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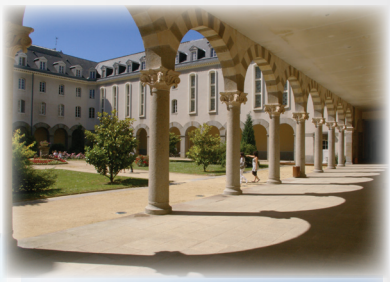

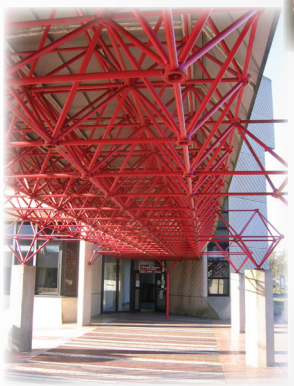

Business cycle and entrepreneurial behavior using French regional data

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Abstract:

We study the influences of new firms startups on growth in regional and macroeconomic dimensions in France using a quarterly data basis over the 1993-2011 period. We find that fluctuations in GDP are an early indicator of new firm startups. Nevertheless the most important relationships are found between unemployment rate and new firms startups. Entrepreneurship is mainly driven by necessity motives that have consequences upon potential of growth of new firms startups in most of the French regions.

Keywords: New firm formation, Business cycle, *Schumpeter effect*, *«refugee» effect*, panel data

JEL Classification: L26, E32, R11

1. Introduction

Audretsch and Thurik (2000; 2001) and Thurik (2011) distinguish two polar economies according to which economic stylized facts can be reinterpreted and reordered. The managerial model articulates economic growth around mass production, specialization, certainty, predictability and homogeneity, allowing the full play of economies of scale. The model of the entrepreneurial economy articulates economic growth around a variety of needs, novelty, turbulence, innovation and functioning in networks, allowing the full play of entrepreneurial flexibility. The entrepreneur is thus becoming an essential vector of growth. In a knowledge-based economy he is the agent that perceives the relevant economic information and decides to "choose between forgoing his/her idea[1] or else starting a new firm to appropriate the value of his/her knowledge" Audretsch (2007, p.68). 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, new processes. Kirzner (1985) retains the ability of alertness for defining the entrepreneurial function[2]. Acs (2006, 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 exhibits different levels of entrepreneurial activity and that the revealed hierarchy is constant over a long-period of time (Fritsch and Wyrwich 2012). Some regions present an environment more favorable to the expression of the entrepreneurial behavior; 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). The more there are entrepreneurs the more the territory shares information that creates new opportunities to set up a firm that will enhance growth.

But is it always the case? Oxenfeldt (1943) was the first to recognize that unemployed individuals or individuals with low prospects for wage employment may become self-employed to earn a living. In such a case the entrepreneur commits himself to an entrepreneurial activity because of a low opportunity cost. In the case of France the decrease of the opportunity cost resulting from the 1929 crisis induced numerous new craftsman startups (Didier 1982)[3]. More recently just after the 1993 crisis one may observe an increase of new firm startups. It is then interesting to consider the entrepreneurial activity in relation both to the territorial level and the motives to set up a firm, with the latter being partly linked to the business cycle.

[1] When the decision-making hierarchy of the incumbent firm does not favour pursuing the idea. Shapero (1979) quoted technological frustration as one of the main sources for engineering firms' creation.

[2] 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).

[3] A break in the increasing concentration of the industrial employment in big plants has then been observed between 1932 and 1937.

The aim of this paper is to study the influences of startups on growth in its two main dimensions. The regional dimension because entrepreneurial firms[4] flourish in an eco system of innovation which is specific. This environment has several components, cultural, social and economic, and its constitution is itself determined by factors which favor the technological opportunities, such as concentration and diversity of industrial activities, important investments in R&D, presence of pioneering and influential users etc... The macroeconomic dimension because the decision to set up a new firm first results from an occupational choice (Lucas 1978; Kihlstrom and Laffont 1979; Evans and Leighton 1989; Evans and Jovanovic 1989).The new entrepreneur generally weighs the creation of a risky activity characterized by a hope of profits against opportunities of jobs on the labor market (Leibenstein 1968; Rampini 2004).

In this paper we analyze interactions in the short and long run between regional new firm's formation, growth domestic product and the regional rate of unemployment in France during the 1993-2011 period. Considering regional data is relevant because at this level the rules of the labor market and the various laws governing the establishment of new companies are then identical. Only considerations relative to specific development of territories - residential amenities, specialization, proximity effects - can explain the regional specificities of new firms startups. We focus in particular on the identification of the existence of the *«refugee» effect* against the *Schumpeter effect* (Thurik et al. 2008). According to the *«refugee» effect* unemployment can lead to new firm formation[5] while the *Schumpeter effect* conveys the fact that new firm formation reduces the rate of unemployment[6].

There are very little empirical studies analyzing relationships between entrepreneurship and business cycles in a dynamic framework. Most of the studies that explored unemployment and entrepreneurship have been based on cross-section analysis or pooled data where time dimension is poorly taken into account. For Hamilton (1989), with these methods it is important that changes over time in the public entrepreneurship policy and relevant factors explaining the differences of new firm formation rate between areas or branches of activity are well taken into account. Thus previous works which studied these relations failed to clearly identify the two effects. To our knowledge, Thurik et *al.* (2008) and Koellinger and Thurik (2012) were the first to propose a study in a dynamic framework. Using panel data from 22 OECD countries, they differentiate between the national and the aggregate level. In line with their work, we also use panel data with the objective to analyze the links between entrepreneurship and the business cycle but we consider regional and national levels over the 1993-2011 period. By concentrating on a country, the present study should allow to understand better the regional dynamics of the renewal of the productive system and its connections with the national cycle. Regional specificities must also 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 etc. In that case the *«refugee»/Schumpeter* effect is to be determined for each region. More, unlike Koellinger and Thurik (2012) who only considered the short term relationships, we implement techniques for analysing long-term relationships. Indeed, Congregado et *al.*(2011) showed the need to take

[4] Young and innovative firms.
[5] People who are unemployed choose to create their own job.
[6] In an entrepreneurial society most new jobs are created by new firms startups.

into account long time horizons to evaluate business cycle effects on entrepreneurship activity. 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.

Considering a panel data context allows to highlight common behaviors for groups of regions. In doing so, we use state-of-the-art advances in panel and we apply techniques never employed on such data. We obtain four main results. First, on the national level, fluctuations in GDP are an early indicator of the new firm startups but this effect disappears at the regional level. Second, in the long term, no relationship between GDP and entrepreneurship could be established. Third, we find that unemployment rates and new firms startups are closely linked and so in the short-run as well as in the long-run. This result is particularly interesting because it shows evidence of the presence of the *«refugee» effect* and the *Schumpeter effect*. The results obtained at the national level are confirmed at the regional level, but the *«refugee» effect* seems to be dominant at this level. A long term relationship between new firm startups and unemployment rate is established at the national level, but such a relation is only significant for three regions at the disaggregated level. Finally, we show that in France new firms startups are mainly driven by necessity motives.

In the following section, we provide a brief review of the related literature. Section 3 describes the data and their properties. Section 4 is devoted to the short-term analysis. Section 5 presents and discusses results in the long term. Section 6 concludes.

2. Literature review

If we consider the regional and macroeconomic dimensions of new firms startups, we can notice that, for the first dimension, Audretsch et *al.* (2006) shed a light on the importance of the problem of information and its processing that renews interpretations with regard to the entrepreneurial function[7]. They define entrepreneur as the "knowledge's filter"; he is the individual who filters in the stock of knowledge "the more limited economically useful

[7] Schumpeter (1911), in his seminal work, has noted the predominant role of the innovative entrepreneur that diverts intermediate and investment goods in order to realize his innovation and at the end added value by innovation overcoming prices' increase due to bank loans. With Schumpeter, we thus have an eminently dynamic vision of the role of the entrepreneur who drives the growth. Hayek's (1937; 1945; 1948) highlighted the role of information and the discovery process in the market which is a process in perpetual adjustment where the building of the needs, preferences and production plans are themselves inseparable from interaction, demonstration and learning's effects (Heertje 1981). The entrepreneur has therefore an important place, but his role does not predominate over the customer's one. Kirznerian's alertness gives importance to the entrepreneur that acts positively on the coordination of plans of supply and demand in the market. According to him the entrepreneurial profit is a pure profit which is not bound to the use of factors of production. It results from a simultaneous decision of purchase and sale further to the discovery of advantageous price differences, the existence of which is based on the ignorance of the agents on the precise demand and supply. According to Kirzner (2009, p.10) "*All the price differentials (both attributable to Schumpeterian creativity and those present in the simplest of arbitrage contexts) can and should be seen as examples of entrepreneurial arbitrage activity. Such activity drives prices systematically in directions tending to eliminate the price differentials (i.e., the opportunities for pure profit) which are, always, the sparks which ignite entrepreneurial attention, drive, and creativity*".
"*So while Schumpeter's entrepreneur destroys all equilibria, Kirzner's works to restore them"*, Baumol (2010, p.15).

knowledge" (Zoltan J. Acs 2006, p.110). Besides the traditional factors - Capital, Labor even R&D expenditures- that explain the macroeconomic function of production of a country, the "entrepreneurship capital" contributes today in an important way to the differences of paths of growth between the regions of industrialized countries (Audrestch and Keilbach (2005) for the German regions, Sterlacchini (2006) for the European regions). The "entrepreneurship capital" can be defined as a local environment favorable to new firm formation. It is facilitated by the geographical proximity of the new knowledge's source and more generally by the presence of an environment favorable to its blooming. This environment is constituted by an innovative *milieu* (institutions, organizations that favor 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 by higher start-up rates, *ceteris paribus* (Audretsch 2007, p.71). This is why we retain the measure of entrepreneurial activity at the regional level. Numerous works now integrated into the orthodox regional economy introduce an entrepreneurial variable (Audretsch and Fritsch 2002; Fritsch and Mueller 2004; Fritsch 2008; Audretsch and Keilbach 2004; Audretsch and Keilbach 2005).

