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Dear reviewer 1 of *The Journal of International Entrepreneurship*,

First we would like to thank the reviewer for his(her) comments and suggestions. They have been taken into account in the revised version of our work. We reviewed the paper carefully along the lines suggested.

In the introduction, the presentation of the "level of development" has been partially rewritten to insure better understanding.

The introduction of the section 2 (p.5) has been revised and reduced to be more concise and we added a paragraph presenting general overview of the subsequent sub-sections.

A paragraph has been added at the end of the sections 2.1 and 2.2 to summarize and conclude about institutional and development factors influencing entrepreneurship activity (p. 6).

To strengthen brevity and clarity of the sections 3 and 4, we merge the first dendrogram with the table which presents Profile and Antiprofile of the three periods (p. 14). We removed the 3 other dendrograms of the text to present them in appendix. We also marginally modified the presentation of the classes and we removed a few comments.

To accentuate the theoretical contributions of the conceptual model, we explicitly establish links between our findings and the different paths of development proposed by conceptual model in the sub-section 4.1. Furthermore, in conclusion we emphasized the adequacy of our theoretical models to represent development patterns of the OECD countries over the period 1999-2008.

In the sub-section 2.3, we provided example for each type of development (B, C, D and F) (pp. 10-11).

Finally, as suggested, we modified the name of the class 3 in sub-section 4.2 (figure A3 in appendix previously figure 6) and of the class 1 in sub-section 4.3 (figure A4 in appendix, previously figure 7) to make reference to the financial crisis.

We would like to thank you for your relevant comments which were very useful for improving the article.

Yours faithfully

The authors

***Entrepreneurship, Economic Development and Institutional
Environment: Evidence from OECD countries***

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Entrepreneurship, Economic Development and Institutional Environment: Evidence from OECD countries

Abstract:

The purpose of this article is to establish a typology of entrepreneurship for OECD countries over the 1999-2012 period. Our aim is to draw a distinction between managerial and entrepreneurial economies, to identify groups of countries with similar economic and entrepreneurial activity variables, and to determine the economic and institutional drivers of entrepreneurial activities in each group. We show that the level of development, sectoral specialization, and institutional variables related to entrepreneurship, functioning of the labor market and openness of the country are decisive to understand differences in entrepreneurship activity across countries. Results show that the pre-crisis period, from 1999 to 2008, is a period of growth favorable to entrepreneurship. The financial crisis involved a break in entrepreneurial dynamism, with agricultural economies withstanding the financial crisis better. The 2010-2012 period of recovery is a period of a sharp slowdown in entrepreneurial activity, during which the countries that are less dependent on the financial sector proved to be the most resilient in terms of entrepreneurial activity. Nevertheless, it is the advanced knowledge economies with developed financial markets, fewer institutional regulatory constraints, and greater scope for qualitative entrepreneurship that show lower unemployment rates. These findings have important implications for the implementation of public policy in order to promote entrepreneurial activity and reduce unemployment.

Résumé :

L'objectif de cet article est d'élaborer une typologie des activités entrepreneuriales des pays de l'OCDE durant la période 1999-2012. Notre intention est d'établir une distinction entre les économies managériales et entrepreneuriales, d'identifier des groupes de pays ayant des comportements économiques et entrepreneuriaux similaires et d'identifier les déterminants économiques et institutionnels des activités entrepreneuriales dans chaque groupe. Nous montrons que le niveau de développement, la spécialisation sectorielle ainsi que les variables institutionnelles liées à l'entrepreneuriat, au fonctionnement du marché du travail et à l'ouverture du pays sont déterminants pour appréhender les différences nationales en matière d'activité entrepreneuriale. Les résultats

1 montrent que la période antérieure à la crise, 1999-2008, est une période de croissance
2 favorable à l'entrepreneuriat. La crise financière a provoqué une rupture du dynamisme
3 entrepreneurial ; ce sont les économies agricoles qui ont le mieux résisté à la crise
4 financière. La période de reprise 2010-2012 est une période de fort ralentissement de
5 l'activité entrepreneuriale, durant laquelle les économies dépendant largement du secteur
6 financier sont les plus affectées par la crise en terme d'activité entrepreneuriale.
7 Néanmoins ce sont les économies avancées de la connaissance caractérisées par des
8 marchés financiers développés, peu de contraintes institutionnelles de régulation et un
9 entrepreneuriat de qualité qui affichent les taux de chômage les plus faibles. Ces résultats
10 ont des implications importantes pour la mise en œuvre des politiques publiques visant à
11 promouvoir l'entrepreneuriat et à réduire le chômage.
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15 **Keywords :**

16 Entrepreneurship, Data analysis methods, Entrepreneurial/Managerial economies
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19 JEL codes : L26, C38, O1
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1. Introduction

Audretsch and Thurik (2000, 2001) and Thurik (2011) distinguish two broad analytical models of national economies according to which stylized economic 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, as well as novelty, turbulence, innovation and networking, allowing the full play of entrepreneurial flexibility. The entrepreneur thus becomes an essential vector of growth. Entrepreneurial firms (young and innovative firms) are an integral part of the transition process from an industrial-based economy to an entrepreneurial-based economy, and have been the engine of economic growth for over a decade (Bonnet et al., 2010). Many of the new entrepreneurial firms are the creators and leaders of new industries. Most job-creating firms are new and fast-growing, and evidence indicates that the trend toward an entrepreneurial society is accelerating. Aghion (2014) points out that innovation involves a creation/destruction process much like the one embodied in the Schumpeterian entrepreneur, and that some countries are better able to “surf” on new waves of innovation such as information technology and communication, “cloud computing” and renewable energy. In most countries the real contribution of entrepreneurship to economic development is emphasized by the observation that “Entrepreneurship is considered to be an important mechanism for economic development through employment, innovation and welfare effects” (Acs and Amoros, 2008, p. 121). Entrepreneurial activity varies greatly from one country to another over time. Economic development and the institutional environment are major factors that can drive and shape entrepreneurial activity. When one wishes to analyze entrepreneurship from a perspective of international comparisons between countries, one must take into account that countries differ both in their level of development and their regulation of the economy.

The level of development explains why the level of entrepreneurial activity is different among countries. The weight of the primary sector and the functioning of the informal economy explain the high rate of entrepreneurial activity in developing countries. GEM¹ studies gather countries according to their main engine for growth: factor-driven economies for the less developed ones, efficiency-driven economies for the medium class and innovation-driven economies for the more developed ones. Observations, collected by the Global Entrepreneurship Monitor consortium, have been translated into an U-shaped curve linking countries’ GDP per capita and rate of entrepreneurial activity (Carree et al., 2007). “Total Early stage Entrepreneurial Activity rates² (TEA) tend to be highest in the factor-driven group, decreasing with higher levels of economic development” (GEM 2015-2016, p. 18). As noticed by Lucas (1978), with the development of and increase in wage opportunities (i.e. the level of the actual wage increases), a diminution of entrepreneurial activity is observed. Nevertheless, according to Naudé (2010), entrepreneurship remains essential for structural change, contributing to the transformation of agricultural economies into knowledge and service economies.

¹ “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>

² The Total Early-stage Entrepreneurial Activity rate (TEA) is defined as the percentage of individuals aged 18-64 who are either actively involved in creating a business or running a business for less than 42 months.

1 Based on institutional theory -the view that institutions drive the behavior of firms
2 and individuals (North, 1990, Scott, 1995)- a number of studies have highlighted the
3 importance of the institutional environment to explain differences in entrepreneurial
4 activity between countries. Indeed, institutional factors such as national culture (Mueller
5 and Thomas, 2000, Mitchell et al., 2002) and government regulation (Storey, 1991,
6 Verheul and Van Stel, 2007, Acs et al., 2014) can promote or deter entrepreneurship in a
7 society. Institutions regulate the behavior of both firms and individuals in an institutional
8 setting, and provide an environment in which they can operate. Thus, the regulatory
9 framework and economic policies not only create rules for organizations and individuals,
10 but also determine the difficulty of and incentives for starting a business (Bruton and
11 Ahlstrom, 2003, Valdez and Richardson, 2013).

12 The aim of this paper is to analyze entrepreneurial activity in OECD countries³ over
13 the period 1999-2012, in order to propose a typology of entrepreneurship within these
14 countries. Our intention is to draw a distinction between managerial and entrepreneurial
15 economies, to identify groups of countries with similar entrepreneurship behavior and to
16 determine the economic and institutional drivers of entrepreneurial activities in each group.
17 We postulate, according to the assumptions of Audretsch and Thurik (2000, 2001), that
18 entrepreneurial economies are more able to deal with a high rate of growth and a low rate
19 of unemployment, so we combine these variables with the level of development to build a
20 conceptual model of development. Then we test its relevance empirically. The approach
21 adopted rests on a combined use of multidimensional evolutive data analyses that take into
22 account the characteristics of the countries in terms of four variables: GDP growth,
23 unemployment rate, share of entrepreneurial activity and the growth of this share.
24 According to the similarity of these four variables, we can establish a classification of
25 OECD countries. Then we illustrate the different types of development with a set of
26 variables related to economic development and institutional environment, these latter
27 focusing on the regulatory framework.

28 Our study contributes to explaining the complex relationships between the level of
29 development, entrepreneurial dynamics, growth and unemployment. It differs from the
30 existing literature on several points. First, thanks to the length of the period being
31 considered and the original methods used, we are able to propose a dynamic analysis of
32 entrepreneurship. Moreover, as our data period ends in 2012, we can study the impact of
33 the financial crisis on entrepreneurial activity. Second, we consider a wide range of
34 variables characteristic of both economic development and institutional regulation to
35 consolidate and enrich our typology of OECD entrepreneurship.

36 Several important outcomes emerge from this study. First, the financial crisis
37 involved a break in entrepreneurial dynamism. The effects of the financial crisis are
38 noticeable in 2009, after a delay. Second, we provide evidence that the pre-crisis period,
39 from 1999 to 2008, was a period of growth favorable to entrepreneurship. Over this period,
40 we distinguish different kinds of entrepreneurial and managerial economies. Third, our

41 ³ The Organization for Economic Cooperation and Development (OECD) is an international economic
42 organization of 35 countries, founded in 1961 to stimulate economic progress and world trade. It is a forum
43 of countries committed to democracy and the market economy, providing a platform to compare policy
44 experiences, seek answers to common problems, identify good practices and coordinate domestic and
45 international policies of its members. The following listed countries belong to OECD (the 26 countries taken
46 into account in the study due to data availability are in bold): **Australia, Austria, Belgium, Canada, Chile,**
47 **Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland,**
48 **Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland,**
49 **Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United**
50 **States.**

1 results show that the variables representative of economic development, and in particular
2 those relating to development level and to sectoral specialization, are important to enrich
3 the typology. Moreover, the institutional variables linked to entrepreneurship, functioning
4 of the labor market and openness of the country also help to sharpen the description of the
5 classes. Finally, mainly because of the financial crisis, the entrepreneurial dynamics vary
6 greatly across countries over the 1999-2012 period. We are able to establish common
7 trajectories for a number of them.
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10 In the following section we present a brief review of the literature. In section 3, we
11 describe the data and highlight a break in the dynamics of entrepreneurship since the global
12 financial crisis. Section 4 presents typologies of regional development in OECD countries
13 over three periods: before, during and after the financial crisis. Section 5 concludes and
14 presents policy implications.
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16 **2. Literature review and conceptual model**

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18 Many macroeconomic and institutional causes can explain the differences in
19 entrepreneurial intensity between countries and areas. These all concern what W. J.
20 Baumol names in an important 1990 paper “*the rules of the game*”, i.e. the structure of
21 reward in the economy. He notes that certain societies have historically presented rather
22 unfavorable structures of reward in the development of entrepreneurship. These structures
23 have diverted the national or local elites from the exercise of the entrepreneurial function
24 and proved indirectly harmful to the diffusion of technical progress (ancient Rome with the
25 valorization of political office, medieval China with the Mandarin system, etc.). Although
26 small and new businesses have usually been important for economic vibrancy, employment
27 growth and wealth creation in almost all the world economies (Craig et al, 2003), one
28 might observe that certain differences may still be at work regarding the potentiality of
29 growth for new firms, and that these differences might amount to different “rules of the
30 game”. The level of development is also important as regards entrepreneurial intensity.
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33 This section provides a brief overview of relevant literature to explain differences in
34 entrepreneurship activity between countries. First, we present the literature related to
35 institutional environment. Second, we refer to the wide literature highlighting the link
36 between entrepreneurial activity and economic development. Finally, based on the
37 differences in development level and entrepreneurial activity, we propose a conceptual
38 model presenting different types of development.
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43 **2.1. Institutional environment**

