominates. New-firm start-ups are mainly driven by necessity motives over the period 2000 to 2011. An increase of the unemployment rate has a positive effect on new-firm start-ups. These findings underscore the

importance for France to set up a national dynamic entrepreneurship activity to support employment and are of primary interest to policy makers. In France, around 80% of new-firm start-ups begin without any salaried employees (except for the owner-manager), and there is a lack of high-growth new firms because many firms are launched with the sole purpose of creating one's own job with limited capabilities for growth. An economy characterized by an insufficient number of jobs created and a high level of persistent unemployment reinforces the setting up of firms for predominantly constrained motives and discourages entrepreneurship with unconstrained (i.e. entrepreneurial) motives. In France, these issues are particularly salient because of the high proportion of current businesses founded by necessity entrepreneurs whose firms will not achieve growth.

In the following section, related literature is discussed. In Section III, we describe the data and their properties and propose a regional development typology by using data analysis methods. Section IV is devoted to the analysis of the interactions between the rate of new-firm start-ups and the unemployment rate in order to highlight *refugee*/*Schumpeter* effects both in the short run and in the long run. Section V concludes.

II. Literature Review

Entrepreneurship refers to an individual's allocation of human capital that depends upon the economic situation because, according to the *refugee* effect, unemployment can trigger the creation of new firms while the *Schumpeter* effect rather conveys the fact that new-firm start-ups reduce unemployment.³ Historically, research has focused on the measure of the *refugee* and the *Schumpeter* effects. The results are mixed, with most failing to measure the real dimension of these two effects because they analyse relations in a static perspective. Storey (1991) notes the ambiguity of the results, with some studies arguing for *pull effects* and others supporting the *push effect*.⁴ For example, Evans and Leighton (1989) find a *refugee* effect with American data, as do Acs *et al.* (1994). Storey (1991) finds a mixed effect with American data, as do Tervo and Niittykangas (1994) at the Finnish regional level and Audretsch *et al.* (2001) for OECD countries. Audretsch and Acs (1994) consider that new-firm start-ups are positively linked to GDP but also that unemployment has a positive effect on new-firm start-ups, which seems to

³ Schumpeter (1939) distinguishes major innovations, which are at the origin of the cycles of Kondratieff, from minor innovations, which are at the origin of the cycles of Juglar. During the phases of growth of the cycles, the waves of innovations are explained by the sectorial and chronological grouping of the entrepreneur's imitators.

⁴ *Pull effect*: 'New firm formation takes place when an individual perceives an opportunity to enter a market to make at least a satisfactory level of profit' (Storey, 1991, p. 171). *Push effect* is related to the diminution of the opportunity cost to engage into entrepreneurship when the individual is in a poor position in the labour market. It is similar to the *refugee* effect, sometimes also called the *shopkeeper* effect.

contradict their first result.⁵ Mata (1996) finds that the *pull effect* dominates in the case of Portugal yet the population of new firms he retains is a subset of the total population of new-firm start-ups; those which employed at the beginning of the creation at least five employees. Thurik *et al.* (2008) reconcile ambiguities in measuring the two effects with a vector autoregression model. Using panel data from 23 OECD countries for the 1974 to 2002 period, they prove the existence of two distinct relationships between entrepreneurship and unemployment. Koellinger and Thurik (2012) find that opportunity entrepreneurship leads the cycle by 2 years at the global level. The explanation given is that the subset of opportunity-driven entrepreneurs, who were identified through global entrepreneurship monitor (GEM)⁶ surveys, are more prone to be at the origin of growth in case of newly invented technologies, like the Information Technology boom in the late 1990s. Necessity entrepreneurship leads the cycle by only 1 year. ‘The opportunity entrepreneurs pave the way for necessity entrepreneurs... that are more likely to respond to national labor market conditions’ (Koellinger and Thurik, 2012, p. 9). Using French data, Bonnet and Renou-Maissant (2000) show that in the long run both the increase of the unemployment rate and the increase of the industrial consumption entail a positive variation of the number of new-firm start-ups. Being unemployed reduces the opportunity cost of becoming an entrepreneur. With increasing unemployment, establishment of new firms is more likely. In a period of growth (measured by the consumption of industrial products), the optimism of the economic agents is translated by favourable anticipation which incites them to start new firms.

Entrepreneurship then results from an individual decision-making process and is an important conduit of useful and valuable information for commercialization of new ideas, new products and new processes. Kirzner (1985) retains the ability of alertness for defining the entrepreneurial function.⁷ Acs (Acs, 2006, p. 110) enlarges these abilities to ‘a set of skills, aptitudes, insights and circumstances that is neither uniformly nor widely distributed in the population’. In particular, it is well known that regions exhibit different levels of entrepreneurial activity and that the revealed hierarchy is constant over a long period of time (Fritsch and Wyrwich, 2012). It is then interesting to analyse the factors favourable to the development of entrepreneurship, thanks to the spatial dimension and,

especially, the regional dimension that is, according to Audretsch (2007), the best dimension for studying entrepreneurship.

Besides the traditional factors – capital, labour and R&D expenditures – that explain the macroeconomic function of production of a country, ‘entrepreneurship capital’ contributes, in an important way, to different internal growth within individual industrialized countries (Audretsch and Keilbach, 2005, for German regions; Sterlacchini, 2006, for European regions). ‘Entrepreneurship capital’ can be defined as a local environment favourable to new-firm formation. It is facilitated by the close geographical proximity of a source of new knowledge and, more generally, by the presence of an environment favourable to its blooming. This environment is constituted by an innovative *milieu* (institutions and organizations that favour the setting up of innovative firms). In this perspective, the number of new firms in proportion of the regional population constitutes a proxy indicator of ‘entrepreneurship capital’ since higher levels of ‘entrepreneurship capital’ are reflected with higher start-up rates, *ceteris paribus* (Audretsch 2007, p. 71). Some regions present an environment more favourable to the expression of the entrepreneurial behaviour; individuals living in such regions are more prone to be endowed with the absorptive capacity needed to transform knowledge into market opportunities. In these regions, higher start-up rates create opportunities for others (Holcombe, 1998). With a larger number of entrepreneurs, knowledge spills over from individual to individual – in a geographically limited space – thus creating new opportunities to establish new firms that will, ultimately, enhance growth. We can guess that these developed and technological regions could be driven by a *Schumpeter* effect. They constitute our first type of development (Type 1). Traditional industrialized regions may have high rates of unemployment due to difficulties of reconversion and a weak mobility of the young population that is not highly educated: entrepreneurship rates are not very high and new-firm start-ups will not create many jobs due to the poor innovative capability of these new firms (Type 2). This type of development illustrates the reverse version of the *Schumpeter* effect.

