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The relevance of legal stability for developing renewable energies. The case of the Galician wind sector

VALERA- Pedro†*, SÁNCHEZ- María

Universidad de Santiago de Compostela

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The energy sector depends strongly on public regulation and needs/requires/entails a minimum remuneration, because of its capital-intensive condition. Renewable energies sources are not an exception and they could also make easier the industrial diversification and job creation. Hence, the stability of the regulation framework, especially in the case of new energy sources, is essential due to its positive impact on the emergence and consolidation phases. As several studies show, instability could cause a reduction, or even a shutdown, in their development and economic contribution. Then, it is crucial to quantify the socioeconomic costs of common changes in regulation. The main aim of this paper consists of analysing the economic impact of wind energy regulation instability on Galicia. The wind energy sector was one of the most important drivers in the regional economy, but there are no quantitative studies focused on this issue. Galicia is a Spanish north-west region with the third highest wind energy installed capacity, roughly 3.300 on-shore MW in 2012, but in a steady state from 2008 due to a legislative shutdown. Wind energy and hydroelectric power represent the main renewable sources. This paper underlines the importance of long-term policies and clear guidelines in the development of wind energy in terms of its economic impact. Concerning the theoretical framework, it is based on the systemic approach of the Innovation System (IS). The main results show significant negative effects on the macroeconomic variables during the period when the instability in the regulation framework became more evident.

Poverty, Wind energy, Regulation stability, Economic impact, Galicia

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*pedro.varela.vazquez@usc.es
† Researcher contributing first author.

Introduction

Legal stability constitutes a necessary condition in order to make easier the emergence and development of a capital-intensive sector as the case of wind energy. This kind of processes triggers industrial diversification, the possible creation of industrial agglomerations as well as the emergence of new technological paths. However, instability could cause temporal disruptions and even a permanent shutdown with crucial effects on the regional economy, mainly, in some cases with a significant amount of accumulative installed capacity. Thus, it is important to analyse and quantify the stability phenomenon from the economic and regional perspectives. The main aim of this paper is to analyse the economic impact of wind energy regulation instability on the Galician economy. Galicia is a Spanish regional leader in terms of wind energy and hydropower installed capacity. Then, renewable energies would play a role of economic driver with essential positive socioeconomic effects on the whole economy. However, legal framework constitutes a continuous concern since 2007.

The theoretical approach is based on the systemic perspective of Innovation Systems (IS) and the analysis of the wind energy value chains. It should be outlined due to the different underlying dynamics. Hence, we are able to analyse more accurately the impact of the legal instability on the sector. Concerning the structure, first of all, we analyse the role of institutions and, especially, the legal framework, in the emergence and consolidation phases of the wind energy sector. Later, we describe briefly the main characteristics of the wind energy sector in Galicia at the present. Afterwards, we show the estimation of the wind energy sector in terms of the regional GDP within the period 2000-2010 and the impact on this trend of the legal shutdown.

1 The role of institutional framework in the emergence and consolidation of wind energy

The emergence of new sectors is not an automatic process in which a combination of market-led forces as well as public-led forces should collaborate in order to build a comprehensive structure. Some kinds of externalities, related to the "self-discovery" (information externalities) and the need of simultaneous investments in different sectors (coordination externalities), do not enable an automatic emergence based only on market-led forces (Haussman & Rodrik, 2003; Rodrik, 2004). For these reasons, background and pre-emergence conditions are crucial because of their effects on the initial inertias, critical mass and interactions.

Concerning the emergence and consolidation phases of new sectors, innovation constitutes a key factor in the process of creation and diffusion of new knowledge and techniques. The concept of innovation is closely related to the set of stakeholders and institutions which play an active role in the sector maturation. At that point, the concept of National System of Innovation (SNI) arises; this refers to a combination of "elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge" (Lundvall, 2010, p. 2). A systemic approach should emphasize the role played by institutions in a broad sense, that is, a set of formal (legislation, standards and so on) as well as informal institutions, such as habits or routines. These institutions are playing an essential role in the creation and diffusion of innovation (Edquist, 1997; Edquist & Hommen, 2008). Public sector plays gradually an active and central role, not only as a supplier of formal institutions; but also as a source of new policies and strategies (Sánchez, 2007; Gregersen & Jonhson, 2008; Gregersen, 2010).

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Concerning its role in the innovation process of renewable energies, public policies could be horizontal market-friendly programs without specifying any sector, or targeted programs which are focused on a particular sector or technology (Avnimelech & Teubal, 2007, 2008). Both kinds of programs could enhance the renewable energy development by means of science support or demand (del Río, 2007). Science support polices (technology push) are mainly concentrated on the technological infrastructure. These programs involve basic and applied research, demonstrations activities as well as diffusion issues. Energy legislation constitutes an essential tool in order to boost the diffusion through several instruments like feed-in tariffs schemes, green certificates, or quotas (Couture & Gagnon, 2010; Söderholm, 2008; Campos & Klagge, 2013)[i]. The main aim of these instruments is to increase the installed capacity and, therefore, a unit cost reduction because of a progressive movement in the learning curve. Nowadays, the final goals refer to environmental issues, industrial diversification, national energy security and economic growth. Albeit, diffusion could be foster through demand side policies, such as direct financial promotion of private demand (Edler, 2006). Additionally, feed-in tariffs, quotas and green certificates could be classified as demand side policies (Lewis & Wiser, 2007; Campos & Klagge, 2013), because they are also considered as indirect subsidies which enhance the consumption of energy from these sources by means of a reduction in prices. Then, these policies also increase the market size.

Other kinds of supply policies are the local content requirements (nowadays widespread in Europe, China and Latin America), quality certification or the implementation of standards in the manufacturing or installation processes (Campos & Klagge, 2013).

A good example of standards implementation in wind energy is the Risø National Laboratory (Technical University of Denmark). The implementation of standards from the public sector or private sectorial organizations is crucial due to its positive effects on triggering incremental innovations.

Demand-side support policies (demand pull) depend on learning by doing processes within the value chain, with suppliers, customers or competitors; and the role of environmental standards and mandatory renewable energy targets. Financial and tax incentives represent essential support mechanisms in the wind energy deployment (Campos & Klagge, 2013). We also add the aforementioned case of the feed-in tariffs scheme and green certificates.

Given the central role of institutions and public sector in the innovation process and the emergence of renewable energies, it should not be underestimated the importance of institutional stability (Pavitt, 1984). This stability combined with clear guidelines and institutional learning processes constitutes a key factor to enhance public policy design (Gregersen & Jonhson, 2008).

The learning policy process refers to a conscious evolutionary progression in which policy makers and experts develop competences, called direct policy learning, and another indirect way linked to "learning by doing" or "learning by accident" (Ib.). Then, it is necessary a minimum level of institutional capability as well as a long-term definition of policy goals in order to provide enough financial support and stability, especially in wind energy in which there are high fixed costs (EWEA, 2009).

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Long-term policies which foster renewable energy diffusion by means of financial support and the creation of market demand are essential to reduce the level of uncertainty and increase the financial turnover especially throughout the early steps of development.

Some successful development lessons in wind energy show us the importance of defining and implementing clear guidelines and social consensus over time (Christensen, 2010). The lack of institutional stability causes important shutdowns in the deployment of industrial agglomerations, such as peripheral clusters (Gorenstein & Moltoni, 2011). In those kinds of agglomerations, the macroeconomic and institutional volatility, in a broad sense, and the shortage of critical mass, technological and human capital capabilities hinder the emergence and consolidation of the cluster. In these development steps, public policies make easier to overcome initial inertias and barriers. Some dynamics in peripheral clusters represent vicious cycles, in which there is a lack of regulation and also a wrong design.

The uncertainty about future trends hampers innovation processes and the creation of interactions and critical mass. In addition, these negative effects have significant impact on the regional economy through the decrease of the final demand (decline in investment, consultancy, financial and maintenance services and so on).

They reduce the economic impact in terms of production, backward and forward linkages or employment as well as energy and industrial diversification. Thus, there is a direct relationship between legal instability and economic impact, mainly when one single region has a significant amount of renewable energy production.

2 The Galician wind energy sector: evolution and current situation

In Spain, the power of legislative development and implementation of the special regimen[ii] of electrical production were assumed gradually by the Autonomous Communities (Spanish regions). Central Administration is in charge of the competencies related to the coordination and planning of energy policies and the basic legislation of agreements and administrative authorisations. Likewise, the central government has the legislative power over remuneration models (Bacigalupo, 2010). The regional government is in charge of the regulation competency of the electricity power installations, transport and distribution set in Galicia. In this sense, the regional government is also in charge of spatial planning of wind energy, organisation and solution of controversial issues about wind energy and the approval of new installations. Besides, regional governments could also implement local content requirement policies through industrial plans.

The commercial development of wind energy in Galicia began around the mid-90s, when large conglomerates, such as Endesa, were interested on using the existent wind resources. Nevertheless, this exploitation was previous to the first Galician Wind Energy Sectorial Plan (PESG), which was approved in 1997.

In spite of that normative delay, wind energy developed in Galicia significantly from 2000 until 2008, turning into the Spanish region with more installed capacity, shows two completely different trends between 2000 and 2012 in Galicia. The first one goes from 2000 until 2008, characterised by a continuous growth of installed capacity, higher than 50% in some years.

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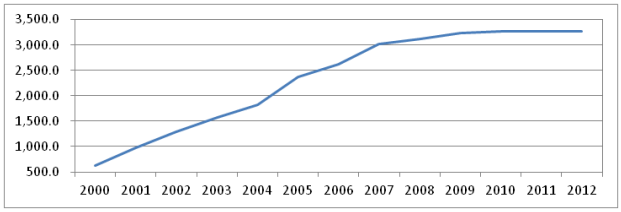
In 2008, normative instability increased due to the fact that the government tendering was appealed and there were several regulatory decrees in the sector. The economic crisis and the gradual reduction of premiums to renewable energies of the special regimen also triggered a strong reduction in the installation of new capacity, characterising a new phase of slow growth.

Nowadays, Spain does not allow register new installations in the special regimen, then wind farms owners do not have right to perceive a premiums by the electrical production generated.



Graph 1

Table 1 shows the main regional legislations and government tendering in Galicia. The first decree (1995) introduces the concept of industrial plans and the local content requirements.

The main aim was to enhance an industrial sector related to wind energy, but the lack of administrative control hampers this goal (Simón et al, 2010). In the next regulation (2001), the figure of the singular wind farms arises.

This kind of installations enables local stakeholders (such as municipalities, landowners and so on) to participate in wind farms. However, the success was really limited in terms of the number of stakeholders and power capacity.

	Main characteristics	Duration
Decree 205/1995	Most important legislation in terms of power capacity installed[iii]. Industrial plans and local content requirements.	1995-2001
Decree 302/2001	Singular wind farms.	2001-2007
Decree 242/2007	Public sector participation in wind farms. Environmental protection of special areas.	2007-2009
Government tendering	Allocation of 2325 MW. Government tendering appealed.	2008
Law 8/2009	No chance of public sector participation in wind farms. New taxes per wind turbine. Environmental Compensation Fund.	2009-at present
Government tendering	New stakeholders. Allocation of 2325 MW. No progression.	2010- at present

Table 1

The aforeomentioned instability arose after several radical changes in the regional legislation. In fact, Table 1shows that between 2007 and 2010, there were two complete different legislations and two government tenderings. The former decree (2007) highlights the public interest in wind energy which enables public sector to participate in the wind energy development. There was also a government tendering linked to this decree, but it was appealed in 2008. The new regional government developed another legal framework in 2009 which gave up the idea of public participation in wind energy farms. Albeit, one of the most crucial factor which makes easier the shutdown was the total change of stakeholders between the two goverment tenderings.

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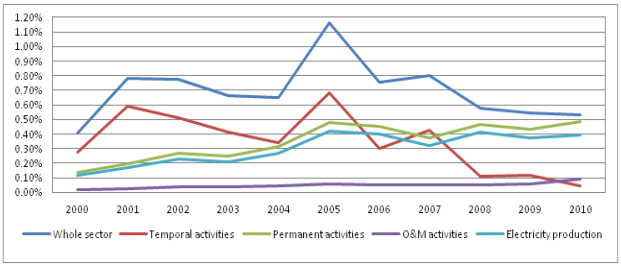
The role played by public administrations in order to regulate Galician wind energy sector and foster its development was focused only on increasing the installed capacity, setting aside industrial or environmental aims such as the protection of special green areas (Simón et al., 2010; Varela & Sánchez, 2014). Likewise, the lack of administrative control of the fulfilment of the industrial plans and environmental controls reduced substantially the positive impact of the wind energy development on the socioeconomic framework (Ib.).

3 Impact of legal stability on wind energy development and regional economy

The empirical methodology is based on the input-output approach and the analysis of the wind energy value chains (Varela et al., 2013; Varela & Sánchez, 2014a).

The economic impact diagnosis has to keep in mind the regional special features as well as the distinctive characteristics of value chains (Llera et al., 2010). This paper focuses only on the relation between legal stability and the Galician wind energy sector, omitting the methodological explanations[iv]. Concerning the estimation of the sector, we make a breakdown in order to undertake a more accurate analysis because of the different sectorial as well as temporal underlying dynamics in both kinds of activities. In this sense, we differentiate between temporal activities and permanent ones. The former constitute the investment related to the installation of wind farms such as the wind turbine components, grid connection, civil work or consultancy activities. The flow of this kind of activities is volatile because it depends on the annual installed capacity in the region.

Permanent activities refer to operation and maintenance tasks (O&M) and the electricity production, and they depend on the cumulative installed capacity. Graph 2 shows the weight of the wind energy sector and of each of its different components in the regional economy. This quantification is crucial in order to measure the size of the sector in relation to the whole economy. It also emphasises the importance of public policies which boost the sector, as well as its potentialities. Equally, it can check the impact of the economic cycle and normative changes on the sector. Besides, the breakdown based on the value chain stands out the relative importance of each subsector.



Graph 2

The weight of the wind energy sector in the Galician economy changes substantially over time. In 2005 reached the highest value (1,16% of the GDP) due to the installation of new wind farms (supposed almost 0,69%) and the electricity production (0,42%). That year constituted the moment with more new installed capacity, with 540 MW. However, it also reached lower figures, such as at the beginning and at the end of the decade (0,40 and 0,54%, respectively). Between 2001 and 2007, the contribution to the economy was above 0,70%.

It should be also emphasised the contribution of the installation of new wind farms to the GDP until 2007. During this year, it was always above 0,3%, therefore, it constitutes the main driver in the wind energy sector and with an essential additional output increase in the economy.

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This evolution reflects the large sector peak, with installed capacity annual growth rates higher than 10% and even reaching 57% in 2001. Since 2007, there were two complete different sectorial legislations with opposite guidelines and the shutdown of the wind energy appeal in 2008. Likewise, it is necessary to emphasise current changes in the remuneration regimen and the new context of economic crisis. The result was a crucial shutdown in the installation of new capacity, which blocked the sectorial development. The dependence on the installation of new capacity highlights the harmful effects that the paralysis of wind energy appeals triggered in the Galician economy.

At the end of the decade permanent activities play a palliative role in contrast to the unfavourable evolution of the annual installed capacity, because their contribution to the GDP has increased. This fact is mainly justified by the contribution of the electricity production with the exception of meteorologically bad years. The special regimen has preference in the energy market; therefore, it is not affected by the fluctuations of the energy market. Likewise, the contribution of operation and maintenance activities is insignificant (underneath 0,1% of the GDP). Consequently, it does not constitute an economic driver. Hence, there is no sufficient wind turbines stock in order to reach an important contribution to the economy. The permanent component of the sector has not still significant size to sustain a repair market.

Given the current sectorial stagnation and its capital-intensive feature, a positive development would go through a growth in the onshore or offshore installed capacity, or by repowering the current wind farms. In this last case, it is necessary a legislative reform, especially in the remuneration regimen[v], in order to increase the expected profitability.

4 Conclusions

Legal stability constitutes a key factor to provide financial security as well as it plays a role of enhancing innovative processes. This stability is essential, mainly, in the case of emerging sectors which have to face technological and institutional inertias and barriers. Experience shows us the necessity of implementing clear and long-term guidelines which make easier the emergence and consolidation of any new sector. These policies should combine supply-side as well as demand-side measures in order to take into account the systemic features of innovation processes. Then, instability has an important impact on both the sectorial development and the economy through the investment and production channels.

In some wind energy peripheral clusters, instability hinders the sectorial development and the potential chance of industrial diversification mainly in the case of regions with high level of wind energy installed capacity.

In these situations, the economic quantification of instability is crucial due to its effect in terms of linkages, output as well as the measure of its potentialities. The analysis of the Galician wind energy sector, by means of the value chain approach the input-output analyses, shows us an important loss of total output (as a sum of direct and indirect effects) because of a decisive legal shutdown in 2008. This shutdown was a consequence of two totally different legal contexts within two years and the paralysation of the government tendering. In fact, we could quantify this loss in more than 0,5% of GDP within its peak reached in 2005 and 2008. The economic crisis also sharpens that trend.

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This legal instability affects seriously the wind energy sector because it is a capital-intensive sector and it needs more than 1 million of euros per onshore MW.

The role played by legal framework is due to the sectorial dependency on new installed capacity. Temporal activities were the most important in the wind energy value chain and for this reason, the sector is very sensitive to normative changes.

Thus, there are few options available and all of them go through repowering wind farms or installing new onshore or offshore capacity.

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The available information on health issues is growing rapidly. The lack of information let us to search strategies especially on the internet exposes students and professionals unreliable, outdated affecting professional performance. In Bolivia and particularly in Sucre, this topic has been little explored, so it was raised as a general objective for this research to determine the level of knowledge, practices and skills regarding finding information on health issues in participants cycle research conference organized by the Science and Technology University of San Francisco Xavier de Chuquisaca. Through a quantitative study type with a cross-sectional descriptive design, the level of knowledge, practices and skills explored in 20 people who attended the meeting on June 14, 2013 (95% response). Based on the literature and on the Fresno test (standardized for measuring information search skills with a focus on evidence-based medicine questionnaire) questionnaire was developed. The results showed a low level of knowledge and use of some databases of particular relevance in Latin America (Cochrane, Lilacs, Hinari) and poor knowledge of MeSH terms / MeSH and Boolean operators. 10% of the population reported good practice. As for skill development in conducting a search for information, 70% no skills are evident and the remaining 30% showed limited skills. In conclusion, the need for training was evident in issues related to information search strategies to locate the most valid and reliable scientific information available on the internet to support decision-making in different situations of their professional performance.

Fresno test, MeSH, San Francisco Xavier, Bolivia

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† Researcher contributing first author.

Introduction

The training of health professionals increasingly requires more and more knowledge about access and management of information available online, so that capacities have to recognize when and what information is needed where it is located, how obtained it and also how it is evaluated critically to use it to communicate properly, this process being called "Information Literacy" (1).

These aspects are essential to improving clinical care, efficiency in operations, improving health equity, increasing and improving research processes, increasing the level of health and ultimately improving the living standards of people. Currently, there is much information on health issues available online, especially in non-specialized sites (like Google, yahoo), those without editorial filters and systems for evaluating websites, exposing professionals and patients to quality information dubious and unreliable which could have important implications for the health of the population (2).

Although among professionals and students in the area of health has extended the use of internet and there is a very positive perception about its application, studies in Latin America (3) (4) found in them, insufficient skills to access, read critically interpret and apply all the information they need.

In Bolivia, they have not found any studies on this topic. Moreover it is necessary to emphasize the increasing value that has been attributed to the information from the last decades.

Health, knowledge management is critical, since the access, use and interpretation of it plays a fundamental role in developing policies, programs and practices that can improve the quality of life of the community, which is why the remaining barriers in terms of access and proper use less chance to make proposals on key issues for social and economic development of communities.

The main barriers to entry described affecting mainly the least developed countries like Bolivia are: technical, economic, administrative, educational and cultural. These limitations are further accentuated when referring to restrict access to information produced by the requirement of a subscription fee or payment from reading certain articles.

While still this inequity in access of information is evident is the expense of developing countries, it is necessary to mention some initiatives that are increasing (5) as the so-called free (Open Access Initiative, OAI), promoted by the Open Society Foundation, through the declaration of Budapest in 2002, which promotes public access and availability of content on the network, allowing reading, download, copy, distribute, print, search, or link to the full texts with no economic, legal or technical barriers, only respecting copyright (6).

These initiatives greatly facilitate access to current high standards of quality, providing ample opportunities to developing countries information.Assessing knowledge and skills regarding the literature search in health among students and health professionals in the San Francisco Xavier University interested in research activities, provide a baseline to identify weaknesses in the process and propose actions specific so that students have the necessary skills to make efficient use of information for the community.

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1 Materials and methods

Quantitative and descriptive study: Population: Students and regular participants in the area of occupational health research lecture series on 2013 organized by the Department of Science and Technology (DICYT) University of San Francisco Xavier de Chuquisaca. For reference of those responsible for the organization in the health area a population of an estimated 20 to 30 people. Sample: A convenience sample was selected to survey all session participants regarding the diagnosis and development of a proposal in the area of health. Those attending the activity that day were 21 participants.

Instruments

A self-administered, anonymous survey of 14 questions, 11 closed questions and 3 open was implemented. For the proper performance of the instrument a pilot instrument was conducted to address some aspects of the drafting and interpretation of the questions.

2 Statistical Methods

Definition of variables:

Variable	Conceptualization	Dimension	Indicators
Knowledge	Organized set of data and information for solving a particular problem or make a decision	Medium/High Knowledge	-Meet And manages websites for specialized searches in health (good and very good categories) -Define Correctly or MeSH terms MESH -Describes Correctly use the operators AND, OR and NOT
		Low Knowledge	-Meet And manages websites for specialized searches in health (Basic categories and no) -Not properly defined MESH terms or MeSH -Not correctly describes the use of AND, OR and NOT
Practice	Action develops the application of certain knowledge	Correct Practice	-Own initiative -Using Database specialized health -Consultation of at least three databases in the last month
		Incorrect Practice	-The search for teacher direction. -Using Google or other unspecialized web pages -Visit at least three databases in the last month
Skills	Talent, skill or aptitude for a task	Excellent	- Mention 3 or more terms that reflect patient, intervention, comparison and event (PICO) -List At least 4 types of sources; Mention and explain at least two aspects of convenience; Mention and explain at

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			least two aspects of clinical relevance; Mention and explain at least two aspects of validity
		Strong	-Mention 2 PICO terms -List 3 types of sources; Mentioned and said at least one aspect of convenience; Mentioned and said at least one aspect of clinical relevance; Mention and explain at least one aspect related validity
		Limited	-Mention 1 PICO Term -List Mentions the two types of sources, but does not explain one aspect of convenience; Mentions but does not explain one aspect of clinical relevance; Mentions but does not explain at least one aspect regarding validity
		Not evident	-No mention of PICO term -List Just 1 type of source; No mention of any aspect of convenience; No mention of any aspect of clinical relevance; Not describe any aspect related validity

Table 1

Knowledge: Defined as the organized set of data and information for solving a particular problem or make a decision (7).

This variable has two dimensions used in previous studies (8) and is defined as follows:

- Medium / High Knowledge: Considered with medium or high knowledge when it meets three requirements: Meet and manages websites for specialized searches in health considering the good and very good categories, correctly defines the MESH terms or MeSH (Tesuro) and finally correctly describes the results obtained with the use of aND, OR and NOT operators.

- Low Knowledge: Considered low knowledge which does not meet the requirements mentioned previously: Meet and manages websites for specialized searches in health considering the basic categories and not properly defined MESH terms or MeSH, not described correctly results obtained with the use of aND, OR and NOT.