44 For economic institutionalists, and following North (1990), “the relevant framework
45 is a set of political, social, and legal ground rules that fixes a basis for production,
46 exchange, and distribution in a system or society” (Bruton and Ahlstrom, 2003). Scott
47 (1995) distinguishes three institutional categories: regulatory, normative and cognitive.
48 North (1990) proposes to split institutions into formal and informal. The most formal
49 institutions are the regulatory institutions representing standards provided by laws and
50 other sanctions (Bruton and Ahlstrom, 2003). Normative institutions are less formal or
51 codified, and define the roles or actions that are expected of individuals. Cognitive
52 institutions relate more to the cultural, behavioral and role models shared in society.
53 Recent research (Acs et al., 2014) proposes a systemic approach to entrepreneurship via
54 the definition of different national systems of entrepreneurship: “A National System of
55 Entrepreneurship is the dynamic, institutionally embedded interaction between
56 entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the
57 allocation of resources through the creation and operation of new ventures”. Regarding
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1 entrepreneurship, the “rules of the game” include the development and the operation of the
2 financial system, the intensity of the administrative barriers, the legislation regulating labor
3 market relations, the fiscal rules, the social security system, legal consequences of the
4 failure of the firm, the entrepreneurial spirit and the collective perception of the failure of
5 the firm as well as the perception of success as an entrepreneur (Bonnet et al., 2011). A
6 number of recent studies have explored the impact of the institutional environment on
7 entrepreneurship activity, but they differ not only in the choice of the institutions they
8 focus on but also as regards which institutional variables seem to be the most salient ones.
9 Bosma and Schutjens (2011) point out the importance of institutional factors in explaining
10 variations in regional entrepreneurial attitude and activity. Considering different
11 components of entrepreneurial attitudes -i.e. fear of failure in starting a business,
12 perceptions of start-up opportunities, and self-assessment of personal capabilities to start a
13 firm- they argue that institutional conditions influence entrepreneurial behavior not directly
14 but indirectly, firstly by affecting entrepreneurial attitudes. Nissan et al. (2011) find that
15 “institutions affect economic growth, specifically formal institutions, such as procedures or
16 time needed to create a new business, indicating that regulation can influence the context
17 in which entrepreneurship affects economic growth”. Van Stel et al. (2007) examine the
18 relationship between regulation and entrepreneurship in 39 countries and show that a
19 minimum capital requirement for starting a business does seem to lower entrepreneurship
20 rates across countries, while administrative procedures such as time, cost or the number of
21 procedures needed to start a business do not. Using GEM aggregated survey data of
22 individuals at national level, Valdez and Richardson (2013) show that normative and
23 cultural-cognitive institutions are the main drivers of entrepreneurship. Simón-Moya et al.
24 (2014) suggest that both formal and informal institutions matter: countries with high levels
25 of economic freedom and education tend to have more opportunity entrepreneurship. Using
26 cross-sectional data on 42 countries over the 2000-2005 period, Sambharya and Musteen
27 (2014) show that market openness, regulatory quality (for example time and funds
28 consumed by complying with complex regulatory requirements to set up a firm) and some
29 elements of entrepreneurial culture (uncertainty avoidance, institutional collectivism and
30 power distance) explain the level of opportunity-versus necessity-driven entrepreneurial
31 activity. Their findings suggest that the impact of institutional factors varies depending on
32 the type of entrepreneurship activity. Aparicio et al. (2016) find that informal institutions,
33 namely control of corruption and confidence in one’s skills, have a higher impact on
34 opportunity-driven entrepreneurship than formal institutions such as number of procedures
35 to start a new business and private coverage needed to get credit.

36 The empirical literature strongly supports that the three institutional pillars
37 (regulatory, normative, cognitive) can be viewed as important drivers of entrepreneurial
38 activity and contribute to explaining both intensity (level and rate) and motives (necessity
39 or opportunity) of entrepreneurship, as well as the differences between countries. Yet while
40 all the institutional variables have proved to be relevant in understanding the determinants
41 of entrepreneurial activity, those related to regulatory institutions deserve particular
42 attention because they are likely to be controlled by policy makers in order to promote
43 entrepreneurship.

44 **2.2. Economic development**

45 GEM reports (2002, 2004, 2006, 2009, 2011, and 2013) highlight a high rate of
46 entrepreneurship in countries whose economic development is relatively low. The weight
47 of the primary sector and the functioning of the informal economy explain the high level of
48 entrepreneurial activity in developing countries. Nevertheless, there is also an impact of
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1 entrepreneurship on economic growth that depends on the nature of the entrepreneurial
2 activities, and especially on the motives for setting up a firm (opportunity- vs. necessity-
3 driven). According to Szerb et al. (2013, p. 22), “as an economy matures and its wealth
4 increases, the emphasis of industrial activity shifts towards an expanding services sector
5 [...]. The industrial sector evolves and experiences improvements in variety and
6 sophistication. Such a development would be typically associated with increasing research
7 and development and knowledge intensity, as knowledge-generating institutions in the
8 economy gain momentum. This change opens the way for development of entrepreneurial
9 activity with high aspirations.” Wennekers et al. (2010) argue “that the reemergence of
10 independent entrepreneurship is based on at least two ‘revolutions’”: the rise of solo self-
11 employment (Bögenhold and Fachinger, 2008, Bögenhold et al., 2017, Fachinger and
12 Frankus, 2017) which is important for societal and flexibility reasons, and the ambitious
13 and/or innovative entrepreneurs (Acs et al., 1999, Van Stel and Carree, 2004, Audretsch,
14 2007). Simón-Moya et al. (2014) argue that necessity-driven entrepreneurship plays a more
15 relevant role in countries whose economic development is relatively low and where
16 inequality prevails. Conversely, in more developed countries with relatively low income
17 inequality and low levels of unemployment, rates of entrepreneurial activity are
18 significantly lower, necessity-driven entrepreneurship is less prevalent, and opportunity-
19 driven entrepreneurship is dominant. According to Sambharya and Musteen (2014),
20 “opportunity-driven entrepreneurship often involves more intensive creative processes
21 while necessity entrepreneurship often relies on imitation of well-known business models”.
22 Both are necessary when considering emerging and developing countries. Yet in the case
23 of advanced economies, a high ratio of opportunity- to necessity-driven entrepreneurship is
24 recorded, reflecting a flexible economy more prone to enhance growth. According to Van
25 Stel et al. (2005), the Total Entrepreneurial Activity rate for the 1999-2003 period in 36
26 countries shows a positive and significant impact on economic growth. Nevertheless, this
27 impact must be differentiated according to the level of development and the development
28 process of the respective countries. It is less important in transition economies (for
29 example, in Hungary, Poland and Slovenia) and it may even have a negative impact on
30 economic growth in some developing countries (for example in Mexico). The absence of
31 large companies in these countries, as well as a low actual wage, may explain why people
32 tend to favor the choice to become an entrepreneur, as it is sometimes the only means to
33 earn a living.

41 It is well established that economic development and entrepreneurial activities are
42 closely linked and that less developed countries show a higher entrepreneurial activity.
43 Economic development modifies both the weight and nature of self-employment,
44 contributes to the growth of wage employment at the expense of self-employment and
45 leads to sectoral specialization towards a knowledge and service economy. The economy
46 moves towards qualitative entrepreneurship and fosters opportunity-driven
47 entrepreneurship. Therefore, in order to understand the differences in the intensity and
48 nature of entrepreneurial activity between countries, it is necessary to consider both the
49 variables relating to the level of development and the sectoral specialization of countries.

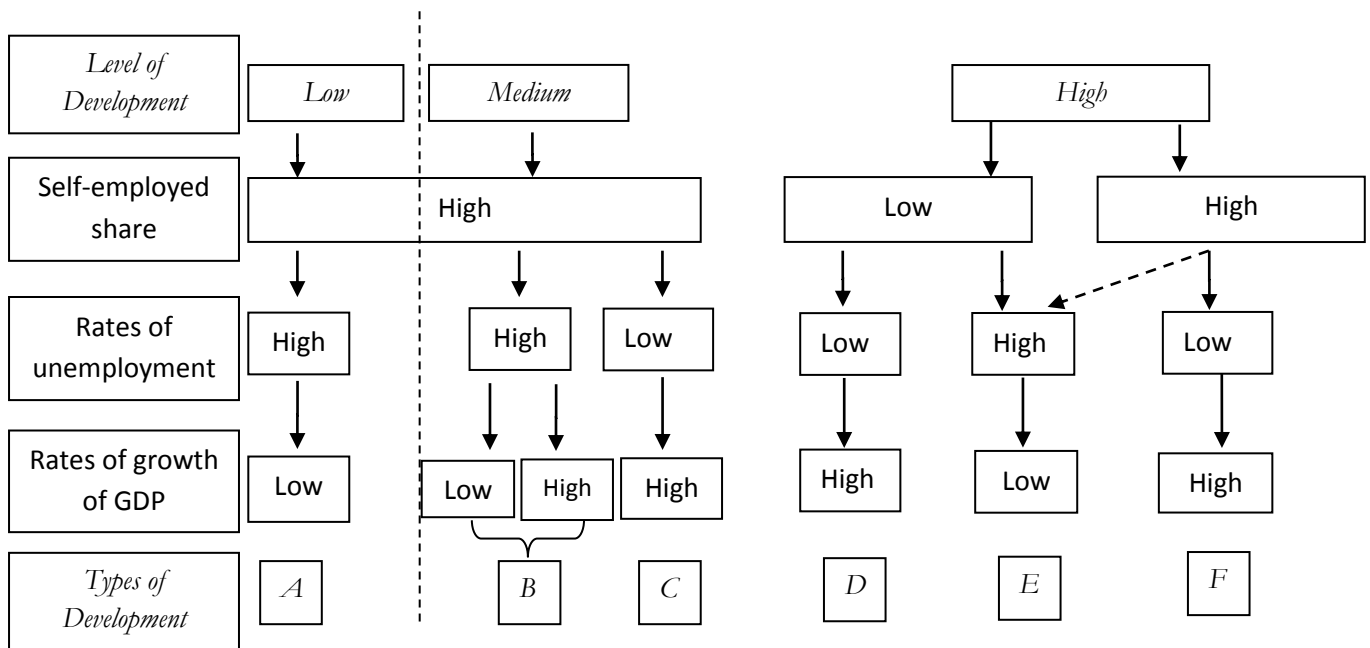
53 **2.3. The conceptual model**

54 This paper seeks to throw more light on the combination of the structural type of an
55 economy and certain institutional dimensions, in explaining complex relationships between
56 level of development, entrepreneurial dynamics, growth and unemployment. We propose a
57 conceptual model that takes into account the level of development of the country, the share
58 of self-employment (as a measure of the entrepreneurial activity), the level of
59

unemployment and the rate of growth of GDP (as measures of performance of an economy) (figure 1). We take into account the structural effect of development by considering low, medium and high levels of development. The combination of the share of the self-employed in the workforce, along with rates of unemployment and rates of GDP growth, then allows us to identify six theoretical types of development.

Because it is a cyclical variable, the growth of the self-employment share does not directly intervene in the typology of the theoretical types of development presented below; however, it remains an important variable in our study, since it helps to identify the reactions to macroeconomic fluctuations in terms of entrepreneurial characteristics, especially in times of crisis, and it sheds light on the entrepreneurial environment of different economies and its role in overcoming difficulties. Moreover, this variable also makes it possible to identify the *refugee/Schumpeter* effects in different classes. It is indeed relevant to conceptualize the entrepreneurial choice to start a new venture with the well-known *refugee/Schumpeter* effects (Thurik et al., 2008; Abdesselam et al., 2014). According to the *refugee* effect, unemployment may induce new-firm start-ups. Increasing unemployment reduces the opportunity cost of entrepreneurship and consequently stimulates entrepreneurship. The *refugee* effect is sometimes called the *shopkeeper* effect. Contrastingly, the *Schumpeter* effect conveys the fact that new-firm start-ups, launched for opportunity motives, may contribute to the reduction of unemployment (Thurik et al., 2008; Koellinger and Thurik, 2012). So, motives related to the start-up of firms stand for different potentialities in terms of growth and employment creation. For example, using cross-sectional data on the 37 countries participating in GEM 2002, Wong et al. (2005) show that among the different types of entrepreneurial activities, only high-growth-potential entrepreneurship is found to have a significant impact on economic growth.

Figure 1: Types of development relative to the three variables and levels of development



Acs (2006) describes different stages of development. The first is “marked by high rates of non-agricultural self-employment. Sole proprietorships -i.e. the self-employed- probably account for most small manufacturing firms and service firms. Almost all economies

1 experience this stage". In terms of the share of self-employment, we consider that this
2 share is rather high for low- and medium-developed countries, and this for two main
3 reasons: the agricultural specialization (Kuznets, 1966, Syrquin, 1998), and the lack or
4 insufficient development of firms that offer wage work (Lucas, 1978). The second stage is
5 marked by decreasing rates of self-employment alongside the increase of the average firm
6 size: "marginal managers find they can earn more money while being employed by
7 somebody else" (Acs, 2006). Yet the impact of entrepreneurship on economic growth also
8 depends on the nature of the entrepreneurial activities, and refers to the difference between
9 an entrepreneurial society which develops private initiative and a wage-based society
10 which increases the opportunity cost to undertake new ventures. For example, for highly
11 developed countries a "rather" low share of self-employment may be translated into low
12 level of unemployment and high growth if the firms are opportunity-driven, while it is the
13 contrary in the case of necessity-driven motives. In the third stage, Acs (2006) explains the
14 revival of entrepreneurship in the most developed countries (although service firms are
15 smaller, they are numerous and have a great importance in GDP and employment share;
16 information and communication technologies increase the returns to entrepreneurship for
17 all firms) and finally justifies the U-shaped relationship between entrepreneurial activity
18 and economic development in the global economy. By definition, for highly developed
19 countries with a high share of self-employment, rates of unemployment are rather low
20 because self-employment supersedes unemployment (Acs, 2006). We can then describe
21 our typology:
22

23 Path A corresponds to developing countries that are still waiting for take-off. The
24 high share of self-employment is mainly related to the low opportunities for a wage job. A
25 theoretical explanation based on managerial skills and the level of actual wage can be
26 found in Lucas (1978). This path should not be retained, because countries belonging to the
27 OECD cannot be regarded as low-developed countries.

28 Path B sheds light on developing countries in transition towards becoming
29 developed countries. A priori, Push entrepreneurs are numerous, even though Naudé
30 (2010) observes that in some developing countries there also exists entrepreneurship for
31 opportunity motives -since there is so much to do in these countries in order to catch up
32 with the more developed ones- and there is room for imitative entrepreneurship
33 (Koellinger, 2008).

