

Comparing subjective and objective indicators to describe the national entrepreneurial context: the Global Entrepreneurship Monitor and the Global Competitiveness Index contributions

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ABSTRACT: Entrepreneurship research is progressing towards the construction of indexes that integrate the information of the three predominant approaches: the entrepreneurial activity output; the population's entrepreneurial behavior, values and aspirations; and the context in which entrepreneurship takes place. In this study we compare the Global Competitiveness Index data, one of the objective sources of information selected among those recognized as descriptors of national contexts, with the national entrepreneurial context qualitative information provided by the Global Entrepreneurship Monitor. The main purpose of this research is to contribute to the knowledge of entrepreneurial context sources of information by opening a discussion around the usefulness and contribution that could make the Global Entrepreneurship Monitor source in this field, and to determine if it is recommendable to proceed to its formal validation in the short time. The obtained results evidence that the two sources do not overlap to the degree of substituting one by the other and that the Global Entrepreneurship Monitor provides relevant qualitative details about the state of entrepreneurial context that are interesting to complement the Global Competitiveness Index information. The conclusion is to recommend the formal validation of this source, being also necessary to make comparisons with other relevant sources and to clear up its role in the progress of the integrated indexes construction.

Classification JEL: M13; O1; O57.

Keywords: entrepreneurial context; entrepreneurial framework conditions; experts' survey; subjective and objective context information; GEM; GCI.

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Comparación de indicadores subjetivos y objetivos para describir el contexto nacional para emprender: las contribuciones del Global Entrepreneurship Monitor y del Índice de Competitividad Global

RESUMEN: La investigación sobre emprendimiento está avanzando hacia la construcción de índices que integran la información de los tres enfoques predominantes en esta materia: el resultado de la actividad emprendedora propiamente dicha; el comportamiento, valores y aspiraciones emprendedoras de la población, y el contexto en que se desarrolla el emprendimiento. En este estudio se comparan los datos del Índice de Competitividad Global —una de las fuentes objetivas de información seleccionadas entre aquellas más reconocidas como descriptoras de contextos nacionales— con la información cualitativa acerca del estado del entorno nacional para emprender proporcionada por Global Entrepreneurship Monitor (GEM). El objetivo principal de este trabajo es el de contribuir al conocimiento de las fuentes de información sobre el contexto emprendedor, abriendo un debate en torno a la utilidad y la contribución que puede hacer Global Entrepreneurship Monitor como fuente de información en este ámbito, y para determinar si es recomendable proceder a la validación formal de la herramienta que utiliza en el corto plazo.

Los resultados obtenidos en esta investigación evidencian que las dos fuentes de información comparadas no se solapan hasta el punto de poder sustituir una por la otra, y que la fuente de Global Entrepreneurship Monitor, proporciona detalles cualitativos relevantes sobre el estado del contexto emprendedor que son interesantes para complementar los datos proporcionados por el Índice de Competitividad Global. La conclusión es recomendar la validación formal de la fuente de información GEM, así como la realización de comparaciones con otras fuentes de información relevantes, clarificando su papel en el avance de la construcción de índices integrados de emprendimiento.

Clasificación JEL: M13; O1; O57.

Palabras clave: contexto emprendedor; condiciones de entorno para emprender; encuesta de expertos; información contextual subjetiva y objetiva; GEM; GCI.

1. Introduction

The building of entrepreneurship indicators has been working until very recent dates in three main almost independent approaches that include: the measurement of the entrepreneurial activity scope (output approach); the analysis of the entrepreneurial behavior, values, attitudes and opinions on the working age populations; and the measurement or evaluation of the state of the context or entrepreneurial conditions faced by potential and effective entrepreneurs (Acs, Autio and Szerb, 2012).

The attention devoted by the entrepreneurship literature to each one of these parts does not appear as balanced and the context approach is perceived as some undervalued compared with the other two approaches (Lindmark, 2011). Nowadays, it

becomes necessary to consider more effort to evaluate the usefulness of the sources of information focused on the context and to determine their contribution to the entrepreneurial context description, because the entrepreneurship measurement is called to offer integrated information instead of independent parts of information.

Thus, the most recent entrepreneurship measurement trends highlighted, and are demonstrating with effective results, the need of joining the three independent approaches (output, behavior/attitudes/values and context) to build entrepreneurship integrated indexes. These indexes represent an extended view of the entrepreneurial phenomenon and facilitate the identification of its strengths and weaknesses, opening up possibilities for policies correction and promote more adequate actions, a task that is much more difficult to do if based on partial or fragmented information.

For the construction of integrated entrepreneurship indexes, it has been more widely discussed the selection of indicators on entrepreneurial activity and on behavior/values/attitudes than the selection of context descriptors. Thus, although there are no perfect indicators of each part of the entrepreneurship equation the integrated indexes are based in a selection of entrepreneurial activity indexes, in variables that represent the entrepreneurial attitudes and aspirations of the populations and in prestigious context descriptors. The most advanced integrated index is the Global Entrepreneurship and Development Index (GEDI) due to Acs and Szerb (2008). It is based in information provided by the Global Entrepreneurship Monitor (GEM) for the entrepreneurial activity and entrepreneurial attitudes and aspirations of the populations, and in information provided by the Global Competitiveness Index (GCI), the Doing Business Index (EDB) and the Economic Freedom Index (EFI) for the context part.

As most of the variables that can be used to build integrated indexes can be provided by the GEM project and as it appears that its source of information on the entrepreneurial context has not been considered as a contributor to integrated indexes in front of other sources, the aim of this paper is to open a discussion to analyze if the information collected by GEM to describe the entrepreneurial context can provide differential information regarding one of these other sources: the Global Competitiveness Index.

The general justification of the need of this type of research has been pointed out before: to improve the knowledge on the entrepreneurial context indicators, the information they give and their usefulness to allow researchers to make adequate selections when building integrated entrepreneurship indexes. But there are other relevant and concrete justifications. Thus, in first place it is important to clear up questions about if the GEM source of information on the entrepreneurial context can contribute to integrated indexes with differential information or if it not able to do so. In second place, as GEM collects subjective information instead of objective information on the entrepreneurial context, it is relevant to clear up questions around the possible relationship and usefulness of both types of indicators. Finally, it is important to find ways to establish comparisons among different sources of information on the context, and this research represents a methodological contribution to this field. In this sense, we point out that it would be desirable to compare the GEM context information with

all others mentioned above, but given the constraints of an academic paper, the comparisons must be individually addressed. We begin with the GCI because the EDB and EFI are, apparently, more related with very concrete parts of the GEM information while the GCI includes a larger number of common variables appearing as the most indicated to make a first general exploration.

To structure the present research the following sections include: a brief view on the importance of the national and regional context for entrepreneurship and the explanation of the methodology of the compared sources of information; the research hypotheses; the research methodology; the statistical analyses; the derived conclusions and the final discussion.

2. The relevance of the national and regional context in entrepreneurship research

Without taking into account the context, and its complexity, it is not possible to explain the great variations in the formation of new ventures that exist between industries, regions and countries, but also over time (Shane, 2008; GEM, 2006, and 2011).

The context for entrepreneurship has been discussed from different perspectives. Among others, Shane (2003) discusses sources of entrepreneurial opportunities in terms of technological changes, political/regulatory changes and social/demographic changes. Bowen and de Clercq (2008) analyzed how a country's institutional environment will influence the allocation of the entrepreneurial effort. In a study of the relationship between bureaucratic work environments and entrepreneurship Sørensen (2007) has revisited sociological approaches to entrepreneurship, and found support for a negative relationship between bureaucratic work environments and entrepreneurship.

From the cited examples, and many others, it is possible to state that studies of the relationship between the context and entrepreneurship are based on different theoretical perspectives and are focusing on different aspects of the entrepreneurial process. Some are focusing on the supply of entrepreneurial individuals, others on the origin of entrepreneurial opportunities or on contextual factors that support or hinder the exploitation of entrepreneurial opportunities. From this follows that analyses of the context for entrepreneurial ventures can be structured in many different ways based on different perspectives and theories depending on the purpose of the study. This is the main reason that justifies the need to progress in the knowledge and contribution made by the different sources of information on the entrepreneurial context to build integrated entrepreneurship indexes.