Another type of development based on attractiveness may be identified: ‘The presence of temporary consumers whom are the tourists appears for certain areas, little favored on the productive plan but endowed with strong

⁵ A descriptive analysis of GDP and unemployment shows that unemployment is strongly countercyclical.

⁶ ‘The global entrepreneurship monitor (GEM) project is an annual assessment of the entrepreneurial activity, aspirations and attitudes of individuals across a wide range of countries. Initiated in 1999 as a partnership between London Business School and Babson College, the first study covered 10 countries; since then, nearly 100 ‘National Teams’ from every corner of the globe have participated in the project, which continues to grow annually’. <http://www.gemconsortium.org/What-is-GEM>

⁷ It is the ability to perceive opportunities for profit. These opportunities are seized by entrepreneurs because, ‘if one has become sufficiently alerted to the existence of an opportunity – that is, one has become sufficiently convinced regarding the facts of a situation – it becomes virtually impossible to imagine not taking advantage of the opportunity so discovered’ (Kirzner, 1985, p. 22).

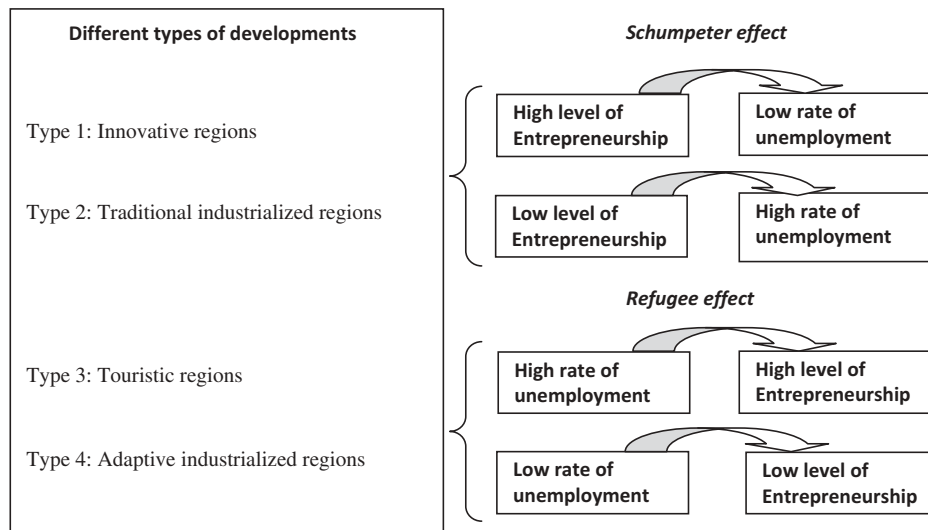


Fig. 1. Different types of development according to refugee/Schumpeter effects

residential amenities, as a particularly important economic stake' (Lejoux, 2007, p. 285). In these regions of positive internal migrations, both unemployment rates and entrepreneurship rates are high. We notice the importance of the attractiveness these regions have to tourists but also to retired and unemployed people; such a mode of development has been described as constitutive of a residential economy (Davezies, 2008). In these regions, we have the illustration of the *refugee* effect (Type 3). Adaptive industrialized regions have based their development upon their own resources; they have been able to sustain the strong competition due to globalization, thanks to their ability to adapt their products and processes and to implement organizational changes. In these regions, the unemployment rates are rather low and entrepreneurship rates are not so high because of the development of SMEs and the importance of takeovers (Type 4). This type of development illustrates the reverse version of the *refugee* effect. Figure 1 summarizes the different types of development described above.

III. Preliminary Analysis

Data presentation

The multidimensional and evolutionary data analysis is realized, thanks to annual data extracted from INSEE⁸

databases. The rate of unemployment (UNEMPLRATE) and the rate of new-firm start-ups (NFSTRATE) are considered for the period 1993 to 2011. The rate of new-firm start-ups encompass all activities and, since the beginning of 2009, the new category of 'auto-entrepreneurs'.⁹

In Fig. 2, the evolution of variables UNEMPLRATE and NFSTRATE is represented for metropolitan France. We notice a linear trend of these variables; the NFSTRATE progressed and the UNEMPLRATE declined over the period 1993 to 2011. However, in a first sub-period, 1993–1999/2000, we observe a decline of the two variables, while subsequently it increases. The global evolution of the rate of new-firm start-ups finds its explanation in the evolution of public policies aiming at supporting entrepreneurship in France since 1999 (Appendix 1).

We illustrate the different types of development with a set of socio-economic variables. These variables characterizing the different types of regional developments were positioned as supplementary variables in the multidimensional analysis. Although they do not affect the calculations based on the two variables UNEMPLRATE and NFSTRATE, they bring useful information, *a posteriori*, to consolidate and enrich the interpretation of the classes of regions.

These variables and their availability period are described in Table 1.

⁸ National Institute of Statistics and Economic Studies.

⁹ GEM studies point out the importance of the taxation and social benefit attached to the employment status in comparison with the independent status. In the case of France, this regime was not very favourable to entrepreneurship till the new legislation on the 'auto-entrepreneurs'. Success was immediate: over 600 000 auto-entrepreneurs registered in 2009 and 2010. However, among administratively active 'auto-entrepreneurs', less than half are economically active and declare a positive turnover. To avoid breaks in the series, we correct for the administratively recorded 'auto-entrepreneurs', considering only the contribution of paying members who had stated a positive turnover; we used figures published by INSEE concerning the demography of the accounts contributors.