34 Poland could illustrate this case. Since it joined the EU in May 2004, Poland has
35 become one of the most dynamic economies of Europe with an average GDP growth rate
36 of 4.3% over the 2004-2012 period.

37 Path C comprises entrepreneurial economies issuing from medium development
38 economies that are at the end of the transition phase towards becoming developed
39 countries. The Czech Republic could illustrate this case. It was one of the most stable and
40 prosperous countries in the former Communist countries. In the beginning of the nineties,
41 the privatization of the Czechoslovak economy by Václav Klaus enjoyed a broad political
42 consensus. The Czech Republic presents the most industrialized and developed economy
43 from among the emerging countries of Central Europe, with high growth rates of GDP.

44 Path D relates to advanced knowledge and service economies where the relatively
45 low level of the share of self-employment is indicative of a mature economy, and so the
46 unemployment rate is rather low. In these countries innovation accounts for 30% of
47 economic activity, and very often small and innovative entrepreneurial firms operate as
48 'agents of creative destruction'. Nevertheless, the growth in the self-employed share of the
49 workforce is rather weak because the more mature economies undergo development that is
50 more based on qualitative entrepreneurship. *Schumpeter* effects are more prone to be
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1 observed in these countries. The US is representative of this class: in this country, the
2 institutional and cultural environment is more favorable to opportunity motives. According
3 to Acs and Szerb (2007), the federal policy has led to a transition towards an
4 entrepreneurial capitalism (versus managerial capitalism), giving more attention to
5 individuals. For example, the fiscal policy promotes good returns on entrepreneurship,
6 universities give incentives to enhance commercialization of new ideas by researchers, the
7 Small Business Innovation Research (SBIR) reserves 2.5% of federal R&D funds for small
8 innovative enterprises.⁴ All things equal, in comparison to France, the US registers 3 times
9 as many new-firm start-ups that employ at least one salaried worker at the beginning.

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12 Path *E* corresponds to managerial economies where a low level of entrepreneurship
13 is associated with a high level of unemployment and a low level of growth. It illustrates the
14 reverse version of the *Schumpeter* effect. For example, in the case of France, several
15 explanations may be put forward for the low intensity of entrepreneurship and the factors
16 deterring “pull” motives: an education inadequate for furthering creativity and
17 entrepreneurship (Retis, 2007), the slow development of incubators and an under-
18 development of seed money and private financing networks (Aernoudt, 2004), a lack of
19 entrepreneurial spirit (CGPME, 2005), the existence of sunk costs for elites (Bonnet and
20 Cussy, 2010) and a high unemployment rate that mainly induces entrepreneurship for
21 “push” motives (Abdesselam et al., 2014, Aubry et al., 2014a, 2014b). Obviously, one of
22 the conditions for risk-taking is to be able to find a job again quickly in case of failure,
23 and/or to give value to one’s experience. This implies that unconstrained entrepreneurship
24 is favored in economies characterized by a low rate of unemployment, even if an
25 unemployed position generates a low opportunity cost for new entrepreneurs. Empirically,
26 Wenekers (2006) has established a negative relation between the unemployment rate and
27 the rate of entrepreneurial activity in the European case. This result corroborates the fact
28 that the fluidity of the labor market encourages entrepreneurship for opportunity motives
29 while rigidities in the labor market generate entrepreneurship for necessity motives but
30 decrease total entrepreneurship globally.

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35 Path *F* comprises entrepreneurial economies in highly developed countries with
36 more extensive development based on competitiveness and attractiveness of production
37 factors. Australia and New Zealand may represent this class. In these countries barriers to
38 entrepreneurship are low, immigration is positive and trade is important.

3. Data and preliminary analysis

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43 In this section we describe the data. Then we show evidence of a break in the
44 dynamics of entrepreneurship following the global financial crisis.

3.1. The data

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47 Our proposal aims to establish a classification of OECD countries thanks to
48 variables related to economic and entrepreneurial activity, namely GDP rate of growth
49 (GDP), unemployment rate (UNEMPL), the self-employed share as a percentage of the
50 working age population (SEMPLShare) and the rate of growth in the self-employed share
51 of the workforce (SEMPLGrowth). According to the OECD, “The number of self-
52 employed is the number of individuals who report their status as ‘self-employed’ in
53 population in labor surveys. Self-employment jobs are those jobs where the remuneration
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⁴ In 2010, the SBIR program across 11 federal agencies provided over \$2 billion in grants and contracts to small US businesses for research in innovation leading to commercialization.

1 is directly dependent upon the profits (or the potential for profits). The incumbents make
2 the operational decisions affecting the enterprise, or delegate such decisions while
3 retaining responsibility for the welfare of the enterprise.”⁵ In the case of UK, Faggio and
4 Silva (2012) show that in urban areas self-employment is strongly and positively linked to
5 other measures of entrepreneurship like business start-ups and innovative firms which are
6 salient aspects of entrepreneurship. This is not the case in rural areas where “push”
7 entrepreneurs are more numerous. Nevertheless self-employment is often used as a proxy
8 for entrepreneurship, especially for international comparison, even if there is a
9 comparability issue across OECD countries related to the classification of the incorporated
10 self-employed workers. While in official statistics for most OECD countries the self-
11 employed workers who incorporate their businesses are counted as self-employed, in some
12 countries they are counted as employees (for example, Japan, New Zealand and Norway).

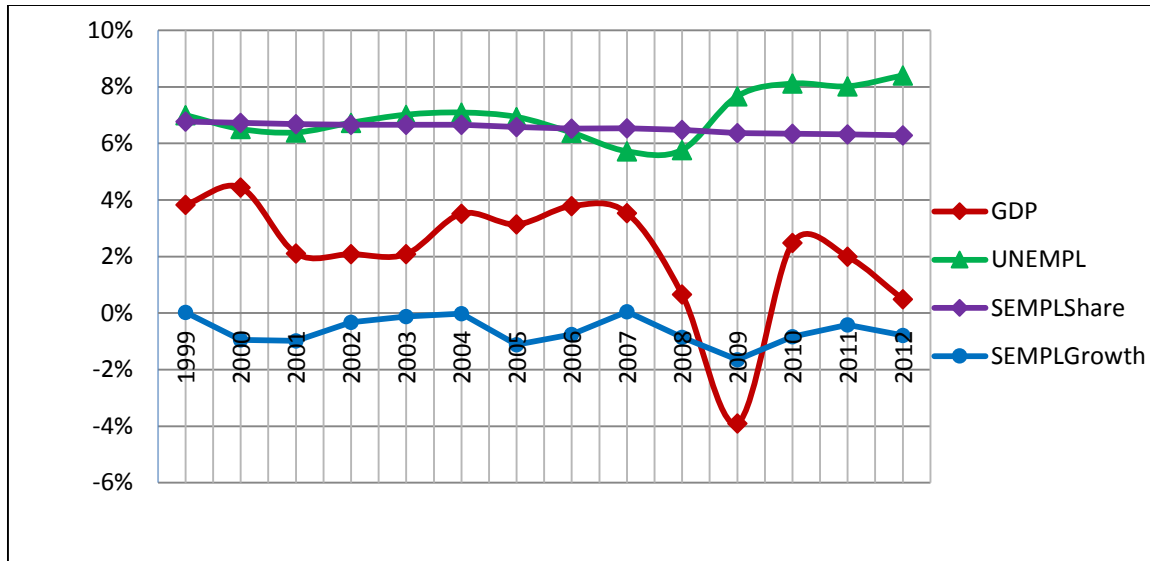
13
14 To better understand entrepreneurship, we retain two variables on self-employment
15 which represent both structural (SEMPLShare) and situational components
16 (SEMPLGrowth). In addition, using the growth rate of the self-employed share of the
17 workforce partially overcomes the problem of comparability of self-employed shares
18 series. We use an annual data basis over the 1999-2012 period.

19
20 These countries may be considered to be relatively homogeneous, i.e. countries
21 driven by market economies and mostly belonging to *innovation-driven* economies.⁶ In
22 order to study the dynamics of entrepreneurship in OECD over the 1999-2012 period, we
23 only consider countries for which active variables are available over the whole period. For
24 reasons of data availability and incomplete data, we retain 26 of the 35 countries that are
25 currently members of the OECD, excluding Latvia, Estonia, Greece, Iceland, Israel, Korea,
26 the Slovak Republic, Switzerland and Turkey. The data are extracted from OECD
27 databases. In figure 2, the average evolution of the UNEMPL, GDP, SEMPLShare and
28 SEMPLGrowth variables is represented for the 26 OECD countries under study for the
29 whole period.
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55 ⁵ The definition therefore includes both unincorporated and incorporated businesses and as such differs from
56 the definition used in the System of National Accounts which classifies self-employed owners of
57 incorporated businesses and quasi-corporation as employees. It should be noted that not all self-employed
58 workers are ‘entrepreneurs’. Self-employment statistics include craft-workers and farmers.

59 ⁶ In the 2009 GEM (p. 5) report, Chile and Hungary -belonging to the group of *efficiency-driven* economies-
60 are considered to be in transition towards the group of *innovation-driven* economies.
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Figure 2: Average evolution of active variables over the 1999-2012 period



The number of self-employed as a percentage of the population is slightly decreasing with a steady curve during the period, while the rate of growth of the self-employed share is of course more volatile -and always negative- with a decrease from 1999 to 2001, followed by an increase during the 2001-2004 period -a less important decrease- and again a decrease in the year 2005, followed by an increase till 2007 and a decrease in 2008 and 2009, with a final increase till 2011 and a decrease in the last year of observation. The rate of GDP growth sharply decreases from 2007 onwards with a very negative level in 2009. There is a recovery in 2010 but a decrease again in 2011 and 2012. After the crisis of 2008-2009, we can observe a sizeable increase in the unemployment rate.

Moreover, in order to better characterize classes, we use a wide set of illustrative variables relevant for characterizing the context of entrepreneurship in the different countries. These variables are likely to depict different types of developments, so they were positioned as supplementary variables in the multidimensional analysis. They do not affect the calculations based upon the four variables UNEMPL, GDP, SEMPLShare and SEMPLGrowth: they are not used to determine the principal component factors but are, a posteriori, positioned in order to assess their degree of similarity with the active variables. These variables provide useful information to consolidate and enrich the interpretation of the classes of countries. We consider three categories of variables, representative of national economic development and institutional environment as well as variables specific to the entrepreneurial population. The level of development is usually evaluated by GDP/capita. Due to the imperfection of this measure, it is more appropriate to evaluate it as a combination of a set of variables representing the level of development of the economy, such as the weight of finance in the economic system, the importance of innovation, the quality of the labor force (by proxy with education and health expenditures) or the proportion of the urban population. Combined with the sectoral specialization it allows us to enrich the different kinds of development. Institutional environment is taken into account by way of variables relative to regulatory requirements (Sambharya and Musteen, 2014). We choose to consider only institutional regulatory variables. These variables are particularly interesting for the implementation of public policies because they can be more easily controlled in the short run to promote entrepreneurial activities. In this set of variables we distinguish the requirements to set up a firm (Time, Cost, Procedures and Barriers), labor market regulations (Employment protection, Minimum wage, Inflows

of foreign population) and market openness indicators (Foreign Direct Investment, Outward/Inward position), Net barter terms of trade, Trade). In addition, we consider variables specific to the entrepreneurial population: for each class we identify the relative importance of necessity/opportunity motives (OEAI), the Nascent Entrepreneurial Activity Index (NEAI) and the Young Firm Entrepreneurial Activity Index (YFEAI), ratios obtained through the Global Entrepreneurship Monitor (GEM) and which are supposed to differ according to the different classes of countries obtained. These variables and their availability periods are described in table 1.