The context is very complex because the number of contextual factors is very large and because their importance varies depending on other factors as for example the level of national or regional development. Nevertheless, actually it seems accepted that a division of the environment for entrepreneurship is constituted by three main analytical sub-contexts: the economic, the political and the socio-cultural and

by three analytical levels: the global, the national and the regional/local level (Lindmark, 2011).

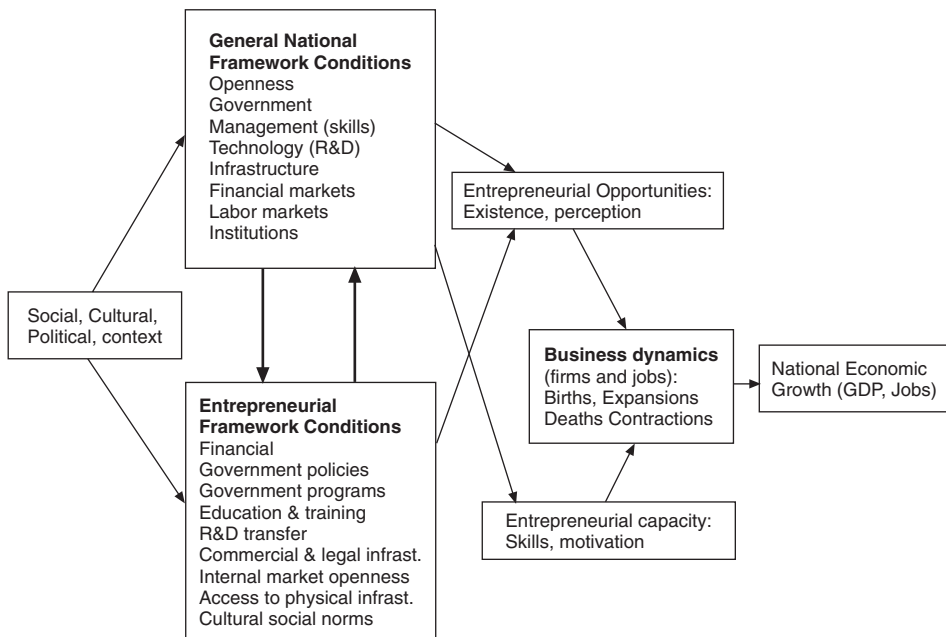
In the framework-institutional area, different types of measures can be identified. One approach surveys national experts thanks to a mail or online questionnaire to construct multi-item scales that reflect entrepreneurial framework conditions. The Global Entrepreneurship Monitor's National Expert Survey (Reynolds *et al.*, 2005) is an example of this since the year 1999. Another approach is the mixture of objective and subjective information provided by the World Economic Forum through the Global Competitiveness Indexes which relate key contextual factors with the countries' development level. More recently, there is another approach that compares the national regulatory framework for new business entry (Djankov *et al.*, 2002), which results in the widely used World Bank «Ease of Doing Business (EDB)» index. This source collects data on the regulatory framework which is relevant for the registration of new limited liability companies, focusing on highly tangible indicators of the regulatory environment such as the number of procedures required to register a new business; the number of days required to complete a new business registration; minimum capital requirement for new limited liability companies (as % of GDP per capita); procedures and cost to build a warehouse; creditor recovery rate in bankruptcy events and so on. Differently from other entrepreneurship sources of information, the EDB is invaluable in its specialty and, as it does not provide information on actual new firm creation, it constitutes the most appreciated general complement to objectively assess the state of the regulatory framework. Its most significant limitation is that the data is restricted to a «standardized» company that, among others is registered, employs from 5 to 50 employees within the first month of operation, and has sales turnover of up to 10 times seed capital (Djankov *et al.*, 2002). This means that the EDB framework conditions may or may not apply to well over 90% of the new firm population in any given country (Acs, Autio, Szerb, 2012). Related and building on this effort, OECD Entrepreneurship Indicators Program (EIP) has developed a more comprehensive framework measure that distinguishes between framework conditions, entrepreneurship performance, and economic impact (Ahmad and Hoffmann, 2008; Hoffmann *et al.*, 2006). This source is perhaps the most systematic and comprehensive approach to measuring entrepreneurship policy frameworks. It builds on and extends research into entrepreneurship policies initiated by the Danish government and policy research think tank FORA, and it also draws on the EDB, the World Bank Entrepreneurship Survey and the OECD's efforts to track various forms of new business registrations and exits. The core of the EIP approach is the framework conditions economic impact model developed by Ahmad and Hoffmann (2008; see also Nordic Council, 2010). In this model, entrepreneurship performance, understood as registration and growth of new limited liability companies) is regulated by entrepreneurship framework conditions. However, the link between framework conditions and entrepreneurship performance still remains a conjecture instead of a statistically established relationship and given the all-encompassing definitions employed to describe entrepreneurship, to demonstrate this statistical link appears as challenging (Ahmad and Hoffmann, 2008: 8).

Summarizing, while framework indicators provide useful benchmarks of the institutional and regulatory conditions that prevail in the economy, they lack connectivity with actual activity. In this perspective, an entrepreneurial country is one where the regulations and broader institutional conditions are supportive of entrepreneurial actions, regardless of whether such activity occurs and in which form. A further limitation of the regulations-focused framework indices is that they can only target registered activity, and the «standardized» approach overlooks up to the majority of self-employment attempts and new firm formations, depending on country (Acs, Autio and Szerb, 2012).

2.1. The contribution of the Global Entrepreneurship Monitor to the entrepreneurial context analysis and information

The initial GEM theoretical model (see figure 1), includes since the year 1999 a number of factors, social, cultural, and political, to assess the entrepreneurial context and under the statement that it can explain the opportunities existence, the entrepreneurial capacity of the population and, consequently, variations in entrepreneurship and national economic growth (GEM 2006 & 2011).

Figure 1. The first version of the GEM Theoretical Model, 1999



Source: Reynolds, Hay and Camp, 1999. Global Entrepreneurship Monitor: 1999 Executive Report. Babson, LBS and Kauffman Foundation.

To provide the section devoted to the entrepreneurial context with information, the GEM designers stated the year 1999, that there was not any international source available. This fact leads them to design an information tool which was the National Experts Survey (NES).

Taking in account the relevance of the entrepreneurial context as an essential part of the entrepreneurship research, the GEM's researchers built a source of information that, at least, took in consideration both some division of the context and the above mentioned levels when designed the experts' survey the year 1999. Thus, although it collects subjective information from selected experts, the core questionnaire includes batteries of statements on entrepreneurial financing, governmental policies, governmental programs, entrepreneurial education and training, R&D transfer, commercial and professional infrastructure, internal market openness, physical and services infrastructure and cultural and social norms, which attempts to assess on some of the main economic, political and socio-cultural aspects related to entrepreneurship. On the other hand, the GEM experts' survey can be applied to collect information from samples of experts at the global, national and regional or local level. These are points that indicate that much care was put in the design of this tool in a moment in which most of the present international sources of information considered as related to the context did not exist.

The NES attempts to contribute to the entrepreneurial context diagnostic each year providing evaluations made by a representative group of experts on batteries of items (statements) on each one of the entrepreneurial framework conditions included in the model (see figure 1). The statements are valued in Likert scales of five points and the groups of items were built under the assumption of constructs able to summarize each framework condition thanks to one or at least two unobserved factors. Thus, for example, the six items that experts evaluate on entrepreneurial financing (see figure 2) can be summarized (applying a principal components analysis) in one factor that represents the state of entrepreneurial financing in a territory. The same is done with the rest of groups of items on the rest of framework conditions. The result is that the GEM experts' survey collects wide qualitative information that is translated into summarized quantitative information.