In the second dimension entrepreneurship refers to an individual's allocation of human capital that depends upon the economic situation because, according to the *«refugee» effect*, unemployment can arouse the creation of new firms while the *Schumpeter effect* rather conveys the fact than new firms startups reduce unemployment[8]. Koellinger and Thurik (2012) [9] demonstrate that entrepreneurship causes, in the sense of Granger, the macroeconomic cycles at the global level. They add that the entrepreneurship cycle is positively influenced by national cycles of unemployment. Highfield and Smileys (1987) show for American data that it is rather in the downward phase of the economic cycle that we observe a positive effect on the number of new firms startups (because of a low opportunity cost)[10]. Bonnet and Renou (2000) showed using French data 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 firms startups[11]. In the past, several authors have focused their research on the measure of the *«refugee»* and the *Schumpeter* effects. Their results are mixed and most of them failed to measure the real dimension of these two effects because they analyze relations in a static perspective. Storey (1991) noticed the ambiguity of the results where some studies argue for the *pull effect* while other studies support the *push*

[8] 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.

[9] From a database which takes into account the observations of 22 countries of the OECD during the period from 1972 till 2007.

[10] They note however that new firms startups are rather found in the sectors which experience the strongest rates of profit, growth of salaries and intensity of the research and development in the downward phase of the cycle.

[11] A raised unemployment rate reduces the opportunity cost to become an entrepreneur and then stimulates new firms startups. In a period of growth (measured by the consumption of industrial products), the optimism of the economic agents is translated by favorable anticipations and incites them to engage new firm startups. In a 1968 paper, Leibenstein presents the entrepreneur as a « gap-filler » and an « input completer ». There too opportunities for profit and arbitrages are essential to the entrepreneurial activity. It then benefits from the growth of the economic activity which offers true perspectives for new economic activities (and new firms) in the market niches it gives rise to.

effect[12]. For example Evans and Leighton (1989) find a *«refugee» effect* with American data, as Acs, Audretsch and Evans (1994). Storey (1991) finds a mixed effect with American data as Tervo and Niittykangas (1994) at the regional level for Finland and so for Audretsch et *al.* (2001), for OECD countries. Audretsch and Acs (1994) consider that new firms startups are positively linked to GDP but also that unemployment has a positive effect on new firms startups that seems to be contradictory with their first result[13]. Mata (1996) considers that at a national level the *pull effect* is dominant in the case of Portugal –yet he retains new firms with at least five employees at the beginning-. Thurik et *al.* (2008) reconcile ambiguities in measuring the two effects by using a vector autoregression model. Using panel data from 23 OECD countries for the period 1974 to 2002, they prove the existence of two distinct relationships between entrepreneurship and unemployment. Koellinger and Thurik (2012) find that opportunity entrepreneurship leads the cycle by two years at the global level. The explanation given is that the subset of opportunity driven entrepreneurs that have been identified thanks to GEM[14] surveys are more prone to be at the origin of growth in case of newly invented technologies like the Information Technology (IT) boom in the late 1990's for example. Necessity entrepreneurship leads the cycle by one year only. "The opportunity entrepreneurs pave the way for necessity entrepreneurs… that are more prone to be driven by national labor markets conditions".

Highlighting the existence of the *«refugee» effect* and/or the *Schumpeter effect* is also interesting on a regional level for the reasons developed above. Every region is characterized by a specific sectorial development, a level of urbanization, qualification of the population and amenities. In France, the most entrepreneurial regions are among the most technologically developed and the most attractive regions for the population (Bonnet 2010). On a regional scale, the *Schumpeter effect* is connected to the regional innovative potential which differentiates regions according to their capacity to favor new technologies which enjoy an important entrepreneurial dynamism. Rhône-Alpes, the second technological region after the Île-de-France region, presents a strong entrepreneurial activity with furthermore relatively important job creations resulting from this entrepreneurial activity (Abdesselam, Bonnet, and Le Pape 2004). The regions of the South of France (Languedoc-Roussillon, Provence-Alpes Côte d'Azur, Midi-Pyrénées, Aquitaine) have been the most attractive regions in the French area for around thirty years now[15]. 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*.

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[12] *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 bad position on the labor market. It is similar to the *refugee effect* sometimes also called *shopkeeper effect*.

[13] A descriptive analysis of GDP and unemployment shows that unemployment is strongly countercyclical.

[14] "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

[15] They have organized their development around the tourist sector and activities linked to the spending of retired people, to migrations linked to heliotropism etc.

3. Data and statistical properties of the series

In order to study interactions between new firms startups (NFST) and economic activity, we consider two macroeconomic variables: Gross Domestic Product (GDP) and unemployment rate (UNEMP). These variables are usual indicators for the business cycle, they have also been used by Koellinger and Thurik (2012). Data are quarterly and covers the 1993-2011 period. We consider the 22 metropolitan French regions.

We use series extracted from the databases of INSEE (National Institute for Statistics and Economic Studies). We retained GDP in constant currency. The number of new firms startups concerns all business sectors and includes the auto-entrepreneurs since 2009[16].

Finally, the creations were seasonally adjusted by the Census X-12 multiplicative method over the period 1993Q1 to 2011Q4. The series are expressed in natural logarithms, except the unemployment rate, their name are then preceded by the prefix L. Let us note that the used indicator of activity is the national GDP [17] while the series relative to the unemployment rate and to the creations are series relative to every French region.

We study at first the properties of time series by means of standard unit root tests (Augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski et *al*.(1992)). The first two tests are based on the null hypothesis of a unit root while the KPSS test considers the null hypothesis of no unit root. All the series are first-order integrated. In Table 1, we only present results relative to GDP because this series corresponds to a national aggregate which will be used for every region[18].

Table 1: Unit root tests in time series

Variable LGDP	ADF	PP	KPSS
Level	2,54	3,79	1,15***
First difference	-2,60***	-4,76***	0,23

Note: * (respectively **, ***) indicates rejection of the null hypothesis at the 10 % level (respectively 5%, 1%).

Then 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 raising the power of unit root. There are numerous unit root tests in panel data. Indeed, since the seminal works of Levin and Lin (1992; 1993), successive improvements were brought aiming first of all at taking into account the heterogeneity of the dynamic properties of the series then the dependence between the individuals. We usually distinguish two generations of tests.

[16] 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 favorable to entrepreneurship till the new legislation on the "autoentrepreneurs" appeared at the beginning of 2009. Success was immediate: over 600 000 auto-entrepreneurs got 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 brought a correction for the administratively recorded auto-entrepreneurs so as to consider 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.

[17] The regional GDPs are not available at a quarterly frequency.

[18] Results are not reported here but are available upon request to the authors.

The first generation of tests is based on the cross-sectional independence assumption[19], an hypothesis that is difficulty acceptable within the framework of macroeconomic applications. Among these tests, we implemented the tests of de Levin et *al*. (1993) and Breitung (2001), 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 that 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's test (2004) which postulates the interdependence between individuals[20].

The results of these various tests are recorded in table 2. 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) while it is systematically rejected when series are in first differences. As regards the second generation tests, results are more ambiguous. The unemployment rate is integrated of order one while new firms startups seem to follow a stationary process, the contradictory result between the tests of the first and second generation can be attributed to inter-individual dependences of the regional new firms startups[21].

Although the Moon and Perron's test is the most performing, we accept the hypothesis of a unit root for new firms startups by concerns of coherence with the tests of causality and cointegration in panel implemented which assume the absence of individual dependences. We thus maintain the hypothesis that all the series are integrated of order 1, and then the existence of a long-run relation between these series is possible.

[19] These unit root tests don't allow for potential correlations across residuals of panel units; within this context, correlations across units constitute nuisance parameters.