Table 1: Supplementary variables

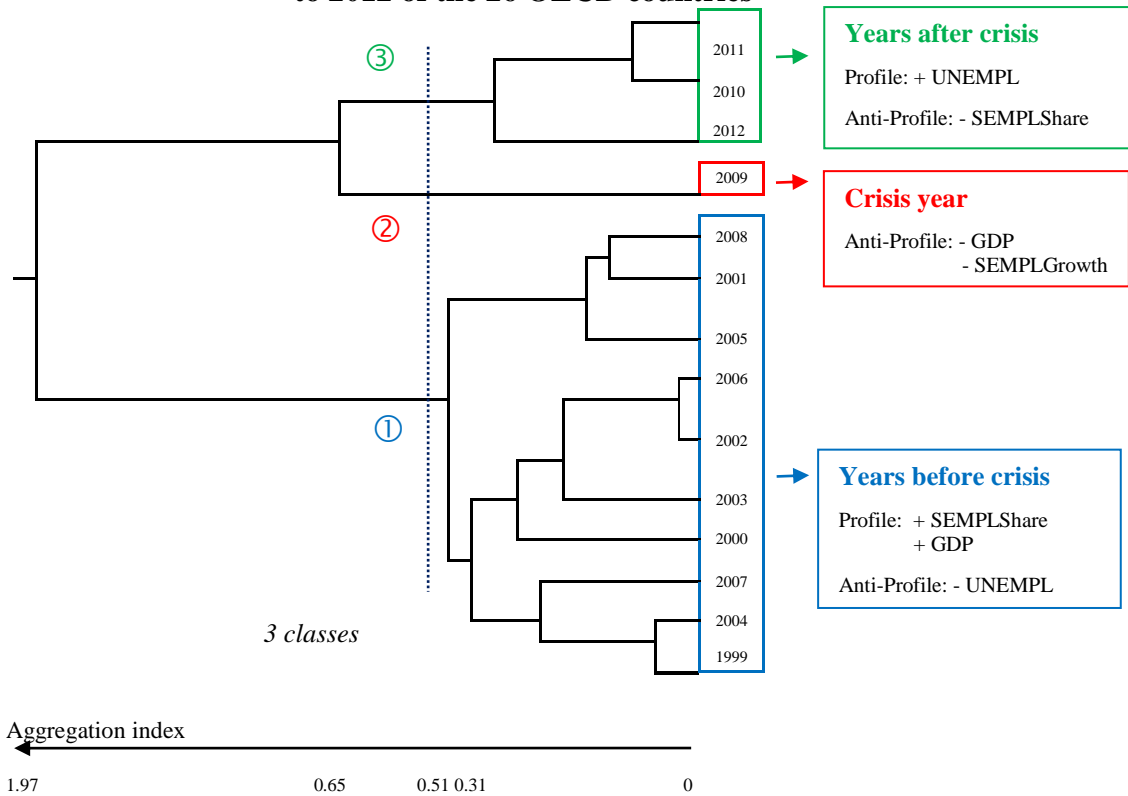
Name	Description	Period	Source
Economic Development			
- relative to the level			
DCR	Domestic credit provided by the financial sector (% of GDP)	1999-2012	World Bank
GDERD	Gross Domestic Expenditure on R&D (GDERD) (% of GDP)	1999-2012	OECD
PATENTS	Patents (numbers per capita) ⁷	1999-2011	OECD
EDU	Public spending on education, total (% of GDP)	1999-2010	World Bank
HEALTH	Health expenditure, total (% of GDP)	1999-2012	World Bank
URBAN	Urban population (% of total population)	1999-2012	World Bank
- relative to sectoral specialization			
AGRI	Agriculture, value added (% of GDP)	1999-2012	World Bank
INDUS	Industry, value added (% of GDP)	1999-2012	World Bank
SER	Services, etc., value added (% of GDP)	1999-2012	World Bank
AGRIEMPL	Employment in agriculture (% of total employment)	1999-2012	World Bank
INDUSEMPL	Employment in industry (% of total employment)	1999-2012	World Bank
SEREMPL	Employment in services (% of total employment)	1999-2012	World Bank
I PRO	Industrial production, seasonally adjusted (Growth previous period)	1999-2012	World Bank
Institutional environment			
- relative to entrepreneurship			
TIME	Time required to start a business (days)	2003-2012	World Bank
COST	Cost of business start-up procedures (% of GNI per capita)	2003-2012	World Bank
PROC	Procedures required to start a business (number)	2003-2012	World Bank
BTE	Barriers to entrepreneurship	1998,2003,2008,2013	OECD
- relative to functioning of the labor market			
STRICT	Strictness of employment protection	1999-2012	OECD
RMINW	Real minimum wages (hourly, US\$PPP)	1999-2012	OECD
IMM	Inflows of foreign population by nationality as a % of total population	1999-2011	OECD
- relative to openness of the country			
OutFDI	Foreign Direct Investment (FDI) Outward position at year end as a % of GDP	1999-2012	OECD
InFDI	Foreign Direct Investment (FDI) Inward position at year end as a % of GDP	1999-2012	OECD
TRADE	Trade (% of GDP)	1999-2012	World Bank
ECH	Net barter terms of trade index (2000 = 100)	2001-2012	World Bank
Entrepreneurial variables			
YFEAI	Measures the number of people owning/managing a business that has existed for up to 3.5 years; relative to the adult population 18-64	2002-2012	GEM
NEAI	Nascent Entrepreneurial Activity Index: Measures the number of people who are actively trying to start a new business; relative to the adult population 18-64 years.	2002-2012	GEM

⁷ Fractional counts are applied for patents with multiple inventors/applicants: When a patent has been invented by several inventors from different countries, the respective contributions of each country are taken into account. This is done in order to eliminate multiple counting of such patents.

3.2. A break in the dynamics of entrepreneurship: the global financial crisis

To analyze the dynamic of development over the 1999-2012 period, we study the annual average evolution of the variables relative to the economic and entrepreneurial activity -UNEMPL, GDP, SEMPLShare and SEMPLGrowth- for the 26 OECD countries. In this analysis, years play the role of “individuals” and average annual rates the role of variables. A cluster analysis was applied to group the years of the 1999-2012 period into homogeneous classes or sub-periods. More precisely, a Hierarchical Ascendant Classification (HAC) was used on the significant factors of the Principal Component Analysis (PCA) of average annual rates of the four variables of dynamic development. This methodological linking of factorial and clustering methods constitutes an instrument for statistical observation and structural analysis of data. The dendrogram in figure 2 represents the hierarchical tree of the years with a characterization of the main results of the chosen partition into three periods.

Figure 2: Cluster dendrogram and Profile/Antiprofile* of years over the period 1999 to 2012 of the 26 OECD countries⁸



* Note: Variables are significant at the level of 5%.

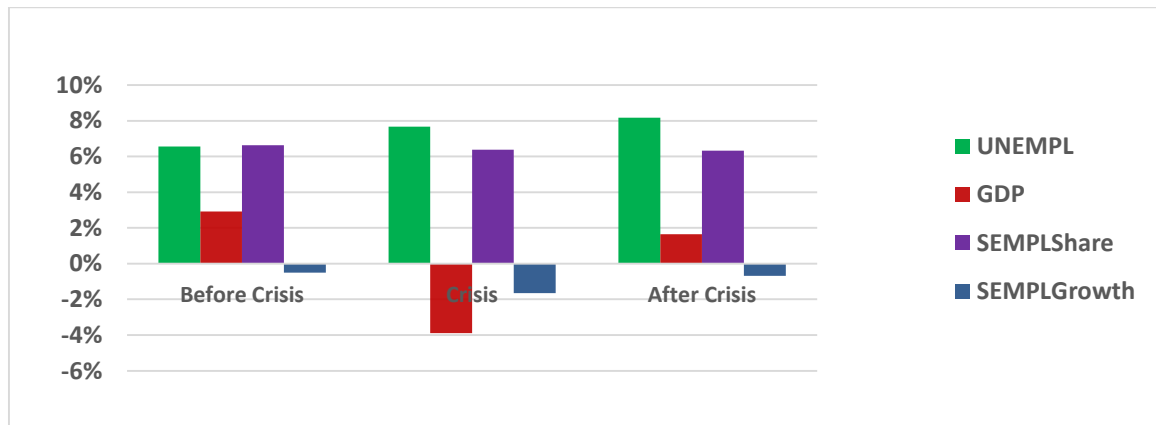
Clearly the effect of the crisis is noticeable in 2009 with a rate of GDP growth and a rate of growth in the self-employed share of the workforce significantly lower than those registered on the overall period. “The recent crisis, characterized by tighter credit restrictions, has arguably hampered new start-ups and impeded growth in existing start-ups as well as their ability to survive in tough market conditions” (OECD, 2013, p.7). Although

⁸ The Hierarchical Cluster Analysis (HCA) is employed. An explanatory technical note on this method is provided in the Appendix.

the crisis started in 2007, the decline in rates of GDP and self-employed growth are significantly lower than those registered on the overall period only in 2009. Using panel data on the number of new firm registrations in 95 countries to study the impact of the 2008 financial crisis on new firm creation, Klapper and Love (2011) also show that the impact of the crisis was much more pronounced in 2009.

The first period, comprising the years before the crisis, is characterized by high GDP growth; a high level of self-employment and a low unemployment rate. It is a period of growth favorable to entrepreneurship. However, the crisis significantly impacted the dynamics of entrepreneurship: in the sub-period after the crisis we can observe that the unemployment rate is significantly higher than average for the whole period and the share of self-employment is significantly lower. The financial crisis seems to have broken the dynamics of entrepreneurship. It clearly appears (figure 3) that the rate of growth does not recover its initial level after the crisis: it stands at 1.65% over the 2010-2012 period against 2.92% before the crisis. Consequently the level of unemployment is still increasing in the last period (but with a lower slope). The self-employment share is steadily decreasing during the whole period (figure 2) with an acceleration in 2009 -see self-employment growth- due to the closure of numerous firms during the crisis.

Figure 3: Average rates of active variables over the sub-periods



According to the OECD (2009), it is important to note that SMEs and therefore self-employed workers are generally more vulnerable in times of crisis; this is for several reasons, including that “it is more difficult for them to downsize as they are already small; they are individually less diversified in their economic activities; they have a weaker financial structure (i.e. lower capitalization); they have a lower or no credit rating; they are heavily dependent on credit and they have fewer financing options”. In addition, they are more vulnerable because they often bear the brunt of the difficulties of large companies.

The International Labor Organization (ILO) has described this crisis as a global job crisis. It has resulted in an increase in the unemployment rate as well as the failure of many businesses, leading to a decrease in levels of self-employment over the 2010-2012 period.

When unemployment increases, there is a very short lag before we observe an increase in the setting-up of new firms, i.e. the *refugee* effect (Abdesselam et al., 2014). In fact, for some people unemployment acts as a trigger factor for entrepreneurial involvement. Being unemployed is one of the displacement factors (breaks in the life of individuals) that can lead to entrepreneurship (Shapiro, 1975). The lag in the reduction of the unemployment rate due to new-firm start-ups (*Schumpeter* effect) is greater because new firms usually do not create a lot of jobs at the beginning of their activity. Indeed, jobs

1 can be considered as quasi-fixed costs in countries where labor market regulation is rigid
2 and it is worth waiting until demand becomes sufficiently constant before hiring
3 employees.
4

6 **4. Dynamic regional development and typologies of OECD countries**

7
8 To better understand the dynamics of the development of entrepreneurship over the
9 period and to take into account the effects of the financial crisis, we carried out an analysis
10 over the three sub-periods: before, during and after the crisis. The approach adopted relies
11 on a combined use of multidimensional evolutive data analyses that take into account the
12 characteristics of the countries in terms of GDP growth, unemployment rates, the number
13 of self-employed as a percentage of the population and the rate of self-employment growth
14 as well as its evolution over the 1999-2012 period. According to the similarity of these four
15 rates, we can establish a typology of the 26 OECD countries. The usual analyses of annual
16 data do not allow for a global analysis of the countries and their characteristics because
17 these analyses are carried out separately (year by year) and do not take into account the
18 possibility of their having a common structure across time. The total evolution of the
19 countries is thus studied by a Multiple Factor Analysis (MFA) (Escofier and Pagès, 1985,
20 1998), based on a weighted analysis of the principal components of all the data.
21

22 This analysis is especially designed to study individuals -namely the countries-
23 characterized by a certain number of groups of the same variables measured at each
24 different moment in time. The MFA highlights the common structure of a set of groups of
25 variables observed for the same 26 countries. The first interest this method offers is to
26 carry out a factor analysis in which the influence of the different groups of variables is
27 equilibrated a priori. This balance is necessary because the groups of variables always
28 differ according to the structure of the variables, namely with their interrelationships. It
29 provides representations of countries and variables that can be interpreted according to a
30 usual Principal Component Analysis (PCA). A Hierarchical Ascendant Classification
31 (HAC) was then used on the significant factors of the MFA in order to characterize the
32 classes of countries relative to the evolution of the four chosen variables.
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39 **4.1. The pre-crisis financial period: towards more entrepreneurial economies**

40 The dendrogram in figure A1 in the appendix represents the hierarchical tree of the
41 countries obtained using an HAC with the Ward criterion⁹ according to the active variables
42 over the 1999-2008 period. Table A1 in the appendix summarizes the main results of the
43 characterization of the chosen partition into six classes, obtained from the cut of the
44 hierarchical tree in figure A1.
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46

47 **Entrepreneurial economies** (class 1): Australia, Austria, Ireland, Luxembourg,
48 Mexico, the Netherlands, New Zealand, Slovenia and the United Kingdom

49 This class is characterized by an unemployment rate significantly lower than the
50 average of the 26 countries considered and shows a high growth in self-employment at the
51 end of the period. It corresponds to the development model *F* described in section 2.2.
52 Barriers to entrepreneurship are significantly lower in 2003 and 2008.¹⁰ These countries
53 have an institutional environment in terms of the functioning of labor market and the
54 openness of the country being favorable to entrepreneurship. Their development is based
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59 ⁹ Generalised Ward's Criteria, i.e. aggregation based on the criterion of the loss of minimal inertia.

60 ¹⁰ Remember that this variable is observed only in 1998, 2003 and 2008 in this period.
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1 on competitiveness and attractiveness of production factors, including labor inflows of
2 foreign populations that are significantly higher than average. This class is also attractive
3 for FDI in 2002 and 2003 and displays a high level of trade during the 1999-2002 period. It
4 shows the willingness to be competitive via the attractiveness of production factors. These
5 results are in line with those of Simón-Moya et al. (2014) showing that business freedom,
6 trade freedom and labor market freedom are favorable to opportunity entrepreneurship.
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10 **Managerial industrial economies** (class 2): Italy, Japan and Portugal

11 The countries of this class have a high level of self-employment relative to all
12 countries of our sample during almost the whole period -1999 to 2006- and weak GDP
13 growth for the years 1999 and 2002-2006. They illustrate development path *E*. They are
14 also characterized by an institutional environment relative to the functioning of the labor
15 market that is unfavorable to entrepreneurship, namely a high strictness of employment
16 protection in the whole period; they have rather high levels of employment in industry but
17 a low performance in industry growth, which could denote some problems in maintaining
18 their market share. In these countries, domestic credit provided by the financial sector as a
19 percentage of GDP is significantly higher than average. These results are in line with those
20 of Klapper and Love (2011), who demonstrated that company creation is higher in
21 countries with greater financial sector development, as measured by bank credit ratio to
22 GDP. The level of expenditure on education is rather low. The Nascent Entrepreneurial
23 Activity Index is also weak in 2004 and 2006, which denotes an insufficient renewal of
24 entrepreneurs.
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30 **Managerial service economies** (class 3): Belgium, Finland, France, Germany and 31 Spain

32 These countries present high rates of unemployment and a high level of self-
33 employment growth in 2005 and 2006. We can identify the presence of a refugee effect:
34 unemployment leads to new-firm creation and increased self-employment.¹¹ These
35 countries also present a typical path of development of type *E*. These economies are
36 characterized by a rather low proportion of people owning/managing a business that has
37 existed for up to 3.5 years, and some institutional restrictions on entrepreneurship. Barriers
38 to entrepreneurship are significantly higher in 1998 and 2003. Clearly these economies are
39 not conducive to opportunity-driven entrepreneurship.¹² Yet during the whole period they
40 attempt to develop entrepreneurship.¹³
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44 **Advanced knowledge and service economies** (class 4): Canada, Denmark, 45 Hungary, Norway, Sweden and the United States

46 These economies are characterized by a weak self-employment growth compared to
47 the average population over the whole period. They recorded a significantly lower GDP
48 growth rate in 2007, suggesting they were affected by the crisis earlier. This class is
49 composed of highly developed countries with a high proportion of service sector jobs, and
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53 ¹¹ This effect is clearly identified in the case of France (Aubry et al., 2014, Abdesselam et al., 2014).