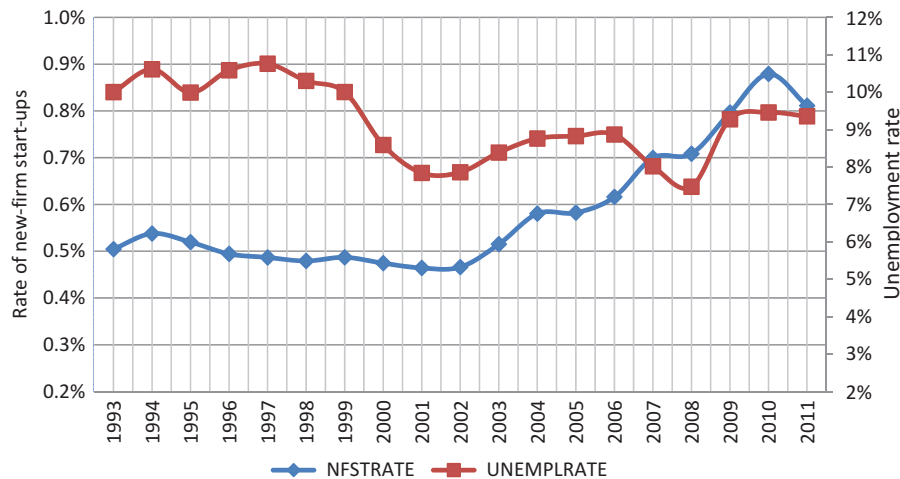


Fig. 2. Evolutions of the rates in metropolitan France over the period 1993 to 2011

Table 1. Supplementary variables

Name	Description	Period
Variables representative of the regulation of the productive system		
INDEPSHARE	Share of independent workers in the occupied workforce (wage earners, independent workers, family workers)	1999–2009
FAILRATE	Rate of failures by date of publication to the BODACC (<i>Bulletin Commercial des Annonces Civiles et Commerciales</i>) per 10 000 inhabitants	2000–2008
Variables representative of the sectorial specialization		
MANUSHARE	Manufacturing's share of employees in the proportion of the total employees	2000–2008
HTSHARE	Share of employees in high-tech manufacturing or in high-technology and knowledge-based service sector in the proportion of the total employees	1994–2008
NSTAE	Nights spent at tourist accommodation establishments	1993–2011
NCMRATE	Net corrected migration rate	2000–2008
Variables representative of the level of development		
GDP	Gross domestic product in euros per inhabitant	1993–2011
NHDI	Net household's disposable income in euros per inhabitant	1995–2009
URBRATE	Rate of urbanization (share of households living in densely populated areas), more than 500 inhabitants/km ²	1999–2009
STPSHARE	Share of students in the total of pupils and students	1999–2011
Variable representative of the functioning of the labour market		
LTUNEMPRATE	Long-term unemployment rate (12 months and more)	1999–2011

Regional development typology

The approach adopted rests on a combined use of multi-dimensional and evolutive data analysis methods that take into account the characteristics of the regions in terms of rates of new-firm start-ups and unemployment as well as their evolution over the 1993 to 2011 period. According to the similarity of these two rates, we can establish a typology of the 22 French regions. The usual analyses of annual data do not allow for a global analysis of the regions and their characteristics because these analyses are carried out separately (year by year) and do not take into account the possibility of having a common structure across time. The total evolution of the regions is thus studied by a multiple

factor analysis (MFA) (Escofier and Pages, 1985, 1998), based on a weighted analysis of the principal components of all the data.

This analysis is especially designed to study individuals – namely the regions – characterized by a certain number of groups of the same variables measured at each different moment in time. The MFA highlights the common structure to a set of groups of variables observed for the same 22 regions of metropolitan France. Its originality lies in the weighting of the variables, which balances the influence of the various groups of variables and provides a representation of the regions and variables interpretable according to the usual principal component

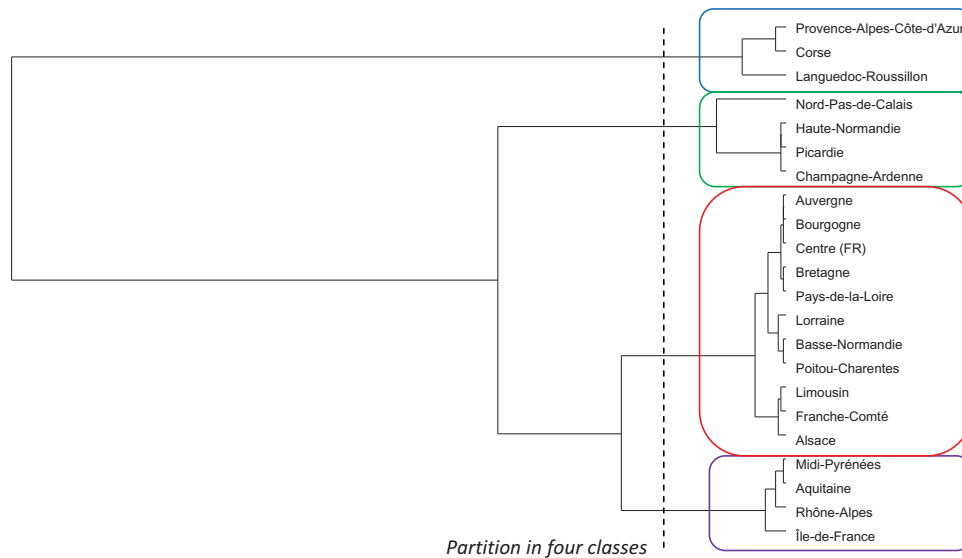


Fig. 3. Hierarchical tree of the 22 regions of France

analysis. This method makes it possible to consider all the groups on an equal basis. A hierarchical ascendant classification (HAC) was then used on the significant factors of the MFA in order to characterize the classes of the regions relatively to the evolution of the two

retained variables. The dendrogram of Fig. 3 represents the hierarchical tree of the regions obtained by using an HAC with the Ward criterion.¹⁰

Table 2 summarizes the main results of characterization of the chosen partition in four classes of regions, obtained

Table 2. Synthesis of the partition in four classes of the 22 regions of metropolitan France