[20] The authors consider a standard autoregressive model with fixed individual effects in which residuals follow a factor model. Their approach consists in the 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 proposed two test statistics, noted t_a and t_b.

[21] The possible explanations for the inter-individual dependences could be the following ones:

-Proximity effects: for example some regions technologically dynamic can exercise an eviction effect on the new firms startups of regions at their border (Rhône-Alpes with regard to Auvergne, even to Franche-Comté or Bourgogne),

-Residential amenities effects according to Lejoux (2007) "The presence of these temporary consumers whom are the tourists appears for certain areas, little favored on the productive plan but endowed with strong residential amenities, as a particularly importing economic stake". Tourist regions participate in vast group of contiguous regions of the south and west of France and we can suppose that there are spillovers effects between these regions. They still correspond to the main regions of destination of the migrations of French active persons and retired people (Gonnard 2006).

-Regional specialization: certain regions have acquired some reputation thanks to their history of development and to public policy that reinforces and advertises their specialization (competiveness poles). At the beginning a firm leader took the risk of the primo location, later agglomeration effect and network externalities attract new firms (Suire 2003).

Table 2: Panel unit root tests

Variables	LLC	Breitung	IPS	Hadri	MP	
					t_a	t_b
	Variables : Level					
LNFST	1,73	-0,83	1,03	25,28	-11,23	-5,60
	(0,95)	(0,20)	(0,84)	(0,00)	(0,00)	(0,00)
LUNEMP	0,72	-7,91	-1,30	12,08	-1,10	-1,18
	(0,76)	(0,00)	(0,10)	(0,00)	(0,13)	(0,12)
	Variables : First difference					
LNFST	-7,82	-5,44	-15,24	-1,46	-228,36	-84,57
	(0,00)	(0,00)	(0,00)	(0,93)	(0,00)	(0,00)
LUNEMP	-15,96	-8,24	-9,90	-3,16	-95,10	-24,84
	(0,00)	(0,00)	(0,00)	(0,99)	(0,00)	(0,00)

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 KPSS test.
P-values are given in parentheses.

4. Short run analysis

4.1 Causality tests

In order to analyze the short-run links between new firms startups, GDP and unemployment rate, we carried out Granger non-causality tests in a bivariate framework. Because most of the tests of unit root brought us to conclude that the series are integrated of order 1, the tests of non-causality are applied to the series in first differences.

The results of the Granger non-causality tests made on the regional time series are presented in table 3. On a regional scale, we notice that few relations of causality between the GDP and the new firms startups seemed significant at the 5 % level. Indeed, the creations cause the GDP only in the case of the Rhône-Alpes region. The relation of causality from the GDP to the creations was established for two regions: Picardie and Provence-Alpes-Côte d'Azur. This result can be attributed to the specificities of the GDP series, which is evaluated on a national scale and constitutes a weighted average of the evolution of the regional GDPs. The use of an aggregate indicator of activities was conditioned by the availability of the data in quarterly frequency; it seems that the national GDP imperfectly reports regional specificities in term of dynamics of the levels of activity. Nevertheless, we notice that Rhône-Alpes, Picardie and Provence-Alpes-Côte-d'Azur regions showed themselves more sensitive to the national cycle.

With 6 272 467 inhabitants, the Rhône-Alpes region is the 2nd region of metropolitan France (behind the Île-de-France region); it represents approximately 10 % of the national GDP. The GDP by employment, an indicator of economic efficiency, classifies the region in the third position behind the Île-de-France and the Provence-Alpes-Côte d'Azur and the average Gross Disposable Income (RDB in French -Revenu Disponible Brut-) in Rhône-Alpes exceeds that of all other regions of province. Rhône-Alpes, the 2nd technological region after the Île-de-France, also presents a strong entrepreneurial activity with on average more job creations resulting from this entrepreneurial activity than in Île-de-France (Abdesselam, Bonnet, and Le Pape 2004).

Provence-Alpes-Côte d'Azur is the first touristic region of France and the tourist activity stimulates new firms startups. Tourism is also connected to growth and to growth perspectives; the waiting-game of the current period is translated by tourist seasons which have difficulty in starting with later reservations. It is thus not surprising that the growth on a national scale can have a repercussion on new firms startups in this region.

The dependence of the new firms startups of Picardie towards the national GDP results may be explained by the proximity of this region with the capital city region because the national variation of the GDP is explained for 33% by the variation of the GDP in Île-de-France (IDF).

Île-de-France, the *capital* region, is a region which conjugates many entries in and exits from entrepreneurship, with a very important part of the new-firm startups in the entrepreneurial event; the ratio weight of the region in takeovers terms reported to the weight of the region in ex-nihilo startups terms is equal to 0,579 [22]. The metropolitan area is endowed with an active labor market and the setting-up of a new firm can be considered as a step in a career-path for a qualified fringe of the population. Then for this population the exit from entrepreneurship is not always resulting from a bankruptcy and cannot always be considered as an entrepreneurial failure because part of them sell their business and find an interesting wage position afterwards (Bates 2005). This kind of trajectory is possible because the entrepreneurial experience is better valued in the metropolitan area or in region rich in entrepreneurship capital like Silicon Valley (Saxenian 1996, p.96–97)[23]. Abdesselam and *al.* (2004) also showed that Île-de-France includes a significant immigrant population of constrained entrepreneurs who gets into entrepreneurship because they have difficulty of insertion on the labor market. This entrepreneurship of insertion has then fewer effects on the economic growth and may explain that new firms startups in IDF have no repercussions on growth due to the mixed populations.

The relations of causality between new firms startups and unemployment rate have proved much more significant. The results highlight the presence of the *Schumpeter effect* and the *«refugee» effect* at the regional level and we find that the *«refugee» effect* seems to be

[22] Based on data from the Siren repertory (Information System of Registration of Firms) for the year 2006.

[23] "It is not simply the concentration of skilled labor, suppliers and information that distinguish the region. A variety of regional institutions—including Stanford University, several trade associations and local business organizations, and a myriad of specialized consulting, market research, public relations and venture capital firms—provide technical, financial, and networking services which the region's enterprises often cannot afford individually. These networks defy sectoral barriers: individuals move easily from semiconductor to disk drive firms or from computer to network makers. They move from established firms to start-ups (or vice versa) and even to market research or consulting firms, and from consulting firms back into start-ups".

dominant at this scale. At 5%, 11 regions register a one-way causality from unemployment to new-firm startups and we highlight a feedback effect between creations and unemployment rate in two regions: Bretagne and Limousin. So the unemployment rate causes the creations in 13 regions (59 %). We notice that the creations cause the unemployment rate in only 5 regions (23 %) and one-way causality runs for three regions (Île-de-France, Lorraine and Midi-Pyrénées).

Table 3: Bivariate Granger non-causality tests

Région	LGDP →LNFST	LNFST →LGDP	LUNEMP →LNFST	LNFST →LUNEMP
Alsace	0,44	1,69	4,28**	2,93*
Aquitaine	0,30	0,64	2,12	0,41
Auvergne	1,47	0,03	0,32	1,02
Basse-Normandie	1,04	0,99	3,61**	0,97
Bourgogne	1,25	1,12	6,04***	2,96*
Bretagne	1,95	0,65	10,02***	3,15**
Centre	1,04	0,57	6,29**	1,51
Champagne-Ardenne	0,54	1,29	3,45**	2,29*
Corse	0,60	1,48	0,08	0,30
Franche-Comté	1,19	1,43	7,07***	2,44
Haute-Normandie	0,71	1,26	4,68**	1,20
Ile de France	1,11	1,40	1,56	2,15**
Languedoc-Roussillon	1,11	0,04	1,23	0,47
Limousin	1,45	2,02*	3,60***	4,16***
Lorraine	0,91	1,16	2,61	7,44***
Midi-Pyrénées	0,31	0,70	3,22*	4,67***
Nord-Pas-de-Calais	0,46	0,21	3,60*	0,82
Pays de la Loire	0,72	0,27	7,01***	1,93
Picardie	6,45**	0,12	6,07**	0,85
Poitou-Charentes (PC)	1,52	0,56	3,78**	1,79
Provence-Alpes-Côte d'Azur (PR)	3,47***	0,31	1,61	1,02
Rhône-Alpes	0,59	3,04**	3,90***	1,02

Note: * (respectively **, ***) means the rejection of the null hypothesis of non-causality at the 10 % level (respectively 5%, 1%)

We also implemented the Granger non-causality test for heterogenous panel data models proposed by Dumitrescu and Hurlin (2012). The test statistic is based on the individual Wald statistics of Granger non causality averaged across the cross-section units. It considers the null hypothesis of homogeneous non-causality from a variable *x* to a variable *y* in a bivariate framework; that means 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 contrary, there is no relation of causality[24]. 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.