- Practice: Defined as the action unfolds with the application of certain knowledge (Praxis) (9). This variable has two dimensions described elsewhere (8) and defined as follows:

- Right Practices: Considered good practice when the literature search is mostly on their own initiative, using database consulting specializing in health and at least three specialized databases in health over the last month.

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- Wrong Practices: Considered malpractice when the literature search is mainly teacher direction, use Google or not specialized websites and check fewer than three specialized databases in health in the last month.

Skills: Defined as talent, skill or fitness for any task (10).

Questions about skills are based on two questions (2 and 4) of the Fresno test, standardized test and validated in its English version to measure skills on Evidence Based Medicine.

Question 4 of the Fresno test (question 12a our questionnaire) explores strategies search databases such as Medline for original research, and is described as follows (Table 2): Table 2 Rating Skills about search strategies (terms and delimiters used)

Score	Search Terms	Delimiters (filters)
Excellent	Mention 3 or more terms that reflect patient, intervention, comparison and event (PICO).	Describe more than one way to limit the search strategy. (eg limited to humans, adults or language,. specific type of research; Boolean operators; terms related to optimal design study)
Strong	Mention 2 PICO Terms	Describe only one way to limit the search
Limited	Mention 1 PICO Term	Do not describe only one way to limit the search
Not evidence	No term	Do not describe only one way to limit the search

Table 2

Moreover, the test question 2 Fresno (12 b of our questionnaire), measures the recognition of strengths and weaknesses of the different sources of information in clinical practice and is described as follows (Table 3):

Skill Score	Variety of sources of information	Convenience	Clinical relevance	Validity (quality of information)
Excellent	List at least 4 types of sources: Databases original articles (Medline, scielo, etc) Journals Texts Systematic reviews (Cochrane) Medical websites General search on the internet (google, yahoo, ect) Clinical guidelines Professional organizations	Mention and explain at least two aspects: Costs Speed Easy to find User friendly Availability	Mention and explain at least two aspects: Outcome (event) clinically relevant Written for clinical application (eg information side effects, patient info, etc.) Information applicable to patients Includes specific interventions specificity	Mention and explain at least two aspects: Approach to Evidence-Based Medicine Expert bias systematic approach Peer review Availability to review Standardized care (accepted treatments in the community) Provides enough information to criticize validity Update
Strong	Mention three types of sources	Mention and explain 1 aspect	Mention and explain 1 aspect	Mention and explain 1 aspect
Limited	Mention two types of sources	Mentioned the desirability of one or more sources without any explanations	Mentioned the desirability of one or more sources without any explanations	Mentioned the desirability of one or more sources without any explanations
Not evidence	No mention variety, only mentions one type of source	No mention convenience	No mention convenience	No mention convenience

Table 3

3 Analysis Plan

The questionnaires were scanned using EpiInfo v. 3.5.3 and exported to SPSS v.17 program for the analysis. The graphs were created in Microsoft-Excel 2010. Considering the descriptive scope of the essay, the final sample size, and distribution of data, continuous (age) variables were expressed relative to the median value and the minimum and maximum value.

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Moreover categorical variables were expressed in absolute and relative value.

Ethical Issues

4 Results

The survey was conducted for the diagnosis on 14 June this year, 20 students who participated in the meeting regarding the proposed development of diagnostics and focusing on health. The rejection rate was 5% (1 student 21). The general characteristics of the study population are shown in Table 4.

		n	%
Age (median, min-max)	21 (19-33)		
Procedencia	Sucre	11	57.9
	Inside the country	8	42.1
Gender	Masculine	7	35.0
	Femenine	13	65.0
Career	Kinesiology / Physical Therapy	7	35.0
	Medicine	5	25.0
	Nursing	5	25.0
	Pharmacy	2	10.0
	Imaging	1	5.0
Grade	Second	1	5.0
	Third	9	45.0
	Fourth	5	25.0
	Interned	1	5.0
	Graduated	4	20.0
Management Languages Good / Very Good	English	4	20.0
	Quechua	3	15.0
	Portuguese	2	10.0
Memberships scientific society		7	35.0
Research conducted	None	3	15.0
	1-2 jobs	10	50.0
	More tan 2 jobs	7	35.0
Training literature search	Any formation	8	40.0
	Through the University	8	40.0
	Self-learning	4	20.0

Table 4

Increased participation of students was presented in the middle of the race course (45%) with a median age of 21, mostly in Sucre (58%), women (65%).

In this session there was greater involvement of racing Kinesiology / Physical Therapy (35%), medicine (25%) and nursing (25%). Moreover it is shown that only a small percentage of the study population manages a language other than Spanish to good or very good level (20% English, Quechua 15%, Portuguese 10%), something that often restricts access to international literature . Also about a third of the study population (35%) belong to some scientific society, while 85% made 1 or more research papers and 40% reported training in literature search through a course in college. As for the main point of access to internet shows that the highest percentage accessed from an internet point (50%) and uses an average of 1-5 hours per week (63.2%) (Table 5).

		n	%
Principal place of acces	Internet Point	10	50.0
	House	8	40
	Cellphone	1	5.0
	None	1	5.0
Frequency of Use	Less than 1 hour per week	4	21.1
	1-5 hours per week	12	63.2
	5-10 hours per week	2	10.5
	More than 10 hours per week	1	5.3

Table 5

Information sources are consulted more frequently during training are specialized books on health (often / always: 55%), class notes (45%) and Internet pages of general information (75%). Moreover the less frequented notes are compiled (never / only sometimes / sometimes 78%), articles, magazines or specialized health reviews whether print (70%) or digital (55%) (Figure 1).

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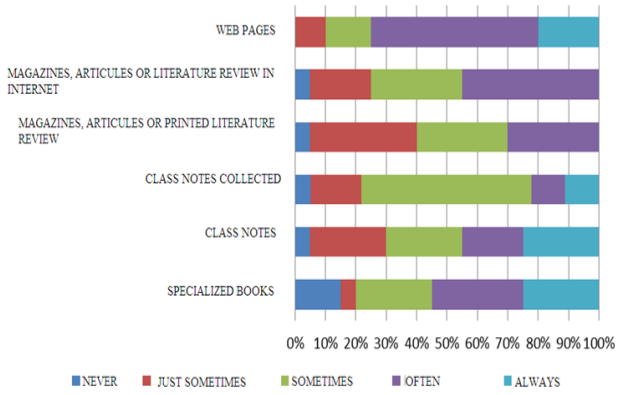

Figure 1

5 Results on knowledge

Specialized pages on topics best known as most health management are the World Health Organization (Good: 50%), Pan American Health Organization (35%) and Vademecum (Good / Very Good: 45%). Moreover among the lesser known websites and are handled INASP: Programme for Strengthening of information for research (None / Basic: 100%), Cochrane (100%), Lilacs (95%) and Hinari (95%), although some of those shortcut link from the college website (Figure 2).

None of the respondents knew the terms or descriptors Mesh Health Sciences (MeSH). Moreover four people (20%) correctly described the results obtained using the Boolean "AND" and only two (10%) correctly described the results operated by the Boolean "OR" and "NOT" respectively (Table 3).

	n	%
Knowledge of the terms Mesh o DeCS	0	0.0
Operator knowledge AND (Y)	4	20.0
Operator knowledge OR (o)	2	10.0
Operator knowledge NOT (no)	2	10.0

Table 6

6 Results on practical

Most of those surveyed visited Google to search for health information (95%), followed by SciELO (45%), and Lilacs (45%). Moreover the least visited are database Cochrane systematic reviews (8%) and Hinari (10%), (Figure 3). These practices relate to the previously reported levels of knowledge. A criterion is considered good practice for consultation over three specialized health pages per month. In our study, only 2 people (10%) visited at least three Internet sites specializing in health (Figure 4).

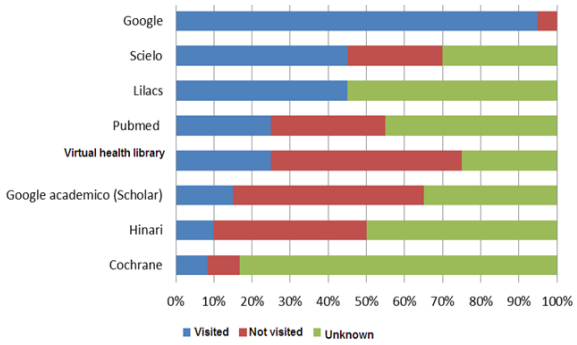

Figura 3

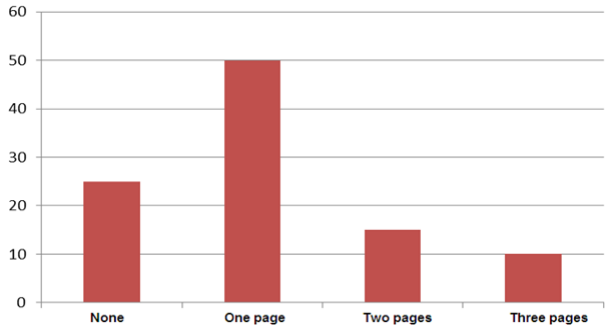

Figura 4

As the main reason for search, six people, of all respondents, reported having sought information at the request of the teacher while nine (60%) did so on their own initiative. For this question five missing values were recorded.

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Considering the number of pages visited and the main reason for search, only two (10%) are considered correct search practices.

Results on skills

For the rating of the skills developed during a literature search terms and filters or delimiters used in a search for a clinical problem described were considered. In our study population 40% (8) showed limited skills, and 60% skills are not evidence and that did not include any terms related to Patient Intervention Comparison Outcome or (PICO) and not to mention no way to limit the search .

As for the ability to recognize some related information sources on health as variety, convenience, clinical relevance or quality of information attributes, in our study, only one person (5%) was shown to have strong skills to mention at least three types of sources of information (Dialnet, SciELO, google / books) also mention and explain at least one aspect of convenience (subscription required, ease of access), clinical relevance (clinical application) and information quality respectively (sufficient) information. Five people (25%) reported limited skills to name just two sources, and mention only one aspect of convenience, clinical relevance and quality of information respectively. The highest percentage of the study population (70%) showed prowess and that only one type of information source and does not mention any aspect of convenience, clinical relevance and quality of information. Considering the skills to describe a search strategy and to describe the characteristics of the information sources, 30% of the study population (6) demonstrates limited skills; lie to the rest of the population does not demonstrate developed skills.

Finally, the perceived difficulty was explored to find health information and relevance of training on the topic and found that most of the respondents (55.5%) found it difficult to find health information (Figure 5) and 88.9% find the relevant receive training on the subject, a fact that supports the proposal made in the next chapter.

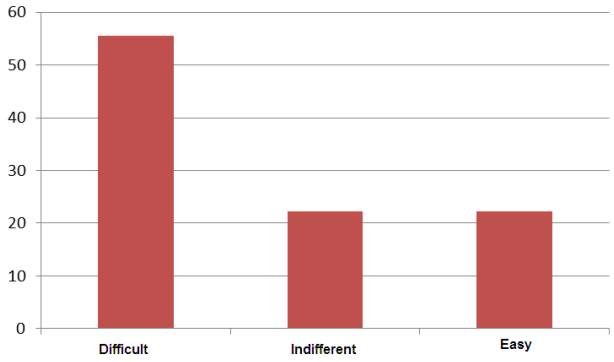

Figure 5

6 Discussion

The survey population reported a low level of knowledge of specialized databases available in Spanish language health as Cochrane, Lilacs or Virtual Health Library (VHL) which is a Latin reference for professionals in the health area. Moreover poor knowledge was also evident as the thesaurus (MeSH or MesH) and Boolean operators, which are key elements in achieving effective Internet searches.

Most respondents reported improper conducting searches for health information practices. While most searches conducted on they own initiative, few of them looked at health specialist sites. Moreover undeveloped search skills are also evidence describing incomplete terms in the search strategy for a specific clinical problem. Also little recognition of the diversity of information sources available, their advantages and limitations, clinical relevance or quality of the information they contain is reported.

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Although a convenience sample to consider attending one session is selected, it is likely that the sample is representative of the study population. This group has different characteristics to other students, being a population with greater motivation and research experience, as well as some access to internet. Given these characteristics it is possible that the level of training on this issue is deficient in most other students, aspects to be considered in the implementation of training workshops such as the one presented in the proposal.

7 Conclusions

In the present investigation a low level of knowledge, inappropriate behavior, and poorly developed skills regarding search strategies for health information on the participants cycle research conferences organized by the Directorate of Science and Technology, University San Francisco Xavier de Chuquisaca. It is necessary to include in undergraduate training workshops on finding information, whether in health as in other branches of science from the first training course, so to prepare professionals to deal with the abundant information produced, especially in the Internet, and student and professional optimize the time spent retrieving quality information and form both a critical thinking to evaluate information and its applicability considering each particular context. Moreover it is important to foster in students a more critical attitude towards the information accessed and assimilated so that a stronger background, updated to provide quality care and to consider the best available evidence is taken.

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Size asymmetries in equine upper molar series

PARÉS- P. *† & MORROS- C.

Dept. of Animal Production, University of Lleida. Av. Alcalde Rovira Roure 191, 25198 Lleida (Catalunya, Spain)

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Size morphological symmetry and asymmetry of complete horse molar series (n=16) belonging to 'Cavall Pirinenc Català' (Pyrenean horse) were decomposed using geometric morphometric methods. Fluctuating asymmetry (FA) was used as an indicator of environmental stress, and directional asymmetry (DA) as biomechanical constraints. Two-dimensional coordinates of 18 occlusal landmarks were digitized and analyzed using multivariate analyses which showed the presence of significant DA as well as FA. Stressors such as extreme temperatures, lack of dental care and parasites could explain the significative FA whereas DA could be explained by a lateralization in masticatory process, a preference for one side of the dentition during chewing, as has been described in humans.

'Cavall Pirinenc Català', cheek teeth, molar, morphological variation, *Equus*, Pyrenean horse, symmetry

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*Correspondence to Author (email: peremiquelp@prodan.udl.cat)
† Researcher contributing first author

Introduction

Bilateral symmetry, which amongst others includes object and matched symmetries, is rarely perfect, and asymmetries can be found in normal growth and development as a typical adaptation of organisms to their environment. When deviations from expected perfect symmetry occur, organisms develop several kinds of asymmetries, among others fluctuating asymmetry (FA) and directional asymmetry (DA).

The level of FA often increases if individuals suffer developmental perturbations (Zakharov, 1989; Parsons, 1990). FA sometimes responds to genetic stressors such as inbreeding and selection, as inbreeding promotes homozygosity and this renders organisms less able to cope with changes in the environment and makes them less fit (Lerner, 1954) and is one of the best measures of developmental instability in populations (Leamy et al., 2001).

DA happens whenever one side on the plane of symmetry develops more than the other side, and has a proportion of genetic component (Van Valen, 1962; Palmer and Strobeck, 1986). Teeth are the hardest tissues and are constantly worn away by prolonged use (Getty, 1975).

From an evolutionary perspective dental wear is one of the prime selective forces that shaped not only the anatomy of teeth but the properties of the dental tissues themselves (Kaidonis, 2008) being the anatomical relationship and different wear characteristics of dentine and enamel essential for masticatory efficiency (Kaidonis, 2008).

There seems to be subtle variations in how the wear mechanisms act and they can be separated into abrasion, demastication, attrition, abfraction, resorption and erosion (Imfeld, 1996). Abrasion is the loss of tooth substance (Pindborg, 1970) due to tooth wear by exogenous material (Butler, 1972); although a multitude of foreign bodies can cause abrasion, the most common yet most overlooked is food (Kaidonis, 2008). The action of food on a tooth surface is ‘non-anatomically specific’; that is, the action generally occurs over the whole occlusal surface producing a wear area as opposed to a facet (Kaidonis, 2008).

Demastication describes the wearing away of tooth substance during the mastication of food with the bolus intervening between opposing teeth. Attrition is defined as the loss of enamel, dentine, or restoration by tooth-to-tooth contact without the presence of food (Pindborg, 1970; Butler, 1972). The term abfraction is used to describe a special form of wedge-shaped defect at the cement-enamel junction of a tooth (Imfeld, 1996). Resorption describes the process of biological degradation and assimilation of substances or structures previously produced by the body due to cementoclastic, dentinoclastic and ameloclastic activity (Imfeld, 1996). And erosion is the loss of dental hard tissues by chemical action not involving bacteria (Eccles, 1982).

These mechanisms probably act together, each with different intensity and duration to produce a multitude of different wear patterns which expose modifications representing areas of differential wear resistance. For instance dentine and even cementum scoop soon after exposure. The interplay between wear and continual eruption determines the occlusal vertical dimension.

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In general, by abrasion the buccal cusps of the lower molars and the palatal cusps of the upper molars wear faster (Kaidonis, 2008). If any of these processes affect right and left teeth sides differently, one could expect differences between series. It must be emphasized that no research studies have been conducted on these documented different clinical erosive patterns, and few studies on teeth right-left symmetries.

The horse, like other domestic mammals, has a heterogeneous dentition that consists of incisors, canines, premolars and molars of which the two last-named are similar, and because of this they are referred to simply as 'cheek teeth'. The cheek teeth dentition is characterized by most cheek teeth being hypsodont, possessing long crowns that are completely covered by coronal cement at eruption (Sahara, 2014) and continuing to erupt in length after apparition (König and Lieblich, 2009), such teeth having to last the horse until death (Budras et al., 2009). Matched symmetry between the left and right sides of the dentition due to wear is a form of matching symmetry and is expected since their genetic determination is theoretically the same, at least it is in humans.

In the present study we analyzed lateral asymmetries in the molar series of adult horse skulls using geometric morphometric (GM) techniques, with the aim to quantify asymmetries and to assess and describe differences between right and left series. These GM methods combined with tools of multivariate statistics make it possible to study the morphological variation with direct reference to the anatomical context. We have quantified FA and DA as components of the total asymmetry of the complete landmark configuration under consideration applying the Procrustes asymmetry assessment method.

Digitizing the landmarks as two-dimensional (2D) coordinates enabled us to test symmetry by interchanging pairs of landmarks and comparing the original configurations with their relabelled reflections. The within-samples sum of squares around the average of original and mirrored data, which expresses the extent to which the sample fluctuates about its own average asymmetry, correspond to FA, whereas the sum of squares for average asymmetry, i.e. the squared shape distance between the original and mirrored average, corresponds to DA.

The interest of this study is focused not only on morphological study per se, but on its implication for functional and clinical equine dental studies.

2. Materials and methods

Specimen collection

Sixteen skulls were obtained from corpses following natural death on grassland. The origin of these skulls represents a wide range of geographical origins, but all specimens belonged to the Pyrenean horse ('Cavall Pirinenc Català', CPC). No inbreeding was supposed. Specimens corresponded to adult animals > 40 months (assessed by total eruption of M^3). Classification into more closely defined age groups based on molar occlusal design was considered inaccurate as the use of surface roughness parameters (such as those proposed by Grant, 1982) to establish age is, in practice, very unclear in many of the animals sampled. No cases of cheek tooth diseases (peg-shaped, dental agenesis, asymmetrical wear, chronic abscesses...) nor osseous abnormalities (enthesopathies, osteomyelitis, periodontitis...), which could cause gross bony deformations intra vitam, were detected.

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CPC is a local horse bred for meat production in the northeastern part of the Pyrenees along the Spanish-French border (Fernández et al., 2009), being compact and broad-built (Parés and Parés, 1997).

Genetic analysis suggests that this small population (<4,600 individuals) (Infante, 2011) is closely related to the French breeds, Breton and Comtois (Infante et al., 2010).

The horses are reared outdoors throughout the year and they are fed on grass, sometimes hay during winter, with no concentrate food except when they are being prepared for abattoir, normally around 1 year of age.

Farmers do not provide systematic clinical care to animals, so studies focused on their dentition, like this one, are representative of wearing from 'natural' grazing.

Data collection and geometric morphometric analyses

Clean and dry skulls were labelled and levelled on a horizontal plane on their dorsal plane, and then photographed once. Image capture was performed with a Nikon® D70 digital camera (image resolution of 2,240 x 1,488 pixels) equipped with a Nikon AF Nikkor® 28-200 mm telephoto lens. The camera was placed on a tripod parallel to the ground plane so the focal axis of the camera was parallel to the horizontal plane of reference and centred on the skull ventral aspect. In total, 18-2D occlusal landmarks (homologous anatomical points) were used on each series (Figure 1).

The software TpsUtil v. 1.50 (Rohlf, 2012) was used to prepare and organize the images.

Landmarks were digitized twice using TPSDig v. 2.16 (Rohlf, 2010) by the same person (Morros) on two different days, in the same order, for assessing measurement error. In order to compare Procrustes to tangent space distances between individuals, a Generalized Procrustes Analysis superimposition (equivalent to generalized least squares) procedure of Rohlf and Slice (1990) was performed on each data set using TPSSmall v. 1.29 (Rohlf, 2014).

The high degree (r=0.999) of approximation of shapes in the sample (i.e. shape space) by the reference shape (i.e. tangent space) allowed accurate capture of the nature and extent of shape deformations in subsequent statistical analyses. Size was obtained as centroid size (CS), which is the square root of the summed square distance from each landmark to the centre of the form. An ANOVA was then used to quantify the amount of size FA and DA; results are reported as sum of squares (SS) and means squares (MS).

Finally, a Kruskal-Wallis H test was performed to know if size was different between corresponding counterpart individual dental pieces (M^1, M^2 and M^3), and a one-way ANOVA to know if mean squares differences were different for each of them too.

SAGE v. 1. 05, available at http://www-personal.umich.edu/~emarquez/morph/, was used to determine symmetries. The CoordGen6f software, available at http://www.canisius.edu/sheets, was used to obtain CS. PAST v. 2.17c, available at http://palaeo-electronica.org/2001_1/past/issue1_01.html, was used for the rest of the statistical analysis. Significance level was established at 5%.

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3 Results

Measurement error resulted in FA being smaller than MS values for individuals, DA and FA (Table 1), so we proceeded with all subsequent analyses. Size of molar series differed significantly between sides, being mean CS of the left series 11.76 (SD=0.422) bigger than those of the right series 11.70 (SD=0.445) (these numbers are dimensionless) (Table 1 and Figure 2). ANOVA indicated that variation between size sides was significant concerning both FA and DA (see Table 1 for details). No differences appeared for size asymmetries between corresponding counterpart individual dental pieces (H=0.233, p=0.850), and although mean squares were highest for M^3 (0.0008, 0.0006 and 0.0021 for M^1, M^2 and M^3 respectively) no differences appeared in their variances (F=0.012, p=0.988) (Figure 3).

4 Discussion

Tooth wear is a normal physiological phenomenon where teeth, although worn, remain functional throughout life. In this study, authors have applied the general method for GM analysis of bilateral size variation and asymmetry in equine molar series in the CPC breed, which due to an extensive management can be considered as representative of a 'natural' grazing wearing.

It was noted that there was considerable inter-individual variation, probably due to the wide range of ages (not being possible to be adjusted merely on wearing). Increased FA may occur for various genetic reasons: homozygosity for deleterious recessive alleles, presence of certain dominant mutant alleles, deleterious gene combinations, aneuploidy, or chromosome aberrations.

Disruption of the genetic composition of coadapted gene complexes by inbreeding or selection for traits, so that the buffering potential is diminished, may increase the magnitude of developmental instability, resulting in increased FA (Schaefer et al., 2006).

Many studies show overall FA to be higher in homozygotes than in heterozygotes (e.g. Palmer and Strobeck, 1986), and some reports in the literature support the hypothesis that developmental instability, resulting in increased FA, is associated with inbreeding and homozygosity. But as it has been demonstrated the low rates of consanguinity in CPC horses (Infante, 2011), and stressors in the environment may be the reasons for such asymmetries.