	Class 1	Class 2	Class 3	Class 4
Frequency	4	11	4	3
Regions	Île de France Aquitaine Midi-Pyrénées Rhône-Alpes	Centre Basse-Normandie Bourgogne Lorraine Alsace Auvergne Franche-Comté, Pays de la Loire Bretagne Poitou-Charentes Limousin	Champagne-Ardenne Picardie Haute-Normandie Nord-Pas-de-Calais	Languedoc-Roussillon Provence-Alpes-Côte d'Azur Corse
Profile	+ NFSTRATE		+ UNEMPLRATE	+ NFSTRATE + UNEMPLRATE
Anti-Profile		– NFSTRATE – UNEMPLRATE	– NFSTRATE	
Supplementary variables	+ HTSHARE + STPSHARE + GDP + NHDI + URBRATE – MANUSHARE	+ MANUSHARE – LTUNEMPLRATE – URBRATE – FAILRATE	+ LTUNEMPLRATE – STPSHARE – INDEPSHARE – NSTAE – NCMRATE – HTSHARE	+ NSTAE + LTUNEMPLRATE + FAILRATE + NCMRATE + INDEPSHARE – MANUSHARE
Type of development		Type 4	Type 2	Type 3

¹⁰ Generalized Ward's criteria, i.e. aggregation based on the criterion of the loss of minimal inertia.

from the cut of the hierarchical tree shown in Fig. 3. Division is carried out according to the positions of the regions on the factorial axes of the MFA.

- The first class, including Île-de-France, Aquitaine, Midi-Pyrénées and Rhône-Alpes, shows a rate of new-firm start-ups higher than the average on the whole of the regions. The class 1 includes strongly urbanized regions, with a high level of GDP and household income per capital. The high-technology sectors represent an important part of the employment, and the manufacturing industry is under-represented. The educational level seems also upper to that observed in the whole of regions. The Île-de-France region displays a development based on economies of agglomeration – a concentration of power and the emergence of new products (Duranton and Puga, 2005) and the localization of headquarters (Vandermotten, 2002). In all shift-share analyses, the Île-de-France region presents an ‘over-efficiency’ (measured by a positive structural effect) and a negative regional effect (Carre, 2006). It is certainly the place where new knowledge and professions develop, where jobs evolve (and this is not taken into account by a simple sectoral decomposition) and thus other regions are in a permanent catch-up process. Rhône-Alpes, the second technological region after the Île-de-France region, also presents a strong entrepreneurial activity – but lower than Île-de-France – with furthermore relatively important job creations resulting from this entrepreneurial activity (Abdesselam *et al.*, 2004). Midi-Pyrénées and Aquitaine are specialized in the branches of aeronautics and spatial building (especially Midi-Pyrénées). High specialization allows the latter to benefit from all the talents, energy, money and means in order to build a specific project related to the sector. Midi-Pyrénées and Aquitaine are also attractive regions with a lot of amenities (climate, sea, mountains, quality of life – good eating places); many foreign pensioners (English and Dutch) bought houses there. Recently, the Bordeaux vineyards are also found to be very attractive for Chinese investors. This class does not totally represent the *Schumpeter* effect because a low rate of unemployment does not appear to be a characteristic of it.
- The second class consists of 11 regions: Centre, Basse-Normandie, Bourgogne, Lorraine, Alsace, Auvergne, Franche-Comté, Pays de la Loire, Bretagne, Poitou-Charentes and Limousin. For these regions, the rate of new-firm start-ups and unemployment rate are significantly low across the whole period. These regions present a high share of employment in the manufacturing industry. Rates of

urbanization, long-term unemployment and failure of companies are significantly lower than the population average. Lorraine, Alsace and Franche-Comté benefit from their proximity with Luxembourg, Germany and Switzerland. Lorraine is the first French region according to the proportion of the labour force working across the border, in front of Alsace and Franche-Comté (1 employee in 11 of the regional labour force for Lorraine, 1 in 12 for Alsace and 1 in 20 for Franche-Comté). Limousin is a rural region with some problem of desertification. Bretagne and Pays de la Loire present a high share of employment in the manufacturing industry with a specialization in food industry. In Lorraine, which used to belong to traditional industrialized regions (see below the third class), we may notice the good behaviour of automobile production and electronic equipments and the positive effect of cross-border working, mainly with Luxembourg, which allows better earnings spending in the region and a classification in the class of adaptive industrialized regions.

- The third class, consisting of Champagne-Ardenne, Picardie, Haute-Normandie and Nord-Pas-de-Calais regions, shows both a high unemployment rate and a significantly lower rate of new-firm start-ups. It groups regions showing a high long-term unemployment rate and an educational level lower than average. High-technology sector employment and self-employment are weak. The number of nights spent at tourist accommodation establishments and the migratory balance are significantly lower than the average of regions. The region Nord-Pas-de-Calais is a region of old industrialization that has suffered from the decline of the textile industry and the progressive abandon of the steel industry and first-stage processing steel products (Bonnet, 1997). Lorraine and Champagne-Ardenne have also suffered from their specialization in the same branches of activities (excluding steel industry for Champagne Ardennes and including extraction and preparation of iron ore for Lorraine). Nevertheless, these regions display better rates of unemployment, thanks to, for Champagne-Ardenne, its specialization in metal products production and a good behaviour in machinery and equipment, plastics processing and automobile production branches of activity.
- Finally, the other regions of metropolitan France Class 4 are Languedoc-Roussillon, Provence-Alpes-Côte d’Azur and Corse. These are characterized by unemployment rates and new-firm start-ups higher than the national average. In the regions of Languedoc-Roussillon, Provence-Alpes-Côte d’Azur and Corse, both unemployment rates and

entrepreneurship rates are high. These regions are among the most attractive regions in the French area for around 30 years now. Their development is organized around the tourist sector and activities linked to the spending of retired people, to migrations linked to heliotropism etc. It results into a strong unemployment qualified as growth's unemployment but also a strong propensity to get into entrepreneurship. It may illustrate the *refugee* effect.