The results of this test presented in table 4 shows a feedback effect between new-firm startups and unemployment rate on the short-run. The causality from the GDP to new firms startups is also proved true while the creations do not seem to cause the GDP according to the test statistic $\tilde{Z}-bar$. Our results confirm those obtained by Koellinger and Thurik (2012). Indeed from a study carried out on 22 countries, they showed that if the global evolution of the entrepreneurship represents a leading indicator of the macroeconomic cycles, this effect disappears at the national level. Besides, these results are particularly interesting because the causalities established between the unemployment rate and the creations are at the heart of the debate on the presence of the *«refugee»* and *Schumpeter effect*. Indeed, the revealing of causality from the creations to the unemployment rate confirms the presence of the *Schumpeter effect* while the existence of causality from the unemployment rate to the creations confirms the existence of the *«refugee» effect*. The analyses of the cross-correlations between these two variables will allow characterizing the effects.

Table 4: Panel bivariate Granger non-causality tests

	LGDP →LNFST	LNFST →LGDP	LUNEMP →LNFST	LNFST →LUNEMP
$Z-bar$	34,25	-5,15	83,87	47,52
	(0,00)	(0,00)	(0,00)	(0,00)
$\tilde{Z}-bar$	7,74	-1,38	19,24	10,82
	(0,00)	(0,17)	(0,00)	(0,00)

Note: p-values are given in parentheses.

4.2 Cyclical correlations

The cyclical correlations between new-firm startups 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 startups (denoted x) and the cyclical

[24] The authors propose two standardized statistics: $Z-bar$ based on the moments of the asymptotic distribution of the individual statistics and $\tilde{Z}-bar$ based 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 non causality and this propensity becomes stronger as the individual dimension increases. We thus prefer the statistics $\tilde{Z}-bar$.

components of the other series (denoted y). The correlation coefficient between $x(t)$ and $y(t+j)$ where $j = 0, \pm 1 \ldots, \pm 12$ measures the degree of co-movement of new-firm startups with the economic activity variables over the business cycle. This approach allows us to examine the dynamics of the co-movements of the short-run components and, so, to obtain information about both their strength and their synchronization[25]. The results are recorded in tables 5 and 6. They reveal cyclical relations between the retained variables, excepted for the Corse region for which no significant relation was observed.

At the global level, we notice that a peak in the economic cycle is followed by a reduction in new-firm startups on a horizon of 1 to 4 quarters then generates a strong entrepreneurial activity on a horizon from 8 to 12 quarters. This result confirms the study of Koellinger and Thurik (2012) which highlights the interdependence of the entrepreneurial cycle and the business cycle. The decline of the entrepreneurial activity posterior to an economic boom can be explained by the occurrence of opportunities on the labor market when the situation is favorable that dissuades the individuals to create their own activity in the very short term, the opportunity cost being high[26]. In the longer term we notice that an increase of the GDP on a horizon from 2 to 3 years is translated by an increase of the number of new-firm startups which can be interpreted as being a demonstration of the opportunities of new-firm startups aroused by the growth described by Leibenstein (1968). An increase of new-firm startups is translated in the very short-term (1 in 3 quarters) by an increase of the GDP, generates a contracyclic effect on a horizon from 6 to 8 quarters[27] then leads to an increase of the GDP within 12 quarters.

[25] 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 %, not significant at 10 %, respectively. If the cross-correlation $\rho(j)$ is positive, null or negative then new firms startups 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 firms startups is leading the other cycle by *j* periods, is synchronous or is lagging the other cycle by *j* periods, respectively.

[26] At the opposite, Parker (2009) points to the effect of falling wages in recessions, which may lower the opportunity costs for starting a business and encouraging marginal types of entrepreneurship (Koellinger and Thurik 2012).

[27] Let us remind that the survival rate after 3 years of the new companies is about 60 %.

Table 5: Cyclic correlations between new-firm startups and GDP

($\rho(x_t, y_{t+j})$; j = -12, -10, -8, -6, -4, -3, -1, 0, 1, 2, 3, 4, 6,8 10,12 avec x_t = NFST)

j	-12	-10	-8	-6	-4	-3	-2	-1	0	1	2	3	4	6	8	10	12
Alsace	0,14	0,22*	0,12	-0,04	**-0,22***	**-0,24****	-0,17	-0,11	-0,01	0,12	0,16	0,15	0,06	-0,11	**-0,21***	-0,03	0,19*
Aquitaine	0,19	0,22*	0,09	-0,05	-0,18	**-0,21***	-0,15	-0,09	0,00	0,08	0,12	0,08	0,02	-0,14	-0,17	0,02	0,22*
Auvergne	0,08	0,24**	0,26**	0,03	-0,15	**-0,19***	-0,18	-0,11	-0,03	0,05	0,09	0,11	0,09	-0,05	-0,10	-0,04	0,08
Basse-Normandie	0,18	0,21*	0,11	-0,17	**-0,39*****	**-0,43*****	**-0,37*****	**-0,27****	-0,14	0,00	0,10	0,16	0,16	0,04	-0,04	0,08	0,22*
Bourgogne	0,12	0,19*	0,13	-0,04	**-0,21***	**-0,24****	-0,19	-0,13	-0,02	0,05	0,12	0,15	0,13	-0,01	-0,11	-0,04	0,07
Bretagne	0,13	0,11	0,05	-0,14	**-0,28****	**-0,31*****	**-0,29****	-0,19	-0,05	0,08	0,14	0,16	0,13	-0,02	-0,06	0,06	0,24**
Centre	0,13	0,12	0,06	-0,13	**-0,33*****	**-0,35*****	**-0,32*****	**-0,24****	-0,12	0,02	0,12	0,16	0,16	0,05	0,03	0,10	0,26**
Champagne-Ardenne	0,14	0,30***	0,25**	0,03	**-0,21***	**-0,27****	**-0,27****	**-0,20***	-0,11	-0,05	0,04	0,10	0,06	-0,02	-0,07	0,02	0,12
Corse	0,03	0,03	-0,01	0,02	0,04	-0,04	-0,03	-0,02	0,07	0,05	0,07	0,10	0,02	0,03	0,05	0,06	0,10
Franche-Comté	0,15	0,22*	0,09	**-0,20***	**-0,36*****	**-0,33*****	**-0,27****	-0,14	-0,01	0,11	0,21*	0,24**	0,22	0,05	-0,03	0,03	0,14
Haute-Normandie	0,10	0,11	-0,01	-0,19	**-0,28****	**-0,29****	**-0,22***	-0,14	0,00	0,13	0,21*	0,19*	0,11	-0,02	-0,09	0,08	0,28**
Ile de France	0,26**	0,28**	0,15	-0,13	**-0,37*****	**-0,39*****	**-0,36*****	**-0,27****	-0,15	-0,04	0,05	0,07	0,07	-0,04	-0,02	0,11	0,27**
Languedoc-Roussillon	0,36***	0,39***	0,23*	-0,01	**-0,20***	**-0,24****	**-0,23***	-0,17	-0,11	-0,07	-0,05	-0,06	-0,10	**-0,29****	**-0,26****	-0,09	0,20*
Limousin	0,12	0,17	0,12	-0,10	**-0,25****	**-0,29****	**-0,32*****	**-0,27****	-0,15	-0,04	0,04	0,09	0,12	0,01	0,05	0,18	0,27**
Lorraine	0,19	0,28**	0,17	-0,05	**-0,22***	**-0,25****	-0,17	-0,14	-0,04	0,04	0,09	0,08	0,04	-0,15	**-0,20***	-0,02	0,19
Midi-Pyrénées	0,26**	0,38***	0,25**	0,01	**-0,22***	**-0,28****	**-0,26****	**-0,21***	-0,10	0,00	0,06	0,08	0,02	-0,16	**-0,22***	-0,08	0,17
Nord-Pas-de-Calais	0,17	0,15	0,01	**-0,22***	**-0,40*****	**-0,41*****	**-0,37*****	**-0,26****	-0,11	0,04	0,14	0,17	0,17	0,09	0,08	0,17	0,28**
Pays de la Loire	0,11	0,10	-0,01	-0,19	**-0,32*****	**-0,32*****	**-0,24****	-0,12	0,02	0,14	0,21*	0,25**	0,19*	0,03	-0,05	0,04	0,19
Picardie	0,19	0,24**	0,11	-0,14	**-0,32*****	**-0,35*****	**-0,26****	**-0,24****	-0,07	0,04	0,12	0,14	0,12	0,02	-0,03	0,07	0,19
Poitou-Charentes (PC)	0,18	0,17	0,04	-0,17	**-0,35*****	**-0,35*****	**-0,33*****	**-0,23***	-0,12	0,00	0,10	0,12	0,11	0,04	0,00	0,11	0,27**
PACA	0,28**	0,40***	0,31***	0,10	-0,14	**-0,23***	**-0,26****	**-0,24***	-0,13	-0,07	-0,02	-0,03	-0,07	**-0,24****	-0,18	-0,01	0,23*
Rhône-Alpes	0,25**	0,28**	0,12	-0,12	**-0,31*****	**-0,31*****	**-0,23***	-0,14	0,03	0,10	0,17	0,12	0,04	-0,15	-0,22	-0,03	0,23*
PANEL	0,20***	0,35***	0,23***	0,02	**-0,21*****	**-0,25*****	**-0,18*****	**-0,13*****	-0,02	0,10***	0,14***	0,13***	0,04	**-0,13*****	**-0,23*****	**-0,06****	0,14***

Note: * (respectively **, ***) means the rejection of the null hypothesis at the 10 % level (respectively 5 %, 1 %). In bold, when the evolutions of both variables are countercyclical.