Stressors such as pollution, malnutrition, toxins, extreme temperatures, or parasites have been described (Clarke, 1992; Markow, 1994, 1995; Woolf and Markow, 2003). Pollution and malnutrition can be excluded, as being bred for meat purposes, animals are rarely seen in poor corporal condition; moreover, they thrive in mountainous areas 'a priori' far from polluted areas.

Extreme temperatures for a horse that thrives all year round outdoors in Pyrenean areas (where minus zero temperatures and long snow and especially cold periods are not rare during winter), the lack of dental care, and generally poor anthelmintic programmes (Infante, 2011) could explain the significant detected levels of FA, uniformly distributed on the occlusal molar series. For DA, it could be assumed not to be an indicator of developmental (in)stability but a mere preference for performing an action with one side of the body or to one side.

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The tooth form functions when the mandible moves with a wide, 'lateral' masticatory cycle to produce a shearing action made possible by a shallow glenoid fossa. That is, the opposing enamel blades move past one another to produce what is called 'scissorial point cutting', which is a very efficient masticatory action (Every, 1972) and this may induce the appearance of bilateral asymmetry, which for our study would consist of enhanced development of left compared to right series. Over time, mastication causes tooth wear, which in turn would affect tooth size and hence the occlusion and again in time the masticatory pattern.

Our study revealed the presence of significant size FA and DA in equine molar series. The results of FA on the whole would indicate the presence of some stressors (extreme temperatures, lack of dental care, and a poor anthelmintic programme), apparently sufficient to infer developmental stability and minimize fitness and DA would be explained by a lateralization in masticatory function. But the interpretation remains just that: an interpretation, not an inference.

We know too little about how wearing is physically and chemically related to components of the diet or the habitat, and to what extent they are the result of tooth morphology and function, foraging and chewing behaviour, digestive physiology, thegosis, salivary and food chemistry, in horses.

A clear shortcoming of this study is the fairly low sample size, which probably would mask the different levels of asymmetry between molar pieces.

Moreover, occlusal surface must be described as a complex landscape with more or less elevated alterations, only possible working with 3-D techniques which have not been applied here (the level of 'texture' is not possible to be evaluated with the picture-based method used in this study, which takes into account only horizontal features – spacing parameters).

The detected phenomena must be explored further through future studies, as well as with experimental models. What is clear is that these morphometric studies should open up promising areas of research in many anatomical parts of domestic ungulates, taking into account the 'breed' and 'management' factor. The study of counterpart mandibular cheek teeth (upper and lower series) would no doubt give more clues about the mechanical forces which are involved in these asymmetries.

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Conflict of interests

None to declare.

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Article **ECORFAN Journal-Mexico**
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Country risk score over pacific alliance

CASTILLO - Edgar† & FORNAGUERA- Luis

Instituto Tecnologico de Estudios Superiores Monterrey

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The Pacific Alliance has become the biggest block of countries in Latin America, aiming towards a better interaction with Asian markets and an even closer coordination between the four founder countries as well as a broader arrange of members in the future. However, how well are they doing in a strictly financial matter, such as banking? Is the financial system of the four founders tough enough to sustain the size of such a group? We discuss this and many other matters with the numbers provided by their respective authorities and, even better, rank them with a new country risk score to meet the soundness of their economies, aiming to create an even more accurate model to predict bankruptcy in banks.

Pacific Alliance, Financial system, Economies, Banks

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† Researcher contributing first author.

Introduction

Banking, since the recent 2008 crisis and the overwhelming evidence of its causes in the banking, regulatory and mortgage sector, has become (if it wasn't enough already) one of the most important pillars of the economic analysis, projections and risk forecasting for every single economy around the world. However, regulatory authorities, as well as rating agencies, have the somewhat 'dirty' job of checking financial statements to verify the soundness of banks. Even with a variety of scales and methods to check those financial statements, a good and accurate measure for every single bank around the world would prove helpful to predict the default risk and health of the banks. Some other sectors on the worldwide economies have a proper way to achieve indexes and default risk indicators. Manufacturing sectors, stock participants and companies other than manufacturing (other than banks) have the Z-Scores by Altman. DuPont analysis, in the other hand, has been proven useful by using financial statements and reasons to achieve indicators on capital, rotation and profit margins, among other indexes, achieving a 'universal' approach since most respected companies use financial statements with a (kind of) similar base.

However, we all know banks don't have regular financial statements. Most of these indexes focus on normal companies rather than the specific banking companies and penalize high levels of debt and leverage, one of the main characteristics of a bank. It would be fair to assume that we can't use the standard way of measuring these indexes since the base of them, a financial statement, is not normal. In the other hand, emergent economies have been some of the best performing over the last years.

Even with the 2008 crisis, the 'natural' things that happened on the following years (like the rising of prices of bonds, attractive interest rates and a not-so-big response to worldwide volatility) have had a rather positive impact on these economies and most of them have been doing well so far, maintaining their exports and economic conditions stable. It is well known, as well, that some of the most important banks around the world have made emergent economies (specifically Latin America) their 'jewels' and most important markets, such as BBVA, Santander, Scotiabank, Citibank, HSBC, Barclays and many others. If Latin America has become that important on the banking sector, it would be fair as well to analyze the health of the latin banks. However, we need a source big enough to make a difference.

Luckily, the Pacific Alliance (Alianza del Pacífico, in Spanish) has been growing on the last years and caught the attention of the world's biggest blocks and economies. Lately, the Pacific Alliance has dispatched Mercosur from the biggest exporting block of Latin America, becoming the 8^{th} biggest economy and 7^{th} biggest exporting block of the world. Finland, Morocco, Costa Rica and Greece, among many other countries, have developed interest on joining this block originally formed by México, Chile, Colombia and Peru and make it even more powerful. If there is a Latin American zone to be recognized and worth of being analyzed, this is it. Having our problems and sector defined, from now on we'll be focusing on proving some standard approaches on the country risk measurement and even creating a new approach, aiming to combine it with another qualitative analysis to create a new, accurate default risk predictor for banks.

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Even if these approaches don't make that much of a difference now, we'll be aiming to adapt and even create other models proper to the banking sector all around the world while discussing several curious facts and a first round of analysis.

1 Development

First off, we thought we needed a base model to develop a new one. Country risk models are (luckily) varied with plenty of variations, bases and approaches. We focused on four models and companies, given their strength and their methodologies:

- BBVA Research Model
- Bloomberg Model
- Moody's Model
- S&P Model

All four of them had varied approaches and assumptions. While BBVA focused on macroeconomic variables over other kind of data, Moody's and S&P had a specific approach for banks. Bloomberg, on the other hand, had a simple, yet practical way of determining a score rather than a complex methodology. The decision of a base model was tough, but Bloomberg came out as our choice because a basic spreadsheet with a very basic methodology came out with very interesting results and with a very accurate (and general) way of developing and concluding a significant country risk score. Bloomberg's score is basic and practical, yet accurate. It's based on first-hand Bloomberg's economic data and a basic percent calculation to deliver a score accurate enough to make yourself an idea of the situation of a country.

First, Bloomberg's model acquires a set of data on a specific topic (Bond spreads, GDP, etc.) and ranks every single country with a "Percent Rank" function, which means they rank every number as a percentage (being 100% the highest number and 0% the lowest). That percentage is multiplied by a factor, given by the result of 100 divided by the number of data sets or topics (default factor was 3.85 on equally weighted numbers) to sum a score, finally. Simple, isn't it? However, we thought Bloomberg's model was not enough for our goals. Even with a practical and simple spreadsheet, Bloomberg's model only considered economic, financial and political risk. We thought a country's situation is not measured accurately only by those factors, but by many other things as well. In consequence, we needed to find some other data sets to add to our model. We believe society was our solution, and came out with important variables explained shortly.

Pollution: Since the beginning of (industrialized) time, pollution has become a major concern on our modern life. Countries invest insane amounts of money just to lower the levels of contaminant agents and that should talk about the soundness of an economy (if you don't have money as a country, you don't invest in such things). Anyway, pollution also talks about the country's culture itself and the way they develop with the bigger, cleaner economies. That should be a plus.

Criminality: Being safe is a major topic anywhere. Criminality indexes show how safe a country is and how safe a business investment would be. Major companies don't invest in violent countries because they take the risk of losing it all if violence spreads and gets out of control. Again, criminality also talks about a country's culture and the way they develop their lives: the good way (working and getting a job, etc.) or with violence.

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Birth rate: It is a well-known fact that Europe's most advanced economies are, as well, the oldest ones. Being an old economy (not too old) is an advantage since it represents experience, education and culture. It also means that elder people are prepared enough to know the risks of having a baby and are concerned about birth control, which means an efficient health system and a rather good health infrastructure (or infrastructure in general terms).

Migration: People flee from bad working conditions. That's a fact. Bad working conditions, in consequence, mean under-developed economies or a poor labor force regulation. Any of those meanings are bad for our comparison, which could lead to social volatility apart from low salaries and a slow-growing economy. We are looking for countries where people want to go, not to flee from.

Scholarship: Prepared people mean a bright future. Just to give an example, South Korea invested on education and had an impressive growth on GDP per capita over the last 40 years based on technology. Modern society is not about prime material, but about knowledge. Technical advancements are directly related to this and could lead to a better future if encouraged.

Internet: Yes, internet. The World Wide Web has become the main source of advancements on technologic and educational matters over the last 25 years. Having a connected country definitely impacts the way society learns and interacts with the world positively, meaning a higher chance of a growing economy.

We now have a 32-factored coefficient with financial, economic, political and social indicators. Using Bloomberg's method, country risk for the four founders of the Pacific Alliance came out like this:

Colombia Indicators		Values	Percent Rank Per * Coef.	
5Y CDS		118.658	51.00%	1.59375
10Y Bond Spread (10Y		371.1	22.80%	0.7125
1Y Price Change (%)		-11.17551	7.00%	0.21875
Index Returns To Global		-0.536041	7.00%	0.21875
Index PE Ratio		18.8146	37.50%	1.171875
EIU Banking Risk		39	52.70%	1.646875
Historical 3M Volatility		5.1819	73.50%	2.296875
FX Vol – 3M Implied Vol		7.465	72.40%	2.2625
GDP YOY%		5.1	75.90%	2.371875
GDP Forecast		4.3	75.50%	2.359375
GDP Value (BLN USD)		369.606	54.30%	1.696875
Currency Reserves (BLN		42.7579	38.50%	1.203125
Total External Debt (BLN		83.888	72.60%	2.26875
CPI Actual		2.02	59.00%	1.84375
CPI Forecast		2.3	49.10%	1.534375
Exports (BLN USD)		62.9869	26.30%	0.821875
Imports (BLN USD)		58.6313	65.00%	2.03125
Unemployment		9.65	29.50%	0.921875
Ages 15-24 Population		57.4	85.90%	2.684375
EIU Political Risk		46	35.10%	1.096875
Government Effectiveness		0.01	29.80%	0.93125
Rule Of Law		-0.39	24.50%	0.765625
Regulatory Quality		0.39	36.80%	1.15
Control Of Corruption		-0.43	22.80%	0.7125
Ease of Doing Business		42	54.40%	1.7
Starting a Business Rank		74	49.20%	1.5375
Pollution		71	23.40%	0.73125
Criminality		58.54	20.50%	0.640625
Birth Rate		17.23	52.80%	1.65
Migration		-0.66	35.00%	1.09375
Scholarship		90.4	43.10%	1.346875
Internet Penetration		22538000	49.82%	1.55686746
	Score	44.7724925		

Table 1

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Chile Indicators						Values
5Y CDS		79.55		64.80%		2.025
10Y Bond Spread (10Y UST)		370.1		25.00%		0.78125
1Y Price Change (%)		-14.00009		3.50%		0.109375
Index Returns To Global Avg (Z-		-0.579695		3.50%		0.109375
Index PE Ratio		18.0823		44.70%		1.396875
EIU Banking Risk		28		87.80%		2.74375
Historical 3M Volatility		7.24		32.70%		1.021875
FX Vol - 3M Implied Vol		8.98		34.10%		1.065625
GDP YOY%		5.7		85.10%		2.659375
GDP Forecast		3.4		66.60%		2.08125
GDP Value (BLN USD)		269.869		43.80%		1.36875
Currency Reserves (BLN USD)		41.6361		36.80%		1.15
Total External Debt (BLN USD)		119.829		66.70%		2.084375
CPI Actual		1.76		60.80%		1.9
CPI Forecast		2.2		52.80%		1.65
Exports (BLN USD)		81.8759		33.30%		1.040625
Imports (BLN USD)		79.4681		50.90%		1.590625
Unemployment		5.98		58.90%		1.840625
Ages 15-24 Population Ratio		31.3		31.50%		0.984375
EIU Political Risk		26		70.20%		2.19375
Government Effectiveness		1.25		70.10%		2.190625
Rule Of Law		1.37		71.90%		2.246875
Regulatory Quality		1.54		82.40%		2.575
Control Of Corruption		1.56		77.10%		2.409375
Ease of Doing Business Rank		34		61.50%		1.921875
Starting a Business Rank		30		75.50%		2.359375
Pollution		62		28.90%		0.903125
Criminality		47.09		39.40%		1.23125
Birth Rate		14.28		63.70%		1.990625
Migration		0.35		70.90%		2.215625
Scholarship		95.7		61.20%		1.9125
Internet Penetration		7,009,000		41.07%		1.28333342
	Score	53.0364584				

Table 2

Peru Indicators						Values
5Y CDS		133.067		43.20%		1.35
10Y Bond Spread (10Y UST)						0
1Y Price Change (%)		-23.63477		0.00%		0
Index Returns To Global Avg (Z-Score)		-0.728601		0.00%		0
Index PE Ratio		22.9795		21.50%		0.671875
EIU Banking Risk		35		66.70%		2.084375
Historical 3M Volatility		4.1479		79.60%		2.4875
FX Vol - 3M Implied Vol		7.165		76.60%		2.39375
GDP YOY%		4.4		66.60%		2.08125
GDP Forecast		5.15		84.40%		2.6375
GDP Value (BLN USD)		203.79		28.00%		0.875
Currency Reserves (BLN USD)		62.3003		61.40%		1.91875
Total External Debt (BLN USD)		55.462		82.40%		2.575
CPI Actual		2.81		39.30%		1.228125
CPI Forecast		3.05		40.00%		1.25
Exports (BLN USD)		42.9598		19.20%		0.6
Imports (BLN USD)		42.5813		70.20%		2.19375
Unemployment		5.7		60.80%		1.9
Ages 15-24 Population Ratio		57.4		85.90%		2.684375
EIU Political Risk		40		49.20%		1.5375
Government Effectiveness		-0.16		21.00%		0.65625
Rule Of Law		-0.61		10.50%		0.328125
Regulatory Quality		0.49		45.60%		1.425
Control Of Corruption		-0.39		28.00%		0.875
Ease of Doing Business Rank		39		57.90%		1.809375
Starting a Business Rank		60		56.20%		1.75625
Pollution		74		22.30%		0.696875
Criminality		58.14		21.30%		0.665625
Birth Rate		19.13		43.20%		1.35
Migration		-3.03		20.70%		0.646875
Scholarship		92.9		52.90%		1.653125
Internet Penetration		9,158,000		30.99%		0.96850145
				Score		43.2997514

Table 3

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Mexico Indicators						Values
5Y CDS		91.51		58.90		1.840625
10Y Bond		338.6		29.60		0.925
1Y Price		-		17.50		0.546875
Index		-		17.50		0.546875
Index PE		23.3336		19.70		0.615625
EIU Banking		36		63.20		1.975
Historical		10.685		10.30		0.321875
FX Vol - 3M		11.675		12.80		0.4
GDP YOY%		1.3		31.40		0.98125
GDP		1.53		28.80		0.9
GDP Value		1178.126		77.10		2.409375
Currency		175.432		82.40		2.575
Total		362.949		51.00		1.59375
CPI Actual		3.81		32.20		1.00625
CPI Forecast		3.6		32.80		1.025
Exports		395.569		82.40		2.575
Imports		407.827		14.10		0.440625
Unemploym		4.25		78.50		2.453125
Ages 15-24		43.3		63.10		1.971875
EIU Political		42		43.90		1.371875
Government		0.32		43.80		1.36875
Rule Of Law		-0.56		15.70		0.490625
Regulatory		0.47		43.80		1.36875
Control Of		-0.41		24.50		0.765625
Ease of		51		43.90		1.371875
Starting a		41		72.00		2.25
Pollution		55		34.50		1.078125
Criminality		52.46		30.00		0.9375
Birth Rate		18.87		46.00		1.4375
Migration		-3.11		20.20		0.63125
Scholarship		86.1		33.30		1.040625
Internet		31,020,0		26.98		0.843115
				Score		40.05874

Table 4

We should note that, other than the social data and the coefficient, all other data comes from Bloomberg's Country Risk methodology.

However, we believe social data adds a new, different dimension to our score and we think it's perfect to analyze, along with other quantitative data, the soundness and a default risk analysis for banks.

2 Conclusion

It turns out Pacific Alliance's countries have curious things between them. First off, Peru doesn't have a complete set of data (10Y Bond Spread data is not available) and, anyway, managed to be out of the bottom of the list. Mexico, on the other hand, has issues with financial and political stability, the main reasons of the fourth place out of four possible. Chile, in the other hand, has proven to be a solid and sound economy with the necessary reforms to develop itself. The final scores are (from 0 to 100, higher means better):

Chile: 53.03
Colombia: 44.77
Peru: 43.29
Mexico: 40.05

We should note that, even being a practical, easy and accurate (again, general) model, Bloomberg's model is far from being the ideal methodology we should be asking for. We, as a part of our investigation, are looking forward to develop a more specific model using probability and some other valuable financial resources in order to apply it to our default forecasting model for banks.

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The equality of opportunity: critical guidelines for the continuity of the argentine centre-periphery with continental contributions unequalizing process

REZZOAGLI- Luciano` & †*GAMBERG- Guillermina``

` *University of Salamanca*
`` *Austral University*

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The equal access of the population to social services and the unrestricted development of their potential, faculties, and rights, in the different regions of the country (in particular) and of Latin America (in general), represents a fundamental challenge for our States. Latin America is sadly unequal and Argentina is no exception. Therefore, beyond the liberal discourse of the neoliberal economic policies that characterize the financial and institutional dynamics of the last quarter of the twentieth century, it needs to determine the existence of continuities or reversals in our days as a guideline for understanding and analyzing the current ongoing processes and existing needs.

Equality of Opportunity - Fiscal Federalism - Production - Employment - Public Policies.

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*Correspondence to Author (email: lrezzoagli@hotmail.com)
† Researcher contributing first author.

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Introduction

Inquiry

The nature of this mixed method research is primarily qualitative, non-experimental, analytical and logical deductive. Its main objective is to answer the following questions:

1- What are the implications of the inequality of opportunities in the different regions of Argentina, and in a wider context, in the American continent?

2- What was and is the influence of the decentralization discourse and the action of the neoliberal policy based on the downsizing of the State and the structural change of its endogenous capacities, on the inequality of opportunities?

3- Until today, is there a continuity or a reversal of the regional asymmetries mainly related to the production and employment, generated and/or deepened in the 90s? What are the causes for this?

4- Why is it important to establish a relationship between this context of regional asymmetries, inequality of opportunities, and the capacities of the State, with the financial and tax fields? What role does or should play the Fiscal Federalism, viewed as a phenomenon, to recompose those asymmetries?

Aside from the intrinsic arguments based on justice, a high inequality of opportunities encourages social exclusion (ECLAC, 2008:5), reduces the capacity of the societies to use the human capital on its full potential, and enables wealthy people to distort the market for their own benefit. Moreover, it can encourage crime, violence and political instability (Blofield, 2011).

The equality of opportunities is a fundamental principle in the modern and inclusive States. Recent studies (Oxfam Report, 2014) show a close correlation between income inequality and the inequality of opportunities, therefore the possibilities of development that the siblings have during the course of their lives are highly dependent on the socio-economic situation of their parents (Tilly, 1999). For example in Denmark (one of the countries with the lower Gini[1] coefficient in the world), only 15% of the income of a young adult depends on the income of their parents; in Peru (one of the countries with the higher Gini coefficient in the world), a contrario sensu, two thirds of the current income of a person are related to what their parents earned in the past (Smeeding, T. M., Erikson, R. and Jantii, M., 2011).

This data shows the existence of "opportunity hoarding" [2], which of course must be subject to much deeper analysis. That is to say, the process that perpetuates inequalities, and takes place when specific groups assume control of resources and valuable assets., to use them for their own benefit, trying to guarantee the hoarding of the benefits that the captured resources generate.

[1]The Gini coefficient is named after its author Corado Gini (in his book Variability and Mutability). It corresponds to a number between 0 and 1, where 0 corresponds to perfect equality (everyone has the same income); 1 corresponds to perfect inequality (one person receive all the income and the rest receive none). The Gini index is the Gini coefficient expressed in percentages (the Gini coefficient multiplied by 100). The Gini coefficient calculation can be done in 2 ways: Through the Lorenz Curve or through the Brown Formula.

[2] The exploitation and opportunity hoarding are key elements for stabilizing a system of categorical inequalities because they generate permanent advantages for certain people in the access to scarce resources and they limit or exclude others as a way of ensuring this process (Tilly, 1999).

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These resources can be of different types, for example, the public spending, the access to quality education, and the higher-paying jobs, amongst others. (Oxfam Report, 2014).

The Human Development Report for Latin America and the Caribbean, presented in 2010 by the United Nations Development Program (UNDP), shows that in spite of the meaningful advances, this is still the most unequal region in the world[3]. Therefore, there is an urgent need to focus on redistributive policies.

The government structure is mainly defined by social criteria, based on the explicit recognition of the inter-regional differences.

This recognition is implicitly associated with the existence of negative effects on personal terms, as the geographical location of an individual would determine, in a way, their socio-economic and development opportunities[4]. To the extent that there is unequal access from certain sector of the population to social services or any restrictions on their potentialities, powers and/or duties (such as education and employment), due to exogenous factors (gender, ethnicity, place of origin or habitation, etc.), these will contribute to the inequality of opportunities.

Based on what has been said above, we can reflect on some guidelines offered by the 2006 World Development Report. This report states that in some particular circumstances (notably but not exclusively of inherited wealth) inequality could lead to an inadequate ex-post resource allocation. For example, it is very unlikely that children, who lack adequate financial resources, even if they are the most capable, get the best educational opportunities in based on these capabilities. On the contrary, it is much more likely that the relative poverty they suffer restricts their educational opportunities. Mainly in comparison with children from wealthier backgrounds who get a disproportionate access to the best schools.

[3] Some key messages of the report on Latin America and the Caribbean are: 1 The inequality observed in income, education, health and other indicators, is persistent across generations, and also presented in a context of low social mobility; 2 Clearly understanding these mechanisms of transmission of achievements at the household level will allow us to design more effective policies to break the vicious circles of reproduction poverty and inequality; 3 There are subjective factors that are determined by objective constraints and are essential to explain the differences in socioeconomic attainments; 4 The explanation for the persistence of inequality are not only present at the household level. The political process also responds differently to the needs of different groups. The sustainable reduction of inequality requires acting on the low quality of political representation, institutional weakness, differential access to the influence over specific and concrete policies, and it also requires acting on the institutional failures that lead to corruption and the state capture by minority groups; 5. A more comprehensive public policy approach is required. Redistribution strategies must reach those for whom they were designed, they should consider not only each constraint separately, but note that the constraints households face are multiple and sometimes reinforce each other. In addition, the objectives of public policy should be incorporated to the imaginary of the recipients, who must be active participants in their own development.