The main critic to the NES methodology is about the validation of experts' surveys and about the subjective character of the collected information on the entrepreneurial context. In its defense, it is possible to argue that expert's surveys are used and accepted by several economic and social projects to assess the state of different contexts, when there are no other objective sources of information, being critical the methodological design, the experts' selection and the calculation of reliability measures. In this sense, GEM trains the participating teams on the experts' sample selection, asks for a sample proposal which is reviewed and approved when it meets the required quality about the adequacy of experts to each entrepreneurial framework condition, and calculates reliability measures (Cronbach's Alpha) to ensure that the qualitative information will result in the expected unobserved variables which will summarize the state of the entrepreneurial context. Since the year 1999, the GEM

Figure 2. An example of how the GEM's experts' survey collects information. The case of the entrepreneurial financing framework condition

Topic A: Finance		In my country (or region, or city)				T			
		F							
A01	There is sufficient equity funding available for new and growing firms.	1	2	3	4	5		DK	NA
A02	There is sufficient debt funding available for new and growing firms.	1	2	3	4	5		DK	NA
A03	There are sufficient government subsidies available for new and growing firms.	1	2	3	4	5		DK	NA
A04	There is sufficient funding available from private individuals (other than founders) for new and growing firms.	1	2	3	4	5		DK	NA
A05	There is sufficient venture capitalist funding available for new and growing firms.	1	2	3	4	5		DK	NA
A06	There is sufficient funding available through initial public offerings (IPOs) for new and growing firms.	1	2	3	4	5		DK	NA

Note: the scale goes from 1 (completely false) to 5 (completely true), plus don't know and not applicable responses. These six items are summarized in one applying principal components. The result is a quantitative variable that aspires to represent how favorable or unfavorable is the entrepreneurial financing condition in a territory.

experts' survey has worked well and responding to the design. Further validation actions are expected for the near future.

2.2. The contribution of the Global Competitiveness Index to the context analysis

Since 2005, the World Economic Forum (WEF) has based its competitiveness analysis on the Global Competitiveness Index (GCI), a highly comprehensive index for measuring national competitiveness, which captures the microeconomic and macroeconomic foundations of national competitiveness (Sala i Martin, Blanke *et al.*, 2010).

The WEF defines competitiveness as the set of institutions, policies and factors that determine the level of productivity of a country. By its side, the level of productivity states the level of prosperity that can be earned by an economy. As a result, more competitive economies tend to produce higher levels of income for their populations. Also, the productivity level is the main factor determining the rates of return obtained by physical, human and technological investments in an economy. As the rates of return are the key drivers of the growth rates of the economy, a more competitive economy is one that is likely to grow faster in the medium to long run.

The WEF analysts identify static and dynamic components of the competitiveness concept: although the productivity of a country clearly determines its ability to sustain a high level of income, it is also one of the central determinants of the returns to investment, which is one of the critical factors explaining and economy's growth potential.

To build the GCI, these analysts have been identified some years ago 12 pillars of the economic competitiveness. To identify these pillars, a wide study on the economists thinking has been made: from the Adam's Smith focus on specialization and division of labor, to neoclassical economists' emphasis on investment in physical capital and infrastructure, and, more recently, to interest in other mechanisms such as education and training, technological progress, macroeconomic stability, good governance, firms' sophistication and market efficiency, among others. The GCI captures this wide vision by including a weighted average of many different components, each measuring a different aspect of competitiveness. These components are those grouped into 12 pillars of economic competitiveness.

The 12 pillars are: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor markets efficiency, financial market development, technological readiness, market size, business sophistication and innovation. It is clear that some of these pillars are also identified by GEM as entrepreneurial framework conditions.

The GCI reports separately about each one of the 12 pillars, but their authors aware about how important is to keep in mind that they are not independent. In fact, they have demonstrated that they tend to reinforce each other and that a weakness in one area often has a negative impact on other areas. To illustrate this reality, a good example can be given. Thus, innovation (pillar 12), will be very difficult to develop without a well-educated and trained workforce (pillars 4 and 5), that are adept at absorbing new technologies (pillar 9), and without sufficient financing (pillar 8) for R&D or an efficient goods market (pillar 6) that makes it possible to take new innovations to market (pillar 10) (Sala i Martin, 2010).

The GCI consists in a single index in which pillars are aggregated and weighted, but it is important to note that the Global Competitiveness Report offers indicators for the 12 pillars separately, because the detailed information provides a sense of the specific areas in which a particular country needs to improve.

In line with the economic theory of stages of development (Rostow W. W., 1959, Porter, 2002), the GCI assumes that in the first stage, the economy is factor driven, and countries compete based on their factor endowments, that is, primarily unskilled labor and natural resources. The companies compete on the basis of price and sell basic products or commodities. These countries show low productivity and this is reflected in low wages. The competitiveness at this stage relies on the first four pillars: well-functioning of public and private institutions, well developed infrastructure, a stable macroeconomic environment and a healthy workforce that has received at least basic education.

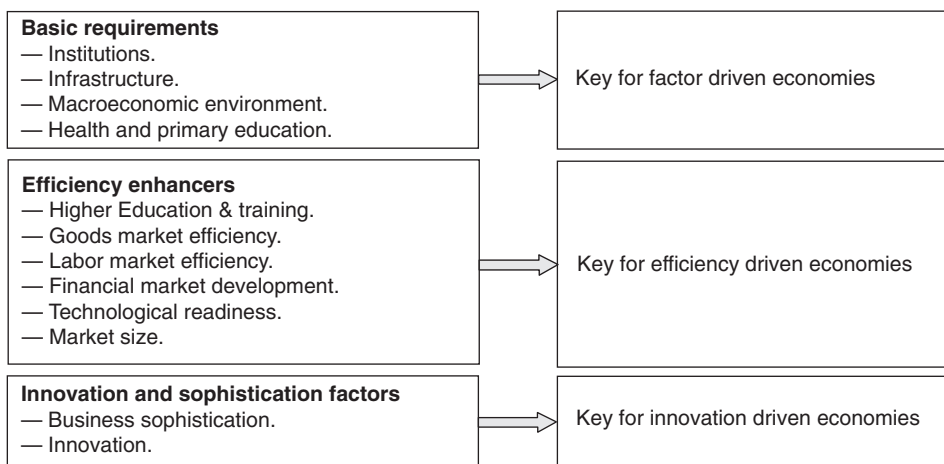
The second stage is achieved when a country becomes more competitive, productivity increases, wages rise and development advances. Nations that follow this process get the second stage of development that is named efficiency driven phase. In this stage, countries must begin to develop more efficient production processes and increase product quality, because wages have risen and they cannot increase prices. In this stage, competitiveness is increasingly driven by pillars from 5 to 10, that is:

higher education, efficient goods markets, well-functioning labor markets, developed financial markets, the ability to harness the benefits of existing technologies and a large domestic or foreign market.

The process is completed when countries move into the innovation driven stage. As countries reach this phase, wages will have risen by so much that they are able to sustain the associated standard of living only if their businesses are able to compete through new and unique products. Companies must compete producing new and different goods and services using the most sophisticated production processes, which involves pillar 11, and using innovation, which involves pillar 12.

The GCI incorporate the stages of development by attributing higher relative weights to those pillars that are more relevant for an economy (see figure 3), given its particular stage of development. Thus, although it is considered that all 12 pillars matter to certain extent for all countries, the relative importance of each one depends on a country's particular development stage. To implement this concept, the 12 pillars are organized into three sub-indexes: the basic requirements sub index (includes critical pillars for countries in the factor driven stage), the efficiency enhancers sub index (groups critical pillars for efficiency driven nations) and the innovation and sophistication factors sub index (that groups the critical pillars for innovation driven countries). These sub-indexes are shown in figure 3, and the weights attributed to each sub index in every stage of development, can be seen in table 1. These weights are obtained applying a maximum likelihood regression of GDP per capita against each sub index for past years. This system brings different coefficients for each stage of development and the rounding of these econometric estimates, led to the choice of weights displayed in table 1.

Figure 3. The 12 pillars of competitiveness and the stage of development as presented by the Global Competitiveness Report



Source: 2010-2011, Global Competitiveness Index Report, World Economic Forum.

Table 1. Weights of the three main sub-indexes at each stage of development

<i>Sub index</i>	<i>Factor driven stage (%)</i>	<i>Efficiency driven stage (%)</i>	<i>Innovation driven stage (%)</i>
Basic requirements	60	40	20
Efficiency enhancers	35	50	50
Innovation and sophistication factors	5	10	30

Source: 2010-2011, Global Competitiveness Index Report, World Economic Forum.

This same conceptualization has been applied to the GEM theoretical reviewed model since the year 2008 (GEM, 2008). The purpose of this change was to incorporate the economic competitiveness phases of the countries when the entrepreneurship and consolidated processes are analyzed by the observatory. So, nowadays, both GEM and the GCI base the classification of countries in their stages of development, using two criteria to allocate them. The first is the level of GDP per capita at market exchange rates (see table 2). This widely available variable is used in the GCI context as a proxy for wages, because it is internationally comparable and data on wages are not available for all countries. A second criterion measures the extent to which countries are factor driven. This can be calculated thanks to the share of exports of mineral goods in total exports (goods and services), under the assumption that countries that export more than 70 percent of mineral products (measured using a five year average), are to large extent factor driven. The nations falling between two of the three stages are considered to be in transition. The GCI analysts consider that, for these countries, the weights change smoothly as a country develops, reflecting the smooth transition from one stage of development to another. This allows these analysts to place increasingly more weight on the areas that are becoming more relevant for the country's competitiveness as it develops, ensuring that de GCI can gradually «penalize» those countries that are not preparing for the next stage.