Statistical properties

In order to study the interactions between NFSTRATE and UNEMPLRATE from the perspective of testing the presence of *refugee/Schumpeter* effects according to the different classes of the partition, we retain quarterly data covering the period 1993 to 2011. Quarterly frequency allows for analysing very short-term interactions between NFSTRATE and UNEMPLRATE. For this reason, we consider a bivariate framework and exclude the GDP of our analysis because regional GDPs are not available at a quarterly frequency.¹¹ Series were seasonally adjusted by the Census X-12 multiplicative method over the period 1993Q1 to 2011Q4. In the first step of our empirical analysis, it is crucial to ascertain the statistical properties of the data series to avoid spurious regressions. We develop unit root tests in panel data. The main advantage of these tests is to increase the number of observations by introducing information relating to the individual dimension (the French regions) that allows for raising the power of unit root. There are numerous unit root tests in panel data. Indeed, since the seminal works of Levin and Lin (Levin and Lin, 1992, 1993), successive improvements sought, first of all, at taking into account the heterogeneity of the dynamic properties of the series and then the dependence between the individuals. We usually distinguish two generations of tests. The first generation of tests is based on the cross-sectional independence assumption¹²; this hypothesis is quite restrictive in many empirical applications in macroeconomics. Among these tests, we implemented the tests of Levin and Lin (1993) and Breitung (2000), based on the hypothesis of a common unit root process. The homogeneity of the autoregressive parameters across individuals under the alternative hypothesis turns out to be very restrictive, which is why we also developed the tests of Im *et al.* (2003) and Hadri (2000) who allow for heterogeneity in the value of the autoregressive coefficient under the alternative hypothesis.

Under the alternative hypothesis, some series may be characterized by a unit root while some other series can be stationary. Finally, we implemented a second-generation test, the Moon and Perron test (Moon and Perron, 2004), which postulates the interdependence between individuals. The authors consider a standard autoregressive model with fixed individual effects in which residuals follow a factor model. Their approach consists in applying a transformation of the model in order to eliminate the common components of the series and on the application of the unit root test on de-factored series to remove the cross-sectional dependencies. Moon and Perron propose two test statistics, noted t_a and t_b .

The results of these various tests are presented in Table 3. The results of the first-generation tests are similar at the 5% level of significance; the hypothesis of unit root is never rejected when series are in level (except for the test of Breitung applied to the unemployment rate for the total panel and for the class 3), while it is systematically rejected when series are in first differences. With respect to the second-generation tests, results are more ambiguous. The unemployment rate is integrated of order 1 (excepted in the fourth class), while new-firm start-ups seem to follow a stationary process on the total panel as well as for the first and fourth classes. The contradictory result between the tests of the first and second generation can probably be attributed to inter-individual dependencies of the regional new-firm start-ups. However, Moon and Perron (2004) specify that the implementation of their test requires having a minimum of 20 individuals to obtain a precise estimation of the number of factors and reliable results. Given the reduced sizes of our panels, we validate the conclusions stemming from first-generation tests and we accept the hypothesis of unit root for new-firm start-ups. Besides, the use of the first-generation tests ensures the coherence with the tests of causality and cointegration in panel, which are based on the hypothesis of absence of individual dependencies. We thus maintain the hypothesis that all the series are integrated by order 1; from then the existence of a long-term relation between the series is possible.

IV. Refugee Effect Versus Schumpeter Effect

Short-run analysis

To characterize the dynamics of new-firm start-ups on a regional scale in the French case, the interactions between

¹¹ In a previous study (Aubry *et al.*, 2014), we considered a trivariate framework adding the national GDP. The results concerning the interactions between GDP and the two others variables were inconclusive; it seems that the national GDP imperfectly reflects regional specificities in terms of the dynamics of the levels of activity.

¹² These unit root tests do not allow for potential correlations across residuals of panel units; within this context, correlations across units constitute nuisance parameters.

Table 3. Panel unit root tests

					MP	
	LLC	Breitung	IPS	Hadri	t_a	t_b
UNEMPLRATE						
<i>Variables: Level</i>						
Total	-1.50*	-1.88**	2.81	11.11***	-1.10	-1.18
Class 1	-0.68	-0.55	1.18	3.62***	-0.63	-1.18
Class 2	-0.97	-1.31*	1.97	9.14***	1.22	1.40
Class 3	-0.61	-1.73**	1.13	4.82***	-0.52	-0.53
Class 4	-0.66	-0.24	1.17	2.84***	-2.06**	-1.69**
<i>Variables: First difference</i>						
Total	-16.64***	-7.14***	-10.72***	-1.78	-95.10***	-24.84***
Class 1	-6.47***	-2.44***	-3.89***	-0.83	-39.80***	-12.84***
Class 2	-12.16***	-6.31***	-8.05***	-1.43	-73.53***	-21.52***
Class 3	-7.67***	-2.08**	-5.18***	-0.81	-62.04***	-15.39***
Class 4	-5.40***	-2.62***	-3.16***	-0.19	-45.57***	-11.48***
NFSTRATE						
<i>Variables: Level</i>						
Total	7.93	7.80	6.08	23.06***	-4.32***	-3.97***
Class 1	2.04	3.97	3.47	9.85***	-1.90**	-1.08
Class 2	3.40	3.45	2.91	16.27***	-4.81***	-5.26***
Class 3	5.23	4.99	4.19	10.28***	-0.14	-0.04
Class 4	1.60	2.19	1.97	8.05***	-11.39***	-13.23***
<i>Variables: First difference</i>						
Total	-12.14***	-15.65***	-17.68***	0.02	-229.06***	-73.13***
Class 1	-5.05***	-4.82***	-5.21***	0.23	-100.08***	-16.80***
Class 2	-10.10***	-10.94***	-13.66***	-0.74	-135.07***	-52.16***
Class 3	-4.15***	-4.72***	-7.64***	1.29*	-101.44***	-16.56***
Class 4	-15.67***	-12.94***	-15.58***	-0.29	-92.89***	-14.89***

Notes: The tests of Levin, Lin and Chu (LLC), Breitung, Im, Pesaran and Shin (IPS) and Moon and Perron (MP) are based on the null hypothesis of unit root. The test of Hadri is based on the null hypothesis of stationary; it establishes an extension of the Kwiatkowski -Phillips -Schmidt -Shin test.