[4] For example, if we consider the access to the possibility of having electricity in your home for rich and poor families, we can assure that relatively wealthy households have electricity almost anywhere in the world, but in countries like Panama, Peru and Nicaragua, among others, less than 20% (ca) of poor families have it. The same applies to the access to any public service or to the restriction of their development potential, this difference between the citizens of the same country from one or more different regions, is what marks the inequality of opportunity.

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In societies similar to the Latin American societies, we can begin to understand this phenomenon based on three basic ideas

- First, the social field in the markets is related with the inequalities encouraged by those who seek the control of the commercial resources.

- Second, such control is necessary to generation and appropriation of surplus, these are essential because they structure the material life of the societies.

- Third, control is achieved through power struggles that not only confront individuals but also social groups and primarily social classes[5].

1 A situation that calls for reflection and (re) discussion of redistributive alternatives

In this continental context that invites to a further study of the issue of equality of opportunities, this study will focus on the Argentine Republic. The country shows two very different periods in terms of economic policies during the last two decades (from 1990 to 2010).

During the course of the decade of the '90 efforts were specifically directed at achieving price stability, mainly because there was an inflation higher than 3000% (ca), and in that context there was a reduction of the state involvement in the economy (as a main actor) and his policies were prone to achieve an open economy.

[5]Pérez Sáinz, J.P. and Mora Salas (2008), analyze the contributions of Tilly (Durable Inequality) in a concise presentation that is worth highlighting and sharing given the richness and clarity of its concepts:
First, Tilly begins his reflection with an uncompromising criticism, to the methodological individualism that often characterizes liberal approaches inspired and that are based on the premise of considering the individual as autonomous. For him, this means that inequalities (whether gender, race, ethnicity or citizenship) are addressed as cases of overall inequality that is characterized by two elements: the members of a certain social category share some attribute that makes them relate similarly with the market; and the groups present in the market define the preferences on how to relate to certain categories in terms of maximizing their profits. This implies, for Tilly, that the causal mechanisms are reduced to decisions such as mental events, which prevents the methodological individualism from explaining how such decisions produce inequalities in the context of complex social structures and erratic human behavior. On the contrary, this author advocates for a relational understanding of the phenomenon of inequality.
Second, for Tilly, the phenomenon of inequality arises from the different forms taken by social relations, primarily with organizations as these face a old and crucial problem: the generation of surplus and propitiation. This occurs through two mechanisms: exploitation and opportunity hoarding. For him, there is exploitation when powerful and well related people have access to resources from which they extract significantly increased profits by coordinating the efforts of outsiders who are relegated from this added value. Meanwhile, the opportunity hoarding happens when members of a network circumscribed in categorical terms, gain access to a valuable and renewable resource that is subject to monopoly through the activities of this network that, in turn, is strengthened by this modus operandi. Exploitation, for this author, is the main form of appropriation of the elites, while opportunity hoarding is the main form of appropriation for non-elites. This does not mean that the elites cannot hoard opportunites and non-elites cannot exploit.
And in the third place, although exploitation and monopolization imply a control of resources, like any social process it poses the problem of an increased reproduction, that is sustaining and deepening. It is in response to this problem that Tilly proposes the inequality based on categorical pairs. These distinctions are created and established within organizations but are reinforced when they manage to couple with other pairs. This coupling between internal and external categories reinforces inequality.

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For the neoliberal political project, the transfer of social responsibilities of the state towards the civil society, and to the private sector, together with the privatization of state enterprises were considered essential to reduce the role of the state, apart from being an alternative to alleviate the fiscal deficit (Adelantado and Scherer, 2008).

During the second decade subject to analysis (2000 - 2010), after going through a strong economic crisis that caused the contraction of GDP by 11% (ca) in a single year, the state began to reverse much of what was planned and carried out in the previous period, therefore trade is restricted, services and strategic products were nationalized, public spending was highly increased (with a strong social character) and a marked advance of the state over the economy is observed (Albornoz et. al, 2012).

We consider that there is no doubt that the social upheaval of 2001 generated an ideological paradigm change - political and economic in the Argentine Republic, however, the previous neoliberal stage left traces that are still palpable today. We can embrace these traces in at least three aspects of importance (Féliz and López, 2010):

1- A key domain of transnational capital.

2- The consolidation of the peripheral position of the cycle of the domestic capital within the cycle of the global capital, based on the preeminence of the strategy of exploitation of natural resources.

3- The accommodation of a stage of structural precariousness of the labor force [6].

These considerations demonstrate the continuity and consolidation of the "cycle of dependency"[7].

[6] This begins to reverse in Argentina from 2007 onwards, however in 2014 there seems a retreat, or at least a slowdown in the wage recomposition of the working class. Given that besides the continuing currency devaluations against the dollar, and the establishment a dollar clamp, there was a sharp devaluation in late January 2014, as an attempt to stop the growing inflation and the strong level of domestic consumption, with the challenge of trying to achieve a recovery of the banking system. To be competitive the banks must necessarily offer a return in pesos greater than the currency devaluation, in the same amount of time and at the same time be more attractive than the profitability obtained from speculating with dollar. This has not been achieved yet.

[7] Concepts such as Center and Periphery were used by Raul Prebisch in 1950, within the Dependency Theory to analyze the overall global differentiation. The regions called peripheral, were called so just because they met a peripheral role in the production, their economies were aimed at the export of supplies and raw materials, the flow of resources to the regions called Center, i.e. those who held the industrial development and produced highly elaborated products thanks to the resources and raw materials that came from the countries or regions mentioned above, and also due to the monopoly of technology. The so-called underdevelopment of certain areas was due to the bonds of dependence and subordination to capitalist development of others.
Poverty in Latin America, is largely due to historical conditions which have been structured for and to favor northern countries (called central) and keeps the countries from the south (peripheral) in a constant state of poverty. Since its inception, Latin American countries have served as suppliers of raw materials for the northern countries, and in return, have been the recipients of those finished products that have already saturated the northern markets and seek to extend this context, thus serving as a valve exhaust for developed economies.
The Latin American thinkers and intellectuals, who are part of the dependency theory, call on developing countries to implement policies to internally generate the products on which they depend, and apply a more selective approach to engage in commercial transactions with developed countries applying protection measures such as fees and other taxes.
By virtue of these ideas, it is clear that following the model of the developed countries is not convenient nor logical, because its development occurred in specific historical conditions that are impossible to recreate in the South. In addition, this model reveals that this condition of poverty favors developed countries, and therefore, they do not want them to change the global economic structure.

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In spite of historically being the most unequal region in the world, it is the only region that has managed to significantly reduce the inequity in many of its countries during the past decade.

The governments of the states where the inequality was reduced, have increased their tax revenues (though not always efficiently in terms of redistribution of wealth, we will discuss this when we approach the tax analysis) and are increasing the spending in social protection and poverty reduction policies (Oxfam Report, 2014).

Since 2003, Argentina has gone through a path of growth, technical progress, job creation and reduction of poverty that has no precedents in over half a century (Barcena - Prologue - in Stumbro and Rivas, 2013: 4). This process managed to reverse to a large extent, the terrible economic and social damage produced by the liberal dynamics of the 90s. However, it is also true that in a certain way, there is not only a continuity of the asymmetries and dynamics that characterized the economy of the country in that decade, but there is also an increase in them. We are interested in highlighting this issue to reflect on its implications.

To begin to investigate this latter aspect, which ultimately is one of the main objectives of this paper, we can see how the ownership of large transnational capital (according to their sales) that was 48% in 1998 increased to 66% in 2007. This accounts for the market dominance and the ability to be price makers of these large companies, today this is a crucial issue due to the current inflationary context.

In turn, the branches of agriculture, hunting and forestry, fishing and mining and quarrying, altogether went from representing 6.7% of GDP (in current terms, at market prices) in 1998, to 12.5% in 2008. The participation of the manufacturing industry as a whole in the GDP is a bit larger but remains stable: 18.2% in 1993, 17.8% in 1998, reaching 20% in 2010.

Finally, the capital structure showed a purely progressive modality (regarding the distribution - appropriation of revenues) in the period between 1993 and 2007. To support the latter statement, it is enough to observe how in 2007 workers received 28.1% from the GDP, while in 2003 they took 23.3%. In parallel with this situation, we can highlight the persistence of a high level of luxury goods consumption (Féliz and López, 2010). This issue started to revert since 2007 due to an economic policy aimed at the wage recovery of the working class. Along with the implementation of this policy, several important and thorough measures aiming at the equality of social and economic opportunities in the different regions of the country, such as the universal child allowance, the noncontributory pension plan, the "PROCREAR" credit plan, and the "Conectar Igualdad" technology integration plan, amongst others.[8].

Regarding the fiscal field the Latin American tax regimes, most of them present characteristics of a regressive system, and sadly, the percentage of the GDP that corresponds to the tax collection is still not enough to address the prolific actions to equalize opportunities (Rezzoagli, 2013). It is also worth mentioning that there is a high level of tax evasion in the entire continent.

[8] The tax burden mainly affects employees and captive traders in direct taxes, and the ordinary citizen in indirect taxes given that they are their incidental recipients.

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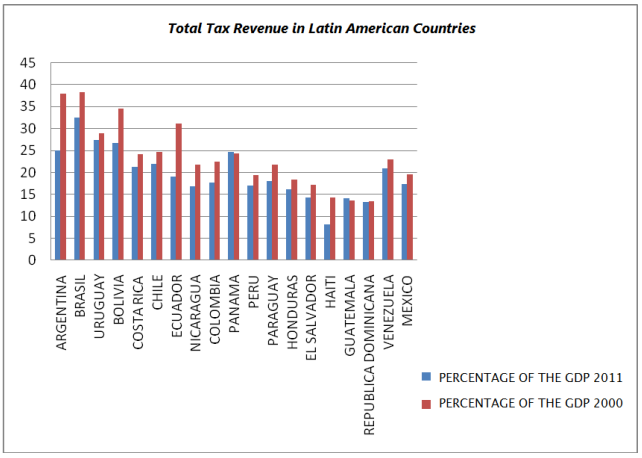
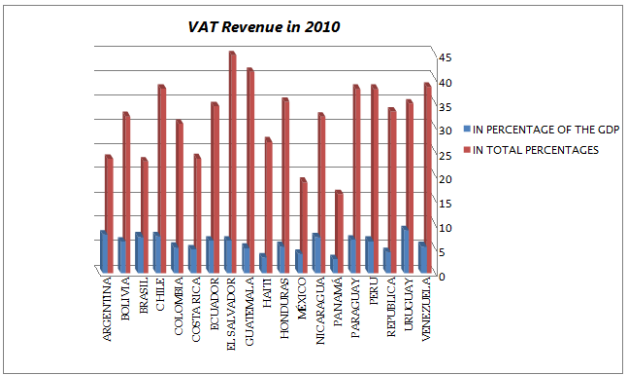
Graphic 1 shows a comparison between the years 2000 and 2011 for the total tax revenue as a percentage of the GDP for various countries of Latin America. Graphic 2 shows a comparison of the revenue that comes exclusively from the Value-Added Tax (VAT) between various Latin American countries, as a percentage of the GDP as well as the total numbers. This graphic only covers the year 2010.

These graphics show how the Argentine Republic is within the higher ranks, which means, among other aspects, a great dependency of the state on the tax resources, as well as a strong tax burden on the contributors. For direct taxes such as the income tax, this burden usually affects captive taxpayers: shopkeepers, small and medium enterprises, salaried workers, among others. These taxpayers do not have access to tax incentives, tax benefits, or tax privileges. For the Value-Added Tax, the tax burden directly affects final consumers. It is worth highlighting that in Argentina the tax revenue represents around 90% of the total fiscal revenue. This differs from other countries in Latin America, where the non-tax sources have a greater importance, such as Mexico, Chile and Panama. This is mainly because of the revenue from oil, cooper and the Panama Channel, respectively.



Graphic 1

We created this graphic based the data published by the ECLAC.



Graphic 2

We created this graphic based the data published by the ECLAC.

Given this reality, that is prone to a deep study from different aspects, that are not the objective of this work, it is interesting to determine and analyze the existence of inequality of opportunities and the centre-periphery dependency cycles within Argentina. This is an important step to try to change this situation that shows the weakness of the institutions, while there is not an approach that clarifies the discourse about redistribution. The latter contradicts the production dynamics and the neoliberal fiscal mechanisms that are still currently used.

A study conducted in the Center for Distributive, Labor and Social Studies at the University of La Plata in 2011 (Serio, 2011), that confirms previous similar studies, presents data that illustrates the situation of the country due to the internal migration of the population seeking a better quality of life. The estimates found in this document suggest that even if the income inequality shows a declining tendency, which is an encouraging fact, the inequality of opportunities has fluctuated over this period.

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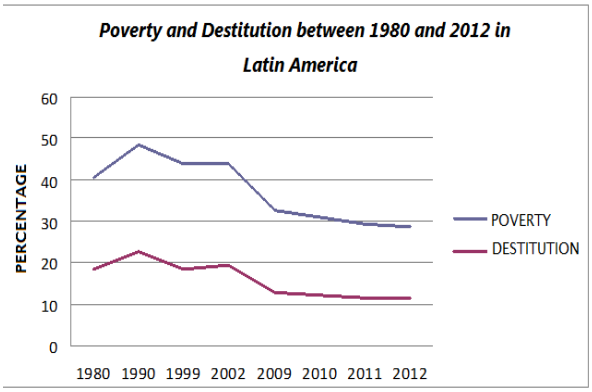
Particularly, since 2009, the levels of inequality of opportunities have increased in the population of the different geographic regions of the country. We will cover this aspect in depth in the next section.

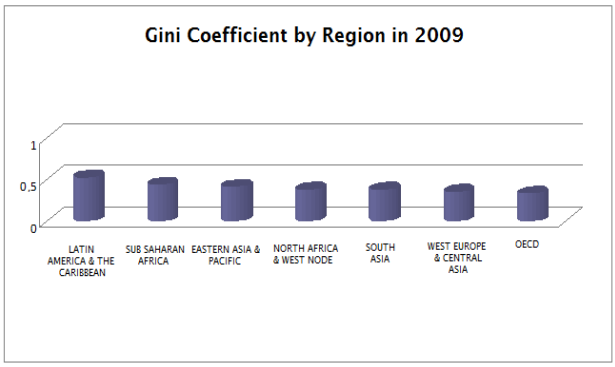
The reduction of the income inequality in Latin America, during the first decade of the XXI century, is the result of an adequate combination of government policies mainly aimed to reduce the level of poverty due to the increase in the public spending on social issues. However, we still are the continent with the greatest inequality of opportunities in the world. We are capable of building large and growing cities, as well as impoverished entire regions whose population decreases every day.

The gathering of population in small territories of Latin America, that forms large and crowded cities which receive the internal migration of people seeking for a better life, is a good evidence of what we discussed above. Argentina does not escape to the continental context where it is located. Graphic 3 shows how the average levels of poverty and destitution in Latin America have substantially decreased from 1980 to 2012. However, graphic 4 shows that it is still the most unequal continent in the world, as shown by the values of the Gini coefficient by region in 2009.



Graphic 3

We created this graphic based the data published by the ECLAC.



Graphic 4

We created this graphic based the data published by the ECLAC.

This is how, in spite of a reduction in the levels of poverty and destitution on a continental level, Latin America still is by far, sadly unequal and restrictive regarding the access of its people to opportunities of development which depend on an exogenous context (ethnicity, place of birth, place of residence, gender, etc.). The issues of regional and personal equality of opportunities have to be addressed on the public and mainly on the financial aspect, with a system of intergovernmental transfers and should be the basis for the improvement of the system. Rethinking the federal organization allows, among other things, to discuss the decentralization proposed by the neoliberal perspective. This involves maintaining the articulation and deployment of development projects in the peripheral provinces carried out by the Nation, with the participation of provincial actors, to equalize opportunities for residents and boost production in areas foreign to the high concentration of the Pampa Húmeda region.

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2 Is there a continuity of reversal of the regional inequalities in argentina? An analyis of the national gross geographical product and employment

In this second part, we will review two key indicators during the years 1990-2009. Our objective is to establish if there was, or there was not, a continuity in the centre-periphery unequalizing process within the national territory that became worse due to the changes in the endogenous state capacities at the end of the 80s decade and beginning of the 90s.

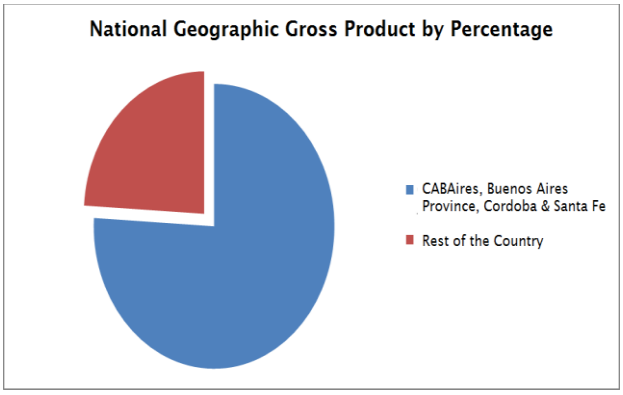
In those aspects, we consider that the essential factor for the equality of opportunities is a stronger and better balance of the access to the wealth of the nation, through the creation of sources of employment (either employed or through business and industrial development). Instead of depending on the tax revenues from the vast primary resources that exist in our country. That is why we have considered the following key indicators: a) the gross geographic product (GGP) and b) the level of employment of the workers registered in the private sector (which includes state-owned companies) in each of the Argentine provinces, including the Autonomous City of Buenos Aires.

For the first indicator we consider crucial to determine which were percentages and total amounts of productivity and value creation for each of the Argentine provinces, because this brings along a greater number of services, education and infrastructural investments that determine the access to a better quality of life for the inhabitants of that region. The years 1993, 2002 and 2009[9] are used as a reference for this indicator.

The second indicator is a direct consequence of the first indicator, given that those regions in the country that are able to absorb a greater number of investments, in turn, absorb a greater number of human resources. For this indicator we focused on the industry, commerce and services sectors during 1996, 2002 and 2011[10].

National Gross Geographic Product

Using the national gross geographic product as a reference, when comparing the values for each of the provinces we observe that there are major differences between them. There are evident continuities from the year 1993 to the year 2009. For example, only three of the provinces (that include the Autonomous City of Buenos Aires), represent 76% of the gross geographic product, while the rest of the country barely reaches the 24%, that is a quarter of the total (See graphic 5). Beyond some minimal percentage changes, this average remained stable from 1993 to 2009.



Graphic 5

We created this graphic based on the data provided by the National Federal Investment Council.

[9] Data from the National Federal Investment Council http://cfired.org.ar/

[10] Data from the National Ministry of Labor http://www.trabajo.gov.ar/

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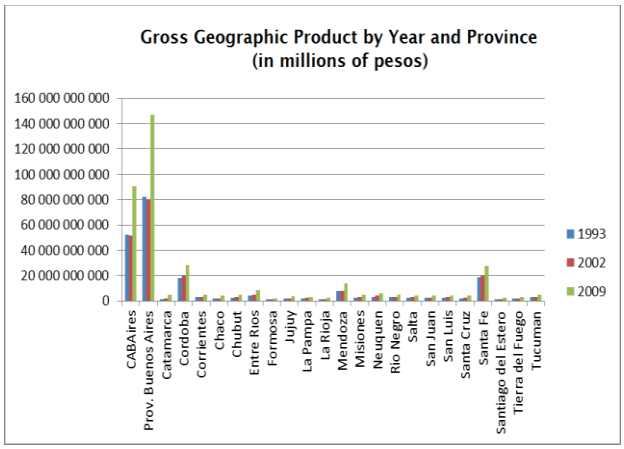
There are minimum variations in the evolution of each province regarding its GGP. That is why it is possible to confirm the existence of continuities not only in the existence of gaps between them, but also in the stagnation shown by this provinces during the three periods of time used for this analysis (See graphic 6).

As an exception, and as a strongly defining factor for the assertion of the existence of regional gaps, we can see that the Autonomous City of Buenos Aires as well as the Buenos Aires province, have increased their GGP, followed slightly by Santa Fe and Cordoba. The province of Buenos Aires accounts for 37% of the national GGP, followed by the Autonomous City of Buenos Aires with a 23%, and by the provinces of Cordoba and Santa Fe which are significantly behind these numbers, with an approximate 8% of the total each.

The province of Mendoza is the only one that manages to keep some distance, though to a small extent, from the rest of the provinces that we can call peripheral or outside the group of central provinces (Buenos Aires, Autonomous City of Buenos Aires and Cordoba). Mendoza accounts for the 4% of the national GGP, while the rest does not exceed the 2% (only reached by Entre Rios and Neuquen).

To complete this analysis, there are 17 provinces out of the total 24 (including the Autonomous City of Buenos Aires) that barely represent 1% of the national GGP. We can observe this in graphic 7, which analyses the general averages in percentages for the years used as reference.



Graphic 6

We created this graphic based on the data provided by the National Federal Investment Council.

Far from decreasing, these asymmetries between the provinces with a greater GGP and the ones with the provinces with fewer resources were increased. We can see that in the year 1993, the province with a greater GGP (Buenos Aires with 82,201,000,000 millions of pesos) exceeded 73 times the value of the province with the smaller GGP (in that year Catamarca with 1,119,000,772 millions of pesos).

This disproportion manages to decrease for the year 2002, when the province with the greater GGP (Buenos Aires with 79,996,000,000 millions of pesos) exceeded 59 times (ca) the value of the province with the smaller GGP (in that year Santiago del Estero with 1,366,639,826 millions of pesos). However, for the year 2009 this gap increases again: Buenos Aires (with 146,724,000,000 millions of pesos) exceeds by 81 times the value of the province with the smaller GGP (in that year Formosa with 1,810,293,691 millions of pesos).

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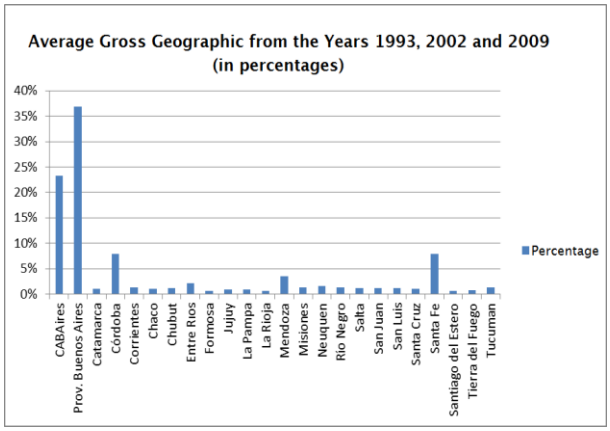
The general average for the three years for the ratio between the richer and poorer provinces is 71. On the other hand, only the Santa Fe, Cordoba and Buenos Aires (including the Autonomous City of Buenos Aires) provinces exceed the national GGP average (11,621,462,037 million), while the remaining provinces barely reach half of this value in the case of Mendoza, a quarter in the case of Entre Rios, or even less.



Graphic 7

We created this graphic based on the data provided by the National Federal Investment Council. Now that we confirmed the disproportion of the creation of value across the length and breadth of the Argentine state, and coming back to the theme that worries us in relation to the equality of opportunities, we will complete the second half of this analysis focusing specifically in the real access possibilities to sources of employment in the different regions of the country.

Level of Employment

We believe the analysis of this factor is crucial, because the settlement patterns and population mobility in the different regions of the country is highly related to the employment offer available in those regions.

Beyond the resources of each province (raw materials, minerals and natural resources), it is necessary to evaluate the degree of development in the secondary (industrial) and tertiary sectors (trade and services), because they require a better skilled and in general, better payed labor force.

For this purpose, we analyze the level of employment based on the current data provided by the National Ministry of Labor for the registered employment of workers employed in the private sector (including state-owned companies), specially in the industry, commerce and services sectors. The comparison was made between the years 1996, 2002 and 2011, observing the continuities or discontinuities in the level of labor registration by sector. We did not considered unregistered and informal employment because it is difficult to measure it accurately. However the data we used shows an interesting general overview that helps to confirm our central approach.