54 ¹² Remember that this variable is observed only in 2005, 2006, 2007 and 2008 for the period.

55 ¹³ In the case of France, entrepreneurship started to be dynamic in the early 2000s, supported by the
56 implementation of public policies aiming to encourage entrepreneurship. In particular the law for the
57 economic initiative (August 2003), called Dutreil's law, aims at making France one of Europe's most
58 favorable countries for new-firm start-ups: extension of the period in which it is permitted to domicile the
59 new firm in one's house (from 2 to 5 years), progressive capitalization of the social capital, simplification of
60 administrative formalities, implementation of community finance institutions, etc.
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1 a high level of education and health expenditures. Jobs in the agricultural sector are
2 significantly lower than the average for all countries. These countries perfectly illustrate
3 development path *D*.
4

5 **Industrialized entrepreneurial economies in developing countries** (class 5):
6 Chile and the Czech Republic
7

8 These economies are characterized by a high level of self-employment from 2003
9 to 2008 and a high growth in self-employment in 2002 and 2003: they follow a
10 development path of type *C*. They are also characterized by an industrial specialization
11 with a high level of added value in industry (as a percentage) for all the periods and jobs in
12 this sector from 2006 to 2008. The evolution of industrial production growth and the terms
13 of trade over the 2004-2008 period are rather better than for all the countries considered.
14 Health expenditure is rather low. The share of the service sector in the added value is also
15 significantly lower in this class over the whole period. The institutional environment
16 relative to the functioning of the labor market also helps to characterize this class, namely
17 the minimum wage appears to be significantly lower than average, while there subsist
18 some barriers to entrepreneurship in 2008.
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22 **Non-entrepreneurial economy in transition** (class 6): Poland
23

24 This class is characterized by both a high level of unemployment and a high level
25 of self-employment during the whole period, as well as a high level of self-employment
26 growth for the years 2000, 2001 and 2008. As already mentioned in section 2.2, Poland is a
27 perfect example of development model of type *B*. We label this class on account of its
28 characteristics linked to major institutional environment constraints relative to
29 entrepreneurship: the procedures for entrepreneurship are fairly numerous during the whole
30 period, the cost of becoming an entrepreneur is high in 2008, and finally the barriers to
31 entrepreneurship are rather high in 1998 and 2008. This result is consistent with those of
32 Aparicio et al. (2016), who highlight that this type of regulation generates entry barriers,
33 discouraging entrepreneurship behavior. These specificities show the occurrence of a
34 refugee effect in Poland for this period -the proportion of people aged 15-64 involved in
35 entrepreneurial activity (TEA) out of opportunity is quite low in 2005-.
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39 **4.2. The financial crisis: 2009**

40 The dendrogram of figure A2 in the appendix represents the hierarchical tree of the
41 26 countries according to the active variables for the year 2009.
42

43 Table A2 in the appendix presents the results of the characterization of the chosen
44 partition into four classes for the year 2009. Note that the MFA does not allow us to
45 analyze the evolution of variables at an absolute level but it does allow for a comparison
46 between countries. For example, a low unemployment rate in a class does not mean that
47 the countries in this class have not been impacted by the crisis in terms of employment; it
48 only means that these countries were less severely affected than the average of the
49 countries under study. Parker (2009) points out the effect of falling wages in recessions,
50 which may lower the opportunity costs for starting a business and encourage marginal
51 types of new-firm start-ups (Koellinger and Thurik, 2012).
52
53

54 **Resilient agricultural countries** (class 1): Australia, Chile, New Zealand and
55 Poland
56

57 These countries recorded high GDP growth and a high proportion of self-
58 employment relative to all countries of our sample in 2009. These countries are also
59 characterized by a high sectoral specialization and an institutional environment favorable
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1 to entrepreneurship. They exhibit a high contribution of agriculture and industry and a low
2 contribution of services to the added value. They also present a high number of jobs in
3 agriculture, favorable net barter terms of trade, a low strictness of employment and low
4 expenditure on R&D. So these agricultural economies are the ones that best withstood the
5 crisis in 2009. The effect of the crisis on Australia was considerably lower than in many
6 other countries, for several reasons: Australia's economy was buoyed by China's growing
7 demand for resources and the Australian financial system was markedly more resilient.
8 Notably, Australian banks continued to be profitable and did not require any capital
9 injections from the government. Hill (2012) also highlights other factors that could explain
10 the relatively good performance of the Australian economy during the crisis; these factors
11 include monetary and fiscal policy; structures and legal reform; regulation of financial
12 markets; banking history; and corporate governance. The economy of New Zealand is very
13 closely related to that of Australia, most major banks operating in New Zealand being
14 Australian. In addition, Australia is the largest trading partner of New Zealand. In 2009,
15 Chile and Poland appeared to be protected against the financial crisis. These countries were
16 little affected by the crisis due to their limited role in trade and international finance,
17 among other things (Sholman et al., 2013).

22 **Countries strongly affected by the crisis with a loss in competitiveness** (class 2):
23 Austria, Belgium, Czech Republic, Finland, Italy, Japan, Mexico, Netherlands, Slovenia
24 and the United Kingdom

25
26 These countries were more affected by the crisis and fell deeply into recession; the
27 GDP growth rate is significantly lower than the sample's average. However, it seems that
28 the crisis did not stop the dynamics of entrepreneurship, for we see that in 2009 the level of
29 self-employment is above average and the rate of unemployment is significantly lower.
30 Probably a percentage of those people laid off set up their own firms, and are characteristic
31 of "push" entrepreneurs. These countries also present unfavorable net barter terms of trade.
32 These are economies with a loss of competitiveness in 2009.

35
36 **Countries mainly coming from the class of advanced knowledge and service**
37 **economies earlier affected by the crisis** (class 3): Canada, Denmark, France, Germany,
38 Hungary, Luxembourg, Norway, Portugal, Sweden and the United States

39
40 These countries are characterized by a rather low level of self-employment. One
41 possible explanation for the low level of self-employment could be the closure of
42 numerous firms, although, due to the mix of structural and situational effects, it is difficult
43 to assess whether the low level of self-employment has only a cyclical component.
44 Furthermore, we showed that countries belonging to the class of advanced knowledge and
45 service economies were affected by the crisis earlier. The weak level of GDP growth in
46 2007 might have led (with some delay) to a decline in the level of self-employment. We
47 note that although the cost of business start-up procedures is significantly lower than
48 average, this did not make it possible to boost entrepreneurship during the crisis period.

51 **Countries hardest hit by the financial crisis** (class 4): Ireland and Spain

52
53 These countries, Ireland and Spain, combine high unemployment rates and a low
54 level of growth in self-employment. In these countries, unemployment rose significantly
55 from 2008 onwards, as a result of a sharp fall in house building leading to major job losses.
56 Construction is among the worst-affected sectors in these countries, where there had been a
57 large boom in residential construction in response to sharply rising housing prices. The
58 crisis reversed the trend of increasing new-company creation.

4.3. The 2010-2012 period: a sharp slowdown in entrepreneurial activity

The crisis persisted after 2009, with widespread consequences for economic performance, labor productivity and employment in all countries around the world. Hysteresis effects are indeed likely to push up structural unemployment as workers who remain unemployed for a long period become less attractive to employers as a result of declining human capital, or as they reduce the intensity of their job search. In 2012, the OECD identified 48 million unemployed people in the OECD countries, about 15 million more than at the beginning of the crisis in 2007. As we underlined in 3.2, the sub-period after the crisis (2010-2012) is characterized by an unemployment rate significantly higher than the average over the whole period and a level of self-employment significantly lower.

The dendrogram in figure A3 in the appendix represents the hierarchical tree of the countries according to the active variables over the period 2010 to 2012. Table A3 in the appendix presents the results of the characterization of the chosen partition into five classes of countries for the post-crisis period. So now let us look at what has happened since the crisis. The aim of the analysis over this period is to study the dynamics of entrepreneurship after the crisis and identify whether recovery processes are under way in some countries which are more or less resilient to the crisis and in which entrepreneurial behaviors remain dynamic.

Advanced knowledge and service economies with developed financial markets deeply affected by the crisis (class 1): Australia, Canada, Denmark, Japan, Luxembourg, Norway, Sweden and United States

This class shows a significantly low level of self-employment relative to all countries of our sample over the 2010-2012 period. This shows that the dynamics of entrepreneurship was deeply affected by the crisis. However, these countries recorded an unemployment rate lower than average, which could be a sign of recovery. This is confirmed by data on the evolution of growth rates that show higher than average growth rates for high-income countries for the year 2013 except for Denmark and Norway (World Bank, 2014). For Canada and the US, a probable explanation is their higher sensibility to cycles, with a hugely depressed level in the recession phase but also a quick and strong recovery in the growth phase (Aghion, 2014). Yet it is also recognized that the recent recovery in the US did not proceed very fast (Dwyer and Lothian, 2011). According to Solomon (2014), financial crises cause permanent damage that lead to huge losses in output levels from initial trends. In addition, Siemer (2014) shows for the US that the number of firms less than one year old -which we can identify as business start-ups- declined by more than 25% in 2007-2010, leading to a “missing generation” of new firms. The class includes highly developed countries with high sectoral specialization, belonging to advanced knowledge and service economies. We observe that although the functioning of the labor market is favorable to entrepreneurship, namely with the attractiveness of production factors and low employment protection, these countries have a level of self-employment that is significantly lower than the average employment level of the population.¹⁴ The OECD (2013) underlines that in Australia, Japan, and the United States, “self-employment levels remain significantly below their pre-crisis level, reflecting in part a shift towards contractual employment, where employment levels were less adversely affected by the crisis”. This situation can be explained by the evolution towards more qualitative entrepreneurship leading to a structural decrease in the self-employment share.

¹⁴ Luxembourg, which is a financial country, was recorded in the grey list of fiscal havens (very low fiscality, non transparent tax system, non cooperation with other states on tax information) some years ago. It has evolved and has since been removed from this list. Nevertheless some characteristics are still at work.

1 In general, these countries show a high level of opportunity-driven entrepreneurship, and
2 this is the case for 2010 and 2011. These results are in line with recent reports by GEM
3 (2014, 2015-2016, 2013, 2011). Moreover, these countries are also characterized by a
4 significantly high level of domestic credit provided by the financial sector as a percentage
5 of GDP.
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8 **Credit crunch impact on domestic activity and push entrepreneurship in**
9 **relatively industrialized countries** (class 2): Austria, Belgium, Czech Republic, Finland,
10 France, Germany, Italy, Netherlands, New Zealand, Poland, Slovenia and United Kingdom

11 The characteristics of this class relative to the unemployment rate and GDP growth
12 rate are similar to those of the sample's mean. These countries registered a significantly
13 high level of self-employment over the period, and a high rate of growth in this level in
14 2012. Probably part of the people laid off set up their firms and became self-employed to
15 earn a living. In these countries, employment in industry is significantly higher than the
16 average over the 2010-2012 period. We also notice that the share of domestic credit
17 provided by the financial sector as a percentage of GDP is lower than the average in 2010
18 and 2011.
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21 **Countries pursuing a dynamic entrepreneurial development** (class 3): Chile and
22 Mexico
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24 It is clear that the South American countries are the countries least affected by the
25 crisis: they show significantly higher levels of GDP growth with higher levels of self-
26 employment over the period. They also feature a high number of people currently setting
27 up a business, as well as a significant number of people owning or managing a business
28 that has existed for up to 3.5 years. These characteristics reflect a dynamic form of
29 entrepreneurship. The industry and agriculture sectors contribute significantly to the value
30 added, while the service sector is under-represented. Institutional environment features,
31 especially net barter terms of trade and lower minimum wages, are more favorable to
32 entrepreneurship in these countries over the period. Globally, this class consists of
33 countries with an economic performance superior to that of the average of the entire
34 sample. These countries are developing countries with health expenditures significantly
35 below the average of OECD countries. The share of domestic credit provided by the
36 financial sector as a percentage of GDP is lower than the average in 2010 and 2011. In
37 these countries, where financial markets are less developed and play a limited role in the
38 national economy, the financial crisis did not severely affect the dynamics of
39 entrepreneurship. The global financial crisis had a relatively limited impact on Latin
40 American economies. The financial systems of these countries did not suffer a ripple effect
41 because they are not very sophisticated and globally less integrated.
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48 **Volatile self-employment growth in an uncertain environment** (class 4): Hungary