Moon and Perron proposed two test statistics, noted t_a and t_b .

*, ** and *** mean the rejection of the null hypothesis at the 10%, 5% and 1% levels, respectively.

the rate of new-firm start-ups and the unemployment rate are analysed. In the short run, tests of causality and calculations of crossed correlations between the cyclical components of the series are developed on the total panel constituted by 22 regions and on the subgroups represented by the four homogeneous classes established by hierarchical classification.

Causality tests. In order to analyse the short-run links between the rate of new-firm start-ups formation and unemployment rate, we carried out Granger noncausality tests in a bivariate framework. We implemented the Granger noncausality test for heterogeneous panel data models proposed by Dumitrescu and Hurlin (2012). It is a test of noncausality in a model of heterogeneous dynamic panel with fixed coefficients. The test statistic is based on the individual Wald statistics of Granger

noncausality averaged across the cross-section units. It considers the null hypothesis of homogeneous noncausality from a variable x to a variable y in a bivariate framework; meaning that under the null hypothesis, there is no causal relationship for any of the cross-section units of the panel. On the other hand, the alternative hypothesis does not inevitably imply a relation of causality for all the individuals of the panel; two subgroups of individuals can coexist: a first subgroup of individuals for whom there is a relation of causality from x to y and a second subgroup of individuals for whom, on the other hand, there is no relation of causality.¹³ Let us specify that this test developed in the line of the test of unit root of Im *et al.* (2003) suffers the same limits as the first-generation tests of unit root because it supposes cross-section independence. Because the series are integrated by order 1, the tests are applied to the series in first differences.

¹³ The authors propose two standardized statistics: \tilde{Z} -bar on the moments of the asymptotic distribution of the individual statistics and \tilde{Z} -bar on an approximation of the moments of the distribution for a fixed T sample. For small values of the time-series dimension, the standardized statistics lead to over-reject the null hypothesis of noncausality, and this propensity becomes stronger as the individual dimension increases. We thus prefer the statistics \tilde{Z} -bar.

Table 4. Granger noncausality test

	NFSTRATE→ UNEMPLRATE	UNEMPLRATE→ NFSTRATE
Total	2.69***	10.27***
Class 1	1.64*	4.31***
Class 2	2.33**	8.72***
Class 3	0.67	5.53***
Class 4	0.15	-0.23

Note: *, ** and *** mean the rejection of the null hypothesis at the 10%, 5% and 1% levels, respectively.

The results of this test, presented in Table 4, are mixed. They make apparent significant differences between the various classes and the total panel. At the 5% level of significance, a double causality between the rate of new-firm start-ups and the unemployment rate is proven true for the total panel and for class 2. A causality of the unemployment rate towards the rate of new-firm start-ups is also established for classes 1 and 3. On the other hand, no causality was revealed between both variables in class 4. These results are particularly interesting because the causalities established between the unemployment rate and the rate of new-firm start-ups are at the heart of the debate on the presence of the *refugee/Schumpeter* effects.

According to the results obtained, both effects could apply at the national level as well as in class 2. The *refugee* effect could be present also in classes 1 and 3. The absence of causality in class 4 invalidates the existence of the *refugee/Schumpeter* effects at this level. The analysis of the cross-correlations between both variables will allow for the characterization of the effects.

Cyclical correlations. The cyclical correlations between new-firm start-ups and macroeconomic variables supply interesting information on the short-run interactions. Following the methodology developed by Hodrick and Prescott (1997) and Kydland and Prescott (1990), we decompose time series into long-run and business cycle components by applying the Hodrick and Prescott filter (with a smoothing parameter of 1600). Then, we calculate the cross-correlations between the cyclical component of new-firm start-ups (denoted x) and the cyclical components of the other series (denoted y). The correlation coefficient between $x(t)$ and $y(t+j)$, where $i = 0, \pm 1, \dots, \pm 12$, measures the degree of co-movement of new-firm start-ups rate and the rate of unemployment over the business cycle. This approach allows us to examine the dynamics of the co-movements of the short-run components and, consequently, to obtain information about both their strength and synchronization. Following Fiorito and Kollintzas (1994), we consider that the two

cyclical components are strongly correlated, weakly correlated or not correlated for a shift j when the correlation coefficient is significant at a 1% level, 5% level or not significant at 10%, respectively. If the cross-correlation $\rho(j)$ is positive, null or negative, then new-firm start-ups are respectively procyclical, acyclical or countercyclical. Furthermore, if $|\rho(j)|$ is significant at a 5% level for a positive, null or negative value of j , then the cycle of new-firm start-ups is leading the other cycle by j periods, is synchronous or is lagging the other cycle by j periods, respectively. The results are recorded in Table 5.

The unemployment rate leads procyclically, in the short-run, new-firm start-ups (1 to 4 quarters) regardless of the considered group. When the unemployment rate increases, the opportunity cost of setting up a firm decreases, which favours new-firm start-ups. Let us remind you that in the French case, a large number of new firms are set up by the unemployed, in particular the short-term unemployed, defined as less than 1 year (approximately 20% according to Sine¹⁴). Indeed, qualified unemployed individuals may be induced to set up a firm in order to avoid the depreciation of their human capital (Bhattacharjee *et al.*, 2010). This sequence illustrates the *refugee* effect. At the horizon of 6 to 11 quarters, an increase of the unemployment rate translates into a decrease in new-firm start-ups. All the individuals who wanted to avoid the depreciation of their human capital have already set up their firms. If the results obtained at the national level are confirmed at the level of the sub-groups of regions, differences appear due to the intensity of these effects. These are particularly marked stronger for classes 3 and 1, more moderate for class 4 and weaker for both class 2 and the total panel. Results differ with respect to the effect of a variation of the rate of new-firm start-ups on the unemployment rate. Entrepreneurial activity leads, countercyclically, the unemployment rate with horizons of 3 and 4 quarters in classes 1 and 3. An increase in the entrepreneurial activity will itself lead to a reduction in unemployment. It is an illustration of the *Schumpeter* effect. However, in the longer term (8 and 9 quarters), an increase in new-firm start-ups leads to an increase in the unemployment rate, which can be interpreted by the fact that some new companies are going to fail for classes 1 and 4.