In the first place, we consider the number of workers from the industrial sector from the different provinces in the mentioned years. We can observe clearly the concentration of 40% of the number of workers in the Province of Buenos Aires, followed by a 19% for the Autonomous City of Buenos Aires, and a bit further away, by the provinces of Santa Fe (10%) and the province of Cordoba (8%). The remaining provinces, with the exception of Mendoza (4%), do not exceed the 2% of the national total of registered workers.

The coefficient of variation of these percentages for the average of the years used as reference only reaches 2%, which means there were slight changes in the data. Graphic 8 shows the data for each province for each of the analyzed years, measured in millions of workers.

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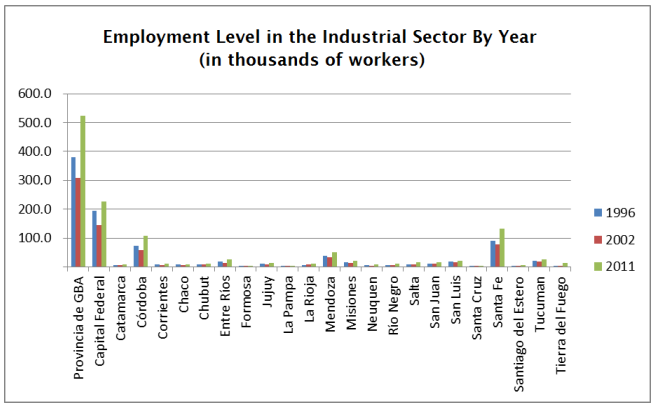
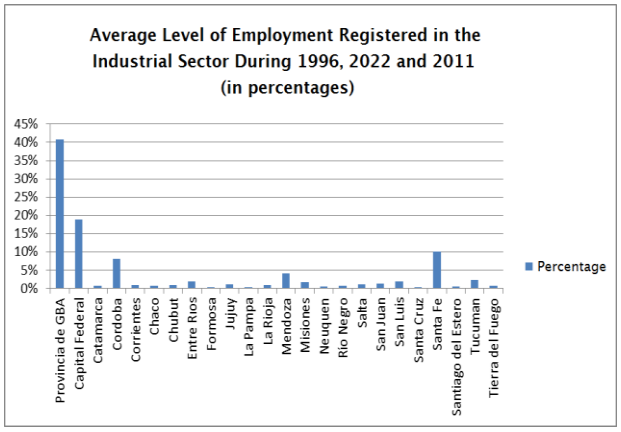
While graphic 9 shows the percentages for the average of the analyzed years.



Graphic 8

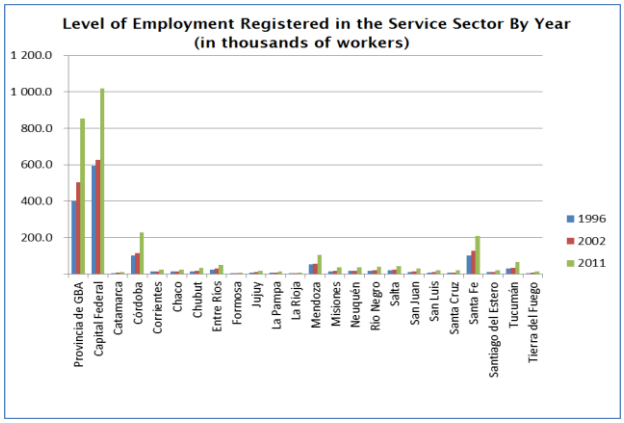
We created this graphic based on the data provided by the National Ministry of Labor.



Graphic 9

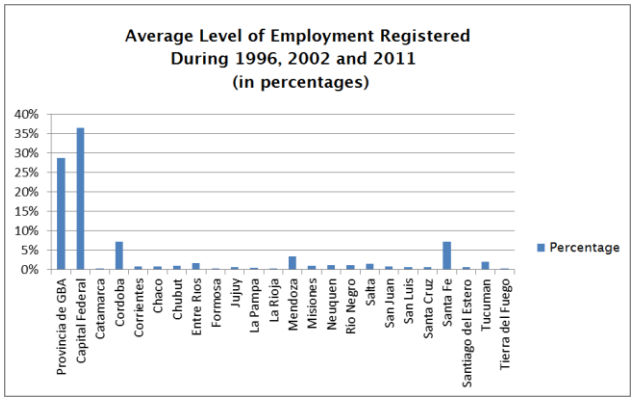
We created this graphic based on the data provided by the National Ministry of Labor. Secondly, we take as a reference the services sector, where differing from the industrial sector, the Autonomous City of Buenos Aires heads the list, with the greater number of registered workers, a total average of 37%.

Beyond this difference, the picture is quite similar to the asymmetries we have observed before. Again, we can see in graphics 10 and 11, how the Buenos Aires (including the Autonomous City of Buenos Aires), Santa Fe and Cordoba provinces account for 80% of the total registered jobs in the country, the remaining 20% is spread among the remaining provinces, which account for less of the 2% of the national total each.



Graphic 10

We created this graphic based on the data provided by the National Ministry of Labor.



Graphic 11

We created this graphic based on the data provided by the National Ministry of Labor.

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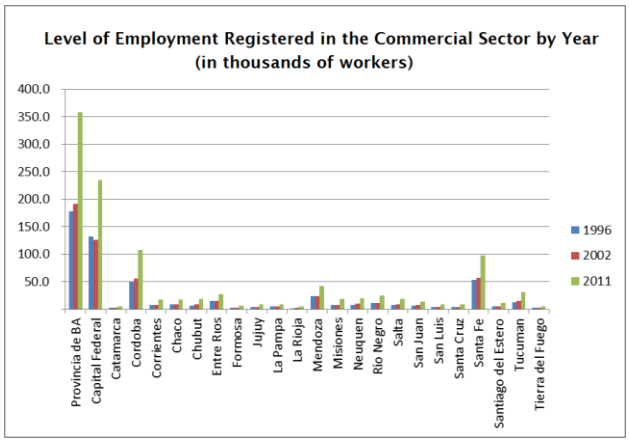
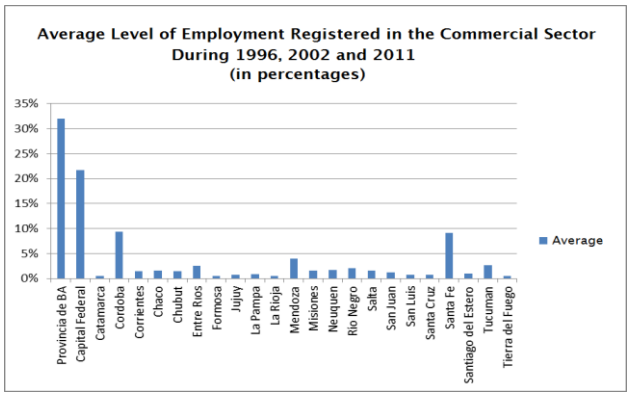
Regarding the commercial sector, again the tendency and original continuity remains. The Buenos Aires province again heads the list with the greater number of job registration (with a 32%), followed by the Autonomous City of Buenos Aires (with a 22%) and further away, by the Santa Fe and Cordoba provinces (with 9% each). The intermediate group consist of Entre Rios (3%), Tucuman (3%) and Mendoza (4%). This group exceeds the 2%, while the remaining provinces are below this figure. For further details, see graphics 12 and 13.



Graphic 12

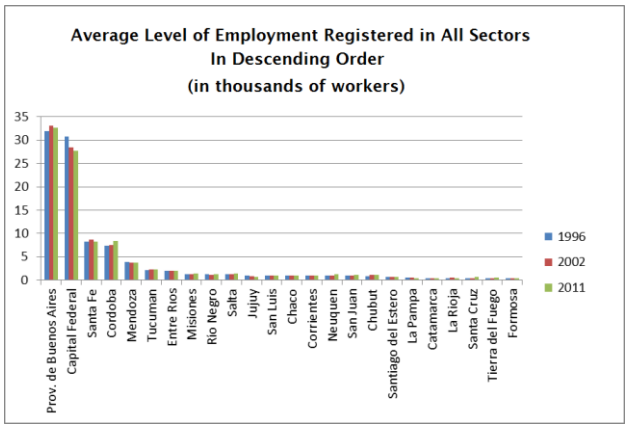
We created this graphic based on the data provided by the National Ministry of Labor.



Graphic 13

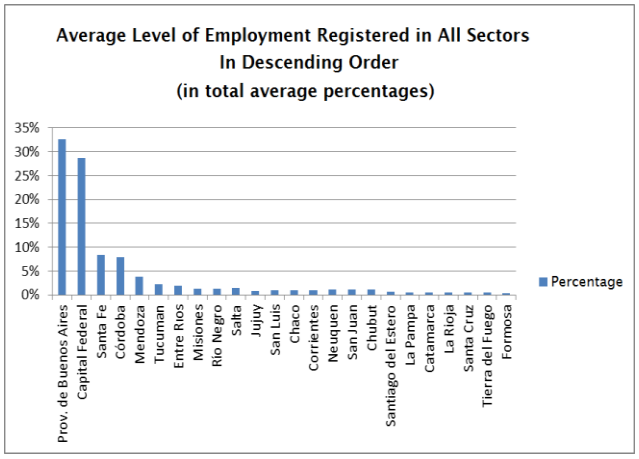
We created this graphic based on the data provided by the National Ministry of Labor.

We have seen that this picture is present in all sectors in a very convincing way. There is a noticeable concentration of job offers in the Pampean region of the country (72% of the national total) and the remaining insignificant 28% is spread unevenly among the remaining regions. We can compare this with the creation of value for each of the provinces (GGP) and we arrive to the exact same results. It is urgent to find adequate mechanisms to distribute the currently polarized job offer and wealth, in a more proportional and fair way all throughout the country.To conclude this presentation of data on the level of employment, we included two more graphics that show the number of registered workers for each province sorted in an descending order. Again, we show the figures for the analyzed years (Graphic 14) and the general average (Graphic 15). We also highlight the high concentration on the provinces of Santa Fe, Cordoba and Buenos Aires (including the Autonomous City of Buenos Aires), compared to the remaining provinces (Graphic 16).



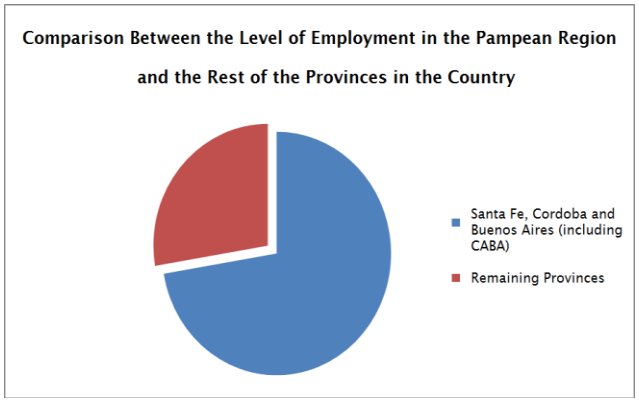
Graphic 14

We created this graphic based on the data provided by the National Ministry of Labor.



Graphic 15

We created this graphic based on the data provided by the National Ministry of Labor.



Graphic 16

We created this graphic based on the data provided by the National Ministry of Labor.Based on the foregoing and having proved the continuous reproduction of the existing inequalities and asymmetries among the different regions and provinces of the country, it is advisable to rethink this situation with the purpose of finding possible solutions.

It is clear, that in spite of the change of ways in politics and institutions that marked the country during the decade of the 90s and the first decade of 2000, there was not enough involvement from the estate in the creation of value and the comparative growth in the employment.

The neoliberal policies to decentralize the capacities towards the sub national states still require a strong economical and political involvement of our national state. Therefore, having raised the issue and expressed the need for greater involvement of the state, we will analyze in the third section of this work, which is the strategic role that the fiscal federalism plays, or should play, with the purpose of alleviating and reducing the existing asymmetries.

3 The fiscal federalism and the articulation of financial public policies in a context with regional asymmetries

The mandates stipulated by the Argentina Constitution after the reform of 1994, in the sections 75 subsection 2, 18 and 19, refer to an equal degree of development in all the regions and for all the inhabitants of the country. They also refer to the need of developing differentiated policies for the equalization of opportunities. This shows the implicit acknowledgement of the existence of regional asymmetries and inequality of opportunities.

The design of the federal federalism (in general) and a regime of federal revenue sharing (in particular) is not an exclusively technical task. The criteria selected for the distribution, the political-economical-social aspects that can influence these criteria, and the objectives to achieve, can vary significantly the content of the same regime in different countries.

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This omission leads to the promotion of a set of public policies to overcome inequality that in most of the cases, did not manage to achieve their strategic objective. This produces constant sense of socio-political frustration that many times leads to surrender to the persistence of inequality.

Background

The fiscal relationship between the state and the provinces around the struggle for the fiscal revenue, have undergone deep changes throughout the history of the country and they continue evolving.

Since the enactment of the Constitution on 1853/60 and until 1890, there was a system to separate the tax sources from the federal government and the provinces. According to this system, each level of the government used its own resources without having any form of federal tax revenue sharing. In this way, the federal government attended to its needs with the proceeds of import and export duties, the exploitation and sale of public lands and some sporadic loan. While the provincial governments applied a series of encumbrances, that because of the contrast with the national taxes mentioned before (external), were generically called internal taxes (Bulit Goñi, 2008).

Since then and until 1935, the system was characterized by a de facto competition of tax sources as a consequence of the central government creation of consumption taxes that overlapped with the ones collected by the provinces.

The year 1935 gave birth to an era characterized by the federal revenue sharing between the nation and the provinces.

The passing of the law 12.139 unifying internal national taxes, the law 12.143 that transformed the tax on transactions to a tax on sales, and the law 12.147 that extended the income taxes, marks the beginning of an era of taxes shared between the nation and the provinces. All these laws were passed between 1934 and 1935. Through this mechanism the national government takes charge of managing the tax collection in all the country, under the same fee, to later share the revenue among the nation, the provinces and the Autonomous City of Buenos Aires. On the year 1935 the primary distribution established that the nation held the 82% of the resources and the provinces the 17.5%. This percentage increased progressively throughout the years and reforms.

In 1973, with the passing of the law 20.221 (by the military government) that establishes the sharing of national taxes, the system is reorganized under a unique sharing regime driven by the need to guarantee a greater stability of the provincial financial systems, with the purpose of reducing the dependence on the National Treasury and establish a preferential treatment for the provinces with lower incomes. This ensured the availability of public services that were responsibility of the provinces, in degrees that guarantee an equal treatment of all the population. It was then established the primary distribution of 50% for the nation and 50% for the provinces. While the secondary distribution was fixed, with different percentages, according to criteria based on the amount of population, the development gap among the provinces and the population dispersion.

Finally in 1988, the Congress passed the last and still current law 23.548 regarding the federal sharing of taxes. However the ambitious objective of strengthening the federal regime was not achieved.

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Through this law and other rulings, the total tax revenue to share is expanded by including all the existing national taxes and the ones that might be created in the future (section 2), and the provincial sharing on the primary distribution is increased (section 3). In this sense, the section 3 states that the primary distribution should use the following percentages: nation 42.34%, provinces: 54.66%, contribution fund of the National Treasury to the provinces: 1%, relative level recovery of some provinces: 2%.

Regarding the secondary distribution, the percentages that correspond to each province were also established (section 4); it was established that the fund created with the contributions from the national treasury for the provinces "will be set aside to attend emergency situations and financial unbalances from the provincial governments, and the budget will be provided in the jurisdiction of the Ministry of Interior, who will be in charge of its allocation (section 5).

Through section 7 a percentage minimum over the total of the collected tax resources, no matter their characteristics, is guaranteed by establishing that the amount to distribute among the provinces cannot be less than 34% of the total national tax revenues collected by the Central Administration, even if the law does not regard them as of distributable character. In turn, the validity of the Federal Tax Committee created by law 20.221 (section 10), is ratified.

Even if the regime established by law 23.548 attends to the request of the provinces to increase their participation in the total tax revenue to share, with the purpose of affording the functions and provision of public services that they gradually took charge of, the law suffered since 1989 a succession of changes.

These changes were made through necessity and urgency decrees (of doubtful constitutional validity) which continued to alter the situation, in obvious detriment of all the provinces.

Meanwhile, the dossier of "earmarking" was used to divert funding from federal tax sharing, this resulted in a progressive increase in the share corresponding to the federal government. The transfer of the public services established by law 24.049 also contributed.

This law enables the national executive power to transfer the educational services that were administered by the central state, to the provinces and the Municipality of Buenos Aires, as well as the faculties and functions over the recognized private schools.

The establishment of the two fiscal pacts (of doubtful constitutional validity) in 1992 and 1993, had equally negative consequences. Through the first pact from August 12th 1992, the provinces ceded 15% of the total tax revenue to share with the purpose of funding the national social security obligations. This deduction to fund such obligations was made before the primary distribution, ensuring a minimum of 725.000.000 pesos per month and the allocation of the resources that corresponded to the National Housing Fund, the Federal Board of Drinking Water and Sanitation, the Electricity Development Fund of the Interior and Federal Road Fund.

Through the second pact from August 12th 1993 named "Federal Pact for Employment, Production and Growth", the first pact was extended and a series of obligations for the provinces and the national state were established.

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As a consequence of the last pact, the provinces were forced to repeal certain taxes (revenue stamp, specific provincial taxes that levy on the transfer of fuel, gas and electric power, taxes that levy on the interjurisdictional circulation of goods or the use of physical space for services, including the air space, taxes that levy on the interest of fixed term deposit and savings accounts, taxes on the bank debits and gradually those taxes that levy on the payroll). They made a commitment to modify other taxes (tax on gross income, taxes on real state). They were forced to encourage the total or partial privatization, and partial or total concession, of services, benefits and public works, where the actual management was in charge of the provinces. And they were also forced to sell any companies, societies, establishments or productive farms that belonged totally or partially to the provinces. Meanwhile, in order to finance the decrease in provincial revenues, the national government increased the minimum amount guaranteed to the provinces to 740,000,000 pesos per month. Another evidence of the centralization of resources is the distorting distribution of the bank debits and credits taxes, established in 2001 and still current due to successive extensions. The distribution of its revenue is a very eloquent example of the deviation from the rule of distribution of taxes between the nation and the provinces established by law 23.548. Even if the total of the revenue should have been shared according to section 2 of the Law 23.548, Law of Federal Revenue Sharing, the truth is that the nation and the provinces agreed[11] to only include 30% of the revenue of this tax in the total tax revenue to share, from March 1st 2002 onwards.

This revenue was distributed according to the primary prorating indexes (distribution between the nation and the group of provinces), and the secondary prorating indexes (distribution among provinces) that correspond to law 23548.

Adding all this to the deductions suffered by the total tax revenue to share, before the distribution according to the percentages established by the law, the sharing of this tax results in a lower effective percentage of around 15% for the provinces and the City of Buenos Aires, who are missing the chance of collect important amounts of money, in obvious detriment of their fiscal revenue and the fiscal revenue of the involved municipal governments.

In the year 1994 the text of the constitution is reformed. Among other changes, the new section 75 subsection 2, establishes the competence of the nation and the provinces regarding indirect taxes and reserves for the provinces the tax jurisdiction in relation to direct taxes. However this will not prevent the nation to enforce them “for a fixed amount of time, proportionally equal in all the country, when required by the defense, common security and the general well being of the state..”. Thus, in relation to direct taxes, the original and unlimited power for the provinces is established, while the nation is allowed a limited, temporary and exceptional power.

[11] Through the law 25570, passed on April 10th, 2002, the Congress ratified the "Nation-Provinces Agreement on the Financial Relationship and the Basis for a federal revenue sharing " concluded between the National Government, the Provincial States and the Autonomous City of Buenos Aires on February 27th, 2002.

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Finally, in the following paragraph, the aforementioned reform introduces to the constitutional text the institution of the federal tax revenue sharing, establishing the still postponed commitment to create a new regime for the sharing of taxes between the nation and the provinces (which include the government of the Autonomous City of Buenos Aires)[12].

In this way, when the section 2 of the subsection 75 makes reference to the basic budgets over which the new federal agreement should be established, it establishes that: "The distribution among the nation, the provinces and the City of Buenos Aires and among them, shall be made in direct relationship to their competences, services and functions…" and that this will be done "…taking into account objective distribution criteria…".

According to the constitutional clause, the allocation of resources should be in correspondence with the spending needs of the different levels of governments. The assignment of functions should be the basis on which the new federal tax deal should be structured.

This subsection also indicates that the distribution "should be equitable, inclusive and will prioritize the achievement of an equivalent degree of development, quality of life and equality of opportunities all throughout the country". These principles should also (and specially) be taken into account.

The received solidarity persuades us about the redistributive function that is attributed to federal tax-sharing regime.

On that same note, when the constitution expresses the need for the federal sharing law to distribute the shared resources among the different levels of government according to their competences, services and functions, it is highlighting objective criteria for the federal revenue sharing but also requiring explicitly, for it to be equitable and inclusive, to give priority to the achievement of an equivalent degree of development, quality of life and equality of opportunities all throughout the country (Rezzoagli and Bazza, 2013).

It seems clear that such regulation is backed up by the commandment included in the section 75, subsection 19, that refers to the need to provide an harmonious growth of the country, the distribution of its population and the promotion of differentiated public policies aimed at balancing the unequal development of provinces and regions.

Thus, by establishing in the constitutional reform that both distributions of resources (primary and secondary) should be done in solidarity, it imposes that the federal government as well as the most developed provinces, should commit with the destiny of the provinces with fewer resources with the purpose of ensuring their sufficiency. Therefore, they have the constitutional responsibility of helping those political units that cannot afford that financial coverage. (Corti, 2007).

Finally, there is a questionable dispositive in the subsection 3 of section 75, which introduces in the text an insistent practice of the Argentine federal system, given its discretional nature and the excessive faculties deposited in the National Government.

[12] The Sixth Transitional Provision of the reform established that the law-agreement should be sanctioned "before the end of 1996", so that must have occurred before 31-12-1996.

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This dispositive empowers the National Congress to establish and modify the specific assignment of shared resources, with the requirement that it be for a fixed term, by a special law, and approved by the absolute majority of all the members of each of the houses of the National Legislative Power. However this is limited by the impossibility of altering the distribution of the total tax revenue to share through a law-agreement without the agreement of the provinces (subsection 2 from section 75).

In spite of the good intentions of the constitutional reform, and even today when the deadline to sanction the new federal tax sharing regime is long past due, the passing of the new law-agreement that that meets the criteria of equity, solidarity and redistribution.

Instead, the current laws, assignments and pacts with various distribution criteria, are so complex that it is difficult to understand exactly the destiny of the collected revenues and favor a discretional nature in the management of the tax resources. It still is a pending matter to issue a new law of federal tax sharing that embodies the constitutional redistributive objectives.

Vertical fiscal unbalance and function assignment decentralization

As a consequence of the described evolution and due to the current fiscal system, the contemporary experience shows that the national state concentrates 80% of the total tax collection.

Thus, even if the provinces have their own resources, it is clear that they depend on the agreement made with the central government. (Rezzoagli and Bazza, 2013).

This means that in the field of resources, there is a clear process of concentration of the tax revenue from the central government, which translates to a real economic and financial dependency on the National Treasury from the sub national levels (provinces and municipalities).

On the other hand, the strong and known concentration of taxing powers in the national orbit was followed by a maximum decentralization in the variable of spending, which resulted in an asymmetric distribution between the spending responsibilities and the interjurisdictional taxing powers. Ultimately to date, there is a strong separation of spending decisions and funding.