49 Hungary registered variations in the level of self-employment growth with a rather
50 high growth in 2011 but a low one in 2012. We could thus infer for this country a kind of
51 volatility in self-employment as a means of adjustment. Real GDP has remained broadly
52 flat over the recent period due to weak domestic demand moderated by net exports which
53 remain the only source of growth. Investment in the country has reached its lowest level in
54 10 years. Hungary's public sector is highly dependent on foreign financing: almost two-
55 thirds of Hungary's public sector debt, which stands at about 80 percent of GDP, is held by
56 foreigners. Growth prospects are largely unfavorable due to the low real wage growth,
57 rising debt servicing, unemployment, and a credit crunch. Importantly, confidence has
58 suffered in a policy environment that is perceived by many investors and consumers as
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1 unpredictable and discriminatory. Hungary was initially considered as the front-runner of
2 market reforms in Central and Eastern Europe, but by the end of the 2000s its economy
3 was facing major structural problems: “It seems that in Hungary, in spite of its head-start
4 as the most entrepreneurial country amongst the socialist countries in 1970s and 1980s,
5 lags in its cultural attitudes and lack of political recognition of entrepreneurship and
6 entrepreneurs” (Szerb et al., 2013, p. 47).
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9 **Countries greatly impacted by crisis, entrepreneurship slowdown (class 5):**
10 Ireland, Portugal and Spain

11 Here the unemployment rate is significantly higher, and the rate of growth
12 significantly lower, than the average of the entire sample over the period. The rate of self-
13 employment growth is also significantly lower than the average in 2010 and 2011. This
14 class includes sparsely urbanized countries with high levels of domestic credit provided by
15 the financial sector as a percentage of GDP. In these countries, new firms are strongly
16 dependent on bank financing. The individual situations of these three countries are
17 somewhat different. In Spain, the ailing banking sector had lent heavily to the construction
18 sector before the housing bubble burst. In Ireland, the property bubble was funded by
19 banks which went bust and were taken over by the state, causing a government debt crisis.
20 Portugal suffers from moderately high indebtedness of the private and public sectors, low
21 competitiveness and anemic growth. The crisis has severely impacted the countries of this
22 class, leading to many bankruptcies and a slowdown in entrepreneurship dynamics in 2010
23 and 2011. The proportion of people aged 15-64 involved in entrepreneurial activity (TEA)
24 out of opportunity is quite low in 2010 and 2011.
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27 Our results point out that classes 2 and 3, which have been the most resilient to the
28 crisis in terms of self employment -both in share and growth- are characterized by a low
29 level of domestic credit provided by the financial sector, whereas countries of classes 1 and
30 5 which are strongly dependent on bank loans have recorded lower-than-average self
31 employment growth and share. These findings are corroborated by Klapper and Love
32 (2011), who observe that “One feature of the crisis was its severe impact on the
33 functioning of financial markets, which resulted in a credit crunch and credit rationing. It is
34 not surprising that countries in which financial markets played a larger role in the domestic
35 economy would experience sharper contractions in new firm creation during the crisis”.
36 Nevertheless, the advanced knowledge economies with developed financial markets, fewer
37 regulatory institutional constraints and greater scope for qualitative entrepreneurship i.e.,
38 class 1 have lower unemployment rates.
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44 **4.4. Trajectories of the 26 OECD countries over the period:**

45 The methods of joint analysis of several data tables -evolutive data- also make it
46 possible to study and represent the evolution of the trajectories of countries to explain the
47 similarities and differences between active variables between sub-periods. If we follow the
48 trajectories of the 26 OECD countries (Table A4 in the appendix) we can see that some
49 countries are still grouped together regardless of the sub-period. That is the case for
50 Canada, Denmark, Sweden, Norway and the United States. These countries were classified
51 in the class of advanced knowledge and service economies and show a more opportunity-
52 driven entrepreneurship. Aghion (2014) underlines the fact that innovation implies creative
53 destruction and that some countries are more able to ‘surf’ on the new waves of innovation.
54 According to him, the United States, Sweden and Canada are more likely to benefit from
55 technologies such as like ICT or renewable energies due to reforms in the labor market to
56 make it more dynamic, the concentration of resources on the knowledge economy, support
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1 of new innovative firms, support for salaried people who leave their jobs and increased
2 competition in the market of goods and services.¹⁵

3 Slovenia, Austria, the Netherlands and the United Kingdom follow the same pattern
4 throughout the period -belonging to the set of entrepreneurial economies, they have been
5 severely impacted by the crisis due to their loss of competitiveness- and they suffer in the
6 third period of credit crunch and entrepreneurship mainly due to *push* motives. These
7 countries showed a rather high level of immigration during the pre-crisis period and were
8 oriented towards exports and attracting foreign investments.

9
10 Belgium and Finland, which come from the managerial services economies, follow
11 the same trajectory as the four previous countries.

12 While France and Germany are often seen as ‘brother enemies’ at the European
13 scale due to their policies -with the German country leader of the northern part more
14 inclined to a strict obedience regarding debt, and the French leader of the southern part less
15 concerned with severe control of debt- they both belong to the set of managerial economies
16 with rather less opportunity-driven entrepreneurship, and finally follow the same
17 trajectory. Coming from the class of managerial services economies they were less affected
18 by the crisis in 2009,¹⁶ but they also suffer in the third period from the credit crunch.

22 23 5. Conclusion

24
25 The present paper aims at proposing a classification of OECD entrepreneurship
26 relative to GDP growth, unemployment rates, self-employment levels and the rate of
27 growth in self-employment, using a database covering the 1999-2012 period. In order to
28 characterize classes and the different kinds of development focusing on entrepreneurial
29 activity (managerial/entrepreneurial), we consider variables representative of economic
30 development and the institutional regulatory environment. A multivariate and evolutive
31 data analysis is thus implemented. The results underline the great impact of the financial
32 crisis on entrepreneurial dynamics, and lead us to distinguish three sub-periods to study
33 entrepreneurial behavior: the pre-crisis period (1999-2008), the crisis (2009) and the post-
34 crisis period (2010-2012). The first period is characterized by high GDP growth, high
35 levels of self-employment and a low unemployment rate. It is a period of growth favorable
36 to entrepreneurship. The effects of the financial crisis are noticeable after a delay in 2009;
37 this year is characterized by a rate of GDP growth and a rate of self-employment growth
38 significantly lower than those registered on the overall period. The 2010-2012 period
39 shows a sharp slowdown in entrepreneurial activity; the crisis seems to have significantly
40 broken the dynamics of entrepreneurship. We can observe in the sub-period after the crisis
41 that the unemployment rate is significantly higher than the average of the whole period and
42 the level of self-employment is significantly lower.

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48 ¹⁵ He also added Germany. We can note that these five countries also share low energy dependence, Norway
49 being self-sufficient. It has developed a form of “state capitalism” that is responsible for managing the
50 abundant natural resources (minerals, fjords, forests, waterfalls) (*Economist*, February, 2-2013). The
51 accumulated wealth allows Norway to operate a “fiscal policy rule” which releases oil wealth into the
52 economy in a measured way in cyclical downturns and reduces the release when GDP growth is good.

53 ¹⁶ Reforms launched by the government of Chancellor Gerhard Schroeder (1998-2005) to enhance growth
54 and reduce unemployment, as well as a government-subsidized reduced working hours scheme, help explain
55 the relatively modest increase in unemployment during the 2008-09 recession. In France, thanks to a deep
56 rise of the budget deficit from 3.3% of GDP in 2008 to 7.5% of GDP in 2009, activity is maintained but at
57 the cost of public debt rising from 68% of GDP to nearly 94% in 2013. Franco-German trade also contributes
58 to this result with nearly 16.5% of French exports being directed towards Germany (the first client), a weight
59 more than 2 times higher than the countries that follow in the rankings. Even if French trade is structurally in
60 deficit with Germany, there exist strong links between these two countries.

1 Based on the pre-crisis period, we identified six types of development:
2 entrepreneurial economies, managerial industrialized economies, managerial service
3 economies, advanced knowledge and service economies, industrialized entrepreneurial
4 economies in developing countries, and a non-entrepreneurial economy in transition.
5 Managerial economies are characterized by high strictness of employment protection and
6 some restrictions to entrepreneurship, such as time and number of procedures required to
7 start a business, as well as barriers to entrepreneurship, that also lead to a low level of
8 opportunity-driven entrepreneurship. Entrepreneurial economies are characterized by
9 strong competitiveness and attractiveness of factors of production in highly developed
10 countries, while they exhibit low actual wages in developing countries. We find that,
11 regardless of the type of development, this period is characterized by strong
12 entrepreneurial activity. This result corroborates those of Klapper and Love (2011) who
13 observed a steady increase in new business registrations prior to the crisis in all groups of
14 countries.
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18 In 2009, it appears that the agricultural economies (Australia, Chile, New Zealand
19 and Poland) best withstood the financial crisis. The analysis of the post-crisis period (2010-
20 2012) shows that the development of entrepreneurship has been severely impacted by the
21 crisis in countries more dependent on the financial sector: such is the case for Ireland,
22 Portugal and Spain, and to a lesser extent Australia, Canada, Denmark, Japan,
23 Luxembourg, Norway, Sweden and the United States. However, it appears that
24 entrepreneurship is particularly dynamic over the 2010-2012 period in countries where the
25 level of domestic credit provided by the financial sector as a percentage of GDP is lower
26 (classes 2 and 3). Nevertheless, class 1-made up of advanced knowledge economies with
27 developed financial markets, fewer regulatory institutional constraints and more scope for
28 qualitative entrepreneurship- has a lower unemployment rate.
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32 Finally, we establish common trajectories over the whole period for a number of
33 countries, mainly explained by institutional characteristics defining the
34 entrepreneurial/managerial economies. In particular, we find that France and Germany
35 have very similar profiles in terms of economic and entrepreneurial activity, and that they
36 follow the same trajectory. Generally, managerial economies (except Germany and France,
37 as seen above), being characterized by a rather low proportion of people owning/managing
38 a business, some restrictions on entrepreneurship and some rigidity in the labor market,
39 have been sensitive to the crisis. Some entrepreneurial economies have been resilient -
40 newly developing countries, the Asian area- but some have also been impacted by the
41 crisis, especially Ireland. So it is difficult to find a unique trajectory based upon our initial
42 classes. This demonstrates the difficulties in accounting for all the diversity present in
43 development. Yet, more than the entrepreneurial economies, the recovery seems to favor
44 the class of advanced knowledge and service economies that comprise countries that
45 register a level of self-employment as well as an unemployment rate that is significantly
46 lower than the average in this last period. The most developed countries, with a lower self-
47 employment share, and evincing both flexibility in the labor market and a desire to attract
48 foreign workers, are more able to 'surf' on the new waves of innovation: they incur a low
49 rate of unemployment thanks to qualitative entrepreneurship. The two South American
50 developing countries, with low wages and improvements in their net barter terms of trade,
51 are more able to increase their growth thanks to dynamic entrepreneurial activity.
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56 Our study contributes to the empirical and theoretical understanding of the
57 determinants of entrepreneurial activity. The results match those of the existing literature
58 and extend them by considering a wider range of variables related to economic
59 development and institutional regulation, in order to characterize different types of
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1 entrepreneurial activity. To our knowledge, no study analyzing the drivers of
2 entrepreneurship considers such an important set of variables. In addition, employing
3 multidimensional evolutive data analyses allows for a dynamic approach to
4 entrepreneurship.
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6 From a theoretical perspective, we propose a conceptual model that takes into
7 account the level of development of the country, the entrepreneurship intensity, the level of
8 unemployment and the rate of growth of GDP. This model proved to be particularly
9 informative: among the six theoretical types of development proposed, five correspond to
10 the development patterns of the OECD countries over the period 1999-2008. As mentioned
11 earlier, since the crisis has greatly affected economies and entrepreneurial behaviors, the
12 adequacy of theoretical models of development is only relevant for the pre-crisis period.
13 Furthermore, this research demonstrates that economic development and the institutional
14 regulatory environment are not only able to stimulate and inhibit entrepreneurial activity
15 itself, but also shape the type of entrepreneurial activity that is pursued. This study
16 provides a better understanding of the components of the national environment and
17 contributes to explaining the differences in entrepreneurship between countries.
18

19 From a practical perspective, our results have important implications for the
20 implementation of public policy. In order to promote policy that encourages
21 entrepreneurship and reduces unemployment, policymakers need to better understand
22 interactions between entrepreneurship, economic development and the institutional
23 environment. Appropriate institutional incentives are essential to stimulate
24 entrepreneurship directly and effectively, and decision-makers must adapt their
25 entrepreneurship policy to national specificities. Our results suggest that policymakers
26 have to alleviate some constraints on entrepreneurship and the functioning of the labor
27 market, and foster their country's openness. It is also crucial to adopt measures to
28 strengthen the national competitiveness and increase the attractiveness of the factors of
29 production which promote entrepreneurship. Besides these points, our findings highlight
30 the need for financial regulation that supports entrepreneurial activities in countries that are
31 more dependent on the financial sector. Bank credit plays an important role in the capital
32 structure of small businesses both at the time of startup and as the small business matures.
33 The financial crisis had a negative effect on bank lending, which mainly affected the small
34 businesses that are the most vulnerable. According to OECD (2009), "Credit sources tend
35 to dry up more rapidly for small firms than for large companies during economic
36 downturns". The crisis has shown that it is necessary to broaden the range of financing
37 instruments available to SMEs and entrepreneurs to improve their financing.¹⁷
38

39 This study does have some limitations regarding the variables considered. Future
40 research should broaden the set of institutional variables to include informal institutional
41 variables, so as to deepen the characterization of the classes. Recent papers (Aparicio et al.,
42 2016, Pinho, 2016, and Simón-Moya et al., 2014) show the relevance of informal
43 institutions like control of corruption, confidence in one's skills, business freedom,
44 property rights, etc., as determinants of entrepreneurship at a macro-level. It would also be
45 interesting to extend the period under study so as to determine whether the entrepreneurial
46 dynamic broken by the crisis has been restored. This might also allow us to better analyze
47 trajectories of the 26 OECD countries over a long period. The consequences of the crisis
48

49 ¹⁷ OECD (2009) distinguishes three kinds of accompanying measures to address the financial constraints of
50 SMEs: (a) measures supporting sales, cash flows, and working capital; (b) measures to enhance SMEs'
51 access to liquidity, mainly to bank lending; (c) measures aimed at helping SMEs to maintain their investment
52 level and more generally to build their capacity to respond in the near future to a possible surge in demand.
53

1 are indeed still evolving over the 2010-2012 period and considerably affect the
2 entrepreneurial dynamics of the countries in question.

