Innovation and education policies impact on knowledge based economies performance

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Abstract: - This paper uses publicly available data to identify the existence of a correlation, between the innovation and education performance of nations, and their Gross Domestic Product (GDP) output to stress that knowledge based economies exhibit higher performance. Although it is not consensual that from the array of public policies available to induce growth the ones fostering innovation are the ones that lead to higher growth, political leaders have been recognizing that, to increase competitiveness, economies need to change their development paradigm from one based on the exploitation of resources to a new one based on knowledge and innovation. To that end, public policies, need to focus on improving the quality of education, to strengthen research performance, to promote innovation and knowledge transfer, so that innovative ideas can be turned into new products and services that create growth, quality jobs and help address global societal challenges.

Key-Words: - knowledge based economies, innovation, competitiveness, entrepreneurship, economic performance

1 Introduction

The importance of fostering a knowledge based economy was recognized by the European Union in the Lisbon strategy when it stated to “set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustaining economic growth with more and better jobs and greater social cohesion”. This statement was reaffirmed in the Europe 2020 strategy [1] of smart growth through more effective investments in education, research and innovation. Nevertheless, the role of innovation, as a basis for a nation economic growth, is not consensual, and by consequence, neither the different countries approach towards innovation as public policy [2]. The recognition that the economic growth, in today’s knowledge-based economy, is not based on capital accumulation, but in the innovative capacity spurred by appropriable knowledge and technological externalities, is not consensual in all economic doctrines. These doctrines, referred to as Neoclassical, Keynesian, and Schumpeterian economics, have formed the thinking about economics, providing the intellectual underpinning for valuing entrepreneurship and innovation. Main differences among this economic frameworks are related to what they consider is of primary importance to economic growth, on the mechanisms that influence the primary focus, and, on the appropriate stance and role for public policy [3] . Knowledge and innovation, as bases for development and growth, are not central to Neoclassical or Keynesian approaches. On the other hand, Schumpeter [4] claimed that institutions, entrepreneurs, and technological change were at the heart of economic growth and that creative destruction is crucial in capitalism. As so, for Schumpeterian economics, innovation based on entrepreneurship, is the key to economic development, and the role for public policy is to facilitate investment in knowledge-creating activities, such as research and education, and to encourage entrepreneurs to innovate [5] [2] [6] . Consequently to the ambivalence of these frameworks, public policy, towards entrepreneurship and innovation have different approaches, as so the relative valuation of innovation and entrepreneurship.

Being the aim of this paper the understanding of the impact and the role of the investments made in innovation and education on the performance of economies, we start from the point of view that the foundation of competitiveness is created on the return that economies have, based on those investments. First, we will review literature related with competitiveness, innovation, and knowledge-based economies, input and output indicators of competitiveness and their correlation. We will base the case that economic competitiveness should be analysed in terms of investments in knowledge. So, to that end we will contrast several countries GDP with data from two knowledge economy and global competitiveness indexes employing a Pearson correlation coefficient (r_{xy}). The correlation results will be crossed with some countries overall position in their economic stage of development, and conclusions will be postulated.

2 Literature review and background

Policies for education, science, technology and innovation aim to create and deploy knowledge. The transition to a knowledge-based economy occurs when a substantial part of country's GDP comes, directly or indirectly, from the science, technology and educational sectors. These economies, once based on resources exploitation, are moving towards a knowledge-based economy leading to a paradigm shift that will create new opportunities, higher standards of living and the expansion of their economic activity [5] . Knowledge-based economy concept was popularized by Peter Drucker, in his book The Age of Discontinuity [7] were he suggests that "knowledge is becoming the one factor of production, side-lining both capital and labour". Nowadays, knowledge-based economy is "an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors" [8]. In this line of thought, literature review pointed to a link between knowledge and economic growth, establishing knowledge as a driver of productivity [9]–[11] , and assumes that R&D return rates are consistent with the view that knowledge, an innovation input, is related to economic growth.

The Centre for International Competitiveness, host of the World Knowledge Competitiveness Index (WKCI), defined the knowledge base of an economy as "the capacity and capability to create and innovate new ideas, thoughts, processes and products, and to translate these into economic value and wealth". More, economic wealth is created through the creation, production, distribution and consumption of knowledge and knowledge-based products, being economic growth and technological change the most important applications of the knowledge-based economy concept.