In that sense, regarding the distribution of the responsibilities of public spending, the Argentine fiscal federalism is marked by a vertical assignment of functions with a high degree of decentralization.

Although in a first phase that began with the national organization, the system was characterized by a growing national public spending, by the early 60s and as a consequence of different decentralization plans, the provinces were taking on new roles. This resulted in a gradual increase in the public spending in the provinces, without a corresponding increase in their comparable income to share.

This context reveals that while the central government reduced the number of services it manages through the decentralization of the public spending to the intermediate sub national levels (not including municipalities), it still is the largest holder of tax resources, retaining a broad base of taxes in the national orbit. This means an important vertical fiscal unbalance that is worth reflecting on.

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That is how the so called fiscal co-responsibility is reduced, and a strong separation between the decisions of raising and spending, crystallizes. This also creates the phenomena of fiscal illusion by hiding from the taxpayers from the different regions, the eventual expenditure growth trends.

Ultimately, there is a vertical structure of dependency between the nation and the provinces. This reflects on the role played by the national resources in supporting the total tax revenue. While on the other hand, there is an important decentralization of the public spending (Rezzoagli and Bazza, 2013).

Regarding the decisions to implement the public spending, we can justify a further strengthening of local governments based on two principles:

- A representative and participatory government works better when closer to their electorate.

- Subsets of people within the same country have the right to vote for different types and quantity of public services.

These principles imply that the decisions should be made at the lowest government level possible that is compatible with the objectives of an efficient economy. The evaluation and control of the public policies by the citizens will have a direct correspondence with those decisions. When this does not happen because the decision are made by governments that are not close to the population, such as the provincial or national government; the representative sphere is deteriorated, there is an effective tension between the concepts of development and democracy, and the spending becomes less effective because of a lack of understanding of the real needs.

However the centralized decision making can be justified by reasons of equity and solidarity, but is still not the most suitable approach regarding the income-spending efficiency, with the exception of those subjects where the effects can be externalized to other regions.

Clearly, actions such as coining money or the struggle against inflation, etc., exceed the merely regional sphere and a national top-down development is required. But there are many other programs, mainly those related to the distribution of the spending, that are created and developed in the national sphere. As well as there are cases where the requests and needs of the population from the different regions of the country do not reach the national government directly, in those cases the budget is transferred to the provinces and municipalities with certain conditions. This lack of direct representation does not only affect the success of the programs, but it also affects the accountability for the implemented policies (Rezzoagli and Bazza, 2013). There is an element in this analysis that deserves a brief self-contained comment because of the importance it has today, a central pillar in the hierarchical relationships between the sub national governments and the central government with respect to finances: the conditional cash transfers.

A great number of plans and programs related to social issues and the struggle against poverty are funded with conditional cash transfers. It is known that these represent a monetary subsidy that requires as a counterpart for the home to invest in the "human capital" (education and health) of their members, specially the younger ones. The objective is to generate the conditions to break one of the main cycles of inter-generational transmission of poverty.

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However, there are at least, two issues that should be reconsidered or re-discussed to end the unequalizing process.

- The first issue is related with those programs that focus on the recipients but do not take into account the provisioning and quality of the provided services. A good example is the program that focuses on parents or tutors, to encourage them to take or keep taking their children to school as well as following the recommended immunization schedules. There is no doubt that this is an important improvement to alleviate the vulnerable situation of children and adolescents. It is also an improvement on the income of the homes that receive this help in all regions of the country. But we should work so that the conditions are not limited exclusively to the receivers, and focus also on the improvement of the quality of the provided services. The key factor of the inequality in the education lies in its quality. If there is not enough investment in the public system, which is the one that can help narrow the existing gap between the rich and the poor, the effort is not enough, even more, taking into account that this is a national program with a mainly sub national funding. Additionally the access opportunities and closeness of the population to the schools differs according to where they live (village, town, municipality, province, region). It is not only about offering the opportunity but also about "giving an opportunity to the opportunity". This requires hard work and coordination to address the endogenous capacities of the state-owned and private structures that provide the service.

- The second issue invites to a deeper reflection, subject to an analysis that we will not develop in this item, but that we would like to highlight nevertheless. This type of intervention may arise coward and discriminatory voices from groups that instead of thinking in strengthening the system, proclaim an alleged responsibility for the poor to overcome such poverty because they have been given an opportunity, and they have wasted it. Moreover, this responsibility can transcend the sphere of the home and be raised as an element of social responsibility or cultural growth of the country, given that poverty would hinder such attainment. That is, the poor would end up being responsible for their condition and therefore for the country not growing as much as expected.

4 Final considerations

This analysis shows us a glimpse of the importance of the adoption and strengthening of redistributive policies as a way to solve the centre-periphery dependency and the great regional asymmetries that exist in Argentina (in particular) as well as in the rest of the Latin American countries (in general).

However, the reduction of poverty and destitution presented by the country as well as the continental context in which it is immersed, during the last decade, does not correlate with a reduction of the inequality of opportunities among regions. Moreover, paradoxically while the poverty and destitution decrease, the inequality of opportunities remains stable with a slight increasing tendency in these last years.

This shows that even if they are closely related, they are not strictly dependent on each other.

The reduction of poverty and destitution is a result of the important and ambitious social and economic redistribution programs implemented by the state after a change in the ideological-political-institutional paradigm caused by the crisis of 2001.

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However we can also observe the perpetuation and even an enhancement of the productive dynamic that characterized the nineties in the Argentine Republic. The differences between the productivity and employment in the different regions keep growing and this has a direct impact on the development possibilities of an individual according to their place of birth, where they choose to live. That is to say that the geographical location of an individual would determine in a certain way, their socio-economic situation and their development opportunities.

To the extent that there is an unequal access to the social services or some restriction to their potential, faculties and/or rights, such as education and employment, related to exogenous factors (such as their place of birth or habitability, among others), these play a very important role in the inequality of opportunities. These causes the mainly internal migratory movement that characterizes the geography of the country, with large and growing cities, next to desolate large territories, and the effects this has on the different edges of this analysis. In this sense, we struggle for the necessary and urgent need for a strategic shift aimed at defining public policies of geographical redistribution of productivity and employment, as well as the generation of endogenous state capacities, as the only possible means of breaking the center-periphery dependency cycle.

The important road Argentina has taken together with several Latin American countries during the last decade, must necessarily address the restructuring of the productivity and employment variables in the various regions of the country, together with a prior or concomitant strengthening of state endogenous capacities from a financial point of view.

This can be achieved through a rethinking of the law of Federal Revenue Sharing Law as an instrument, and of fiscal federalism, as a phenomenon, which is likely to produce the opposite effect to the aforementioned restructuring.

The great disparity and gaps that exist in the different regions of the country due to the lack of technical equipment and/or local public structure to carry out the programs designed at the national level, in provinces and municipalities, causes an estrangement from those who have access to the actual implementation variables. This increases the inequality gap (some provinces keep getting richer and others keep getting poorer) and is ultimately consistent with the indicators that prescribe a reduction in poverty (due to the a large number of families that receive programs and subsidies, but who are completely dependent on them and do not have other possibilities of social reintegration by any other means, which results in a perpetual and irreversible increase of the public spending). But they also prescribe a growing increase of the inequality of opportunities in the different regions of the country.

We must articulate this dynamic in terms of equality of opportunity, with the previous or joint creation of programs that aim at the structural generation of endogenous capacities for the horizontal equalization of the seizing of opportunities. Hence, the need and importance, of articulating these issues to the fiscal federalism. Because in financial terms there is no doubt that the actual system despite of the important social achievements that resulted from the reduction of poverty and destitution, is far from answering and implementing the constitutional appeal to the equality of development opportunities, redistribution and solidarity proposed by the Constitution for all the regions of the country.

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On the contrary, it favors the perpetuation and increase of the regional inequality gap and the maintenance of a state divided and marked by the weakening of its endogenous acting capacities for the reversal of the problem that worries us.

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Regional convergence in Mexico (1941-2010): the contribution of road infrastructure

ISLAS- Victor †*

Instituto Mexicano del Transporte, Secretaría de Comunicaciones y Transportes, México

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To analyze the preference in the learning approach of students with high academic performance, at the University of San Francisco Xavier de Chuquisaca. Subjects and methods. The study was conducted on 392 students with high and high average academic performance of the faculties of health sciences, social, economic and technology at University of San Francisco Xavier [Sucre, Bolivia]. The questionnaire ASSIST Entwistle [1993] was applied, which evaluates the approaches or approximations of students to studying. SPSS V.21 with Chi square, Student T and Crosstabs was used in the statistical processing.Results. The preference for the study approach differs by gender; there is more preference for the strategic approach on females and for deep approach on males. This increased preference for strategic approach shows the use of organizing techniques of study, awareness to the demands of the tasks, achievements and effectiveness monitoring and, in the case of males the use of evidence and interest in ideas.Conclusions. The learning approach has important gender differences and their relationship to high performance is significant. It shows the need to think of a differentiated pedagogy that enhances the techniques that each group applies.

Regional convergence, highway infrastructure

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*Correspondence to Author (email: vislas@imt.mx)
† Researcher contributing first author.

Introduction

It is very common to find the idea that there is a strong correlation between investment in transportation infrastructure and the corresponding economic growth, and that this correlation is much larger than any that exist between economic growth and investment in other infrastructure and even other economic activities. For example, an OECD document states that investment analysis of transport infrastructure should go beyond the calculation of direct benefits to users, because the infrastructure has broad implications for regional development, and these effects must also be taken into account in order to ensure an efficient allocation of resources (OECD, 2002:4). In fact, besides some benefits from job creation, social inclusion and environmental costs reductions, the new transport infrastructure would ensure time and cost savings to the local industry, and improvements in access to markets. As a key result, there is an increase in regional productivity (OECD, 2002:9). However, Vickerman recognizes that this is a very controversial debate that occurs not only among scholars who seek a robust method for identifying and measuring the size of the supposed economic benefits of investment in transport infrastructure, but also among policy makers who are looking for a sound basis in order to justify or reject the investment in a specific investment project (Vickerman, 2007:3).

The aim of this study is to explore the theoretical and empirical foundation that has the link between investment in road transport infrastructure and regional economic development in Mexico. In particular, we analyze if the increase in the road stocks observed in the Mexican states in the last years is contributing to the process of regional convergence in per capita GDP.

1 Aschauer and the debate on the impact of infrastructure investment

The concern about the real contribution that investment in transport infrastructure has on economic development can be found in the literature for several decades. [13] However, it is from a study by Aschauer (1989a) on the role of infrastructure investment that the debate deepens. Indeed, in an analysis of productivity observed in the economy of the United States between 1950 and 1985, Aschauer finds that public capital stocks are much more important in determining productivity than current spending, and basic infrastructure (i.e., highways, airport, public transportation, drainage, fresh water, etc.), has the highest explanatory power for the observed productivity (Aschauer, 1989a:177).

He concludes that the decline in productivity growth (observed in the U.S. economy in the period mentioned) is coincident or slightly forward, with a sharp drop in the increase in net stocks of infrastructure and public facilities (Aschauer, 1989a:195). It is around this statement that begins the debate about the true impact of public capital investments. In fact, Aschauer goes further in a study on the productivity observed (between 1960 and 1980) in the seven most industrialized economies of the world. He founds that the general setting of government spending priorities (which prefers the current spending versus investment in public capital), is related negatively with their productivity, and therefore recommends that public capital would be included as a vital ingredient in the strategy for economic growth (Aschauer, 1989b: 24).

[13] See, for example, the contributions made by Owen (1959), Voigt (1964), or Fromm (1980).

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Later, in a subsequent econometric analysis of road transport performance in the U.S. economy (in the period 1960-1985), Aschauer concluded that a greater quantity and quality of the road capacity expands transport services and, thus, increases the marginal product of private capital. This, in turn, induces more investment in physical capital and increased per capita income and (Aschauer, 1990:14, 22).

Although this causal relationship was corroborated by other studies (see, for example, Munnell, 1990), it also generated a variety of criticisms, most notably the following three: first, that the magnitude of the statistical correlation found between public capital and private capital was weak; second, that Aschauer ignored other variables that could explain the observed decline in productivity; and third, that he was not considering the possibility of reverse causation, i.e., that the drop in productivity was a cause of the decline in public capital investment, and not vice versa. Aschauer's response was that the existence of other variables could not neglect in the importance of public capital. Moreover, He found methodological inconsistencies in criticisms of other researchers, which make their argument unconvincing (Aschauer y Holtz-Eakin, 1993:20).

However, Aschauer recognized the need to incorporate in its analysis of the optimality of public capital stocks compared to maximizing the productivity of private capital. Moreover, in the same work the author presents evidence of a low provision of public capital in the U.S. economy, not congruent with the existence of a rate of return of public capital that was above the corresponding to private capital (Ibid: 11-14).

Other studies by Aschauer have allowed him to refine their analytical instruments, and corroborate, in general, the ideas previously postulated. Indeed, in a study conducted in 1998, Lachler and Aschauer found empirical evidence that Mexico's economic growth began to collapse while public investment did.

However, they also note that although this decrease seems to be coinciding with the decline in capital investment for infrastructure (in particular, in three strategic sectors: electricity, transport and communications), they do not find a strong statistical support. Thus, when performing time series analysis of the relationship (observed in Mexico) between total factor productivity and the ratio of public and private investment, only found correlation coefficients ranging from 0.21 to 0.43 (Lachler y Aschauer, 1998:7).

Aschauer's findings have been corroborated or extended by other researchers, but also widely questioned.

The first major review of the debate is done by Gramlich in 1994, who found that the major problem is the definition of infrastructure capital: in most of econometric studies, publicly owned infrastructure is used as the main independent variable, but other definitions could include investments in privately owned infrastructure, investment in human capital and even in research and development oriented to infrastructure.[14]

Moreover, Gramlich (1994: 1177) identifies the availability of information as a factor hindering the use of broader definitions of capital infrastructure.

[14] In the article by Rozas and Sanchez (2004) one can find a conceptual review of these topics.

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In particular, he emphasizes several important econometric problems: cointegration of the time series of the variables used in the analysis, the absence of important explanatory variables (such as energy prices), and the problem of causality between capital investment infrastructure and the level of productivity in the economy. Thus, Gramlich concluded that this diversity of approaches and the econometric problems are the main reasons that explain conflicting or mixed responses in the study of the economic impact of infrastructure investment, so that the empirical evidence is inconclusive (Gramlich, 1994:1193). Later, another researcher updates the state of the debate on the subject corroborating that the type of infrastructure analyzed can have a differential impact on productivity growth (Bangqiao, 2001). He notes that simple econometric specifications have always parameter estimates higher and more statistically significant than the mathematically more sophisticated specifications, which are not only weak and minor estimates but (in some cases) negative. Moreover, according to this author, the macro-level studies are not able to provide proper guidance to make a decision on a specific project transport infrastructure, which requires using the tools of microeconomic analysis, such as social cost-benefit analysis (Bangqiao, 2001: iii).[15]

More recently, Angel de la Fuente made an analysis of the first twenty years of debate. In fact, he not only corroborates and emphasizes the problems of different empirical specifications, but also reiterates the common problem of data quality and lack of homogeneity, all of which makes very difficult to find conclusions from comparisons between studies conducted in different contexts or countries (de la Fuente, 2010:2).

However, he founds, as Gramlich and Bangqiao, inconclusive the empirical evidence mainly because their interpretation is complicated by the unresolved econometric problems. In particular, he notes that the use of first differences or the introduction of fixed effects in panel data eliminates the significance of the accumulation of fixed capital on regional productivity (de la Fuente, 2010:38). Nonetheless, he finds that investment in public infrastructure itself contributes significantly to productivity growth, at least in countries where the saturation point has not been reached (de la Fuente, 2010:2). This conclusion is similar to that reached in a study of Calderón and Servén (2005). In this analysis of aggregated data over 100 countries, they found a strong relationship between infrastructure stocks and GDP growth, but highlighted the inverse relationship of inequality in income distribution in countries with higher quantity and quality of infrastructure (Calderón and Servén, 2005:26).

It is important to note that the above authors perform their analysis considering the impact of public infrastructure, but not necessarily emphasize the role of transport infrastructure. Instead, a special edition of "The Logistics and Transportation Review" in 1996, includes articles that focus on the analysis of the impacts of transport infrastructure investment in economic development. In fact, in these articles we cloud find essentially the same arguments of the debate, which have been already mentioned above. However, in one of the papers, is emphasized the argument that investment in transport can have spillover effects, which could facilitate the expansion and innovation in other sectors (Garrison and Souleyrette, 1996:5).

[15] For a detailed discussion of this topic, see Weisbrod (2008: 519).

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Morever, in another article Gillen explored the idea about the possibilities of complementarity and substitutability between transport and other factors of production, although their results are not conclusive (Gillen, 1996: 55).

More recent studies show not necessarily matching results. For example, Montolio and Solé conducted a study in 2007 to measure the impact of investment in road infrastructure in the growth of total factor productivity observed in the industries of the Spanish provinces over the period 1984-1994.

By including in their analysis the road "traffic intensity" and road "congestion level" variables, find a positive effect of road investment in the performance of regional productivity, depending on the magnitude of these variables.

In the case of Mexico, Noriega and Fontenla found a complementarity between public investment in infrastructure and private investment in Mexico (Noriega and Fontenla, 2007:885). In particular, these authors review the long-term effects that have had increases in telephone infrastructure, road and telephone in growth of real GDP.

These authors found that the effect of the increase in kilometers of road has its noticeable effect only after seven or eight years. In fact, a similar result found Leduc (2012) who conducted a study of federal investment in roads (in the U.S. between 1993 and 2010).

He found a positive effect on regional GDP, but only as local and temporary impacts, even noticeable only after 6-8 years and disappearing after 10 years (Leduc, 2012:38).

Thus, these results contradict the aforementioned findings of Lachler and Aschauer study, although the analysis of these authors emphasizes on the effects on total factor productivity.

One striking feature of the debate on the economic importance of infrastructure investment (and in particular, investment in road infrastructure) is the frequent absence of analysis of the contribution that investment can have on reducing inequalities observed in the regional economic growth of a country like Mexico. For example, Gerardo Esquivel developed in 2000 an important study that explored the causes of economic development of regions in Mexico. The study includes some variables as representative of the infrastructure (access to water, sanitation and electricity, although excludes transport infrastructure). Esquivel found not enough statistical significance, and concludes that the climate and the vegetation are the variables determining the observed differences between the states on their levels and rates of growth of per capita income (Esquivel, 2000: 44).

More recently, Weiss and Rosenblatt conducted an analysis of the average growth of regional per capita GDP. They have included road infrastructure as part of the analysis, and found that road density[16] is only significant at a level of significance of 10%, lagging behind of other five variables with much greater explanatory power (Weiss and Rosenblatt, 2010:19). Notwithstanding, all the previous debate about the effects of investment in economic growth has not enough focus on the potential impact of more road infrastructure in the most backward regions of the country in order to accelerate their growth and contribute to a more balanced regional development.

[16] That is, the relationship between the number of kilometers of roads and the amount of square kilometers of each state.

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In this sense, in this paper we use the theory of regional convergence as an approach that could be highly relevant in the analysis. The next section of the paper is devoted to the review of this approach.

2 The debate about regional convergence

More than twenty years ago, Barro and Sala-i-Martin published his most important articles on regional convergence, which exploded exponentially the existing interest in the possibility that countries may or may not be converging towards economic development.[17]

This debate has focused on the possibility that poor countries are closing the gap that separates from rich countries.

A very similar idea is handled when is analyzed the economic convergence between different regions within a country.

Of course, there are not only different concepts and measures of economic development but also multiple econometric tools applied to different econometric specifications. Each model could be based on a specific theoretical proposal and could include different variables and factors that may affect economic development.

Clearly, it is not possible to address this diversity of analysis in this paper, since it could divert attention from the issue at hand which is the contribution of road stocks to regional convergence in Mexico. Thus, the analysis focuses on the contributions that are considered most relevant and, indeed, are based on the work of Barro and Sala-i-Martin.

In the concerned literature there are two basic concepts of convergence in regional per capita income (Barro and Sala-i-Martin, 2004:462): "Sigma convergence (**δ**)" and "convergence Beta (β)". The Sigma convergence (**δ**) is a measure of convergence that occurs when the dispersion (estimated by the standard deviation of logarithm of the values of per capita income observed in the regions under study) decreases over time. That is, it measures the possible reduction in the dispersion of per capita income (Esquivel, 1999:727).

Instead, under the unconditional convergence Beta (**β**) is postulated the convergence when a poor economy tends to grow faster than a rich economy, so that the poor economy tends to reach the richest economy in terms of per capita levels of product. Thus, we estimate the rate of convergence of regions to a steady state, which is common to all regions, although some regions are temporarily ahead. In fact, for a positive convergence rate is required to have a negative correlation between the two variables under analysis: the initial levels of per capita income observed in each region and the corresponding growth rates.

However, Barro and Sala-i-Martin have observed that while the Beta convergence tends to generate Sigma convergence, this process could be affected by factors that tend to increase the dispersion: "β convergence is a necessary but not sufficient condition to for δ convergence" (Barro and Sala-i-Martin, 2004:464). In fact, Thirwall noted that the estimation of Beta convergence implies a very important assumption: investment rate, population growth, technology and other factors affecting labor productivity must be the same for all regions being compared (Thirwall, 2003:154).

[17] We refer to papers published by these authors in 1991 and 1992 (see references).

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Considering that the previous assumption is difficult to enforce, Barro and Sala-i-Martin proposed the concept of conditional convergence which implies the inclusion in the analysis of those variables postulated to affect the growth of per capita income, and the calculation of the corresponding parameters that measure the distortion effect of these variables on growth (Barro and Sala-i-Martin, 2004:465). In part, this is a response to the criticisms that have been made to the theory of convergence, because it has failed to capture the full potential of analysis that can allow the theory of endogenous development (Romer, 1994:11).

Of course, there are studies that question the importance of the theory of endogenous development in the process of economic convergence. For example, Hulten and Schwab have provided evidence that technological convergence does not explain the regional development of the manufacturing industry in the United States of America (Hulten and Schwab, 1993:23). Moreover, an important criticism to the application of the convergence hypothesis was given by Steven Durlauf in 2003.

According to him, although applications in the literature have identified some stylized facts about the process of economic development, its main problem is that their statistical tests have failed to find the notion of economic convergence in an interesting way from the economic point of view. In this regard, he proposed to pay more attention to the heterogeneity in the different development process of each country included in the regression analysis. Thus, he suggests the use of convergence clubs to integrate countries into groups with greater homogeneity.

Then, this approach would involve the identification of patterns in groups of observations before estimating parametric models (Durlauf, 2003:13-15).

In line with the proposal of Durlauf, some works have performed the analysis of the process of regional convergence in the provinces of some countries. For instance, De Souza and others managed to identify the different patterns of convergence at regional and sub-regional level in Spain, in the period 1955-2010.

However, they do not identify the causes of the disparity in patterns of convergence at sub-regional level. Thus, they let open an important question: why there are different responses in the sub-regions that implemented the same economic policies? (De Souza et al, 2011:14). In this regard, we explored in this study the possibility that a different policy on road infrastructure provision could explain, in combination with other factors, the existence of regional convergence across the country (see section 5). However, we do not address, in this work, the possibility of convergence at sub-regional level.

Other example of the analysis of possible differential effects that can have the application of certain economic policies, using the traditional approach of convergence, has been made by Spilimbergo and Xingyuan who reviewed the effect of certain structural reforms in the process of economic convergence of regions or states of a set of 32 countries (Xingyuan and Spilimbergo, 2012). From their analysis they found that domestic financial development, trade openness, better institutional infrastructure and certain labor reforms have facilitated the process of regional convergence.