Long-run analysis

The study of the cointegration makes it possible to highlight stable long-run relations between nonstationary series. The series being all integrated of order 1, the existence of a long-run relation between them can be considered. To capture the long-run relations between new-firm start-ups and the unemployment rate, we

¹⁴ French information system on new companies.

Table 5. Cyclic correlations between new-firm start-ups and unemployment rate

$\rho(x_t, y_{t+j}); j = -12, -11, -10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12$ where $x = UNEMPLRATE$ and $y = NFSTRATE$													
j	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0
Total ^a	-0.02	-0.00	0.02	0.04*	0.04	0.02	-0.00	-0.03	-0.05*	-0.04	-0.02	0.02	0.08***
Class 1	-0.06	0.00	0.09	0.16***	0.16**	0.11	0.02	-0.07	-0.15**	-0.13**	-0.05	0.09	0.27***
Class 2	-0.01	-0.00	0.01	0.03	0.02	0.01	-0.01	-0.03	-0.04	-0.03	-0.02	0.02	0.06*
Class 3	-0.10	-0.04	0.04	0.11*	0.11*	0.05	-0.02	-0.08	-0.14**	-0.12**	-0.05	0.09	0.26***
Class 4	0.00	0.03	0.09	0.14**	0.17**	0.13*	0.05	-0.02	-0.07	-0.07	-0.05	0.04	0.12*
j	1	2	3	4	5	6	7	8	9	10	11	12	
Total ^a	0.12***	0.13***	0.11***	0.06**	-0.01	-0.06**	-0.11***	-0.12***	-0.11***	-0.10***	-0.06**	-0.03	
Class 1	0.38***	0.41***	0.32***	0.17***	-0.05	-0.21***	-0.36***	-0.39***	-0.36***	-0.32***	-0.23***	-0.12*	
Class 2	0.09***	0.10***	0.09***	0.05	0.00	-0.03	-0.07*	-0.08**	-0.07**	-0.07*	-0.05	-0.03	
Class 3	0.41***	0.46***	0.41***	0.23***	0.01	-0.17***	-0.35***	-0.38***	-0.35***	-0.31***	-0.21***	-0.09	
Class 4	0.16**	0.16**	0.10	-0.01	-0.13*	-0.21***	-0.26***	-0.23***	-0.22***	-0.16**	-0.06	0.05	

Notes: *, **, and *** mean the rejection of the null hypothesis at the 10%, 5% and 1% levels, respectively. In bold, when the evolutions of both variables are countercyclical.

^aThe total sample corresponds to the 22 regions of metropolitan France.

implement cointegration tests both on the total panel and on each group of regions. As for the first generation of panel unit root tests, the distinction between the various tests is related to the presence or not of heterogeneity within the panel. We consider the tests proposed by Pedroni (Pedroni, 1999, 2004) and Kao (1999). Pedroni proposes tests based on the null hypothesis of no intra-individual cointegration for homogeneous and heterogeneous panels. Four are based on the within dimension (pooled tests) and three on the between dimension (group mean tests). The tests based on between dimension are more general in the sense that they allow for heterogeneity between individuals under the alternative hypothesis. The test of Kao is also based on the null hypothesis of no cointegration and supposes the homogeneity of cointegrating vectors in the individual dimension.

The results of the cointegration tests are presented in Table 6. These results are mixed at the same time according to the considered sample and according to the intra- or inter-individual dimension. As is often the case, the results stemming from tests of Pedroni do not correspond. If we consider the tests based on the intra-individual dimension, at the 5% level of significance (respectively 10%), we notice that three tests on four lead to accept the hypothesis of cointegration for the class 2 (respectively for the total panel and for the class 3). These results are confirmed by the test of Kao, which also highlights the presence of a relation of cointegration for class 1. On the other hand, if we refer to the most general tests, based on the inter-individual dimension, we notice that no long-run relationship can be established

between the unemployment rate and the rate of new-firm start-ups, regardless of the considered class. It seems to us convenient to favour the most general tests that cause us to reject the existence of cointegrating relationship between the two series over the period 1993 to 2011.

However, Fig. 2 shows a contrasted evolution of the rate of new-firm start-up formation over the period. Indeed, it seems that during the 1990s, French entrepreneurial activity is not as dynamic. Entrepreneurship started to be dynamic in the early 2000s, supported by the implementation of public policies aiming to encourage entrepreneurship (Appendix 1). This change in the entrepreneurial behaviour leads us to look for the existence of a long-term relation between the rate of new-firm start-ups and the unemployment rate over the period 2000 to 2011. Thus, we implemented the tests of cointegration over this sub-period; the results are presented in the Table A1 of Appendix 2. At the 5% (10%, respectively) level of significance five (seven, respectively) tests on eight bring us to conclude that a relation of cointegration exists between the rate of new-firm start-ups and the unemployment rate for the total panel. This result is particularly interesting because it means that the rate of new-firm start-ups and the unemployment rate are bound in the long term at the national level. On the other hand, at the level of the classes, the results remain mitigated and do not allow accepting the hypothesis of cointegration.¹⁵

The long-term relationship presented below for the total group is normalized on NFSTRATE and is estimated by dynamic OLS (DOLS).¹⁶ The value in the parenthesis is the estimated value of the Student's *t*-test.

Table 6. Panel cointegration tests over the period 1993 to 2011

	Pedroni							Kao
	Pooled cointegration tests				Group mean cointegration tests			
	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat	
Total	2.61 (0.00)	−1.53 (0.06)	−1.61 (0.05)	1.08 (0.86)	0.31 (0.62)	−0.56 (0.28)	2.31 (0.99)	−3.27 (0.00)
Class 1	1.15 (0.12)	−0.53 (0.29)	−0.50 (0.31)	0.25 (0.60)	0.30 (0.62)	0.01 (0.50)	0.77 (0.77)	−1.66 (0.05)
Class 2	2.93 (0.00)	−1.92 (0.03)	−1.61 (0.05)	0.55 (0.71)	−0.29 (0.38)	−0.73 (0.23)	1.60 (0.94)	−2.82 (0.00)
Class 3	−1.44 (0.07)	−1.23 (0.10)	−1.49 (0.06)	−0.35 (0.36)	−0.24 (0.41)	−1.01 (0.16)	0.34 (0.63)	−1.32 (0.09)
Class 4	−0.47 (0.68)	0.65 (0.74)	0.44 (0.67)	0.95 (0.83)	−1.32 (0.91)	1.02 (0.85)	1.56 (0.94)	−0.81 (0.21)

Note: *p*-values are given in parentheses.