Knowledge-based economies output data, state that at the top of the World Knowledge Competitiveness Index[1] 2008 [6] is the US metropolitan area of San Jose, the home of Silicon Valley, due to its investment in knowledge intensive business development, in particular in the fields of high-technology engineering, computers, and microprocessors. In second place is the metropolitan area of Boston, a region which thrives on high levels of intellectual and financial capital, synonymous with higher education, and is home to eight research universities including Harvard and the Massachusetts Institute of Technology. At the foot of rankings are Chinese, Indian and Eastern European regions. These data reinforce our thought that economic growth requires continued entrepreneurial innovation and expansion. More, European Commission [1] stated that the priority in the European Union is to have a smart growth, strengthening knowledge and innovation as drivers of future growth, by improving the quality of education, strengthening research performance, promoting innovation and knowledge transfer, making full use of information and communication technologies and ensuring that innovative ideas can be turned into new products and services that create growth, quality jobs and help address European and global societal challenges.

2.1 Innovation

The notion that economic growth is constrained and driven by knowledge creation and the key to efficiency in an innovation process involves the interaction between basic and applied research, the

1 The **WKCI** is an integrated and overall benchmark of the knowledge capacity, capability and sustainability of each region, and the extent to which this knowledge is translated into economic value, and transferred into the wealth of the citizens of each region. As such, the competitiveness of a region will depend on its ability to anticipate and successfully adapt to internal and external economic and social challenges, by providing new economic opportunities, including higher quality jobs.

base of technology creation [12] [8]. Innovation can be defined as [8] the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation.

The innovation process was first characterized by Joseph Schumpeter's work [4] where a general distinction between radical and incremental innovation has been recognized. The distinction was made based on the assumption that technology direction is driven either by (i) market demand, or by (ii) advances in science, i.e, innovation can emerge from either non-technological or technological knowledge. Technology can be described as the practical application of knowledge in a particular area. In innovation driven economies the possibility of generating more value by only integrating and adapting exogenous technologies tends to disappear. In those economies technological breakthroughs are the basis of productivity gains. Dewar & Dutton [13] correlated innovation and the degree of technological knowledge, arguing that the major difference between incremental and radical innovation is the degree of novel technological knowledge embedded on it. Being so, innovations can be classified based on degree of new knowledge as: (i) radical innovations, the ones that contain a high degree of new knowledge, and (ii) incremental innovations, the ones that have a low degree of new knowledge. Referring to knowledge-based on new technology, radical innovation has a parallelism with technology push and incremental innovations with market pull or demand pull. A technology push strategy implies that: a new invention is pushed through R&D to the market and, it has to find an unmet market need. In contrast, an innovation based upon market pull has been developed by the R&D function in response to an identified market need [14]. Additionally, Christensen [15] defined disruptive technologies as the ones that change the value proposition in a market.

Radical innovation, concerned with exploration of a new technology, is associated with high level of uncertainty especially in the early stages of the exploration process due to the technology embryonic nature. However, if it is able to succeed, is the key driver of growth, profitability and, competitive advantage. Schumpeter's work [16], [17] had as main argument that, the nature of radical technological change undermines the very foundation of large firms competitive advantages.

Contrary to market pull strategy orientation, where the technology is a response to a market need, in a technology push strategy, discovery is pushed through research and development, proof-of-concept and production to a new market without concern to market attractiveness and applications of developed technologies to products. Hence technology push can be described as, a model process where activities are focus on pushing the discovery to the end user without concern with the market attractiveness and applications of developed technologies to products [5], the technology has to find a "market gap" if it is willing to succeed.

Technology push can occur between an entity that holds specific technological knowledge and another who has an interest in obtaining the right to use this knowledge, typically from research centres to firms, between or within firms. The willingness of firms to proceed with the development of the technology, to transform it into a new product or service for introduction to the marketplace, is influenced by expectations about the returns that they will capture from commercialization (risk/return ratio) if they are successful. These expectations, based on technology future economic benefit, are dependent of the level of information about the technology itself. As a result of this asymmetric information, many discoveries are slow getting to the market, and some of them will probably never get there, but when they enter in the market the value created for the firm can be significant.