This result obtained at the national level seems to mask strong regional disparities; indeed, few coefficients of correlations are significant at the regional level. However, we notice that the creations lead procyclically GDP with varying lags: 3 quarters in Franche-Comté and in Pays de la Loire, 12 quarters in regions Bretagne, Centre, Haute-Normandie, Île-de-France, Limousin, Nord-Pas-de-Calais, and Poitou-Charentes. A countercyclical relation appears in Languedoc-Roussillon with delays from 6 to 8 quarters and in Provence-Alpes-Côte d'Azur with a delay of 6 quarters. Let us underline a specificity of the Aquitaine region, for which no significant correlation between GDP and new-firm startups was established.

In most of the regions the economic activity leads countercyclically creations during 4 quarters. It translates a tradeoff between a salaried work and a new firms startup in the short-run (except for Aquitaine, Auvergne and Corse). The economic activity leads procyclically creations in the regions of Provence-Alpes-Côte d'Azur, Midi-Pyrénées, Languedoc-Roussillon, Rhône-Alpes, Île-de-France, Champagne-Ardenne and Auvergne with delays going from 8 to 12 quarters according to regions.

Table 6 : Cyclic correlations between new firms startups and unemployment rate

($\rho(x_t, y_{t+j})$ **; j = -12, -10, -8, -6, -4, -3, -1, 0, 1, 2, 3, 4, 6,8 10,12 avec** x_t **= NFST)**

j	-12	-10	-8	-6	-4	-3	-2	-1	0	1	2	3	4	6	8	10	12
Alsace	0,01	-0,17	**-0,20***	-0,06	0,21*	0,38***	0,42***	0,35***	0,20*	-0,01	-0,14	**-0,22***	**-0,24****	-0,06	0,21*	0,17	-0,06
Aquitaine	-0,12	**-0,25****	**-0,22***	-0,13	0,10	0,23*	0,31***	0,29**	0,20*	0,06	-0,06	-0,11	-0,08	0,10	0,20*	0,07	-0,13
Auvergne	0,12	-0,17	**-0,35*****	**-0,22***	0,13	0,31***	0,36***	0,29**	0,22*	0,05	-0,08	-0,12	-0,15	-0,02	0,06	0,05	-0,01
Basse-Normandie	-0,08	**-0,28****	**-0,34*****	-0,11	0,33***	0,53***	0,58***	0,47***	0,32***	0,10	-0,05	-0,09	-0,07	0,06	0,09	0,00	-0,07
Bourgogne	-0,05	-0,18	**-0,24****	-0,14	0,19*	0,37***	0,46***	0,38***	0,29***	0,06	-0,07	-0,18	**-0,20***	-0,11	0,02	0,04	0,00
Bretagne	-0,14	**-0,23***	**-0,26****	-0,11	0,29**	0,48***	0,59***	0,54***	0,37***	0,14	-0,06	-0,18	**-0,21***	-0,08	0,05	0,02	-0,10
Centre	-0,12	-0,18	-0,19	-0,06	0,32***	0,47***	0,54***	0,51***	0,37***	0,17	0,00	-0,09	-0,15	-0,06	0,01	-0,06	-0,17
Champagne-Ardenne	0,01	**-0,26****	**-0,31*****	-0,15	0,16	0,33***	0,38***	0,31***	0,18	0,03	-0,05	-0,12	-0,07	0,04	0,15	0,04	-0,08
Corse	0,16	0,07	0,08	0,06	0,05	0,04	0,05	0,05	0,06	0,06	-0,02	-0,05	-0,08	-0,13	0,03	-0,05	-0,09
Franche-Comté	-0,08	**-0,31*****	**-0,29****	0,05	0,44***	0,56***	0,54***	0,44***	0,23*	-0,03	**-0,23***	**-0,34*****	**-0,36*****	-0,16	0,07	0,08	-0,01
Haute-Normandie	-0,11	**-0,21***	**-0,23***	-0,03	0,31***	0,45***	0,50***	0,41***	0,25**	0,07	-0,09	-0,16	-0,15	0,01	0,16	0,05	-0,19
Ile de France	**-0,21***	**-0,30*****	**-0,29****	-0,08	0,26**	0,39***	0,45***	0,43***	0,36***	0,20*	0,06	-0,05	-0,12	-0,04	0,03	-0,03	-0,11
Languedoc-Roussillon	-0,19	**-0,45*****	**-0,42*****	**-0,30*****	0,02	0,17	0,23*	0,21*	0,13	0,01	-0,07	-0,09	-0,07	0,16	0,32***	0,27**	0,14
Limousin	-0,09	**-0,26****	**-0,32*****	-0,15	0,23*	0,39***	0,49***	0,46***	0,35***	0,16	0,05	-0,04	-0,06	0,06	0,03	-0,12	-0,20
Lorraine	-0,08	**-0,29****	**-0,33*****	-0,14	0,21*	0,34***	0,37***	0,34***	0,25**	0,03	-0,11	-0,19	**-0,21***	0,01	0,23*	0,19*	-0,01
Midi-Pyrénées	0,00	**-0,32*****	**-0,48*****	**-0,32*****	0,07	0,23*	0,35***	0,34***	0,24**	0,06	-0,08	-0,17	**-0,19***	0,04	0,25**	0,22*	0,06
Nord-Pas-de-Calais	**-0,21***	**-0,32*****	**-0,32*****	-0,12	0,30***	0,47***	0,51***	0,48***	0,37***	0,21*	0,09	0,00	-0,04	0,04	0,09	-0,03	-0,19
Pays de la Loire	-0,10	**-0,22***	**-0,21***	0,00	0,38***	0,52***	0,57***	0,48***	0,30***	0,06	-0,14	**-0,26****	**-0,30*****	-0,15	0,05	0,04	-0,08
Picardie	-0,16	**-0,35*****	**-0,38*****	-0,09	0,31***	0,45***	0,50***	0,49***	0,35***	0,15	-0,02	-0,13	-0,19	-0,09	0,04	0,02	-0,13
Poitou-Charentes (PC)	**-0,24****	**-0,37*****	**-0,30*****	-0,10	0,26**	0,42***	0,52***	0,49***	0,38**	0,19*	0,03	-0,10	-0,10	0,02	0,08	0,03	-0,11
PACA	0,03	**-0,24****	**-0,40*****	**-0,40*****	-0,09	0,12	0,24**	0,24**	0,18	0,04	-0,09	-0,12	-0,09	0,19	0,29**	0,15	0,03
Rhône-Alpes	**-0,21***	**-0,35*****	**-0,37*****	-0,13	0,34***	0,48***	0,54***	0,46***	0,27**	0,02	-0,16	**-0,25****	**-0,24****	0,00	0,23*	0,13	-0,11
PANEL	0,04	**-0,21*****	**-0,30*****	**-0,16*****	0,14***	0,32***	0,39***	0,33***	0,18***	-0,03	**-0,16*****	**-0,24*****	**-0,25*****	**-0,06****	0,21***	0,18***	-0,02

Note: * (respectively **, ***) means the rejection of the null hypothesis at the 10 % level (respectively 5 %, 1 %). In bold, when the evolutions of both variables are countercyclical.

Cross-correlation coefficients between new-firm startups and unemployment rate show that the unemployment rate leads procyclically new firms startups for delays from 1 to 4 quarters. When the unemployment rate increases, the opportunity cost of setting up a firm decreases which favors the new-firm startups. Let us remind you that in the French case a large number of new-firm startups are set-up by unemployed and particularly short-term -less than a year- unemployed individuals (approximately 20 % according to Sine[28]). 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. 2008). This sequence illustrates the *«refugee» effect*. At the horizon of 6 to 10 quarters an increase of the unemployment rate is translated in a decrease in new firms startups. All the individuals who want to avoid the depreciation of their human capital have already set-up their firms.