3 A promising direction for future research would be to analyze interactions between
4 entrepreneurship, economic development and institutional environment in an econometric
5 framework using panel data techniques. Recent econometric developments in handling
6 non-stationary panel data would make it possible to analyze both short- and long-run
7 relationships (Abdesselam et al., 2014). In such a study we could distinguish different
8 behaviors depending on the nature of the economies, using the typology that we have
9 established. The results could enrich our conclusions even further.

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14
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1 **Appendix**

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4 **The Hierarchical Cluster Analysis (HCA)**

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7 The HCA according to Ward's method consists of gathering classes for which the
8 loss of inertia between classes ΔI_B is the lowest. In this case, the distance between two
9 classes is measured by the loss of inertia that one undergoes in the gathering, called the
10 cluster index or index level of the clustering. A high loss of inertia means that the two
11 classes k and $k-1$ that have been grouped are quite distant from each other. Then a "good"
12 partition is a partition that precedes a significant loss of inertia. It is this test that is
13 commonly used to select the number of classes for HCA.

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17 The choice of the number of classes is usually accomplished from the diagram of
18 aggregate indices. This is a crucial aspect of the evaluation of the proposed solutions when
19 analyzing a hierarchical classification; one is faced with the problem of getting too many
20 or too few classes. However, while there is no single index to determine the optimal
21 number of classes, many criteria can be used to facilitate this decision. First, it is possible
22 to take a decision based on the characterization of classes by the active variables with $\alpha =$
23 0.05 , a classic level of significance. If the profiles and/or anti-profiles of the obtained
24 classes differ significantly on these variables for the classification, the proposed solution is
25 probably relevant. Second, the ease of interpretation is also a criterion that tells us the
26 required number of classes. It is important to question the relevance of the theoretical
27 profiles and/or anti-profiles obtained. Finally, the size of the sample must also be taken
28 into consideration: the larger the sample, the higher the number of classes.

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32 Statistical criteria can be also used to decide how many classes to choose, such as
33 the Semi-Partial R-Squared (SPR^2) or the R-Squared (R^2).

34 - The $SPR^2 = \Delta I_B / I_T$ measures the loss of inertia between classes or cluster indexes
35 ΔI_B as a percentage of total inertia I_T caused by grouping two classes. The goal is to have a
36 maximum within-classes inertia, and we look for a low SPR^2 followed by a strong SPR^2 at
37 the following aggregation: a hollow for k classes and a peak for $k-1$ classes, indicates a
38 good classification in $k-1$ classes. This means that we must cut the hierarchical tree before
39 heavy loss of inertia: a low value of SPR^2 means the fusion of two homogeneous classes.

40 - The $R^2 = I_B / I_T$ is the proportion of variance explained by classes; it measures the
41 quality of the classification. Its value should be as close as possible to one without too
42 many classes; the ideal is to stop after the last big jump.

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46 To assess the stability of obtained classes of HCA, we have consolidated all the
47 classes, using a non-hierarchical cluster analysis, more robust, with mobile centers (k-
48 means). The interpretation of a class is a qualitative description of their profile and/or anti-
49 profile created from the active variables -those on which we wanted to differentiate the
50 classes- but also with other additional (illustrative) variables selected. A generic name has
51 been assigned to each class of HCA.

Figure A1: Hierarchical tree over the 1999 to 2008 period for the 26 OECD countries

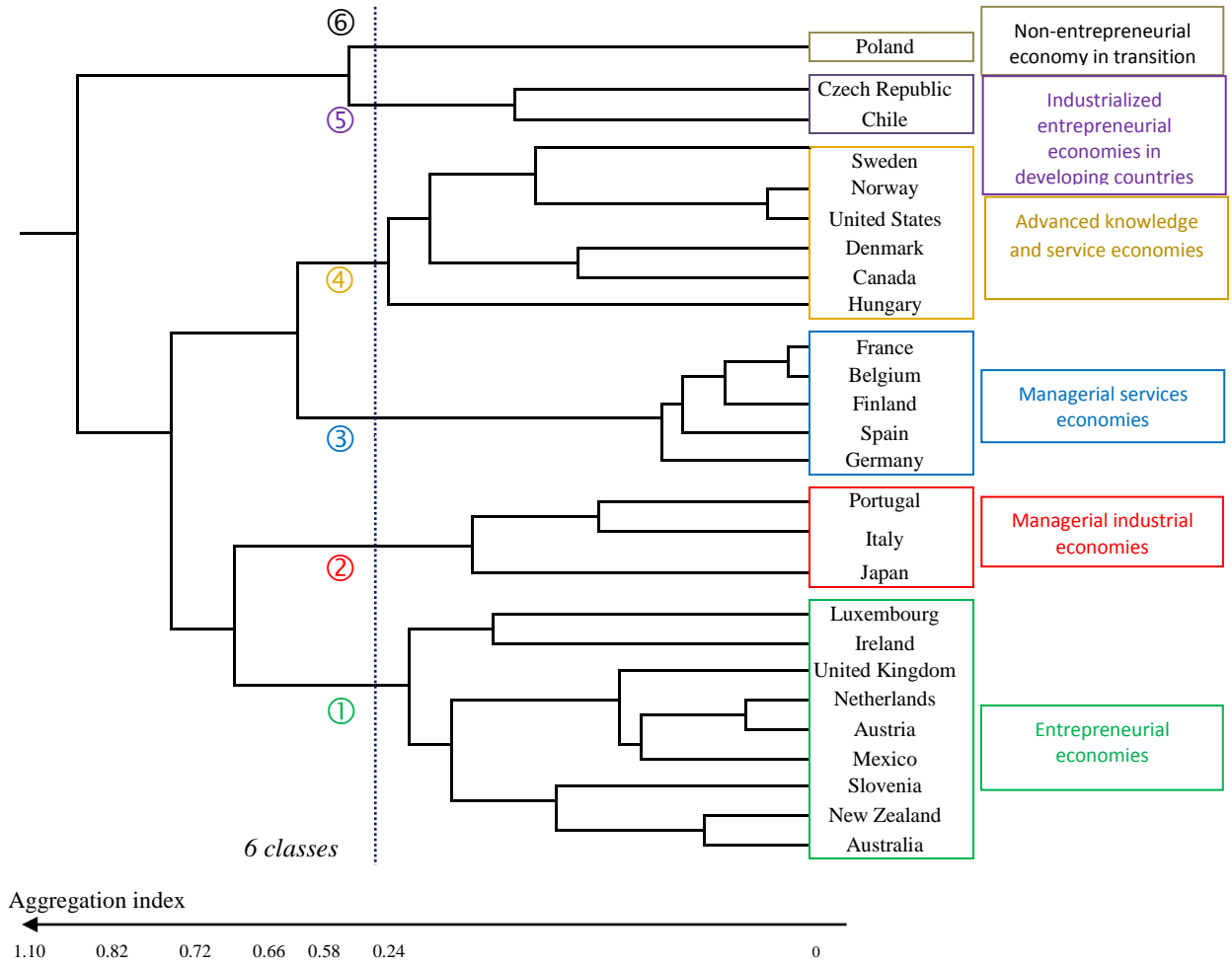


Table A1: Synthesis of the partition into 6 classes of the 26 OECD countries over the period 1999-2008

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	
Frequency	9	3	5	6	2	1	
Countries	Australia Austria Ireland Luxembourg Mexico Netherlands New Zealand Slovenia United Kingdom	Italy Japan Portugal	Belgium Finland France Germany Spain	Canada Denmark Hungary Norway Sweden United States	Chile Czech Republic	Poland	
Profile (+)	+ GDP 1999, 2002 and 2007 + SEMPLShare 2008 + SEMPLGrowth 2007, 2008	+ SEMPLShare 1999 to 2006	+ UNEMPL 1999 to 2008 (-2001) + SEMPLGrowth 2005, 2006		+ SEMPLShare 2003 to 2008 + SEMPLGrowth 2002, 2003	+ UNEMPL 1999 to 2008 + SEMPLShare 1999 to 2008 + GDP 2008 + SEMPLGrowth 2000, 2001	
Anti-Profile (-)	-UNEMPL 1999 to 2008	- GDP 1999, 2002 to 2006		- SEMPLGrowth 1999 to 2008 - GDP 2007	- GDP 1999		
Illustrative variables	Economic Development	+ IPRO 2002 - HEALTH 1999 - EDU 2000	+ DCR 1999 to 2007 + INDUSEMPL 1999, 2000, 2003 - EDU 2003 to 2005, 2007, 2008 - IPRO 2002, 2004, 2005, 2008	+ GERD 2000	+ EDU 1999 to 2008 + HEALTH 1999 to 2008 + PATENTS 2007 + SEREMPL 1999 to 2008 - AGRIEMPL 2001 to 2008 (-2002)	+ INDUS 1999 to 2008 (-2001) + INDUSEMPL 2006 to 2008 + IPRO 2004, 2005, 2007 + AGRI 1999 - DCR 2007 - HEALTH 2004 to 2008 -SER 1999 to 2008 - SEREMPL 2006, 2007	+ IPRO 2003
	Institutional Environment	+ IMM 1999 to 2008 + RMINW 2007 + TRADE 1999 to 2002 + InFDI 2002, 2003 -BTE 2003, 2008	+ STRICT 1999 to 2008 - InFDI 1999	+ TIME 2003 + OutFDI 2001 + BTE 1998, 2003		+ ECH 2004 to 2008 + PROC 2006 to 2008 + BTE 2008 - RMINW 1999 to 2008 - ECH 2001	+ PROC 2003 to 2008 + COST 2008 +BTE 1998, 2008
	Entrepreneurial variables	+ YFEAI 2004	- NEAI 2004, 2006	- NEAI 2002 - YFEAI 2002, 2003, 2008 - OEAI 2005, 2006	- OEAI 2006	+ NEAI 2006	- OEAI 2005

Note: Table A1 summarizes the main results of the characterization of the chosen partition into six classes of countries, obtained from the cut of the hierarchical tree of figure A1. Division is carried out according to the positions of the countries, on the factorial axes of the MFA. All the active and illustrative variables mentioned in this table are significant at the level of 5%.

Figure A2: Hierarchical tree in 2009 for the 26 OECD countries

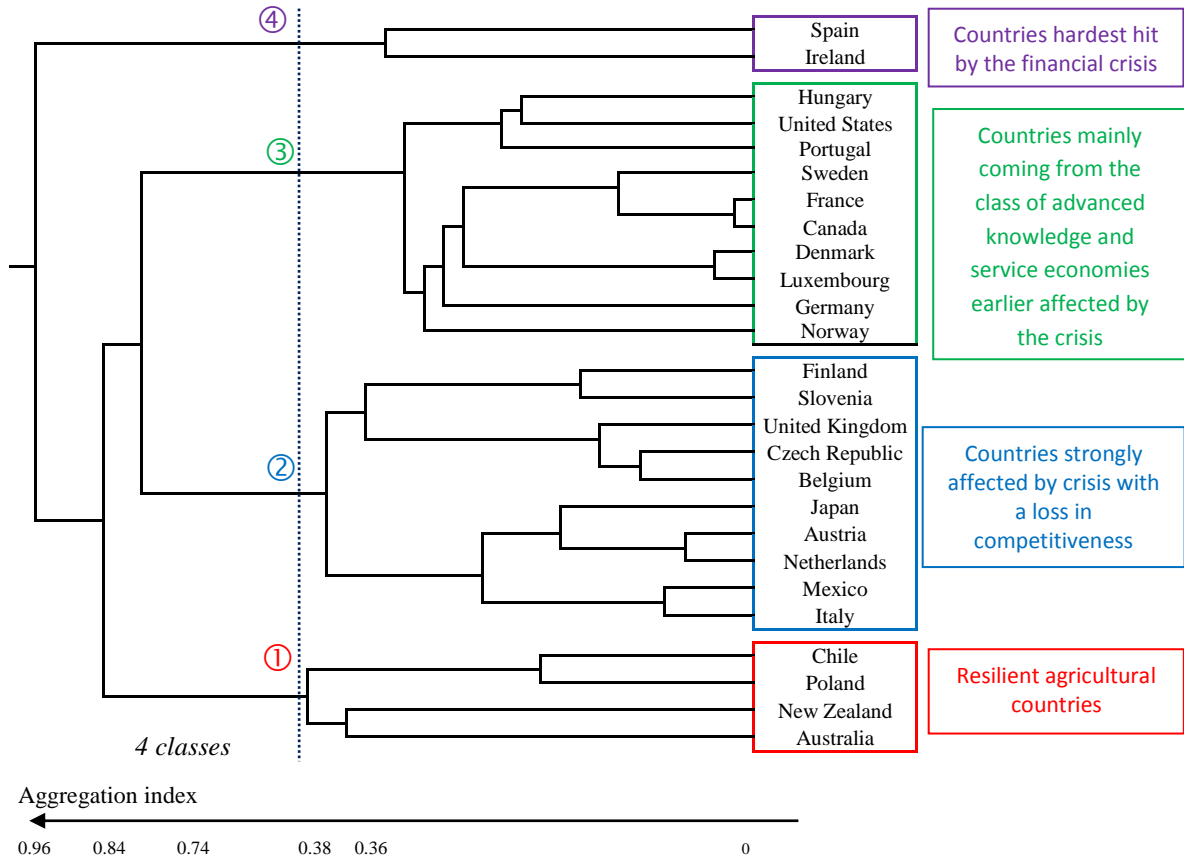


Table A2: Synthesis of the partition into 4 classes of the 26 OECD countries in 2009

		Class 1	Class 2	Class 3	Class 4
Frequency		4	10	10	2
Countries		Australia Chile New Zealand Poland	Austria Belgium Czech Republic Finland Italy Japan Mexico Netherlands Slovenia United Kingdom	Canada Denmark France Germany Hungary Luxembourg Norway Portugal Sweden United States	Ireland Spain
Profile (+)		+ GDP + SEMPLShare	+ SEMPLShare		+ UNEMPL
Anti-Profile (-)			- UNEMPL - GDP	- SEMPLShare	- SEMPLGrowth
Illustrative variables	Economic Development	+ IPRO + AGRI + AGRIEMPL - SER - GDERD		+ HEALTH + PATENTS +SEREMPL + SER	
	Institutional Environment	+ ECH - STRICT	- ECH	- COST	
	Entrepreneurial variables				

Note: Table A2 summarizes the main results of the characterization of the chosen partition into four classes of countries, obtained from the cut of the hierarchical tree of figure A2. Division is carried out according to the positions of the countries, on the factorial axes of the MFA. All the active and illustrative variables mentioned in this table are significant at the level of 5%.