2.2 Competitiveness

The Global Competeveness Report of the World Economic Forum [2], defines competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country". Competitive economies drive productivity enhancements that support high incomes by ensuring that the mechanisms enabling solid economic performance are in place [2]. Public policies are needed to overcome the current economic challenges, but also to establish the fundamentals of economic growth for long term.

Being economic growth, in knowledge-based economies, driven by the innovative capacity supported by new knowledge and new technologies, competitiveness creates the necessary environment for entrepreneurship to emerge and prosper, more, entrepreneurship drives competitiveness, upgrades and enables economic diversification acting as a driver of growth and innovation. Knowledge facilitates the technological change and also generates opportunities for third-party firms [18] [9]. Technology transfer, an entrepreneurship enhancer, act as an enabler of economic growth creating new businesses, developing existing ones and creating new jobs. In an entrepreneurship model, knowledge is created and transmitted for use as well for disciplinary advance, in this context, the capitalization of knowledge becomes the bases for economic and social development [18] .

Entrepreneurship [19], can be defined as: "Any attempt at new business or new venture creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business." The concept of entrepreneurship when related with technology based economic development initiatives, is focused on stimulating technological based initiatives in universities via patenting, licensing, start-up creation, and university industry partnerships based on knowledge creation [20]. The creation of new knowledge expands the set of technological opportunity and so, entrepreneurial activity does not only the search for opportunities, but also the exploitation of intra-temporal knowledge spillovers not appropriated by incumbent firms [9]. Entrepreneurs are actively searching for opportunities to generate value, and so, they are an important key to bring new discoveries to the market. Schumpeter described entrepreneurs as the "promoters of new combinations", individuals who can both see new possibilities and asses market needs [9]. With this recognition has come the acceptance of the crucial role of entrepreneurs in innovation and growth and the significant contribution of innovation and growth to prosperity and economic welfare.

Being the actual macroeconomic environment constraining growth in global economy, sustainable policies are necessary but no sufficient to restore healthy growth [21]. Improvements in competitiveness supports long term jobs and prosperity growth, as so indicators have been used by organisations including government agencies, aid agencies and research institutions to assess the competitiveness of a nation in the context of Knowledge-based economy. Those indexes are the Knowledge Economy Index (KEI) and the Global Competitiveness Index (GCI). Swamidass &Vulasa study [22], a famous example of return studies on of the effect of innovation on growth, concludes that "…there is a statistically significant and direct relationship between the amount of basic research carried out by an industry or firm and its rate of increase of total factor productivity, its expenditures on applied R&D are held constant ". Yet, literature review shows that there are no consensus on the relation between research and its outcome, Etzkowitz [18] states that "there is only a presumption that the relationship is strengthening, or can be strengthened even when is weak". In order to reinforce or counter this thesis, countries Knowledge Economy Index (KEI) and the Global Competitiveness Index (GCI), will be crossed with their GDP, to test correlation type and strength.

3 Data

Knowledge, being an intangible asset, cannot be easily quantified, but it is possible to assess its effect or outcome. For that purpose, several indicators have been developed to capture the impact of knowledge creation and deployment in nations' competitiveness. In this section we will cross knowledge and productivity data in order to test the correlation between investments in innovation and education and levels of growth. To that end we will use the scores from the annual reports of the following indicators: The 2012 Global Competitiveness Index (GCI) developed by World Economic Forum and the 2012 Knowledge Economy Index (KEI) developed by the World Bank. Countries scores will be crossed with countries GDP per capita[2] in order to determine their correlation. Once, Knowledge Economy involves long-term investments in education and in innovation capability, variables defined as pillars in both index, they will also be correlated with GDP for second level analysis.