These results obtained at the national level are confirmed at the regional level. The quasi totality of the regions incurs the *«refugee» effect* except for the Corse region. We can also notice a weaker effect for Languedoc-Roussillon and PACA. Finally these regions that are the most attractive in France show a high unemployment rate due partially to internal migration. In some cases the migration of a whole family of active people responds to the possibility to obtain a job by a member of the family that leads to the setting-up of a firm by the second member of this family that has lost its previous job by migration (Thireau 1993). So the *«refugee» effect* may be not as clear as unemployment partially combines opportunity of jobs for a member of the family that leads to research of employ for the second member of the family and finally new firm formation because of the displacement. Let us note that in the regions Poitou-Charentes, Languedoc-Roussillon, Provence-Alpes-Côte d'Azur the countercyclical effect is particularly strong with delays from 8 to 12 quarters for Poitou-Charentes to 6 to 10 quarters for the two last regions.

We also notice that creations lead countercyclically the unemployment rate with delays from 2 to 6 quarters. An increase in the entrepreneurial activity will itself lead to a reduction in the unemployment. It is an illustration of the *Schumpeter effect*. This effect is displayed principally in four regions: Franche-Comté, Pays de la Loire, Alsace and Rhône-Alpes. These regions are industrialized regions with a relatively low level of unemployment and for the region Pays de la Loire a strong entrepreneurial culture (Bonnet 1997), for the region Alsace a high duration of new firms (Bonneau and Thirion 1997), for the region Rhône-Alpes a strong specialization in new technologies. However in the longer term (8 to 10 quarters), an increase in new firms startups leads to an increase in the unemployment rate which can be interpreted by the fact that some new companies are going to disappear. Let us note that the results are contrasted at the regional level; only 4 regions show significant correlations (Languedoc-Roussillon, Midi-Pyrénées, Pays de la Loire, Provence-Alpes-Côte d'Azur)[29].

[28] French information system on new companies.

[29] Cyclical correlations between unemployment rates and GDP are reported in Table A in appendix. We notice that a decrease in GDP is followed by an immediate increase in the unemployment rate which continues during 6 quarters and leads to a decrease in the unemployment rate with delays from 10 to 12 quarters. Furthermore, the unemployment rate leads countercyclically GDP during two quarters before being at the origin of a reversal of the business cycle with a delay of 4 quarters.

5. Long run analysis

The study of the cointegration makes it possible to highlight stable long-run relations between non-stationary series. The series being all integrated of order 1, the existence of a long-run relation between them can be considered. To apprehend the long-run relations between new firms startups and GDP on one hand and between new firms startups and unemployment rate on the other hand, we implement cointegration tests both on regional time series data and on panel data.

5.1 Regional time series cointegration tests

We use the approach of Engle and Granger (1987) to determine if series are cointegrated[30]. The results are presented in table 7. We consider the two standard ADF statistics, one based on the t-statistic for testing the null hypothesis of non stationarity (called tau-ststistic) and the other one based directly on the normalized autocorrelation coefficient (called z-statistic) for residuals obtained by using every variable as dependent variable in a long-run relation between two variables in level. We notice that the results are similar for both tests. The null hypothesis of no cointegration between new firms startups and the GDP is systematically accepted at the 5 % level. So no relation of cointegration was able to be established between new firms startups and GDP whatever the analyzed region. On the other hand, we observe that for three regions: Île-de-France, Franche-Comté and Lorraine, there is a cointegration relationship between new firms startups and unemployment rate. It demonstrates that new firms startups and unemployment rate are bound in the long run in these three territories. In Franche-Comté and Lorraine; an increase in the unemployment rate tends to generate on the long term an increase in new firms start-ups. In these two industrialized regions, restructurations of large plants have been common for thirty years now. The size of the establishments is rather high which supports the idea that regions that have not already restructured away from large manufacturing have a lower startup rate that those regions that have (Zoltan J. Acs 2006, p.123); partially because the entrepreneurial culture is not widespread. In that case most of the new firms startups are necessity motives driven and reflect the problem of reconversion of industrialized regions. For the region Île-de-France an increase in new firms startups leads a decrease in unemployment rate; in the most developed region of France we find that the *Schumpeter effect* plays its role which highlights the positive effect of the entrepreneurial society replacing the managerial economy[31]. These results are in line with those of Congregado et *al.* (2011) who show that the business cycle may have important effects on real economy, by impacting on the future trajectory of entrepreneurship activity.

[30] The long-run relation is estimated by the Ordinary Least Squares. The OLS estimator is then asymptotically super convergent. So for two cointegrated series, it is necessary that the estimated residuals of the long-term relationship are stationary. The stationary of residuals is tested by means of the Dickey-Fuller test.

[31] Results concerning cointegration relationships can be obtained from authors upon request.

Table 7 : Tests of cointegration by region

	Dependent:	LNFST	Dependent:	LGDP	Dependent:	LNFST	Dependent:	LUNEMP
	tau-stat	z-stat	tau-stat	z-stat	tau-stat	z-stat	tau-stat	z-stat
Alsace	-0,81	-1,81	-0,84	-1,86	-2,04	-9,41	-2,02	-9,49
	(-0,77)	(-0,78)	(-0,77)	(-0,78)	(0,22)	(0,18)	(0,23)	(0,18)
Aquitaine	-0,59	-1,40	-0,61	-1,44	-1,54	-4,35	-1,59	-4,54
	(-0,84)	(-0,82)	(-0,83)	(-0,82)	(0,45)	(0,52)	(0,42)	(0,50)
Auvergne	-0,99	-2,81	-1,01	-2,86	-1,60	-4,90	-1,68	-5,16
	(-0,70)	(-0,68)	(-0,70)	(-0,67)	(0,41)	(0,47)	(0,38)	(0,45)
Basse-Normandie	-0,68	-1,60	-0,71	-1,65	-1,91	-7,30	-1,97	-7,57
	(-0,81)	(-0,80)	(-0,81)	(-0,80)	(0,28)	(0,29)	(0,25)	(0,27)
Bourgogne	-0,27	-0,52	-0,30	-0,57	-1,86	-6,34	-1,93	-6,63
	(-0,90)	(-0,90)	(-0,90)	(0,90)	(0,30)	(0,35)	(0,27)	(0,33)
Bretagne	-0,53	-1,12	-0,55	-1,17	-1,70	-5,28	-1,77	-5,55
	(-0,85)	(-0,85)	(-0,85)	(-0,85)	(0,37)	(0,43)	(0,33)	(0,41)
Centre	-0,16	-0,31	-0,18	-0,36	-2,08	-8,04	-2,14	-8,36
	(-0,92)	(-0,92)	(-0,91)	(-0,91)	(0,21)	(0,25)	(0,19)	(0,23)
Champagne-Ardenne	-0,83	-2,02	-0,85	-2,07	-1,98	-7,81	-2,01	-7,97
	(-0,77)	(-0,76)	(-0,76)	(-0,76)	(0,25)	(0,26)	(0,23)	(0,25)
Corse	-0,04	-0,08	-0,08	-0,15	-0,31	-0,41	-0,49	-0,65
	(-0,93)	(-0,93)	(-0,93)	(-0,93)	(0,89)	(0,91)	(0,86)	(0,89)
Franche-Comté	-1,01	-2,66	-1,03	-2,73	**-2,75**	**-15,32**	**-2,78**	**-15,65**
	(-0,70)	(-0,69)	(-0,69)	(-0,69)	**(0,06)**	**(0,04)**	**(0,05)**	**(0,04)**
Haute-Normandie	-0,58	-1,36	-0,60	-1,41	-1,53	-4,56	-1,59	-4,80
	(-0,84)	(-0,83)	(-0,84)	(-0,82)	(0,45)	(0,50)	(0,42)	(0,48)
Île de France	-0,48	-1,24	-0,50	-1,27	**-2,89**	**-19,01**	**-2,98**	**-19,73**
	(-0,86)	(-0,84)	(-0,86)	(-0,84)	**(0,04)**	**(0,02)**	**(0,03)**	**(0,01)**
Languedoc-Roussillon	-0,68	-1,68	-0,70	-1,73	-1,48	-4,54	-1,53	-4,72
	(-0,82)	(-0,80)	(-0,81)	(-0,79)	(0,47)	(0,50)	(0,45)	(0,48)
Limousin	-1,07	-2,89	-1,09	-2,95	-1,77	-6,43	-1,79	-6,56
	(-0,67)	(-0,67)	(-0,66)	(-0,66)	(0,33)	(0,35)	(0,32)	(0,34)
Lorraine	-0,69	-1,55	-0,72	-1,62	**-2,72**	**-15,61**	**-2,73**	**-15,77**
	(-0,81)	(-0,81)	(-0,80)	(-0,80)	**(0,06)**	**(0,04)**	**(0,06)**	**(0,04)**
Midi-Pyrénées	-0,44	-0,81	-0,47	-0,87	-1,56	-4,85	-1,59	-4,95
	(-0,87)	(-0,88)	(-0,87)	(-0,87)	(0,43)	(0,47)	(0,42)	(0,46)
Nord-Pas-de-Calais	0,36	0,66	0,32	0,58	-1,49	-4,46	-1,56	-4,71
	(-0,96)	(-0,97)	(-0,96)	(-0,96)	(0,47)	(0,51)	(0,43)	(0,49)
Poitou-Charentes	-0,77	-1,91	-0,79	-1,98	-1,46	-3,93	-1,55	-4,20
	(-0,79)	(-0,77)	(-0,78)	(-0,77)	(0,48)	(0,56)	(0,44)	(0,53)
Picardie	-0,18	-0,39	-0,21	-0,45	-2,13	-9,65	-2,13	-9,73
	(-0,91)	(-0,91)	(-0,91)	(-0,91)	(0,19)	(0,17)	(0,19)	(0,17)
Pays de la Loire	-0,65	-1,45	-0,68	-1,51	-1,84	-5,54	-1,98	-6,02
	(-0,82)	(-0,82)	(-0,82)	(-0,81)	(0,30)	(0,41)	(0,25)	(0,38)
PACA	-0,56	-1,32	-0,57	-1,35	-1,19	-2,64	-1,31	-2,94
	(-0,85)	(-0,83)	(-0,84)	(-0,83)	(0,62)	(0,69)	(0,56)	(0,66)
Rhône-Alpes	0,05	0,08	0,02	0,03	-1,99	-6,44	-2,13	-6,95
	(-0,94)	(-0,94)	(-0,94)	(-0,94)	(0,24)	(0,34)	(0,19)	(0,31)