Table 2. Income thresholds for establishing stages of development

<i>Stage of development</i>	<i>GDP per capita in US\$</i>
Factor driven	< 2,000
Transition from stage 1 to 2	2,000-3,000
Efficiency driven	3,000-9,000
Transition from stage 2 to 3	9,000-17,000
Innovation driven	>17,000

Source: 2010-2011, Global Competitiveness Index Report, World Economic Forum.

For the year 2010, the classification of countries into stages of development is shown in table 3. We include those countries that participated both in the GEM national experts' survey and in the adult population survey this year. The GEM sample does not

include the same numbers of nations in the stages of competitiveness, and this is a limitation, as some of them could not be representative of the total GCI sample. Thus, at the end of the table, we show the total GCI number of nations in each stage the year 2010, and the percent that is represented by the GEM sample. Significant gaps can be detected in the two first groups. As the GEM project is mainly sustained by private sponsorship, it is easy to conclude that as the competitiveness of nations increases, so do the odds to participate in the GEM project, although much advancement has been achieved in the field of developing nations sponsorship thanks to the commitment of diverse nonprofit institutions. Furthermore, the GCI is also a non-complete source of information and, like the GEM project, is trying to uncover the whole world, and despite its collection is wider than GEM in number of countries, they are some that could not still participate. The total number of countries reported by GCI was of 139 for the year 2010.

Table 3. GEM countries that participated in the national experts' survey the year 2010, classified following the GCI system

<i>Factor driven (1)</i>	<i>Transition 1-2</i>	<i>Efficiency driven (2)</i>	<i>Transition 2-3</i>	<i>Innovation driven (3)</i>
Bolivia	Angola	Argentina	Chile	Finland
Ghana	Egypt	Bosnia & H	Croatia	France
Pakistan	Guatemala	Brazil	Hungary	Germany
Palestinian S.*	Iran	China	Latvia	Greece
Uganda	Jamaica	Colombia	Taiwan	Iceland
Vanuatu*	Saudi Arabia	Costa Rica	Trinidad T.	Ireland
Zambia		Ecuador	Uruguay	Israel
		Macedonia		Italy
		Malaysia		Japan
		Mexico		Korea R.
		Montenegro		Norway
		Peru		Portugal
		Russia		Slovenia
		South Africa		Spain
		Tunisia		Sweden
		Turkey		Switzerland
				United Kingdom
				United States
N = 5 + 2(GEM)	N = 6 (GEM)	N = 16 (GEM)	N = 7 (GEM)	N = 18 (GEM)
N = 38 (GCI)	N = 25 (GCI)	N = 29 (CGI)	N = 15 (GCI)	N = 32 (GCI)
% = 13.1%	% = 24.0%	% = 55.2%	% = 46.4%	% = 56.2%

* Vanuatu and the Palestinian Settle did not participate in the GCI 2010 Report.

Source: data from GCI 2010 and GEM 2010.

2.3. The link between GEM and GCI

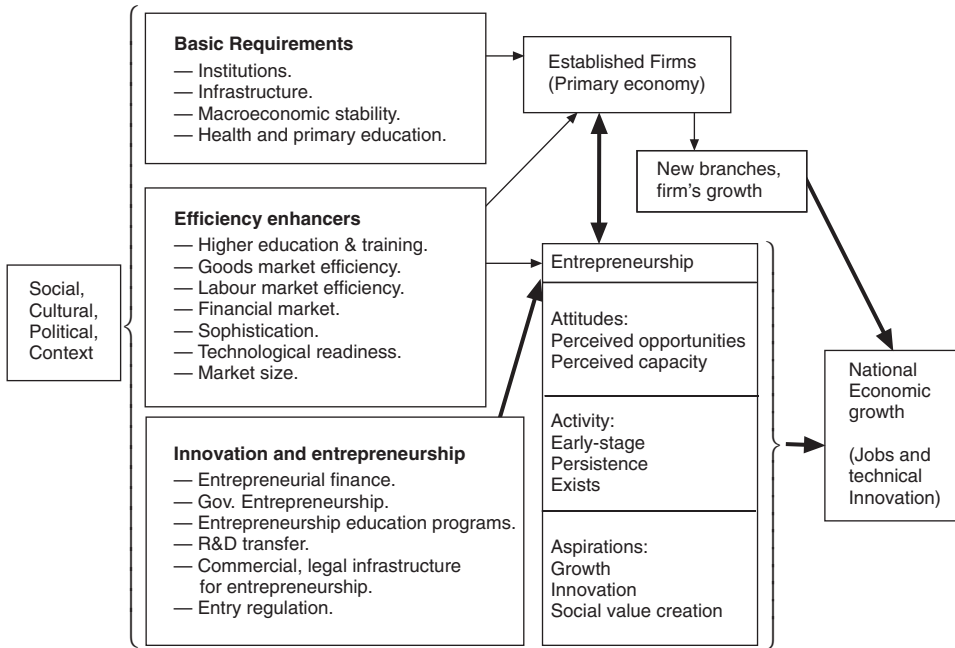
The year 2008, GEM Global Report authors (Bosma, Acs, Autio and Levie, 2008) considered very important to progress toward the construction of integrated indexes. They analyzed the interaction with other prestigious projects' information, especially the World Economic Forum's Global Competitiveness Report (GCR), and to consider more indicators that allow policy makers to better know what areas need more intervention to improve both: the entrepreneurial activity rate and its quality. This decision was justified because the GEM data evidenced that while important, the contribution of entrepreneurs to an economy also varies according to its phase of economic development (Acs, Audretsch, Braunerhjelm, Carlsson, 2003). As GEM growth, the data showed that the level of necessity-driven self-employment activity is high, particularly at low levels of economic development, as the economy may not be able to sustain a high enough number of jobs in high-productivity sectors (Bosma, Acs, Autio, Levie, 2008). As an economy develops, the level of necessity-driven entrepreneurial activity goes progressively down because productive sectors grow and begin to supply more employments. At the same time, opportunity-driven entrepreneurship tends to increase, and this introduces a qualitative change in the overall entrepreneurial activity. This process results in a U-shaped curve that demonstrates an association between entrepreneurship and economic growth, although the model cannot fully reflect the complexity of the causal relationship between the two concepts, and because the population entrepreneurial attitudes and the contextual variables take also part in the model. The 2008 GEM Global Report authors explained that in this document they introduced a more nuanced distinction among phases of economic development, in line with Porter's typology of factor-driven economies, efficiency-driven economies and innovation-driven economies (Porter, 2002). The outcome of this review was the revised GEM theoretical Model, showed in figure 4.

The differences between the first (see figure 1) and the revised model are evident, thus:

- The two sets of initial conditions (general framework and entrepreneurial framework), appear as substituted by the three groups of economy pillars used to build the three global competitiveness sub-indexes that integrate the overall competitiveness index (GCI) depending on the phase of economic development (see figure 4).
- The entrepreneurial opportunities and the entrepreneurial capacity perceptions' were integrated along with the entrepreneurial activity in a unique set of information devoted to entrepreneurship (see figure 4).

The first change stands the relevance of the development stages when measuring the entrepreneurial activity, but at the same time makes less clear where it is allocated the concrete measurement of the entrepreneurial context, an element considered as essential to build integrated entrepreneurship indexes. Thus, looking at the model, one could consider that the entrepreneurial context is included in the general context or that it has been substituted by the GCI pillars. If this is the case, then there is room

Figure 4. The GEM revised model



Source: GEM 2008, Bosma, Acs, Autio, Levie *et al.*

to test if at least part of the GEM information tool to assess on the entrepreneurial context could be substituted by the GCI pillars, which is the main subject of the present research.

The second change also represented an improvement and one of the necessary steps to progress in building integrated entrepreneurship indexes. Thus, it implies to agglutinate the information of the other two branches cited in the introduction, that is, the measurement of the entrepreneurial activity scope (output approach) and the analysis of the entrepreneurial behavior, values, attitudes and opinions on the working age populations.