3.1 Knowledge Economy Index (KEI)

The World Bank's Knowledge Assessment Methodology is the tool that produces the Knowledge Economy Index (KEI), an aggregate index representing a country or region overall preparedness to compete in the Knowledge Economy (KE). For

2 **GDP per capita** is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources (World Bank).

that purpose it takes into account whether the environment is conducive for knowledge to be used effectively for economic development [3]. The KEI is calculated based on the simple average of 12 normalized performance scores of a country on 4 pillars related to the knowledge economy. Each pillar, is defined as follows:

1. Economic Incentive and Institutional Regime. Quality of economic policies and availability of institutions that permit efficient mobilization and allocation of resources and stimulate creativity and incentives for the efficient creation, dissemination, and use of existing knowledge, are accessed in this pillar through a set of three variables, namely: (i) Tariff & Nontariff Barriers, (ii) Rule of Law, and (iii) Regulatory Quality.
2. Innovation and Technological Adoption. The effectiveness of, firms, research centres, universities, consultants, and other organizations, innovation systems is evaluated, taking in account that the system is an enabler of, knowledge revolution and tap into the growing stock of global knowledge, knowledge assimilation and local needs adaptation. The used variables are: (i) Royalty and License Fees Payments and Receipts, (ii) Patent Applications Granted by the US Patent and Trademark Office, and (iii) Scientific and Technical Journal Articles.
3. Education and Training. This pillar measures the countries educational levels and workers training efficiently to create and use knowledge. The applicable variables are: (i) Average years of schooling, (ii) Secondary Enrolment, and (iii) Tertiary Enrolment.
4. Information and Communications Technologies Infrastructure. Proven of an infrastructure that can facilitate the effective communication, dissemination, and processing of information and knowledge is analysed in pillar 4. It variables are: (i) Telephones per 1,000 people, (ii) Computers per 1,000 people, and (iii) Internet Users per 10,000 people.

Chen & Dahlman [23] asserts that investments in the four knowledge economy pillars are necessary for sustained creation, adoption, adaptation and use of knowledge in domestic economic production, which will consequently result in higher value added goods and services. This would tend to increase the probability of economic success, and hence economic development, in the current highly competitive and globalized world economy. To identify the existence or not, of a correlation, between public investments made in innovation and education, and the country wealth, scatter diagrams (x,y) were developed. Figures 1, 2 and 3 represent the relationship between GDP country's data (x) and the knowledge economy indexes (y), namely the global index and the innovation and education pillars (see Fig 1, 2, 3).

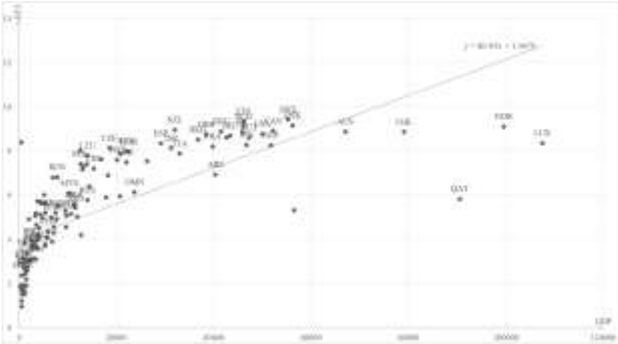

Figure 1: GDP per capita vs KEI (2012)
Data are in current U.S. dollars. Source: World Bank national accounts data, and OECD National Accounts data files.

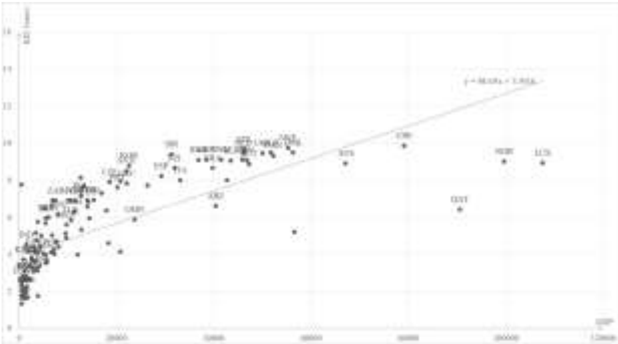

Figure 2: GDP per capita vs KEI Innovation (2012)
Data are in current U.S. dollars. Source: World Bank national accounts data, and OECD National Accounts data files.

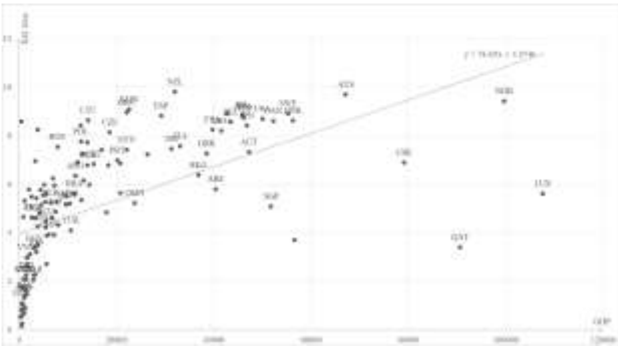

Figure 3: GDP per capita vs KEI Education (2012)
Data are in current U.S. dollars. Source: World Bank national accounts data, and OECD National Accounts data files.