Note: p-values are given in parentheses. In bold when the null hypothesis of no cointegration is rejected at a 10 % level, using MacKinnon (1991) tables.. These results were obtained with no constant and no trend.

5.2 Panel cointegration tests

To complete the analysis, we implement panel cointegration tests. We consider the tests proposed by Pedroni (1999; 2004) and Kao (1999). 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[32].

The results of the cointegration tests are presented in table 8. No relation of cointegration was able to be established between new firms startups and GDP and this whatever the test used. Concerning the relationship between new firms startups and unemployment rate, results are mixed: 5 tests on 8 bring us to reject the null hypothesis of no cointegration. If we give more importance to the tests allowing for heterogeneity, we notice that 2 tests out of 3 lead to accept the cointegration hypothesis. The results in panel data confirm the analysis led on regional time series data. They are particularly interesting because it means that new firms startups and unemployment rate are bound in the long term and it shows that entrepreneurship activity would have a significant impact on the future trajectory of employment. An increase of the unemployment rate has a positive effect on new firms startups. This denotes that in France new firms startups are mainly driven by necessity motives.

Table 8 : Panel cointegration tests

	Pedroni							Kao
	Pooled cointegration tests				Group mean cointegration tests			
	v-stat	rho-stat	PP-stat	ADF-stat	rho-stat	PP-stat	ADF-stat	t-stat
LNFST/LGDP	0,63	0,84	0,70	0,74	4,50	2,98	3,05	-1,07
	(0,26)	(0,80)	(0,76)	(0,77)	(0,99)	(0,99)	(0,99)	(0,14)
LNFST/LUNEMP	-3,31	-4,76	-3,64	-4,03	-0,90	-3,02	-3,58	-0,95
	(0,99)	(0,00)	(0,00)	(0,00)	(0,18)	(0,00)	(0,00)	(0,17)

Note: p-values are given in parentheses.

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 startups begin without any salaried people (except the owner-manager) and there is a lack of high growth new firms[33] because many firms are launched with the sole purpose of creating ones own job and limited capabilities for growth. We have seen that the «refugee» effect is dominant. In the French case particularly, research has shown that there are disincentives within the labor market for well qualified individuals to

[32] The seven tests proposed by Pedroni are based on the null hypothesis of no cointegration. 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.

[33] There is no universally accepted definition of what constitutes a high-growth firm. One of the definition of the high-growth firm is that of firms, generally recent, that employ at least 20 employees and for which staff expenditure other than those relating to executives increased by at least 15% in respect of each of the two previous years. In 2004, the estimation of the new gazelles in UK is 4500 firms per year while in France it is only 3000 firms (Zimmern 2005). Moreover the job figures show that the French gazelles produced 35,000 jobs at the date of creation while 80,000 jobs were created in UK and the gap will grow within 2 to 7 years. The French gazelles will develop very shortly, until approximately 50,000 jobs after seven years, while the English go to reach 150,000 thanks to a 2 to 4 times higher money supply in their social capital.

commit their human capital to entrepreneurship (Bonnet and Cussy 2010). Moreover, 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.

6. Conclusion

Although entrepreneurship activity is becoming an essential vehicle for growth and employment, few studies have focused on the link which can exist between the business cycle and the entrepreneurial cycle in a dynamic framework. The present paper investigates relationships between GDP, the unemployment rate and new firm startups both in the short-run and in the long-run with 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 non-stationary panel data allows us to analyze both short-term and long-term relationships between business cycle and entrepreneurship.

Our empirical results highlight many interactions between entrepreneurship, economic growth and employment. At the national level, GDP fluctuations are an early indicator of new firm startups but this effect disappears at the regional level. In the long term, no relationship between GDP and entrepreneurship could be established. These results can be explained by the use of an aggregate indicator of activities, the national GDP, which imperfectly reflects regional specificities in terms of dynamics of the levels of activity. However, they are consistent with those obtained by Congregado et *al*. (2011) and Thurik et *al.* (2008). We find that unemployment rates and new firms startups are closely linked and so in the short-run as in the long-run and 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 the entrepreneurial activity leads an increase in GDP during four quarters and 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 two years some companies do not survive and thus we again observe an increase in unemployment and a reduction in GDP, producing an increase in the new firms startups. The results obtained at the national level are confirmed at the regional level, but the *«refugee» effect* seems to be dominant at this level[34]. However differences appear between regions. A long-run relationship between new firm startups and unemployment rate is established at the national level, but prevails only for three regions. In a

[34] Specific trajectories of regional development also exist, in which new firms startups do not have the same effects or do not answer the same determiners, for complex reasons of specialization and attractiveness but also maybe regional functioning of the labor market, entrepreneurial culture -different attitudes with regard to entrepreneurship (fear of failure, perception of the opportunities of creation, faith in one's own entrepreneurial capacities (Bosma and Schutjens 2011)-, different local financial constraints, (Michelacci and Silva 2007; Bonnet, Cieply, and Dejardin 2005). The long persistence of regional entrepreneurial culture has been proven in Germany (Fritsch and Wyrwich 2012).

future research a promising issue would be to investigate the regional specific trajectories in more details by enriching the data base and taking into account industry specific elements, or resorting to a typology of the regional development by grouping similar regions.

The link between labor market rigidities and self-employment has already been discussed in the literature that focuses on the macroeconomic interactions between entrepreneurship and unemployment. For instance, Thurik et *al*. (2008) find that the *Schumpeter effect* whereby more entrepreneurship today reduces unemployment tomorrow is much stronger than the *«refugee» effect* corresponding to a higher entrepreneurial activity during periods with high unemployment. Nevertheless "It is obvious that the rate of new venture formation is country-specific since for example entrepreneurial traits may be culture-dependent (Mueller and Thomas, 2001) and (Shane, Kolvereid, and Westhead 1991)" in (Thurik et *al*., 2008). For Baumol (1968; 1990; 2004) human creativity and productive entrepreneurship are needed to combine the inputs in profitable ways and constitute then the final determinant of economic growth. So it is necessary to encourage creative entrepreneurship that will promote social wealth creation. Several explanations in France may be put forward as to the factors detering *pull motives*, that is to say the setting-up of innovative companies. A low involvement of French elites in innovative entrepreneurial activity may be pointed out among them. This low involvement exists because their human capital gets better valorization within a smooth and unrisky carrer path (within which their graduate titles and alumni networks come into play). The network and signal effects of the fame of the "Grandes Ecoles" create a privileged position through a lack of competition that Ribeill (1984) describes as follows: "The entrepreneurial propensity of engineers is inversely proportional to the fame of the schools they graduated from". Then the *«refugee» effect* is predominant because the functioning of the labor market enhances push motives but mainly discourage pull motives (Bhattacharjee et al. 2008). 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 that are able to know a high level of growth. In a future research we would like to make an international comparison by focusing at country-specific effects in order to better explain the existence of rather a *«refugee»* or a *Schumpeter effect*.