Thanks to this model, GEM covers the main entrepreneurship research approaches. Now, it is necessary to clear up the role, usefulness and scope of the entrepreneurial context sources of information.

3. The research hypotheses

To progress in this clearing up, the concrete purpose of this research is to make a comparison between the GEM experts' survey and the GCI results as sources of information on the entrepreneurial context, to extract conclusions that help to clear

up if the first one can contribute to some degree to the building of entrepreneurship integrated indexes. As to compare both sources of information statistical methods must be applied, they have been established the following hypothesis:

H₀₁: The NES information on the national entrepreneurial framework conditions is able to classify the GEM participating nations in their respective GCI stages of competitiveness, that is, in factor-driven, efficiency-driven and innovation-driven economies (the stage of competitiveness depends to some degree on the EFCs state).

By testing this hypothesis we analyze if the subjective information given by GEM experts responds to some degree to the objective information given by the GCI on a general context concept, represented by the stage in which GEM countries are classified in terms of development and competitiveness.

H₀₂: The overall GCI has limited capacity to explain the summarized GEM experts' evaluation of the entrepreneurial framework conditions.

H₀₃: The GEM experts' summarized information has high capacity to explain the overall GCI.

By testing these hypotheses we establish if there exists some correlation between the GEM experts' summarized information and the overall GCI that is also a summary of information on the 12 pillars. The degree of correlation between the two sources of information informs about their overlap or complementarity, clearing up if they contribute to the entrepreneurial context description with similar or different information.

H₀₄: The GEM experts' survey information has high capacity to explain the GC sub-indexes that are critical for each stage of development.

Finally, by testing this hypothesis we refine the previous results taking in consideration the main stages of competitiveness as they also influence the entrepreneurial context.

4. Methodology

The research is based in two sources of data: the 2010 GEM national level edition by one side and the 2010-2011 Global Competitiveness Index Report by the other.

To test the research hypothesis, three types of techniques have been applied:

- 1) A discriminative analysis to prove that the GEM experts' data on EFCs are able to classify nations by their stage of competitiveness.
- 2) A multivariable general lineal model to test if the GCI can explain the main GEM data EFCs.
- 3) A stepwise multiple linear regression analysis to estimate to what point the GEM EFCs data can explain the overall GCI for the 2010 GEM countries.
- 4) A stepwise multiple linear regression analysis to estimate to what point the EFCs data can explain the GC sub-indexes for the 2010 GEM countries at each competitiveness stage.

As explained before, the overall Global Competitiveness Index is the result of three sub-indexes that consider three stages of competitiveness of countries, that is, the factor driven stage, the efficiency driven stage and the innovation driven stage. GEM adopts the same classification and in their files, the project includes a categorical variable to do so. There also exists another variable that considers the five possible groups, when the transition countries are described, but as the GEM sample is reduced compared with the GCR, in this research it is used the three categories variable. For the first hypothesis, the dependent variable is this one, and the explanatory variables are the summary quantitative variables that represent the state of the entrepreneurial framework conditions. As the statistical problem is to determine if the EFCs are able to classify countries, the adequate model is the discriminative.

A discriminative analysis creates a predictive model for belonging to a group. The dependent variable must be categorical with two or more categories that are considered groups of cases or individuals. The independent variables must be quantitative. When considering more than two groups, the model estimates a set of discriminative functions. These functions are based in linear combinations of the explanatory variables that provide the best possible discrimination among the groups. The functions are generated thanks to a sample of cases in which the group of pertinence is known. If the analysis can reproduce 75% or more of the original cases, it is considered as acceptable to predict the group of a new individual for who the group is unknown. The resulting canonical functions can be interpreted thanks to a matrix that provides their correlation with the original explanatory variables.

By its side, the general linear model can be used when several variables must act as dependent and the explanatory is a single variable. This is the case to test the second hypothesis because the problem is to see if the GEM quantitative variables that represent the state of the EFCs are able to explain the GCI. The generalized linear model expands the general linear model, so that the dependent variable is linearly related to the covariates by a particular link function. In addition, the model allows the dependent variable has a distribution that is not normal and covers the most commonly used statistical models. In research, it was selected to analyze a wide set of dependent variables at the same time. Thus, for the second hypothesis, the dependent variables are the GEM EFCs, a set of quantitative and continuous variables, and the independent variable is the overall GCI. The multiple version of the generalized linear model applies simultaneous regressions to all this set of variables, and offers the resulting coefficients as well as the goodness of fit for each case.

Finally, to test the third and fourth hypothesis, it has been considered enough to apply a stepwise multiple linear regression analysis, as the dependents are the GCI or the basic requirements sub index, the efficiency enhancers sub index and the innovation and sophistication factors sub index, while the explanatory have been the EFCs. They have been estimated four models: one for the GCI and the EFCs, one for the basic requirements sub index and the EFCs for the factor driven group of nations, another for the efficiency enhancers sub index and the EFCs for the efficiency driven nations and, the last for the innovation and sophistication factors sub index and the

EFCs for the innovation driven nations. The obtained results are offered in the next section.

5. Results

5.1. Discriminative analysis

To test the first hypothesis, data is composed by 54 nations that participated in the 2010 GEM NES survey. The EFCs are represented by quantitative continuous variables that include the average value of each nation on each condition. The competitiveness level of the nations is represented by a categorical variable in which the values 1, 2 and 3, are for factor-driven, efficiency-driven and innovation-driven nations respectively. There are 13, 23 and 18 nations in each group. Prior probabilities of group pertinence have been chosen as different, to minimize the impact of the different number of nations in each group. The analysis resulted in two canonical functions that captured the 100% of the variance. The first function captured the 76.4% of the information, and the second the remaining 23.6%.

Table 4. Results of the discriminative analysis of EFCs on GCR stage of competitiveness of GEM 2010 nations

<i>Function</i>	<i>Eigenvalue</i>	<i>% of variance</i>	<i>Canonical correlation</i>	
1	1.507	76.4	0.775	
2	0.464	23.6	0.563	
<i>Functions test</i>	<i>Wilks Lambda</i>	<i>Chi Square</i>	<i>F.D.</i>	<i>Significance</i>
1 to 2	0.272	50.173	24	0.000
2	0.683	17.352	11	0.098
<i>Prior probabilities for each group: the option of different prior probabilities has been used due to the different number of cases in each original group: 0.214 (factor driven), 0.426 (efficiency driven), 0.333 (innovation driven).</i>				
<i>Original summary NES variables</i>	<i>Structure matrix</i>	<i>Function 1</i>	<i>Function 2</i>	
Government programs for entrepreneurs		0.529*	0.166	
R&D level of transference		0.494*	0.082	
Physical infrastructures and services access		0.457*	0.061	
Government concrete policies, priority and support		0.206*	0.137	
Financial environment related with entrepreneurship		0.187*	0.134	
Government policies bureaucracy, taxes		0.145*	-0.141	
Professional and commercial infrastructure access		0.143*	-0.019	
Internal market burdens		0.128*	-0.048	
Cultural, social norms and society support		0.023*	-0.016	

Table 4. (continue)

<i>Original summary NES variables</i>	<i>Structure matrix</i>	<i>Function 1</i>	<i>Function 2</i>		
Entrepreneurial level of education at Vocational, Professional, College and University		0.024	0.526*		
Entrepreneurial level of education at Primary and Secondary		0.148	0.356*		
Internal market dynamics		-0.041	0.146*		
* major absolute correlation between each variable and the discriminative functions					
<i>Values of the canonical functions in the group centroids</i>		<i>Function 1</i>	<i>Function 2</i>		
Stage 1: factor driven (includes transition countries to phase 2)		-1.806	-0.615		
Stage 2: efficiency driven (includes transition countries to phase 3)		-0.061	0.768		
Stage 3: innovation driven		1.382	-0.537		
<i>Non standardized discriminative functions evaluated in the average of groups</i>					
<i>Classification results</i>	<i>Predicted</i>	<i>Factor driven</i>	<i>Efficiency driven</i>	<i>Innovation driven</i>	<i>Total</i>
Original	<i>Factor driven</i>	12 (92.3%)	1 (7.7%)	0 (0,0%)	13 (100%)
	<i>Efficiency driven</i>	2 (8.7%)	20 (87%)	1 (4.3%)	23 (100%)
	<i>Innovation driven</i>	1 (5.6%)	3 (16.7%)	14 (77.8%)	18 (100%)
<i>Goodness of fit: they have been correctly classified the 85.2% of the countries in their original groups.</i>					

5.2. Multivariable General Linear Model

To test the second hypothesis, data is composed by 52 nations that participated in the 2010 GEM NES survey and are also included in the 2010-2011 GCR. The EFCs are represented by quantitative continuous variables that include the average value of each nation on each condition and the overall GCI is represented by a quantitative continuous variable whose values have been extracted from the GCR. The generalized linear model expands the general linear model, so that the dependent variable is linearly related to the covariates by a particular link function. In addition, the model allows the dependent variable has a distribution that is not normal. Generalized linear model covers the most commonly used statistical models. In this case it was selected to analyze a wide set of dependent variables at the same time.