¹⁵ We checked that the classification and the results of unit root tests do not change over the period 2000 to 2011.

¹⁶ Kao and Chiang (2000) show that the estimators and test statistics from OLS are biased and demonstrate by simulations that DOLS performs very well in all the cases both for homogeneous and for heterogeneous panels.

$$NFSTRATE = 0.0179 UNEMPLRATE \quad (1) \\ (6.29)$$

The estimated coefficient of the variable UNEMPLRATE is significant. At the national level, we notice that a 1% increase in the unemployment rate leads to around 0.02% increase in the rate of new-firm start-ups. Although the magnitude of the impact of unemployment on new-firm start-ups is fairly low, the effect is significant. So, the *refugee* effect plays and explains the dynamics of entrepreneurship in France over the period 2000 to 2011.

V. Conclusion

This article investigates the relationships between the unemployment rate and new-firm start-ups both in the short run and long-run using French regional panel data. The originality of this work lies both in the scope and in the estimation methods employed. To our knowledge, this is the first empirical study considering entrepreneurship and business cycle at a regional level. The use of recent developments of econometrics of nonstationary panel data allows us to analyse both short- and long-run relationships between business cycle and entrepreneurship. Our empirical results highlight many interactions between entrepreneurship and employment. We find that unemployment rates and new-firm start-ups are closely linked in the short-run and to a lesser extent in the long-run. In the short run, we show evidence of the presence of the *refugee* effect and the *Schumpeter* effect. The increase of the unemployment rate leads to an increase of the entrepreneurial activity during four quarters, confirming the existence of the *refugee* effect. An increase in entrepreneurial activity also leads to a reduction in the unemployment rate over the same period, this latter attesting the existence of the *Schumpeter* effect. Two effects impact the unemployment rate: the individuals who create sometimes go out of unemployment; the growth generated by a more dynamic economy is at the origin of new hiring. However after 2 years, some companies do not survive and thus we again observe an increase in unemployment. The results obtained at the national level are confirmed at the regional level, but the *refugee* effect seems dominant at this level. However, differences do appear between regions. In the long run, the rate of new-firm start-ups and the unemployment rate are bound, but only at the national level over the period 2000 to 2011. We highlight the presence of the *refugee* effect at this level.

There are several explanations why the factors deterring *pull* motives, that is to say the setting-up of innovative companies, are strong in France. Among them, one may notice the importance of the switching cost and the functioning of the labour market. In France, the low involvement

of French elites in innovative entrepreneurial activity is related to the sunk cost this kind of population incurs when participating in entrepreneurial activity (Bonnet and Cussy, 2010). Their human capital gets better rewards within a smooth and unriskey career path (within which their graduate titles and alumni networks come into play). Moreover, the functioning of the French labour market – which is not flexible – enhances *push* motives and mainly discourage *pull* motives (Bhattacharjee *et al.*, 2010). The effect of the discouragement of the right type of entrepreneurship is superior to the *refugee* effect. So France records a weak global entrepreneurial propensity, and especially few firms are able to achieve a high level of growth.

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Appendix 1

Since the end of the '1990s', new laws have been implemented to support entrepreneurship:

1999: Implementation of the EDEN (Encouragement in the Development of New Companies) programme. It mainly constitutes in a repayable advance for new firms plus exemption of social charges, with a broader target than the previous programme.

2001 (July): Possibility to accumulate income stemming from the new entrepreneur's company in conjunction with her/his unemployment benefit for up to 18 months. In case of bankruptcy of the company, her/he is entitled to unemployment benefits for a maximum duration of 3 years after the loss of the employment preceding the setting up of the company.

2002: The ACCRE (financial support – social and tax cuts – for unemployed who set up their firms) can be accumulated

with EDEN (bonus for the new-firm start-up). These modifications strengthened the financial safety of the entrepreneur.

2003 (August): The law for the economic initiative, called Dutreil's law, aims at making France one of Europe's most favourable country for new-firm start-ups: extension of the possibility to domiciliate the new firm in one's house for a while (from 2 to 5 years), progressive capitalization of the social capital, simplification of administrative formalities, implementation of community finance institutions etc.

2006: Directive to capitalize the remaining unemployment benefits in the social capital of the firm.

2009: Legislation on the auto-entrepreneur. Very simple registration by internet and taxes and social charges proportional to the turnover (two sectors: trade and other activities).

Table A1. Panel cointegration tests over the period 2000 to 2011

	Pedroni							
	Pooled cointegration tests				Group mean cointegration tests			Kao
	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat	t-Stat
Total	7.31 (0.00)	-3.7 (0.00)	-3.42 (0.00)	-1.43 (0.08)	-1.33 (0.09)	-2.49 (0.00)	-0.03 (0.49)	-4.10 (0.00)
Class 1	2.87 (0.00)	-1.30 (0.10)	-1.13 (0.13)	-0.51 (0.30)	-0.33 (0.37)	-0.71 (0.24)	-0.01 (0.51)	-2.53 (0.00)
Class 2	5.72 (0.00)	-2.68 (0.00)	-2.20 (0.01)	-0.42 (0.34)	-0.98 (0.16)	-1.50 (0.07)	0.65 (0.74)	-2.86 (0.00)
Class 3	4.14 (0.00)	-2.01 (0.02)	-1.70 (0.04)	-0.68 (0.25)	-0.87 (0.19)	-1.31 (0.09)	-0.11 (0.46)	-2.24 (0.01)
Class 4	1.46 (0.07)	-1.24 (0.11)	-1.81 (0.03)	-1.55 (0.06)	-0.30 (0.38)	-1.53 (0.06)	-1.21 (0.11)	-2.38 (0.00)

Note: *p*-values are given in parentheses.