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Also support the inverse relationship between the degree of dispersion of regional GDP per capita and the level of economic development. Specifically, they find that Mexico has one of the highest levels of dispersion in per capita GDP. In this regard, an interesting calculation made is the possible increase in per capita GDP national that Mexico could have if the income of the poorest regions increase in such amount that the ratio of income between the poorest and richest region were similar to the ratio observed in the U.S. in 2005. Thus Mexico again shows one of the highest percentages of increase (33.2%) in per capita GDP in order to reduce the regional disparity (Spilimbergo and Xingyuan, 2012:4).

However, an important methodological problem is mentioned by Bonnefond (2013:4) in a study of the convergence process in the provinces of China: there is a risk of finding biased results when one use as explanatory variables to those who are endogenous with respect to economic growth itself. In this regard, this research uses the system GMM (Generalized Method of Moments) in order to avoid this problem.

Of course, there are specific theoretical approaches that differ from the methodology of Barro and Sala-i-Martin. For example, in a recent study, Shi analyzed the impact of capital investment in infrastructure in the process of regional economic convergence of the provinces of China.

With the model developed to estimate the rate of growth of per capita GDP, Shi found that the expansion of the road network has indeed favored the regional convergence in China. However, in some regions road growth has been excessive, affecting capital infrastructure which becomes unproductive (Shi, 2012:24).

After the preceding discussion elements, we will proceed to the analysis of regional convergence in Mexico and the role that could be playing the existence of an increasing availability of road infrastructure in Mexico. We will follow the methodological framework of Barro and Sala-i-Martin, mainly because it would allow us to compare with previous work in Mexico, leaving open the future possibility of other approaches such as the identification of convergence clubs within Mexican territory.

3 Regional Convergence in Mexico: backgrounds

In a seminal article about the topic, Esquivel analyzed the effect that some demographic variables have in the observed differences in both the level and the growth rate of per capita income among the Mexican states. Therefore, he calculated the convergence rate δ (as the unweighted standard deviation of income per capita) observed between 1940 and 1995 (Esquivel, 1999: 725-761). This author finds that the value of δ was 0.62 in 1940, falling to a value of 0.44 for 1995, which means a significant reduction in the level of regional dispersion of per capita income states. However, this convergence process in Mexico is really slow (at a rate of 1.2 percent per year), occurring mainly between 1940 and 1960, and remaining relatively constant after 1960. It is noteworthy that Esquivel confirms these results when performing the analysis at the regional level, i.e., grouping the states as belonging to the North Pacific, Gulf and Capital regions that show a tendency to grow faster than the Southern, Central and North Central. In fact, the two factors that Esquivel found as possible explanations for the low rate of convergence between Mexican regions are "the low sensitivity of interstate migration to income differentials and increasing regional disparities in the provision of post-primary education."

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Esquivel's final conclusion in his article just gives a guideline for the purpose of our study, because he states that "it is necessary to outline and implement policy measures aimed at reducing regional disparities in terms of the stocks and the formation of human capital and, perhaps, basic infrastructure " (ibid.: 760, emphasis added).

Shortly after, the same researcher explores the potential role of geographical factors in the type of regional development observed in Mexico. In particular, their analysis finds that the possible influence of geographical variables (location, vegetation and climate) in regional economic development is through its effect on human capital, that is, "through its influence on life expectancy and in the acquisition of a higher educational level" (Esquivel, 2000:30). This conclusion of Esquivel is especially interesting because it reinforces our hypothesis that the roads could be a key factor in the development of the Mexican regions because, precisely, it can be assumed that access to education and health services depends on the physical accessibility provided by the road assets available in each state in the country, although it is possible that access to services remains determined by the total cost of transport, among other factors.

In the same year, Messmacher conducted an investigation to determine the effects of NAFTA on regional inequality in Mexico. Among its key findings, he corroborates the fact that an increasing regional inequality has favored the northern states of the country.

Moreover, the manufacturing activities and transportation and communications are the main factors that explain the dynamics of the states with highest growth (Messmacher, 2000:22).

Thus, although this author was not focusing in transport infrastructure, this finding could support the idea that the transport sector may be not growing because of a lack of adequate infrastructure. So, it is possible to assume that the states that have invested more in roads, for example, have supported the growth of manufacturing activities. Of course, these are precisely the issues within the research agenda of regional development.

Two years after the work of Esquivel, Luis Cabrera Castellanos publish an article about the empirical evidence of regional convergence between the Mexican states (Cabrera, 2002). Although the period of analysis (1970-1995) considered by this researcher is significantly lower than considered by Esquivel, reaches a qualitatively similar conclusion: the existence of absolute convergence is confirmed in Mexico. However, their results contradict Esquivel because Cabrera find that the convergence rate tends to grow in the last years of period since "the speed of absolute convergence is slightly more than 1% for the entire period, but of 3% for the last fifteen years" (Ibid: 18). As noted above, Esquivel (1999:760) finds that convergence has stagnated precisely from the sixties.

One possible explanation for this apparent contradiction is to compare the scale of the graphs of the sigma convergence offered by these two authors. So, taking into consideration a larger period of time, Esquivel find the period 1960-1995 as one with relative stagnation in the convergence rate.

Instead, Cabrera focus is on the last years makes the changes more visible and significant. This topic will be reviewed later in this paper.

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4 Measurement of absolute convergence in the period 1940-2010

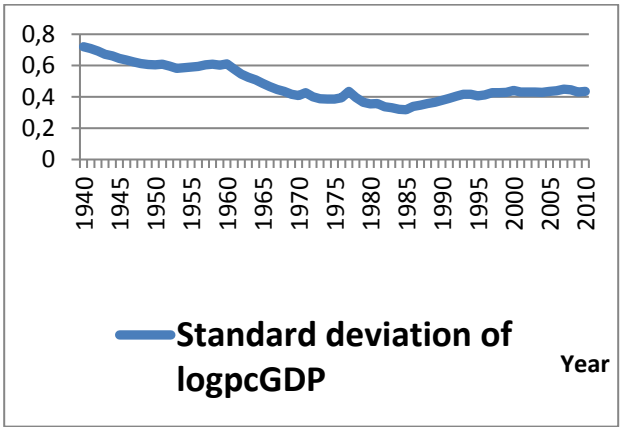
In this paper, the period for the analysis of absolute convergence has been selected by two criteria. First, it is important to have the widest possible range of years of regional economic development in Mexico, whenever we have a situation of relative political and social stability in the country. In other words, we analyze the possible effect of certain public policies in the economic development of regions, by taking into consideration a really long period, from the pacification of the country (i.e., after Mexican revolution). In fact, based on this idea, perhaps we could have taken the early thirties of the last century as the beginning of the period of stability. However, it should be recognized that it is not possible to obtain reasonably reliable information for the process of road construction in each of the states of Mexico, but from the year 1940.[18]

In adition, we are also looking for reliable information about economic growth. In this regard, it has been considered the per capita gross domestic product (hereinafter pcGDP) as one of the most representative variables for comparative analysis of economic growth in each of the regions.

Moreover, the work of Germán-Soto has enabled the availability of a very consistent estimation of pcGDP in Mexican states (Germán-Soto, 2005: 617-653). Thus, from his research, we have a data base of pcGDP (at 1993 prices) covering the period 1940 to 1992, and we combine it with the estimate made by the INEGI for the period 1993 to 2010 (INEGI, 2014).

With this database, it is possible to corroborate the behavior of nationwide pcGDP (in 1993 pesos): a generally rising trend (even with the negative but temporary effects caused by several crises in the Mexican economy). As a consequence, the average pcGDP observed in 2010 is 3.6 times higher than in 1940, i.e., there is an annual growth rate of 1.85% in the past seventy years. It is important to mention that, in the previous figures, we have exclude three Mexican states: Tabasco, Campeche and Baja California Sur, although we still have a behavior with the same general features, but without any temporal biases that involves the inclusion of the above states.[19]

Actually, the topic that interests us is the behavior of pcGDP observed in the states, as well as the degree of dispersion around the mean. This interest is because the hypothesis postulated under the absolute convergence δ implies a reduction in the standard deviation of the per capita GDP logarithm (hereinafter logpcGDP). Thus, Graphic I show the behavior of this pcGDP dispersion measure observed by Mexican states, between 1940 and 2010.



Graphic 1

[18] Thus, the information available about of road stocks in Mexican states can be obtained from statistical yearbooks provided by INEGI in PDF format on their website (see bibliography).

[19] In fact, we are following the idea of Esquivel (1999:740), excluding some states in order to avoid distortion of general behavior of country.

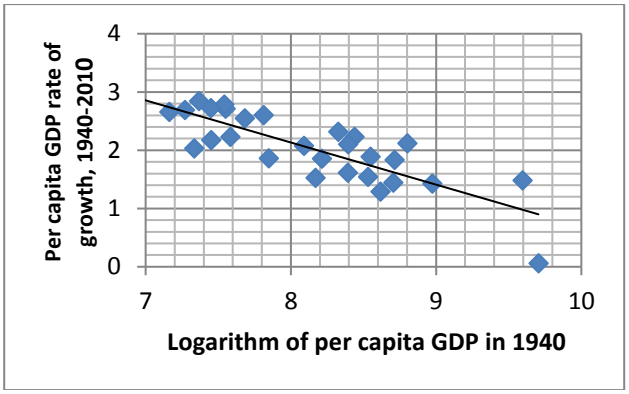
Note that the behavior and the estimated values of logpcGDP (plotted in Figure I) are, in general, closer to those reported by Cabrera (2002) than those found by Esquivel (1999: 740), in the corresponding periods in analysis.[20] In fact, when we take a much longer period of time, we also reach the conclusion of Cabrera: there is an increase in the dispersion of regional GDP between 1985 and 1995.

Thus the long-term trend shown in figure I indicate that indeed this phenomenon is occurring, but it really represents a recovery from the fall experienced by the standard deviation of logpcGDP in the previous decade.

Moreover, we also corroborate the central conclusion of Esquivel: the overall trend between 1940 and 1995 indicates a decrease in state pcGDP disparities, but with two quite distinct periods, one sharp decline between 1940 and 1970, and a subsequent increase towards stabilization.

However, as can be seen in Graphic I, in fact the period of decrease of the dispersion reaches the mid-eighties.

After that date, there seems to be a process of increase in the standard deviation, i.e., an increasing inequality in pcGDP of Mexican states. In fact, following the methodological process of Barro and Sala-i-Martin (2004:466), in Graphic II we show the relationship between the pcGDP growth rate and the logarithm of initial pcGDP observed in the corresponding Mexican state (in the initial year, 1940).



Graphic 2

The corresponding simple regression yields an R^2 of 0.69 and a negative and statistically significant coefficient.[21] Therefore, this analysis indicates that there is a process of economic convergence between the states of Mexico considering all the period from 1940 to 2010. However, in order to estimate the rate of this process of convergence, we have chosen the same expression used by Esquivel (1999:738).In this way, we will make some comparisons with the results that this researcher found in their study. The mentioned expression is:

$$\frac{y_{i,t} - y_{i,t-\tau}}{\tau} = \alpha - \beta y_{i,t-\tau} + \mu_{i,t} \quad (1)$$

Where $y_{i,t}$ is the per capita income observed in the ith region in the t-th period, $\mu_{i,t}$ is the stochastic term, α is the constant that includes the level of income in the steady state, β is a parameter directly related to the rate of convergence to a common steady state in the economy in all regions studied, and τ is the time interval in which the convergence is measured.

[20] Probably, this is because Esquivel (1999: 740) have different sources of information to those used in the present work.

[21] It is noteworthy that we also perform the analysis with the inclusion of BCS, Campeche and Tabasco, but did not find many differences, although the R^2 decreases slightly (now is 0.67).

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As shown, the explanatory variable is the logarithm of initial pcGDP. Table 1 shows the results of estimating the above expression in three different periods of interest for our analysis: 1940-2010, 1940-1985, and 1986-2010. The fourth regression also corresponds to the period 1986-2010, but excludes the states of Baja California Sur, Campeche and Tabasco, for the reasons already mentioned.

		Convergence rate of growth			
Regression	Period	Coefficient	Standard deviation	R^2	Cases
1	1940-2010	0.0070	0.0009	0.672	32
2	1940-1985	0.0138	0.0023	0.537	32
3	1986-2010	0.0135	0.0035	0.346	32
4	1986-2010	0.0025	0.0037	0.016	29

Table 1

From table 1 we note that there is a convergence rate relatively lower than that reported by Esquivel and Cabrera. So while Esquivel (1999) estimated for the period 1940-1995, an annual average of nearly 1.2 percent convergence, our analysis for the period 1940 to 2010 is 0.7 percent. The difference may have two reasons. The first one is the database used, not the period of time. Thus, a regression (not reported in Table 1) made for the same period analyzed by Esquivel (i.e., 1940-1995) still shows a lower rate of convergence (i.e., 0.9%).[22] The second reason (which probably adds to the previous reason), is because we could find, precisely in the last years of the period, a tendency to increase regional disparities in pcGDP.

In fact, this apparent change in the tendency of the convergence rate had been interpreted by Esquivel as stagnant tendency and not a reversal of the trend. Therefore, it is important to separate the analysis in the two periods (see Figure I): the first period (from 1940 to 1985) shows a convergence trend, but the second period (from 1986 to 2010) seems to have a divergence tendency or at least to remain in a stagnation process in the growth of the convergence rate.

As also shown in Table 1, by analyzing only the period from 1940 to 1985, we found a convergence rate even higher than that estimated for the entire period. This is an expected result and also consistent with the values reported by Esquivel (1999:740). However, the estimate of the rate observed between 1986 and 2010 also reports a rate value greater than found for the whole period convergence. Although the estimate is not statistically significant even at 10%, this result requires an explanation.

One possibility involves an analysis excluding Baja California, Campeche and Tabasco. Thus, regression 4 (in Table 1) indicates the existence of a very low convergence rate, although again the estimate is not statistically significant.

Clearly, it is necessary to deep the analysis of convergence in Mexico. However, the review and updating we have done in this part of the work could be sufficient for the purposes of this paper, because the main findings corroborate the previous work on the topic: there is a trend of economic convergence among the states in Mexico, but this process has a very low growth rate.

[22] Again, the differences may be mainly because Esquivel (1999) used a different database to the one used in the present study data, which is provided by the German-Soto (2005).

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We now turn to analysis of the role that could be playing the investment in road infrastructure on the process of convergence.

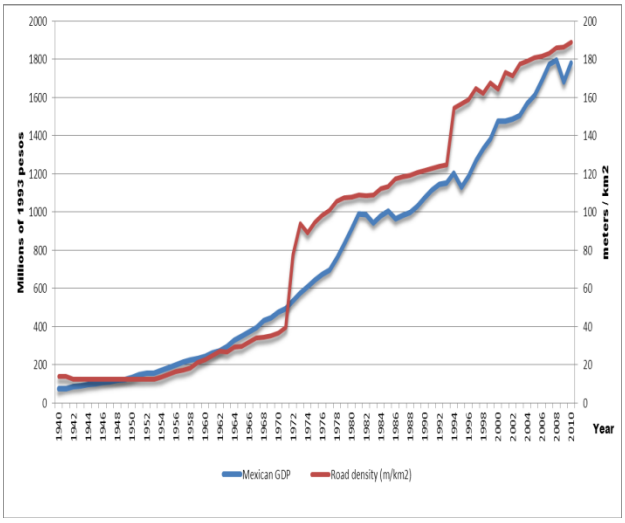
5 Growth of the road network in Mexico

As can be seen in graphic III, the accumulation of road stocks in all the country shows a similar growth in relation to the behavior of GDP. Based on the road density indicator (linear meters of road per square kilometer of territory), one can see that the country is gradually covered by a growing quantity of roads, although the process shows two atypical times of strong growth (1972-1973 and 1994).

Of course, the dynamics under a higher road density is not sufficient, by itself, to conclude that the expansion of the road network has been tailored to the needs of mobility posed by economic development in all regions.

In addition to the quantity of roads, it is important to analyze the effect of some qualitative aspects, such as the type of roads built (paved, semi paved or unpaved) or the number of lanes available to the road.[23]

Moreover, there is the possibility that the roads are built but not where they are needed or where they contribute more to the economic development of the region (Islas, 1990:73).



Graphic 3

For example, as shown in Table 2, not all states have reached a similar level of density in its road network, nor had the same growth rate of roads during the period in analysis.[24] Thus, there is a group of states that have achieved a high level of road density, but this is mainly explained by their relatively smaller total area. Such is the case of Tlaxcala, Morelos, Aguascalientes, Guanajuato, Colima and Tabasco.

One exception is the case of Campeche which has always been a much lower density than the national average. Moreover, there are Mexican states showing a low level of road density, which is partly explained by the large size of its land area, as are the cases of Chihuahua, Coahuila, Baja California Sur, Sonora and Durango.

[23] Which results into a greater capacity of the road, although an increase in capacity is not a factor strictly related to increased security (see, for example, Karlaftis, M. (2002)

[24] Although we are analyzing the total of roads, the growth tendency of paved roads was also analyzed. Thus, in spite of significant differences, they do not change the main argument: the different tendencies of road stocks in the states of the country.

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However, we found several cases where the extension is not huge factor to prevent a relatively high level of road density, as shown by the behavior of Veracruz, Chiapas and Oaxaca.

	1940	1950	1960	1970	1980	1990	2000	2010
Aguascalientes	11.2	45.0	95.5	123.3	367.1	355.5	389.9	408.1
Baja California	9.1	11.1	17.4	20.7	50.0	111.2	167.3	166.2
Baja Calif. Sur	3.7	8.3	21.2	13.8	67.9	82.3	87.7	74.0
Campeche	1.5	4.5	14.9	21.7	47.5	100.2	85.8	98.4
Coahuila	7.6	8.7	16.8	19.3	63.9	63.4	55.5	58.0
Colima	31.3	37.0	66.5	98.1	284.5	287.3	382.4	406.2
Chiapas	7.6	9.7	24.7	41.4	134.1	149.7	275.9	302.7
Chihuahua	3.9	4.7	7.6	12.3	39.1	46.3	51.1	53.7
Durango	12.0	10.1	14.7	18.2	74.8	74.9	103.0	130.0
Guanajuato	23.4	23.8	46.9	84.0	197.3	245.8	361.6	406.4
Guerrero	11.4	10.0	25.5	40.2	140.9	129.6	207.3	281.0
Hidalgo	39.6	45.8	72.7	124.6	292.8	301.3	438.7	537.5
Jalisco	14.3	19.4	27.1	41.2	125.1	142.3	309.7	339.6
México	87.1	45.8	96.4	170.3	361.7	459.7	462.4	638.8
Michoacán	51.5	24.7	41.5	61.9	168.6	157.4	221.1	268.5
Morelos	87.2	99.8	120.4	175.3	466.3	426.6	405.0	563.7
Nayarit	10.1	17.8	33.3	44.5	107.5	127.7	201.7	299.2
Nuevo León	16.9	14.4	27.7	39.4	91.4	137.4	111.2	113.7
Oaxaca	10.8	10.9	18.4	44.0	121.1	116.3	167.2	222.9
Puebla	30.7	31.8	42.1	73.1	216.2	218.6	251.1	289.5
Querétaro	49.2	25.3	36.3	90.4	291.5	313.7	282.6	279.9
Quintana Roo	0.7	2.7	8.3	23.5	83.3	116.6	119.8	129.2
S. L. Potosí	18.9	18.3	25.3	37.0	110.8	151.5	194.1	183.2
Sinaloa	15.5	16.2	38.4	51.7	198.2	189.0	327.5	336.8
Sonora	10.2	7.0	14.8	19.6	62.4	61.4	121.1	133.3
Tabasco	24.0	14.1	33.6	103.4	206.2	291.3	347.9	350.7
Tamaulipas	16.7	15.2	24.6	33.0	132.6	159.4	155.5	174.7
Tlaxcala	98.9	101.8	93.5	191.6	781.3	717.2	638.5	660.4
Veracruz	9.0	18.5	33.0	70.2	157.8	141.3	217.8	354.5
Yucatán	31.9	8.7	23.2	42.6	127.1	164.6	282.5	285.0
Zacatecas	7.8	7.8	14.9	33.5	121.9	134.1	136.6	152.7
Total	13.9	12.7	22.9	36.5	108.0	121.6	164.2	189.1

Table 2

However, it is important to note that even within the above groups of states do not appear to be a strictly inverse relationship between the size of the land area and road density. This observation is even most clear when we analyze the behavior of the rest of the Mexican states. Therefore, there are other factors that could be influencing a higher rate of densification road. For instance, we could assume that the level of economic activity is an important variable. In fact, this could be the explanation of the cases of Jalisco and Mexico. However, the case of Nuevo Leon is an outlier because we have a very high level of economic activity but a low rate of growth in the road density.

In fact, from Table 2 we could not find a stylized or similar trend in the road density of Mexican states. Moreover, it is interesting to notice that there are some states that show an unusual increase in the decade of the seventies. In contrast, in some other states is also observed an increase but more moderate in those years, while the largest increase was observed in the nineties or more recently.

Therefore, we have the following question: is the increased availability of road infrastructure in some states a special factor to reach (in a few years) the pcGDP that now have the richest states?

For instance, the state of Aguascalientes shows some short periods with a high rate of road construction (reflected in higher road density). However, these pulses do not appear to have a visible impact on the tendency of pcGDP. It is clear that we need to perform a more in depth analysis, not constrained to a particular case.

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6 Highway Infrastructure and regional convergence in Mexico

In order to have a more comprehensive analysis about the possible influence of greater road infrastructure availability in the economic convergence of Mexican states, we perform an analysis of conditional convergence, with special emphasis on one variable: the accumulation of road stocks. We use the following expression:

$$\log(y_{i,t} / y_{i,t-\tau}) = \alpha - \beta_1 y_{i,t-\tau} + \beta_2 x_{1it} + \beta_3 x_{2it} + \ldots + \beta_n x_{mit} + \mu_i \quad [2]$$

Where, besides the elements already described from the expression [1], we have the variables x_{1it} to x_{mit} assumed to that affect the growth of per capita income, which Cabrera (2002:14) identifies as "additional control variables of steady state".

For the regression analysis we considered the variables described in Table 3. Obviously, as part of the convergence analysis model, we include in all cases the LPIBPCIN variable. Then he included only one of the variables that could be used to measure the impact of the accumulation of road stocks (CARRPAV, CARRNOPAV, and CARRTOT) in runs for each of these variables separately (to avoid multicollinearity problems, given the existing high coefficients of correlation between these variables). Note that this separation is also important for analysis of the different policies of road infrastructure. Thus, it is interesting to compare the differential effect on economic growth of transport policies that focus on building more roads of poor specifications (i.e., semi-paved and unpaved), versus building fewer roads (being obviously more expensive) but paved with better specifications, or even a mixture of both policies.

Variable	Description (information corresponds to each state in a given year).
LTDCREC	Logarithm of average annual growth rate of per capita GDP.
LPIBPCIN	Logarithm of per capita GDP in the initial year.
CARRNOPAV	Kilometers of semi-paved and unpaved roads.
CARRPAV	Kilometers of paved roads.
CARRTOT	Total of paved roads.

Table 3

Following, to some extent, the above mentioned idea of Durlauf (2003:13-15) about convergence clubs, we have performed our analysis considering the Mexican states grouped in the regionalization most frequently used in Mexico. In fact, we made a preliminary regression exercise considering the 32 Mexican states, but the results were statistically weaker than those obtained with the regionalization shown in Table 4.

Region	States in the region
Noroeste	Baja California Norte, Baja California Sur, Sinaloa, Sonora.
Noreste	Coahuila, Chihuahua, Durango, Nuevo León, Tamaulipas.
Centro-Occidente.	Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán, Nayarit, Querétaro, San Luis Potosí, Zacatecas.
Centro	Distrito Federal, Hidalgo, México, Morelos, Puebla, Tlaxcala.
Sureste	Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz, Yucatán.