3.2 Global Competitiveness Index (GCI)

The Global Competitiveness Report [2] ranks the world's nations according to the Global

Competitiveness Index (GCI). GCI is a structured, systematic and comprehensive approach to identify and measure the drivers of economic performance of more than 140 economies. The report notes that as a nation develops, wages tend to increase, and that in order to sustain higher income, labour productivity must improve for the nation to be competitive. For this reason GCI separates countries into three specific stages: factor-driven, efficiency-driven, and innovation-driven, each implying a growing degree of complexity in the operation of the economy. In a factor-driven stage, countries compete based on their factor endowments, primarily unskilled labour and natural resources. Companies compete on the basis of prices and sell basic products or commodities, with their low productivity reflected in low wages. To sustain competitiveness at this stage of development, countries need to focus mainly on well-functioning public and private institutions (pillar 1), appropriate infrastructure (pillar 2), a stable macroeconomic framework (pillar 3), and good health and primary education (pillar 4).

As wages rise with advancing development, countries move into the efficiency-driven stage of development, when they must begin to develop more efficient production processes and increase product quality. At this point, competitiveness becomes increasingly driven by higher education and training (pillar 5), efficient goods markets (pillar 6), efficient labour markets (pillar 7), developed financial markets (pillar 8), the ability to harness the benefits of existing technologies (pillar 9), and its market size, both domestic and international (pillar 10). Finally, as countries move into the innovation-driven stage, they are only able to sustain higher wages, and a higher standard of living, if their businesses are able to compete by providing new or unique products. At this stage, companies must compete by producing new and different goods using the most sophisticated production processes (pillar 11) and through innovation (pillar 12). Thus, the impact of each pillar on competitiveness varies across countries, in function of their stages of economic development. Therefore, for GCI calculation purposes, pillars are given different weights depending on the per capita income of the nation.

Scatter diagrams (x,y) are presented in figures 4, 5 and 6 to represent the relationship between GDP country's data (x) and the global competitiveness index, innovation and education pillars.

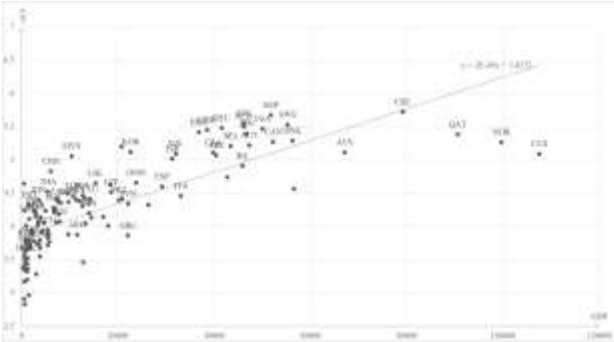

Figure 4: GDP per capita vs GCI (2012)
Data are in current U.S. dollars. Source: World Economic Forum.

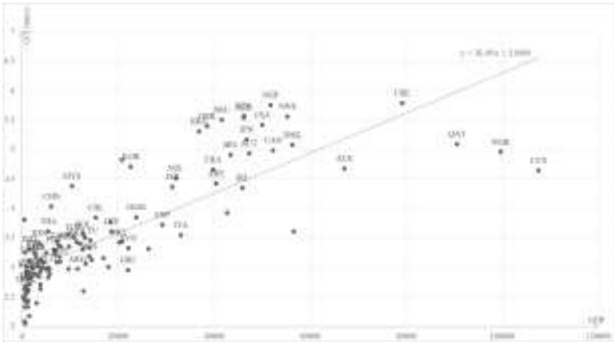

Figure 5: GDP per capita vs GCI Innovation (2012)
Data are in current U.S. dollars. Source: World Economic Forum.