Annexes

Table A: Cyclic correlations between unemployment rates and GDP

($\rho(x_t, y_{t+j})$; j = -12, -10, -8, -6, -4, -3, -1, 0, 1, 2, 3, 4, 6,8 10,12 avec x_t = UNEMP)

j	-12	-10	-8	-6	-4	-3	-2	-1	0	1	2	3	4	6	8	10	12
Alsace	0,33***	0,22*	0,01	**-0,33*** **	**-0,66*** **	**-0,80*** **	**-0,84*** **	**-0,81*** **	**-0,70*** **	**-0,48*** **	**-0,21***	0,04	0,27**	0,52***	0,53***	0,42***	0,33***
Aquitaine	0,30***	0,11	-0,13	**-0,42*** **	**-0,70*** **	**-0,80*** **	**-0,83*** **	**-0,79*** **	**-0,67*** **	**-0,46*** **	**-0,19***	0,06	0,30***	0,60***	0,63***	0,51***	0,36***
Auvergne	0,23*	0,14	-0,01	**-0,27****	**-0,56*** **	**-0,70*** **	**-0,76*** **	**-0,73*** **	**-0,62*** **	**-0,41*** **	-0,13	0,11	0,35***	0,58***	0,50***	0,34***	0,23*
Basse-Normandie	0,30***	0,17	-0,01	**-0,29*** **	**-0,62*** **	**-0,76*** **	**-0,81*** **	**-0,80*** **	**-0,72*** **	**-0,51*** **	**-0,25****	0,01	0,25**	0,55***	0,55***	0,43***	0,33***
Bourgogne	0,32***	0,20	0,01	**-0,29*** **	**-0,63*** **	**-0,77*** **	**-0,82*** **	**-0,80*** **	**-0,70*** **	**-0,48*** **	**-0,21***	0,04	0,26**	0,51***	0,51***	0,40***	0,32***
Bretagne	0,32***	0,20	-0,02	**-0,31*** **	**-0,64*** **	**-0,77*** **	**-0,82*** **	**-0,79*** **	**-0,68*** **	**-0,47*** **	**-0,21***	0,03	0,26**	0,51***	0,51***	0,40***	0,31***
Centre	0,34***	0,20	0,00	**-0,31*** **	**-0,65*** **	**-0,79*** **	**-0,84*** **	**-0,82*** **	**-0,74*** **	**-0,53*** **	**-0,27****	-0,02	0,21*	0,51***	0,55***	0,47***	0,39***
Champagne-Ardenne	0,23*	0,11	-0,03	**-0,27****	**-0,55*** **	**-0,70*** **	**-0,78*** **	**-0,78*** **	**-0,71*** **	**-0,52*** **	**-0,26****	0,01	0,25**	0,54***	0,54***	0,42***	0,31***
Corse	0,13	-0,13	**-0,34*** **	**-0,57*** **	**-0,67*** **	**-0,68*** **	**-0,65*** **	**-0,54*** **	**-0,38*** **	-0,17	0,07	0,28**	0,46***	0,66***	0,60***	0,45***	0,25**
Franche-Comté	0,29**	0,26**	0,15	-0,16	**-0,55*** **	**-0,73*** **	**-0,82*** **	**-0,81*** **	**-0,72*** **	**-0,52*** **	**-0,26****	0,00	0,23*	0,49***	0,51***	0,38***	0,29**
Haute-Normandie	0,27**	0,14	-0,04	**-0,33*** **	**-0,64*** **	**-0,77*** **	**-0,81*** **	**-0,79*** **	**-0,70*** **	**-0,48*** **	-0,21	0,05	0,28**	0,56***	0,57***	0,44***	0,33***
Ile de France	0,37***	0,16	-0,12	**-0,45*** **	**-0,72*** **	**-0,81*** **	**-0,83*** **	**-0,78*** **	**-0,66*** **	**-0,45*** **	-0,23	-0,01	0,19*	0,44***	0,51***	0,50***	0,46***
Languedoc-Roussillon	0,16	0,01	-0,18	**-0,41*** **	**-0,66*** **	**-0,75*** **	**-0,75*** **	**-0,69*** **	**-0,55*** **	**-0,31*** **	-0,03	0,21*	0,43***	0,67***	0,61***	0,42***	0,23*
Limousin	0,25**	0,10	-0,11	**-0,37*** **	**-0,65*** **	**-0,76*** **	**-0,79*** **	**-0,75*** **	**-0,64*** **	**-0,41*** **	-0,14	0,11	0,34***	0,61***	0,59***	0,46***	0,32***
Lorraine	0,29**	0,20	0,02	**-0,31*** **	**-0,64*** **	**-0,77*** **	**-0,83*** **	**-0,80*** **	**-0,68*** **	**-0,47*** **	**-0,19***	0,07	0,30***	0,57***	0,56***	0,42***	0,30***
Midi-Pyrénées	0,22*	0,06	-0,16	**-0,45*** **	**-0,70*** **	**-0,79*** **	**-0,78*** **	**-0,69*** **	**-0,54*** **	**-0,29****	0,00	0,25**	0,48***	0,70***	0,60***	0,38***	0,20*
Nord-Pas-de-Calais	0,18	0,05	-0,13	**-0,37*** **	**-0,63*** **	**-0,74*** **	**-0,74*** **	**-0,68*** **	**-0,57*** **	**-0,34*** **	-0,05	0,21*	0,42***	0,65***	0,58***	0,39***	0,22*
Pays de la Loire	0,35***	0,26**	0,08	**-0,24****	**-0,61*** **	**-0,77*** **	**-0,83*** **	**-0,82*** **	**-0,73*** **	**-0,53*** **	**-0,26****	0,00	0,23*	0,49***	0,50***	0,39***	0,31***
Picardie	0,26**	0,15	-0,02	**-0,31*** **	**-0,62*** **	**-0,76*** **	**-0,80*** **	**-0,75*** **	**-0,65*** **	**-0,42*** **	-0,14	0,13	0,35***	0,60***	0,56***	0,40***	0,25**
Poitou-Charentes (PC)	0,24**	0,13	-0,05	**-0,32*** **	**-0,63*** **	**-0,75*** **	**-0,79*** **	**-0,76*** **	**-0,64*** **	**-0,41*** **	-0,12	0,13	0,37***	0,63***	0,57***	0,41***	0,24**
PACA	0,15	-0,05	**-0,27****	**-0,51*** **	**-0,69*** **	**-0,75*** **	**-0,73*** **	**-0,63*** **	**-0,47*** **	**-0,22***	0,06	0,30***	0,51***	0,69***	0,58***	0,39***	0,22*
Rhône-Alpes	0,30***	0,21*	0,07	**-0,21***	**-0,56*** **	**-0,72*** **	**-0,79*** **	**-0,80*** **	**-0,72*** **	**-0,52*** **	**-0,28****	-0,03	0,19	0,45***	0,47***	0,40***	0,34***
PANEL	0,33***	0,24***	0,04	**-0,31*** **	**-0,65*** **	**-0,80*** **	**-0,83*** **	**-0,80*** **	**-0,70*** **	**-0,48*** **	**-0,21*****	0,04	0,27***	0,53***	0,54***	0,44**	0,33***

Note: * (respectively **, ***) means the rejection of the null hypothesis at the 10 % level (respectively 5 %, 1 %). In bold, when the evolutions of both variables are countercyclical.

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Annex 1: The encouragement of the setting-up of innovative companies in France

The 12 July 1999 law on innovation and research aims at making it easier for researchers to get their research results into a stage of industrial development. The other accompaniment measures are the innovative technologies firms contests, public incubators setting up, the April 2003 innovation plan for young innovative firms. The status of young innovative firm created by the 2004 finance law and implemented by the 21 June 2004 decree gives SMEs which make development-research expenses representing at least 15 per cent of their costs some advantages making it very attractive :

- a tax exemption for profit and yearly fixed tax,

- a tax exemption for the surplus values of securities transfer for the associates of the firm,

- an employer's social security contribution on wages paid to the salaried employees taking part in research relief.

In total, by the end of 2010, 4.400 firms had benefited from 724 millions euros of exemption for social charges and 74 millions euros of tax exemption. After some advantages were revised downwards in 2011, the 2012 finance law brings to the young innovative firm some favourable corrections.

Introducing the status of young university firm (JEU) from January 2008 onwards aims at favoring entrepreneurship by students or any other person taking part in research works of higher education institutions. It is about extending the status of young innovative firm, and its advantages, to young university firms.

-The CIR (Crédit d'impôt-recherche) is a French tax credit which aims at supporting the efforts of research and development of companies. Representing less than 500 million annual euros in 2003, it has quickly increased, since the lifting of its ceiling, to more than 4 billion euro in 2008 to reach 5.8 billions of euros in 2010. Even though SMEs accounts for 78 % of the firms getting the CIR, in total amount the major part of the CIR is rather awarded to the large-size companies which already made expenses of R*D before the reform. The real incentive of the CIR has thus been questionned, as well as its effects on the French scientific employment. The 2011 finance law marked a temporary and limited step back since during the cabinet meeting held on september 2012 the 12th, the government signalled it wished to enlarge the scope of expenses qualifying for CIR for SME with less than 250 employees, which could take into account innovation, prototypes and design.

-"Gazelles" can benefit from tax cut. Gazelles are companies that meet the Community definition of SMEs, subject to company tax, employing at least 20 employees in the year for which the tax reduction is calculated, and with staff expenditure, with the exception of those relating to executives, which rose at least 15% in respect of each of two previous years.