Table 5. Results of the multivariable general linear model of GCI on GEM EFCs

<i>Dependent variable</i>		<i>B</i>	<i>Sig.</i>	<i>R square</i>
Financial environment related with entrepreneurship	Intersection	1.012	0.003	0.275
	GCI	0,316	0.000	
Government concrete policies, priority and support	Intersection	1.062	0.019	0.184
	GCI	0.330	0.001	
Government policies bureaucracy, taxes	Intersection	0.749	0.091	0.214
	GCI	0.360	0.001	
Government programs for entrepreneurs	Intersection	0.442	0.247	0.385
	GCI	0.474	0.000	
Entrepreneurial level of education at Primary and Secondary	Intersection	1.672	0.000	0.019
	GCI	0.067	0.334	
Entrepreneurial level of education at Vocational, Professional, College and University	Intersection	2.875	0.000	0.00
	GCI	-0.008	0.918	
R&D level of transference	Intersection	0.490	0.064	0.508
	GCI	0.418	0.000	
Professional and commercial infrastructure access	Intersection	2.448	0.000	0.053
	GCI	0.115	0.101	
Internal market dynamics	Intersection	2.578	0.000	0.013
	GCI	0.091	0.417	
Internal market burdens	Intersection	1.851	0.000	0.090
	GCI	0.140	0.030	
Physical infrastructures and services access	Intersection	1.396	0.000	0.516
	GCI	0.511	0.000	
Cultural, social norms and society support	Intersection	1.963	0.000	0.052
	GCI	0.179	0.102	

5.3. Multiple linear regression analysis

To test the third hypothesis, data is composed by 52 nations that participated in the 2010 GEM NES survey and are also included in the 2010-2011 GCR. The EFCs are represented by quantitative continuous variables that include the average value of each nation on each condition and the overall is represented by a quantitative continuous variable whose values have been extracted from the GCR. The multiple linear regression models had been considered the simplest technique to make this approach.

Table 6. Multiple linear regression results of EFCs on the overall GCI

<i>Dependent variable: overall GCI</i>					
<i>Independents</i>	<i>B</i>	<i>Beta</i>	<i>Sig.</i>	<i>R square</i>	<i>Method</i>
Constant	2.072		0.000	0.705	Stepwise
Physical infrastructures and services access	0.626	0.445	0.000		
R&D transference	0.554	0.325	0.042		
Entrepreneurial level of education after the school	-0.758	-0.397	0.000		
Government programs	0.361	0.276	0.045		

5.4. Multiple linear regression analysis

To test the last hypothesis, data is composed by 52 nations that participated in the 2010 GEM NES survey and are also included in the 2010-2011 GCR. The EFCs are represented by quantitative continuous variables that include the average value of each nation on each condition and the GCI sub indexes (basic requirements, efficiency enhancers and innovation and sophistication factors), are represented by three quantitative continuous variables whose values have been extracted from the GCR. The multiple linear regression models had been considered the simplest technique

Table 7. Multiple linear regression results of EFCs on the GCI sub indexes that are critical at each stage of competitiveness

Stage 1: factor driven nations Dependent variable: Basic requirements sub index					
<i>Independents</i>	<i>B</i>	<i>Beta</i>	<i>Sig.</i>	<i>R square</i>	<i>Method</i>
Constant	0.205		0.805	0.705	Stepwise
Physical infrastructures and services access	1.116	0.840	0.001		
Stage 2: efficiency driven nations Dependent variable: Efficiency enhancers sub index					
<i>Independents</i>	<i>B</i>	<i>Beta</i>	<i>Sig.</i>	<i>R square</i>	<i>Method</i>
Constant	2.759		0.000	0.383	Stepwise
Financial access and availability for entrepreneurs	0.580	0.619	0.002		
Stage 3: innovation driven nations Dependent variable: Innovation and sophistication factors					
<i>Independents</i>	<i>B</i>	<i>Beta</i>	<i>Sig.</i>	<i>R square</i>	<i>Method</i>
Constant	2.282		0.023	0.335	Stepwise
Government concrete policies, priority and support	0.975	0.579	0.012		

to make this approach. Three analyses, one per competitiveness stages, have been applied.

6. Discussion

The first hypothesis states that the GEM NES information on the national entrepreneurial conditions is able to classify the GEM participating nations in their respective GCI stages of competitiveness, that is, in factor-driven, efficiency-driven and innovation-driven economies. If the data have this capacity this leads to the conclusion that the perceived stage of competitiveness depends on the EFCs state to some degree. We say the «perceived stage», because this is determined by the competitiveness sub-indexes, and they are calculated under the basis of a wide range of economic indicators, while the EFCs are the result of subjective evaluations made by experts. Thus, a nation can be perceived as out of its stage by the experts' opinion while the economic indicators state their real position.

The obtained results lead to completely accept this hypothesis: the discriminative analysis gave two canonical functions whose values allow positioning the GEM countries in the three stages at the 85.2% level, which is very high.

The partial results indicate that the EFCs values are more representative for the factor driven nations, because the model could place the 92.3% of the cases. The only exception, which represents a 7.7% of the total, was Jamaica, a nation considered in transition from the first stage to the second (see table 3). So, the global results for this group of countries are very satisfactory in terms of explanatory capacity of the canonical functions, and are so sensitive that could also capture the Jamaica's transition stage.

The next partial result is referred to efficiency driven nations. In this case, the 87% of countries were correctly assigned, while 8.7% (2 nations) and a 4.3% (1 nation) were assigned to factor driven and innovation driven stages respectively. The first two cases are: Peru and South Africa and the third case Uruguay. The valuation of the EFCs made by the experts in the two nations that have been identified as factor-driven could be indicating that some features of the entrepreneurial framework conditions are more near of those types of nations than the real competitiveness level. On the other hand, Uruguay is a transition country from the second to the third stage, which means that in this field, is possibly more aligned with innovation countries while its competitiveness level is still in transition.

Finally, with respect to the innovation driven nations, a 77.8% has been correctly classified, while a 16.7% (3 nations) has been identified as efficiency driven and a 5.6% (1 nation) as factor driven. The cases are: France, Finland and Slovenia predicted as efficiency driven and Italy predicted as factor driven. This result can be due to the crisis effect. The experts of these countries could have made so extreme negative valuations on critical EFCs that lead them to be matched to the situation of factor and efficiency driven nations. Further analysis on concrete EFCs must be done to make a formal explanation.

Thanks to this analysis, the explicative power of the NES information on the competitiveness stages is perceived as very high and able to offer interesting research lines and practical applications. In fact, due to the special characteristics of the year 2010, one can wonder if the EFCs of the innovation driven nations can be very differently perceived by experts, to the limit of matching them with situations that exceed the economic indicators conclusions. In this sense the «change» of position of Italy is very significant. This is interesting, as the NES has an important qualitative base and this arises when the information is related with the feeling of experts as part of the population and reflects what the people can say in crisis scenarios, despite the economic indicators. The conditions to start up could have become very worst in the Italy's case, and worst in the cases of France and Finland, although economically, the last country is well positioned compared with other European countries during the crisis.

The discriminative analysis also provides summarized information on the characteristics of the competitiveness stages thanks to the two canonical functions. The structure matrix reveals that the first canonical function is correlated with most of the entrepreneurial conditions, while the second is focused in entrepreneurial education provision (both at school and after school phases) and the internal market dynamics. Taking this in consideration and looking at the values of the functions in the averages of the groups (named «centroids» in the analysis results), it is possible to conclude that at factor driven stage, the core of the entrepreneurial conditions is evaluated by the experts as negative (the average value is -1.806), while the entrepreneurial education and the internal market dynamics is also perceived as negative but less than the core of conditions (the average value is -0.615). At the efficiency driven stage, the core of the entrepreneurial conditions is negative («centroid» has the value -0.061), but very near of the neutrality, that is, neither bad nor good, while the entrepreneurial education and the internal market dynamics are perceived as positive («centroid» has a value of 0.768 positive although not brilliant). Finally, at the innovation driven stage, the core of the entrepreneurial conditions is perceived as positive (the «centroid» value is 1.382), while the entrepreneurship education and the internal market dynamics is valued as some negative (the «centroid» value is -0.537).