Figure A3: Hierarchical tree over the 2010-2012 period for the 26 OECD countries

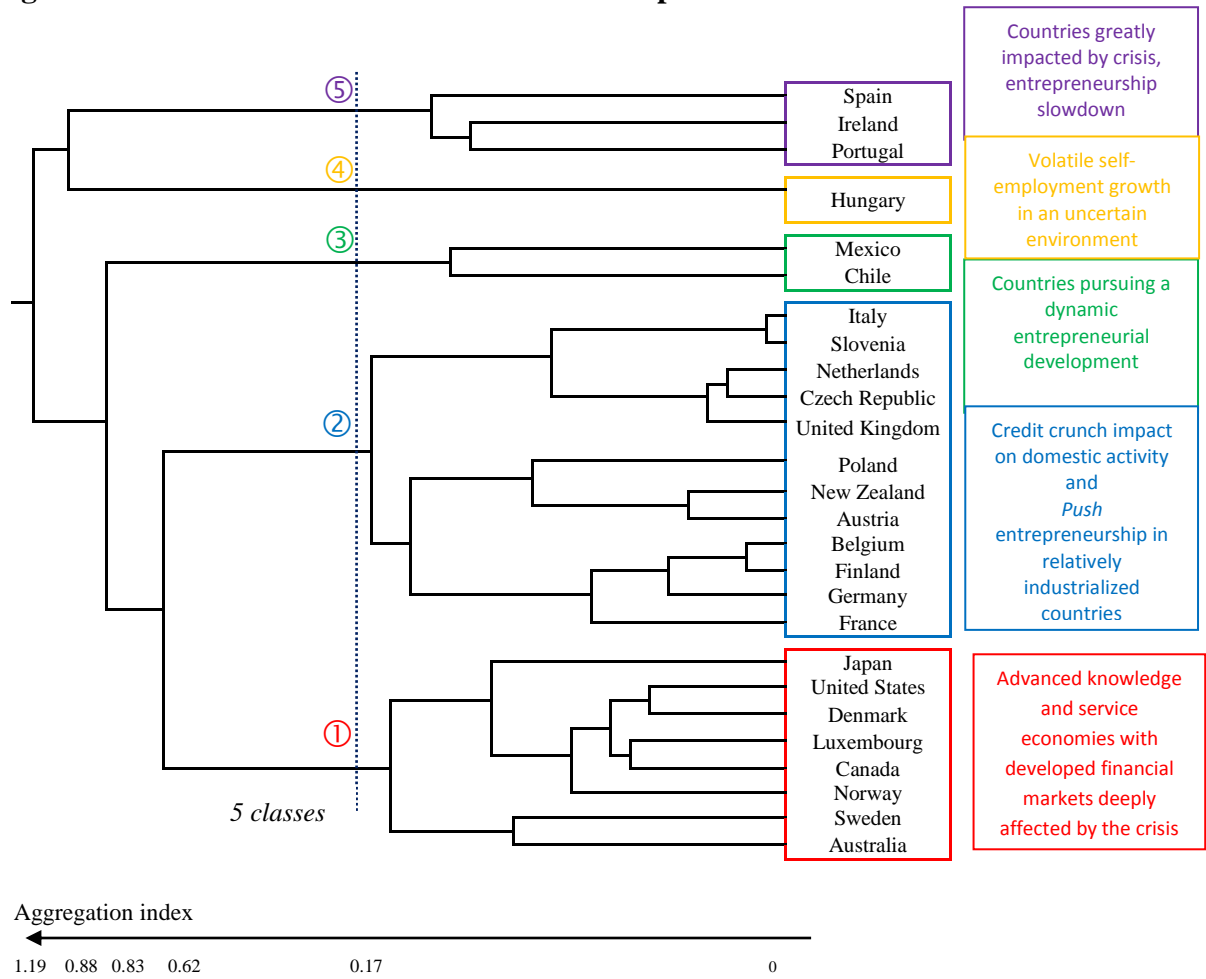


Table A3: Synthesis of the partition into 5 classes of the 26 OECD countries over the period 2010-2012

	Class 1	Class 2	Class 3	Class 4	Class 5
Frequency	8	12	2	1	3
Countries	Australia Canada Denmark Japan Luxembourg Norway Sweden United States	Austria Belgium Czech Republic Finland France Germany Italy Netherlands New Zealand Poland Slovenia United Kingdom	Chile Mexico	Hungary	Ireland Portugal Spain
Profile (+)		+ SEMPLShare _{2010 to 2012} + SEMPLGrowth ₂₀₁₂	+ SEMPLShare _{2010 to 2012} + GDP _{2010 to 2012} + SEMPLGrowth ₂₀₁₀	+ SEMPLGrowth ₂₀₁₁	+ UNEMPL _{2010 to 2012}
Anti-Profile (-)	- SEMPLShare _{2010 to 2012} - SEMPLGrowth ₂₀₁₁ - UNEMPL _{2010 to 2012}			- SEMPLGrowth ₂₀₁₂	- GDP _{2010 to 2012} - SEMPLGrowth _{2010, 2011}
Illustrative variables	Economic Development	+ PATENTS _{2010, 2011} + URBAN _{2010 to 2012} + GDERD _{2010 to 2012} + DCR _{2010 to 2012} + SEREMPL _{2010 to 2012} - INDUSEMPL _{2010 to 2012} - AGRIEMPL _{2010 to 2012} - IPRO ₂₀₁₁ - AGRI ₂₀₁₀	+ INDUSEMPL _{2010 to 2012} - DCR _{2010, 2011} - SEREMPL ₂₀₁₂	+ AGRI _{2010 to 2012} + AGRIEMPL _{2010, 2011} + INDUS _{2010 to 2012} + IPRO ₂₀₁₂ - SER _{2010 to 2012} - HEALTH _{2010 to 2012} - GDERD ₂₀₁₀ - DCR _{2010, 2011}	+ DCR _{2010 to 2012} - GDERD ₂₀₁₂ - URBAN _{2010 to 2012} - IPRO ₂₀₁₂
	Institutional Environment	+ IMM _{2010, 2011} - STRICT _{2010 to 2012}		+ ECH _{2010 to 2012} - RMINW _{2010 to 2012}	
	Entrepreneurial variables	+ OEAI _{2010, 2011}		+ NEAI _{2010 to 2012} + YFEAI _{2011, 2012}	

Note: Table A3 summarizes the main results of the characterization of the chosen partition into five classes of countries, obtained from the cut of the hierarchical tree of figure A3. Division is carried out according to the positions of the countries, on the factorial axes of the MFA. All the active and illustrative variables mentioned in this table are significant at the level of 5%.

Table A4: Trajectories and resemblances in development for the 26 countries of the OECD

Class	Before Crisis: 1999-2008	Crisis: 2009	After Crisis: 2010-2012
1	<p><i>Entrepreneurial economies</i></p> <p>Australia Ireland Luxembourg New Zealand Mexico</p> <p>Slovenia United Kingdom Austria Netherlands</p>	<p><i>Resilient countries</i></p> <p>Australia New Zealand Chile Poland</p>	<p><i>Advanced knowledge and service economies with developed financial markets deeply affected by the crisis.</i></p> <p>Canada Denmark United States Sweden Norway</p> <p>Australia Luxembourg Japan</p>
2	<p><i>Managerial industrialized economies</i></p> <p>Italy Japan Portugal</p>	<p><i>Countries strongly affected by crisis with a loss in competitiveness</i></p> <p>Mexico</p> <p>Slovenia United Kingdom Austria Netherlands</p> <p>Italy Japan</p> <p>Belgium Finland</p> <p>Czech Republic</p>	<p><i>Credit crunch impact on domestic activity and Push entrepreneurship in relatively industrialized countries.</i></p> <p>Belgium Finland</p> <p>Germany France</p> <p>New Zealand</p> <p>Slovenia United Kingdom Austria Netherlands</p> <p>Poland Czech Republic Italy</p>
3	<p><i>Managerial service economies</i></p> <p>Belgium Finland Spain</p> <p>Germany France</p>	<p><i>Countries mainly coming from the class advanced knowledge and service economies earlier affected by crisis</i></p> <p>Germany France</p> <p>Canada Denmark United States Sweden Norway</p> <p>Hungary</p> <p>Luxembourg Portugal</p>	<p><i>Countries pursuing a dynamic entrepreneurial development</i></p> <p>Chile Mexico</p>
4	<p><i>Advanced knowledge and service economies</i></p> <p>Canada Denmark United States Sweden Norway</p> <p>Hungary</p>	<p><i>Countries hardest hit by the financial crisis</i></p> <p>Ireland Spain</p>	<p><i>Volatile self-employment growth in an uncertain environment</i></p> <p>Hungary</p>
5	<p><i>Industrialized entrepreneurial economies in developing countries</i></p> <p>Chile Czech Republic</p>		<p><i>Countries greatly impacted by crisis, entrepreneurship slowdown</i></p> <p>Ireland Portugal Spain</p>
6	<p><i>Non-entrepreneurial economy in transition</i></p>		

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Contributions: This study contributes to existing literature in four ways: first, it proposes a better understanding of the complex relationships between level of development, entrepreneurial dynamics, growth and unemployment, at a country level; second, it determines the economic and institutional drivers of entrepreneurial activities in managerial/entrepreneurial economies; third, it proposes a dynamic approach to entrepreneurship with a sample studied over a 13-year period (including the financial crisis) and appropriate methods; fourth, it suggests recommendations for the implementation of public policy in order to promote entrepreneurial activity and reduce unemployment.

Research questions and purpose: This article addresses the following research questions: first, how can we characterize economies as regards their entrepreneurial activity, taking into account level of development, growth and unemployment? Second, what are the drivers - economic and institutional regulatory constraints- of entrepreneurial activity at the country level? Third, what is the impact of the financial crisis on entrepreneurial activity?

Basic research methodology and information: Following a quantitative approach, we propose a classification of OECD countries relative to variables pertaining to entrepreneurial activity, growth and labor market situation. A combined use of multidimensional evolutive data analysis allows us to identify groups of countries with similar entrepreneurship behavior. Thanks to supplementary variables representative of economic development and institutional environment, the classification is enriched and the different kinds of development highlighted.

Results/findings: Results indicate that: first, the level of development, sectoral specialization, and institutional variables related to entrepreneurship, functioning of the labor market and openness of the country are determinant to understand differences in entrepreneurship activity across countries; second, the pre-crisis period, from 1999 to 2008, is a period of growth favourable to entrepreneurship; third, the financial crisis involved a break in entrepreneurial dynamism with the agricultural economies that have best withstood the financial crisis; fourth, the 2010-2012 period of recovery is a period of a sharp slowdown in entrepreneurial activity, during which the countries that are less dependent on the financial sector proved to be the most resilient; fifth, in this period advanced knowledge economies, with developed financial markets, fewer regulatory institutional constraints and scope for qualitative entrepreneurship, have lower unemployment rates.

Limitations: A possible limitation is that the study only addresses regulatory institutional factors.

Theoretical implications and recommendations: From a theoretical implication point of view, this study provides a better understanding of the components of the national environment (level of development and institutional environment) that promote or deter entrepreneurship, and contributes to explaining the differences between managerial and entrepreneurial economies.

Practical implications and recommendations: From a practical implication perspective, this study provides a useful picture of the economic and institutional conditions that enable an economy to foster opportunity-driven entrepreneurship and reduce unemployment.

Policy recommendations: Four institutional incentives to stimulate entrepreneurship are presented and explained in the paper. It appears that policymakers should: first, alleviate some constraints on entrepreneurship and the functioning of the labor market; second, foster the

country's openness; third, adopt measures to strengthen the national competitiveness and attractiveness of factors of production; fourth, regulate the financial sector.

Future research directions: Future studies should broaden the range of institutional variables investigated, especially considering those relative to informal institutions. Further, a promising direction for future research would be to analyze interactions between entrepreneurship, economic development and institutional environment in an econometric framework using panel data techniques. Moreover, the use of recent developments in the econometrics of non-stationary panel data would make it possible to analyze both short- and long-run relationships.