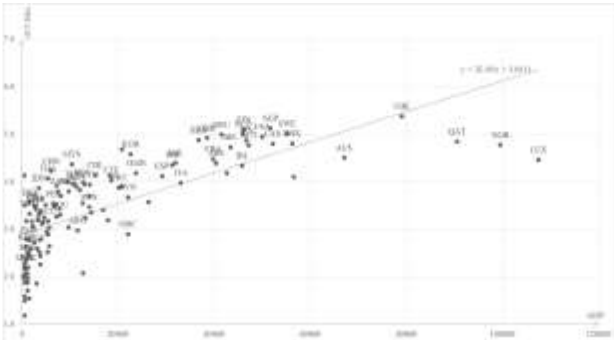

Figure 6: GDP per capita vs GCI Higher Education and Training (2012)
Data are in current U.S. dollars. Source: World Economic Forum.

4 Analysis and discussion

Literature review pointed to a link between knowledge and economic performance, establishing knowledge as a driver of productivity [9]–[11], and assumes that return rates to R&D are consistent with the view that knowledge, an innovation input, is related to economic growth [5]. We extended the existing literature by testing the hypothesis that there are a positive correlation between countries economic performance and their investments in R&D.

To that end, we considered the array of economies included in the Knowledge Economy Index (KEI) and the Global Competitiveness Index (GCI) for explaining the economic performance. The above scatter diagrams (x,y) (Figures 1, 2, 3, 4, 5, and 6) represent the relationship between the impact of knowledge investments on the economy (measure by knowledge economy index and global competitiveness index) through economies income levels, GDP per capita. This variables relationship, where x represents de GDP per capita and y represents KEI and GCI index, is assessed by the occurrence of spatial clusters in all graphs. The trend line shows that GDP per capita is positively affected by both drivers, innovation (R&D intensity) and education. As showed in Table 1 there is a correlation between GDP and the analysed indexes and a linear relationship. If one eliminates some countries that are outliers in these relationships, like Qatar, Norway and Luxemburg, on one side and Senegal, Uganda and Zambia, on the other, which exerts enough influence to lower the correlation coefficient, the linear relationship would be almost perfect.

Table 1 Pearson Correlation values

	$r_{x,y}$	$y = ax + b$
(GDP, KEI)	*0.72*	*y= 8E-05x + 3.96*
$(GDP, KEI\ Ino.)$	*0.74*	*y= 9E-05x + 3.93*
$(GDP, KEI\ Edu.)$	*0.57*	*y= 7E-05x + 3.97*
(GDP, GCI)	*0.78*	*y = 2E-05x + 3.85*
$(GDP, GCI\ Ino.)$	*0.82*	*y= 3E-05x + 2.89*
$(GDP, GCI\ Edu.)$	*0.73*	*y = 3E-05x + 3.69*

A positive correlation, for all peer data (x,y) can be postulated. Based on the statistical analysis, namely the Pearson correlation values r_{xy} between the described variables, we can infer that knowledge plays a major role in a country economic performance, and that value creation depends increasingly on a better creation, diffusion and use of knowledge. Having researched the correlation results, between public investments made in innovation and education, and the performance of knowledge based economies, the next step is to cross this results with countries overall position in economic stage of development.

The World Economic Forum has based its competitiveness analysis on the Global Competitiveness Index (GCI), a comprehensive tool that measures the microeconomic and macroeconomic foundations of national competitiveness. This tool is based on a weighted average of many different components, each measuring a different aspect of competitiveness. Based on this variables it groups economies in line with the economic theory of economies stages of development, in:

1. factor driven economies,
2. efficiency driven economies, and
3. innovation driven economies.

Table 2 (see appendix) represents the list of economies per stage of development. The WEF [2] uses two criteria to allocate countries into stages of development: (i) GDP per capita at market exchange rates, and (ii) the share of exports of mineral goods in total exports. Accordantly, country productivity will increase as it become more competitive and wages will rise with advancing development, what lead them to move into the efficiency-driven stage of development, when they must begin to develop more efficient production processes and increase product quality. At this point, competitiveness is increasingly driven by higher education and training efficient goods markets well-functioning labour markets, developed financial markets, the ability to harness the benefits of existing technologies, and a large domestic or foreign market.