This information explains that the core entrepreneurial conditions tend to improve as the competitiveness level so does, while the entrepreneurship education and the internal market dynamics improve from the factor driven situation to the efficiency driven stage, to strongly become worst when the innovation stage is achieved. This is consistent with the entrepreneurial activity analysis and the conclusions made by GEM researchers in several Reports: at the factor driven stage, there is a high level of necessity entrepreneurship that runs independently of the state of the core of framework conditions, as the population needs to survive anyway, but at least more supported by the entrepreneurial education—that can be interpreted, as a minimum, as basic skills to start up and develop an initiative—and by the internal market dynamics. At the efficiency driven stage, opportunity entrepreneurial activity increases, and this is thanks to the improvement of framework conditions, helped by the efficiency

enhancers, having a relevant role the entrepreneurship education, more extended because there are also intermediate levels of entrepreneurial activity and the population is more trained than those of innovation driven nations. As the entrepreneurial activity is of more quality than in the factor driven nations, this also is consistent with a more qualified entrepreneurial skills and knowledge. Finally, at the innovation driven stage, the entrepreneurial activity rates are, in average, lower compared to the previous stages. Thus, the population loses entrepreneurial spirit and consequently, skills and knowledge, situation that is perceived by the experts and showed in their evaluations. In these nations, the «natural» entrepreneurial training of the population is reduced and affects to a little part of the populations, while the internal market tends to favor the big companies, the public sector and less the entrepreneurial initiatives. The core of the framework conditions can be positive, but there is a lack of entrepreneurial capacity. The governments tend to implement actions to foster entrepreneurship, including entrepreneurship education at the schools, universities, business schools and other institutions, but the impact of these actions is still perceived as very reduced and several years must pass before this effect can be detected.

The second hypothesis stated that the overall GCI has limited capacity to explain the entrepreneurial conditions. This hypothesis can also be interpreted as a way to say that the NES information cannot be completely substituted by the GCI to provide a diagnostic on the entrepreneurial framework conditions. The results of this analysis lead to accept the statement: the GCI has some capacity to explain most of the EFCs, but both sources are not correlated to the point of being indicated to substitute one by the other. The GCI is more general and the NES provides specific information on the conditions for entrepreneurs.

The general regression model stated that the GCI can explain part of all the entrepreneurial conditions except those referred to: entrepreneurship education and training at the school and after school stages; the commercial and professional infrastructure for entrepreneurs; the internal market dynamics and the social and cultural norms.

The highest explanatory capacity is on the physical and services infrastructure for entrepreneurship, followed by R&D transfer level. The explanatory capacity is also significant but more reduced for: government programs, financing for entrepreneurs and government policies.

On the contrary, the NES has high capacity to explain the GCI. This can be stated thanks to the results obtained in the multiple regression analysis of the EFCs data on the GCI. The NES data can explain the 70.5% of the GCI. But, of the set of conditions, the stepwise procedure only accepted four as explanatory: the physical infrastructures and services access, the R&D transfer, the entrepreneurship education after the school and the government programs for entrepreneurs. The regression coefficients are: positive and very significant for physical infrastructure and services access for entrepreneurs, less significant but also positive for the R&D transfer and the government programs, and negative and very significant for the entrepreneurship education after the school.

This result indicates that thanks to the information on few EFCs it can be predicted quite consistently the competitiveness stage of a country, being these EFCs critical to experience gains and loss in the GCI. Thus, if the access to physical infrastructures and services for entrepreneurs improves, the country gains in competitiveness, and the same can be said about the R&D transfer for entrepreneurs and the governmental programs: as they increase, so can do the competitiveness index. The average gain can be of 0.626 points of the GCI for the physical infrastructures, 0.554 points for the R&D transfer and 0.361 for governmental programs. On the contrary, if the entrepreneurship education after school was incremented, the GCI can suffer an average loss of 0.758 points. This result, although seems contradictory to foster entrepreneurship, is logical from the point of view of competitiveness, as the nations that lead the GCI are those that have the minor entrepreneurial activity rates, while the nations with lower GCI values are those that have the major entrepreneurial activity rates. The entrepreneurship education must be an instrument to achieve high quality entrepreneurial activity that increases the GCI and this contribution must be detectable by this index to turn this negative effect in positive in the long term. In the present situation, the entrepreneurship education is perceived as in a negative state by experts worldwide (Coduras, Kelley, Levie, Saedmundsson and Schott, 2009), and this limits its power to contribute to foster entrepreneurial activity and have a significant impact in competitiveness. If the experts' evaluation could change its sign, thanks to actions to implement a qualified educational system worldwide, the results of this analysis could also change.

Finally, about the fourth hypothesis, the results indicate that it can be partially accepted. Thus, the NES information, showed high capacity to explain the basic requirements sub index (70.5%), while showed less capacity (as expected), to explain the efficiency enhancers sub index (38.3%) and the innovation and sophistication factors sub index (33.5%)

For the first sub index, critical to explain the factor driven nation's competitiveness, only one EFC entered in the model: the physical infrastructures and services access. The result indicates that if this condition improved, so could happen with the sub index in an average of 1.116 points. It is interesting to state that the most basic EFC is the one that explains this also basic sub index. The result is consistent with the competitiveness report literature.

For the second sub index, it also entered only one EFC as explanatory: the financial access and availability for entrepreneurs. Thus, in this case, if this condition improved, so will do the efficiency enhancers, in an average of 0.580 points, although the goodness of fit is fewer than in the previous case (38.3%), and consequently the predictive capacity is less confident. What is of most interest is to see what EFC is most critical for efficiency driven nations to improve their key sub index, and to state that there is a difference among the three stages of competitiveness.

Finally, in the innovation driven nations case, the only EFC that has explanatory capacity on the Innovation and sophistication factors sub index is the state of government concrete policies, that is, those focused in the consideration of the entrepreneur-

ship as a priority of the government and the governmental support to entrepreneurship. If this condition could improve, the average gain for this competitiveness sub index would be of 0.975 points. Again, this result must be considered tentative as the goodness of fit of the model is low (33.5%) and its predictive capacity is not highly confident.

7. Conclusions, limitations, prospective of new research lines and recommendations

The first conclusion that can be extracted of this research is that the GEM NES data provide differential and complementary information that cannot be substituted by the Global Competitiveness Index and sub-indexes. This justifies the continuity of this original source of information, being the first recommendation, to make a methodological review to promote its validation and put in more value its capacities as a qualitative complement to analyze the entrepreneurial context. GEM and integrated indexes must profit its potential and analysis capacity for more purposes beyond the description of the entrepreneurial framework conditions and their annual diagnoses. Thus, for example, for the present economic crisis, experts' provide qualitative details that are important for the entrepreneurial context as several countries can accuse relevant changes in the conditions to start up. The worsening could be equivalent to lose several positions in the global competitiveness index to the point that experts could perceive the situation of some entrepreneurial conditions as if the country was in a lower group of competitiveness. Also, the contrary situation can occur, and in some countries experts can be anticipating competitiveness transitions to upper stages. The NES data have demonstrated high capacity to classify nations in their respective competitiveness stages, and the source has shown its extremely sensitivity capturing transition economies and special conflictive situations due to the crisis in a year in which the information can especially be disturbed by the particular global economic climate. This helps to reinforce two aspects of these data: the future validation of the methodological design by one side and the quality of the data by the other.

The limitation of the analysis is related with two issues: the incomplete series of data, and that the results and conclusions can vary each year. GEM is a growing project, and nowadays is still far from the GCI sample: 59 participating in front of 139. But the GEM has had also an additional problem: not all the participating nations completed in the last years the national expert's survey. Thus, for example, the year 2010, 59 nations have participated in the monitor, but 5 of them did not the NES. This problem is being solved, as national teams improve their knowledge and understanding of the usefulness of this original source of information.

Since the review of the GEM theoretical model, another problem could come over the NES: if the GCI provides an overall index and three sub-indexes that seem to provide similar information: is it really necessary to make the NES? The research line presented in this paper includes arguments to give a negative response: the NES is providing complementary information that is not uncovered by the GCI. Thus, the

second recommendation is to review again the GEM theoretical model differentiating the impact of the competitiveness in the TEA —that has been demonstrated that exists— (Bosma, Acs, Autio, Levie, 2008) and to make more clear the role and place of the NES information in the model.

The present research led to other important results: the NES data can be partly explained by the GCI and the NES data also can explain part of the GCI and the sub-indexes of each development stage. This leads to other interesting conclusions: the competitiveness index is able to explain the state of the entrepreneurial conditions and it could be interesting to make analysis each year to follow the evolution of this explanation in general and at each stage of competitiveness to see the improvement or loss they experience due to the influence of the pillars of the economy. The GEDI index (Acs, Szerb, 2009, 2010) is progressing in this line, but does not include the NES information to elaborate its conclusions.

On the other hand, the inverse analysis leads to conclude that the EFCs can explain the overall GCI, being this perspective more informative as it allows determining what entrepreneurial conditions are critical to improve the GCI. The third recommendation is to make this analysis each year and to follow the evolution of the EFCs that enter the model. As GEM is committed with the entrepreneurship development, the project could contribute to assess the GCI from the perspective of the entrepreneurship contribution to the national competitiveness, and the NES can provide information about the key conditions that must be reinforced each year to improve the GCI.

The contribution of this research is to improve the knowledge and diffusion of the GEM NES data, and especially, to open new research lines that can be of scientific interest and practical application. The future goals in this field are: to compare part of the NES information with the EDB and EFI data; to reconsider the NES place in the GEM revised theoretical model; to build practical analysis tools to implement the main findings of this research; to study how is their evolution in the next years; to investigate more in deep the relationships between the EFCs and concrete pillars of the economy using the information collected by the GCR, and finally, to try to contribute to the interaction between these two powerful sources of data, submitting the entrepreneurial framework conditions analysis to the GCI analysts for their consideration.

8. References

- Acs, Z. J. (2007): «How is entrepreneurship good for economic growth?», *Innovations*, 1 (1), 97-107.
- Acs, Z. J.; Audretsch, D. B.; Braunerhjelm, P., and Carlsson, B. (2003): *The missing link: the knowledge filter and endogenous growth*, Stockholm, Sweden: Center for Business and Policy Studies.
- Álvarez, C.; Urbano, D.; Coduras, A., and Ruiz-Navarro, J. (2011): «Environmental conditions and entrepreneurial activity: a regional comparison in Spain», *Journal of Small Business and Enterprise Development*, 18 (1), 120-140.

- Amorós, J. E., and Cristi, O. (2008): «Entrepreneurship and competitiveness development: A longitudinal analysis of Latin American countries», *International Entrepreneurship and Management Journal*, 4 (2).
- Barro, R. J., and Sala i Martin, X. (2004): *Economic growth*, MIT Press.
- Bosma, N.; Acs, Z. J.; Autio, E.; Coduras, A., and Levie, J. (2008): *Global Entrepreneurship Monitor*, Executive Report. Babson, London Business School.
- Bosma, N.; Jones, K.; Autio, E., and Levie, J. (2007): *Global Entrepreneurship Monitor*, Executive Report, Babson, London Business School.
- Chin, N. (2005): *Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998-2003*, *Small Business Economics*, 24 (3), 205-231.
- Coduras, A.; Urbano, D.; Rojas, A., and Ruiz Navarro, J. (2007): «Environmental factors and entrepreneurship in Spain: a regional comparison», JSBED, 2008. Paper presented at the Second GEM based Research Workshop, San Sebastián, July of 2007, Spain.
- Coduras, A.; Urbano, D., and Ruiz, J. (2007): *La transferencia de I+D en España: Diagnóstico basado en los datos del observatorio GEM 2006*, Economía industrial, ISSN: 04222784.
- Díaz, J. C.; Hernández, R.; and Roldán, R. (2007): *Environmental factors that influence the entrepreneurial capacity. An empirical approach from the GEM Project using a structural equation model*, Paper presented at the third GEM Research Conference in Washington, October.
- Hämäläinen, T. J. (2003): *National Competitiveness and Economic Growth. New Horizons in Institutional and Evolutionary Economics*, Edward Elgar Publishing, 2003.
- Hechavarria, D. M., and Reynolds, P. D. (2009): «Cultural norms & business start-ups: the impact of national values on opportunity and necessity entrepreneurs», *International Entrepreneurship and Management Journal*, 4 (5), 417-437.
- Hindle, K. (2006): «A Measurement Framework for International Entrepreneurship Policy Research: from Impossible Index to Malleable Matrix», *International Journal of Entrepreneurship and Small Business*, 31, 139-182.
- Klyver, K. (forthcoming 2008): «An analytical framework for micro level analysis of GEM data», *International Journal of Entrepreneurship and Small Business*.
- Lee, L., and Wong, P. K. (2004): «Cognitive Divergence among Entrepreneurship National Experts: Analysis of GEM Data 2000-2003», in Zahra *et al.* (eds), *Frontiers of Entrepreneurship Research 2004*, Wellesley, Ma.: Babson College, 620-634.
- Levie, J., and Autio, E. (2008): «A theoretical grounding and test of the GEM model», *Small Business Economics*, 31: 235-263.
- Lindmark, L. (2011): *The underestimated context. Center for Entrepreneurship and Business Creation*, Sweden: Stockholm School of Economics.
- Namatovu, R. (2005): *Entrepreneurial Framework Conditions and the Occurrence of Entrepreneurship among Ugandans: An International Comparison*, Makerere University, Uganda. Supervisor: Thomas Walter and Isaac Nkote-Nabeta.
- North, D. (1990): *Institutions. Institutional Change and Economic Performance*, Cambridge University Press.
- (2005): *Understanding the process of economic change*, Princeton: University Press.
- Reynolds, P. D.; Hay, M., and Camp, R. M. (1999): *Global Entrepreneurship Monitor*, Kansas City: Kauffman Center for Entrepreneurial Leadership.
- Reynolds, P.; Autio, E.; Hay, M.; Bygrave, W., and Camp, S. (2001): *Global Entrepreneurship Monitor*, Executive Report, GEM.
- Reynolds, P. D.; Hay, M., and Camp, R. M. (2002): *Global Entrepreneurship Monitor*, Executive Report, London: London School Business. Babson College, Kauffman Center For Entrepreneurial Leadership.
- Reynolds, P.; Bosma, N.; Autio, E.; Hunt, S.; De Bono, N.; Servais, I.; Lopez-García, P., and Chin, N. (2005): «Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998-2003», *Small Business Economics*, 24 (3), 205-231.

- Rostow, W. W. (1959): «The stages of economic growth», *Economic History Review*.
- Sala-i-Martí, X.; Bilbao-Osorio, B.; Blanke, J. *et al.* (2011): «The Global Competitiveness Report 2011-2012», *World Economic Forum*, ISBN-13: 978-92-95044-87-6; ISBN-10: 92-95044-87-8
- Schwab, K.; Sala-i-Martín, X., and Greenhill, R. (2010): «The Global Competitiveness Report 2010-2011», *World Economic Forum*, ISBN-13: 978-92-95044-87-6; ISBN-10: 92-95044-87-8
- Schøtt, T., and Wickstrøm Jensen, K. (2008): «The Coupling between Entrepreneurship and Public Policy: Tight in Developed Countries but Loose in Developing Countries», *Estudios de Economía*, 35 (2), 195-215
- Vaillant, Y., and Lafuente, E. (2007): «Do different institutional frameworks condition the influence of local fear of failure and entrepreneurial examples over entrepreneurial activity?», *Entrepreneurship and Regional Development*, 19 (4), 313-337.
- Wennekers, S. (2006): *Entrepreneurship at Country Level; Economic and Non-Economic Determinants*, Rotterdam: ERIM, Netherlands.
- Wennekers, S.; van Stel, A.; Thurik, R., and Reynolds, P. (2005): «Nascent entrepreneurship and the level of economic development», *Small Business Economics*, 24 (3), 293-309.
- World Economic Forum (2010): *The Global Competitiveness Report 2010-2011*, Klaus Schwab Editor, ISBN-13: 978-92-95044-87-6.