The latest Global Competitiveness Report [2] shows that the top 10 competitive countries remains dominated by a number of European countries, with Switzerland, Finland, Sweden, the Netherlands, Germany, and the United Kingdom among the most competitive economies. Along with the United States in 7th place, Singapore remains the second-most competitive economy in the world, and Hong Kong SAR and Japan placing 9th and 10th. According to de report, Switzerland strengths are related to innovation and labour market efficiency. Switzerland's scientific research institutions are among the world's best, and the strong collaboration between its academic and business sectors, combined with high company spending on R&D, ensures that much of countries research output is translated into marketable products and processes reinforced by strong intellectual property protection. Singapore country's competitiveness is related with the strong focus on education, providing individuals with the skills needed for a rapidly changing global economy. Finland strength, the 2nd most innovative country in Europe, is the result of a strong focus on education over recent decades which has provided the workforce with the skills needed for high levels of technological adoption and innovation.

5 Conclusions and future developments

As countries move into the innovation-driven stage, wages will have risen by so much that they are able to sustain those higher wages and the associated standard of living only if their businesses are able to compete with new and/or unique products, services, models, and processes. At this stage, companies must compete by producing new and different goods through new technologies and the most sophisticated production processes or business models [2].

Although productivity can be improved by adopting existing technologies, innovation driven economies, in order to maintain competitive edge, have to move toward higher value-added activities. This progression requires: investment in research and development (R&D), the presence of high-quality scientific research institutions, collaboration in research and technological developments between universities and industry, and the protection of intellectual property models [2] [23]. Considering the 3 groups of countries, per stage of development, and also the one grouped in the transition stages, the clusters identified in Figures 1, 2, 3, 4, 5, 6 are also present in table 2.

The analysis of the impact of a country's innovation and knowledge framework on its economic growth will be the next step on the on-going research and, for that, the time series data for the relevant indexes and per capita GDP will be analysed.

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Appendix

Table 2 Countries/economies at each stage of development

Stage 1: factor driven	*Transition from stage 1 to stage 2*	*Stage 2: Efficiency driven*	*Transition from stage 2 to stage 3*	*Stage 3: Innovation driven*
GDP per capita (US$)				
<2,000	2,000–2,999	3,000–8,999	9,000–17,000	>17,000
Bangladesh	Algeria	Albania	Argentina	Australia
Benin	Azerbaijan	Armenia	Bahrain	Austia
Burkina Faso	Bolivia	Bosnia Herzegovina	Barbados	Belgium
Burundi	Botswana	Bulgaria	Brazil	Canada
Cambodia	Brunei Darussalam	Cape Verde	Chile	Cyprus
Cameroon	Egypt	China	Croatia	Czech Republic
Chad	Gabon	Colombia	Estonia	Denmark
Côte d'Ivoire	Honduras	Costa Rica	Hungary	Finland
Ethiopia	Iran, Islamic rep.	Dominican Republic	Kazakhstan	France
Gambia,	Kuwait	Ecuador	Latvia	Germany
Ghana	Libya	El Salvador	Lebanon	Greece
Guinea	Mongolia	Georgia	Lithuania	Hong Kong SAR
Haiti	Philippines	Guatemala	Malaysia	Iceland
India	Qatar	Guyana	Mexico	Ireland
Kenya	Saudi Arabia	Indonesia	Oman	Israel
Kyrgyz	Rep Sri Lanka	Jamaica	Poland	Italy
Lesotho	Venezuela	Jordan	Russian Federation	Japan
Liberia		Macedonia, FYR	Seychelles	Korea, Rep.
Madagascar		Mauritius	Trinidad and Tobago	Luxembourg
Malawi		Montenegro	Turkey	Malta
Mali		Morocco	Uruguay	Netherlands
Mauritania		Namibia		New Zealand
Moldova		Panama		Norway
Mozambique		Paraguay		Portugal
Nepal		Peru		Puerto Rico
Nicaragua		Romania		Singapore
Nigeria		Serbia		Slovak Republic
Pakistan		South Africa		Slovenia
Rwanda		Suriname		Spain
Senegal		Swaziland		Sweden
Sierra Leone		Thailand		Switzerland
Tajikistan		Timor-Leste		Taiwan, China
Tanzania		Ukraine		United Arab Emirates
Uganda				United Kingdom
Vietnam				United States
Yemen				
Zambia				
Zimbabwe				

source: world economic forum 2012