Table 4

The results obtained in the different regressions related with model postulated in expression 2, are shown in Table 5.

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Independent variable	Dependent variable: LTDCREC		
	1	2	3
Constant	0.042484 (16.18577)	0.044387 (17.57108)	0.042830 (12.75309)
LPIBPCIN	-0.015009 (-20.76352)	-0.015170 (-19.80483)	-0.015001 (-20.31570)
CARRPAV	0.000355 (1.07366)**		
CARRNOPAV		-3.45E-05 (-0.12017)**	
CARRTOT			0.000267 (0.70656)**
Adjusted R^2	0.167	0.167	0.167
F-statistic	225.958	225.274	225.565

Table 5

In table 5 we corroborate the relationship between the growth rate of per capita GDP (i.e., LTDCREC) and the initial level of per capita GDP (LPIBPCIN). Although the parameter value is relatively low (around 0.43 in all regression runs), it has a negative sign and it is statistically significant.

This result is consistent with the main conclusion from the above analysis of absolute convergence (see the previous section 4): there are clear indications that the Mexican states are in a process of convergence but at a relatively slow rate in the period 1941-2010.

In contrast, the parameter estimates for the different variables that measure the road stocks, are actually very low,[25] particularly if they are compared with the parameter obtained for the initial GDP per capita. Actually, it is important to note that the adjusted R^2 of regressions is 0.167. This finding corroborates the low explanatory power of the variables measuring the road stocks. Therefore, we need to include other variables (i.e., x_{mit} type, in expression [2]), if we have the aim to find the variables that really explain the regional convergence process in Mexico.

Considering the above, and even considering that this explanation is not a central part of this work, we have included in the analysis some variables typically associated with the growth of per capita GDP. Thus, this analysis will allows us to compare the performance of the variables associated with the growth of road stocks of Mexican states.[26]

Unfortunately, we have not had the availability of complete and reliable information for the entire period of the previous analysis (1941 to 2010) but only for recent years (in fact, from 1994 to 2010). Nevertheless, it can still be useful because it would allow also compare the performance of the road stocks in a recent period.

Firstly, we are adding the life expectancy as a variable that is assumed to be a proxy that measures the human capital available to each Mexican state.[27]

[25] Although that parameters are not statistically significant in all cases.

[26] However, the comparison with the effect of initial per capita GDP must be taken carefully, given the theoretical importance of this variable.

[27] "Life expectancy" is defined as the expected average number of life years of resident population (see CONAPO, 2012).

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In fact, from the analysis of our database (for the period 1994 to 2010) we found a correlation coefficient (hereinafter CC) between life expectancy and growth rate of pcGDP of 0.29, which is the greatest of all the CC calculated for the variables in the analysis.

Secondly, we originally included in the regression the average years of schooling because it is frequently used to measure the impact of human capital on economic growth.[28] In addition, it shows a CC of 0.19 in relation with the growth rate of pcGDP. However, schooling was removed from the analysis because it has a very high CC in relation with life expectancy and also with initial pcGDP. In fact, the same problem arose with another variable that originally we have assumed could help in the analysis, i.e., foreign direct investment. Thirdly, instead of this two variables, we included the net population migration (hereinafter, MIGN) [29] because this variable shows relatively low CC in relation with initial pcGDP and life expectancy.

Moreover, MIGN shows a negative correlation with the pcGDP rate of growth, implying that states that retain or even attract more people (that is, with greater immigration than emigration) tend to economic growth. It important to note that the additional variables finally included in the regression (i. e., schooling, life expectancy, and interstate migration) have low values of CC in relation with the variables representing the road stocks.

In fact, this low correlation was not expected because we commonly may assume, for instance, that there is greater life expectancy in the states with more road stocks. Nevertheless, this situation let us to include the variables as shown in Table 6, which contains the results of the regression analysis, made for the period 1994-2010.

Independent variable	Dependent variable: LTDCREC		
	1	2	3
Constant	-0.28633 (-6.6014)	-0.29671 (-6.74794)	-0.29737 (-6.78897)
LPIBPCIN	-0.00624 (-2.97244)	-0.00787 (-3.76426)	-0.007399 (-3.51883)
CARRPAV	1.50E-06 (3.57889)		
CARRNOPAV		1.45E-07 (1.10129)**	
CARRTOT			1.96E-07 (1.81277)*
ESPVIDA	0.004126 (6.78371)	0.00438 (7.15997)	0.004359 (7.14397)
MIGN	-7.38E-08 (-1.73026)**	-6.38E-08 (-1.47848)**	-6.38E-08 (-1.48395)**
R^2	0.1189	0.0999	0.1034
F-statistic	14.5211	11.95028	12.40996

Table 6

Again, in all cases, we found statistical significance (tested at 99%) of the parameters associated with the level of initial per capita GDP, with the correct (negative) sign for the theoretical approach, but their parameters show relatively low values.

[28] For example, in a recent study of conditional convergence in China, in the period 1995 to 2009, Bonnefond found that both investment in physical capital and education have played a very important role in promoting economic growth and reducing regional disparity (Bonnefond, 2013: 12).

[29] Calculated as the difference between the thousands of people who migrated to another Mexican state, and the thousands of people who migrated to the corresponding Mexican (see CONAPO, 2012).

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Indeed, these parameters are even lower than the values found in the analysis of the period 1941-2010 (see Table 5). These results are congruent with the findings reported in section 4.

In particular, from regression 1 we conclude that CARRPAV has the best statistical performance even if the parameter value is actually very low compared to the corresponding parameter to life expectancy and much less representative if it is compared to the corresponding parameter of LPIBPCIN (initial level of per capita GDP).

Instead, regression 2 shows that CARRNOPAV (i.e., unpaved roads in the state) is a variable not statistically significant. Similarly, CARRTOT (i.e., total roads) is only significant at 95%. These results are consistent with the findings of Weiss in the sense of lower statistical significance of road stocks in comparison with other variables with greater explanatory power about regional growth in per capita GDP (Weiss, 2010: 19).

7 Conclusions

The road transport system in Mexico has grown throughout the country. Although part of this quantitative and qualitative growth may have been happened in response to the detection of specific needs (and, perhaps, looking for an appropriate allocation of resources), there is the possibility that another part of the road infrastructure has been built for reasons unrelated to economic rationality or without a better understanding of the interrelationship between road infrastructure investment and the process of economic development of the regions where such infrastructure is built.

Of course, the topic is really complex. From a literature review, mainly centered around the debate generated by Aschauer contributions, we found a richness in the past analysis of the issue, with a great diversity of possibilities of approaches and argumentation. In fact, the current state of the debate indicates that there are not conclusive elements to be sure that road infrastructure investment will be, ipso facto, an undisputed factor of economic growth, as seem to be assumed by the vast majority of government programs that are oriented to look for greater economic development.

In particular, some of these programs also assume the idea that infrastructure investments contribute to a more balanced regional development. However, there are not enough and rigorous analysis of the extent to which the largest endowment of road infrastructure is really contributing to reduce disparities in regional development.

Therefore, in this paper we apply the conceptual framework that studies the process of regional convergence, particularly based on the methodological contributions of Barro and Sala-i-Martin. Thus, we took into account the previous work made about absolute and conditional convergence process of Mexican states, focusing in the results of Esquivel (1999) and Cabrera (2002). In addition to corroborate the main findings of these researchers (in the sense of the existence of a process of absolute convergence in the evolution of per capita GDP in Mexico, but at a very low rate) our analysis was made on a period of analysis substantially greater than that considered by the authors.

Thus, in this paper we analyzed the possibility of absolute convergence between 1940 and 2010, meanwhile Esquivel (1999) studied it from 1940 to 1995 and Cabrera (2002) did from 1970 to 1995.

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Indeed, our greater period of analysis seems to explain why these authors have some conflicting results: Esquivel (1999) finds the years 1960-1995 as a relative stagnation in the behavior of the convergence rate, while Cabrera (2002) found an increase in the dispersion of regional GDP between 1985 and 1995. In fact, when analyzing a period larger time, we have corroborated this increase but only as part of a slight reversal in the trend towards regional convergence in recent years, while Esquivel (1999) identifies a stagnation period.

In the case of conditional convergence analysis from our long-term analysis (i. e., taking the period 1941-2010), we find that the estimated parameters for the different variables that measure the road stocks, are really very low, particularly when compared with the parameter obtained for the initial GDP per capita. Moreover, they are not statistically significant in all cases. In fact, the adjusted R^2 is very low, in spite of the inclusion of road stocks variables. Thus, even considering that the full explanation of the process of regional convergence is not the central part of the present work, we have included in the analysis some variables typically associated with the growth of GDP per capita: life expectancy and state net migration (although only for the period 1994-2010).

The main conclusion from the analysis of conditional convergence in this period is that only paved road stocks are statistically significant, but only with a barely perceptible effect on the growth rate of convergence of regional per capita GDP.

Moreover, this effect is rather limited compared with the corresponding to the "life expectancy" and much less representative compared to the initial levels of per capita GDP.

In sum, these results indicate that there are not many conclusive arguments (either in terms of statistical significance or relative contribution) to accept that road stocks are contributing to convergence in regional economic development in Mexico, though the debate is far from being overcome.

We need to continue the work, following the recommendations of Gramlich, Bangqiao, Durlauf, among others, on the use of various econometric tools; the improvement in the availability of more reliable information; the use of more sophisticated econometric specifications (for example, with more variables or not linear relationships); and, the improvement on the economic significance of regional analysis (for example, it is very important to corroborate the existence of spillover effects and possibilities of complementarity of transport with other economic sectors).

8 References

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The influence of innovation activities and knowledge management on the competitiveness of manufacturing smes: an empirical study

CUEVAS- Héctor*†, AGUILERA- Luis, RANGEL- Jorge, HERNÁNDEZ- Octavio

Universidad Autónoma de Aguascalientes

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This research aims to show the influence of innovation activities and knowledge management on the competitiveness of manufacturing small and medium enterprises (SMEs). For this, with a sample of 150 SMEs in the manufacturing sector in the state of Aguascalientes, Mexico, a multiple linear regression analysis was performed in order to evaluate the correlation among the variables used. The results obtained provide empirical evidence that innovation activities and knowledge management have a positive and significant impact on the competitiveness of the companies studied.

Innovation, Knowledge Management, Competitiveness, SMEs

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*Correspondence to Author (email: hcuevas@utsoe.edu.mx)
† Researcher contributing first author.

Introduction

In the present day, the importance of small and medium enterprises (SMEs) to the national and international economy is indisputable. According to the figures produced by the most recent economic census carried out by the National Institute for Statistics and Geography (INEGI) in 2009, SMEs in Mexico represent 4.8% of all companies in the country.

Furthermore, they generate 26.4% of the Gross Domestic Product and 31.2% of formal employment. With very similar figures, SMEs are also very important to the state of Aguascalientes with, according to INEGI, 5.14% of businesses being this size.

Additionally, SMEs provide 24.85% of the Gross Domestic Product in the state, and 25.81% of economically active people found employed in a business with these characteristics (INEGI, 2009).

The manufacturing industry occupies a position of transition in the state. 10.52% of the manufacturing businesses in the state are small or medium in size (INEGI, 2009). According to the figures produced by INEGI in 2012, Aguascalientes has been one of the states in which the manufacturing industry, with 27.1%, occupies first place in the generation of Gross Domestic Product; furthermore, employment is principally provided by the manufacturing sector, at a level of 30.4%.

The total level of remuneration made to people employed by the manufacturing industry rises to 48.7% of the total remunerations to the employed population in the state. Despite the importance of this type of company, one of the principal problems that they face is a lack of innovation.

The 2010 Business Environment Survey "Problems Encountered by Businesses in the Industrial Sector" conducted by the National Chamber for the Transformation of Industry (CANACINTRA) identified the principal problems encountered by businesses of this type. The results show that industrial companies are not able to adequately become competitive due to a lack of technological innovation, to which attested 20% of the 472 industrial companies surveyed (Cámara Nacional de la Industria de Transformación, 2010).

Combined with the foregoing, and in order to keep themselves fully functioning, 13% of the companies surveyed do not use new suppliers. Reestablishing relationships with existing suppliers, with whom a greater effort is made to incorporate greater innovation in products, is seen as a viable alternative to follow in order to confront contemporary challenges (Varma, Wadhwa & Deshmukh, 2006). For their part, SME manufacturers are in the same situation in that that they find it difficult meeting the challenge of adequately competing with their rivals due to a lack of innovation and development activities (Cámara Nacional de la Industria de Transformación, 2010). On the other hand, companies are placing ever greater importance on the treatment and conversion of information, knowledge, and abilities in the workforce, and to this end, knowledge management. These changes have been identified by various researchers as processes through which companies' values are displaced into intangible values (Jones, 2004; Maldonado, Martínez & García, 2012).

In this sense, Maldonado et al. (2012), quoting McAdam & Reid (2001), show how SME's low competitiveness could be related to a low level of investment in knowledge management.

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To be successful in ever more globalized and highly competitive markets, companies need to develop new ideas which translate into useful, transmissible and conservable knowledge. From this emerges the necessity of studying the influence of innovation activities and knowledge management on companies' levels of competitiveness. This research, through surveys conducted with managers in a sample of 150 companies from the manufacturing sector in Aguascalientes, obtained the results analyzed here through the technique of Multiple Regression, with support from the statistical program IBM SPSS Statistics version 21. The results show innovation activities and knowledge management as having a positive and significant influence on the competitiveness of SME manufacturers.

1 Literature review

Innovation activities and the competitiveness of SME manufacturers

Currently, the growth of organizations demands, among other options, the reinforcement of innovation activities (Jiménez, 2006). To do this, it is important to emphasize that, with the influence of innovation activities, organizations need to have a greater level of competitiveness, especially SME manufacturers (Valentinavičius, 2005).

In their research, Pavón & Goodman (1981) consider that innovation activities influence companies in such a way as to be reflected both in business results and in a gradual increase in competitiveness (Brunnermeier & Cohen, 2003).

SME manufacturers, through their staff responsible for operational activities, are concerned with the updating of the methods and strategies that enable them to control their innovation activities in the best way possible, in order to make their company ever more competitive (Cho, Leem & Shin, 2008).

In this way, on being developed in organizations, all innovation activity should have as an objective the standardization of operations, such as procedures, on being integrated into the organizational activity of the manufacturing SME (Kickert, 1979; Saren, 1984; Vrakking & Cozijnsen, 1993).

This means that it is important that all innovation is for the benefit of the organizations, so that each activity undertaken internally adds elements to ensure that the company has better results and is, therefore, more competitive (Bessant & Grunt, 1986).

It is important, therefore, to show that innovation activity is the result of a process of analysis and study focused on improving some part of the operations on which SME manufacturers rely (Fernández, 1995; Velázquez, 2007; Aguilera, González & Hernández, 2013).

To this end, all innovation activity that is carried out in each of the company's internal processes needs to use strategies that deliver both a beneficial system and a registry of the results of each improvement implemented.

With this the company can evaluate whether the innovation will be a key element in making it more competitive and, with this, enabling it to perform better (Fernández, 1995; Macdonald, 2000; Aguilera et al., 2013).

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The European Commission (2011) considers that innovation activity is a key element for the growth and competitiveness of an organization, which informs those business people seeking to invest in this option, enabling them to see companies as benefitting in each of the instances of this type of investment (Jaffe & Palmer, 1997; Mineikaitė, 2013). Innovation activity has been converted into an essential part of the development of a region and, of course, a company. Currently, for this reason, many researchers associate this activity with business results in terms of the competitiveness of manufacturing companies (Sternberg, 2000; Cho et al., 2008; Mineikaitė, 2013).

For the Organization for Economic Co-operation and Development (OECD), innovation activity has been an important element in normalization. As, from the international point of view, this is something that should be established, great efforts have been undertaken in the generation of proposals significant for organizations' competitiveness and performance, especially for manufacturing SMEs that demonstrate the following typology (Sternberg, 2000; Panne, Beers & Kleinknecht, 2003; Chía, 2004; Ozcelik & Taymaz, 2004; Fagerberg, Mowery & Nelson 2005; Rodríguez, 2013):

a) Innovation in products: Considered as goods and services which are constantly required for cosmetic improvements, the adoption of technology, and functional adaptations, according to the requirements of the market.

b) Innovation in processes: Focused on substantial improvements which can be either operational or administrative, and which have a strong impact on companies' productivity, effectiveness, and competitiveness.

c) Organizational innovations: These understand improvements and structural adjustments, as well as organizations, from the perspective of the implementation and/or improvement of administrative processes applied to each of the company's operational areas.

Innovation activities are fundamental to making businesses, such as manufacturing SMEs, more competitive (Chía, 2004; Ozcelik & Taymaz, 2004; Rodríguez, 2013). To this end the following hypothesis is proposed:

H_1: The competitiveness of the manufacturing SMEs in Aguascalientes is positively and significantly influenced by innovation activities.

2 Knowledge management and competitiveness in the SME

Based on various studies conducted by other researchers, some authors define knowledge management as the interchange of knowledge between individuals with the aim of constructing an information system which can be used, once information has accumulated (Crnjar, 2006; Bernal, Turriago & Sierra, 2010), to establish a relationship with educational systems.

Intervention, in this context, on the part of technology and internet systems, then gives a sense of benefit and positivity to the management of information useful for individuals' development (Blanco and Bernal, 2009). In particular, this benefits manufacturing SMEs in their continual search for improved performance and competitiveness (Andreu, Baiget & Salvaj, 2004; Crnjar, 2006).

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It is hoped that knowledge management in organizations will be a key element, whose objective will be to cooperate in the improvement of business systems in order to create more competitive organizations in the face of the dynamic and aggressive contemporary business environment (Bergeron, 2003; Andreu et al., 2004).

In this sense, it is important to emphasize that business people must be aware that the knowledge generated by individuals is of great importance to the achievement of business objectives, and to facilitate the sense that, through procedures and techniques, individuals need to learn and grow in order to be better able to carry out their duties (Črnjar, 2006).

From an entrepreneurial and business point of view, and through the integration of elements such as strategies, policies, techniques and specific procedures (Earl, 2001), knowledge management is an activity through which an operational system can be established.

Besides the business objectives involved, this system focuses on enabling managers to achieve results in terms of manufacturing SME's levels of performance and competitiveness. This development of the individual also has great benefit for the organization in general (Bernal, Fracica & Frost, 2012; Aguilera, Sandoval, Torres & Rodríguez, 2013).

From a strategic point of view, knowledge management requires the interrelationship between implicit and explicit knowledge in all intellectual activity and learning. This allows individuals to find and make collaborative use of knowledge as a group in the interest of ensuring that organizations are seen to benefit from these types of individual actions (Bernal et al., 2012).

From the point of view of many companies, knowledge management is the intentional and systematic strategy in which intellectual capital is integrated into business activities with the aim of contributing to the organization's performance and competitiveness (Bergeron, 2003; Črnjar, 2006).

Being of intentional and systematic characters, knowledge management, the administration of human and technological resources, work systems, and other organizational structures all enable companies to optimize their resources, as seen in their contribution to the innovation required by the company for improved performance.

For this, the generation of knowledge and its appropriate use enables SME manufacturers to achieve an improved level of development and use of resources.

This is so that the operational systems will benefit in that they are able to rely on an accumulation of knowledge generated by the individuals that form part of the company, which will in turn facilitate the work of any other individual working within the same company (Dalkir, 2005).

The basic objective of knowledge management is to develop excellence in a business, and to work to ensure that this type of organization is competitive in the market.

For this, it is important to ensure that knowledge is a key element within the organization, guaranteeing its performance and position in these ever more demanding markets. In this sense, knowledge management should consider the following elements:

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The efficient development of new and existing knowledge, taking into account the strategy of the organization and the objectives of the individual employees; the selective distribution of new knowledge and the transfer of knowledge to other employees; an efficient distribution of knowledge, such as the information given to all those within the organization; and, the optimal use of the knowledge generated (Črnjar, 2006). For the companies and the individuals involved, knowledge represents a way of having intangible assets whose value depends on how they should be put into practice. This is depends on the business policies and practices that enable this knowledge to acquire specific value for both the institution and the individual.

Knowledge is an important element to consider in terms of business performance, which leads to the consideration that the measurement of knowledge management is not an exact science, as in the case of accountancy or the basic sciences. This measurement should, therefore, be broad and conducted depending on the sector on which the knowledge management study is focused (Davidson & Voss, 2002; Crnjar, 2006). It is important to emphasize that, on effectively taking advantage of the benefits of knowledge management, organizations and especially manufacturing SMEs find it easier to become competitive in that there is an added value to human capital, as much for individuals as the companies themselves (Pascale, 2005; Wiig, 2009). In this sense, among the benefits that companies can obtain through knowledge management are innovation and development, the improvement and optimization of intellectual capital, the increase of knowledge as well as the abilities of the individual, and with these improve both internal and external client services (Despres & Chauvel, 2000; Davidson & Voss, 2002; Crnjar, 2006; Aguilera et al., 2013).

Through the application of knowledge management, a business system can augment its profitability, create a harmonious environment between the employees and ensure the sustainability and competitiveness of the organization. Knowledge management initiatives can create added value for the organizations, based on the fact that the use of knowledge is a key element that can improve the companies' performance and competitiveness, providing a significant benefit for both clients and individuals within the same organization (Sveiby, 2004; Crnjar, 2006; Aguilera et al., 2013).

Knowledge management within an organization naturally involves people, technology and processes. It is important to emphasize the general consensus that knowledge management depends on the context, the processes and forms of execution of other functions and processes. This leads to the emphasis that there are important reasons that a company should promote the following (Navas & Guerras, 1998; Vázquez, Sánchez & Rodríguez, 2012):

1.- The creation of exponential knowledge benefits for those learning and developing themselves from the same source, with an impact focused on giving them a greater level of performance in the activities generated within the business.

2.- Develop the capacity of businesses to rapidly respond to clients, the creation of new markets, the development of new products and new dominant technologies, based on the fact that knowledge management takes advantage of and maximizes concentrated information for internal use within the organizations.

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3.- Build mutual confidence between employees and the knowledge held by their manager to the point where, finally, there is an expectation of incrementing and encouraging cooperation in terms of time management for whichever of the tasks assigned to the individuals within the organizations.

4.- Manage both the knowledge generated by the experts in a field and the retention of the same, with the aim that the information obtained be of advantage to the business dynamic of the organizations in which said information is concentrated.

In this way, the following hypothesis is posited: (Despres & Chauvel, 2000; Davidson & Voss, 2002; Crnjar, 2006; Aguilera et al., 2013)

H_2: The competitiveness of manufacturing SMEs in Aguascalientes is positively and significantly influenced by knowledge management.

3 Theoretical model

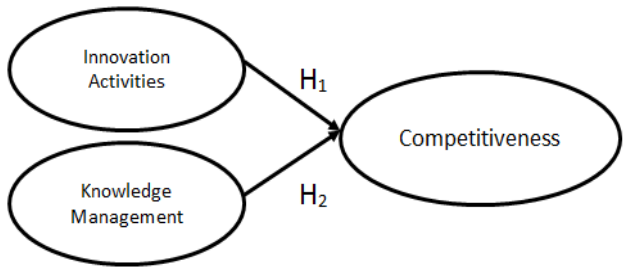

Figure 1

3.1 Materials and methods

An empirical study was carried out with a quantitative focus of a correlational and transverse type, through multiple linear regression analysis.

The instrument on which the study was based comprises 52 items measured on a Lickert type scale from 1 to 5, which registers from total disagreement up to total agreement, and which was conducted with the managers at manufacturing SMEs in the state of Aguascalientes, México.

The study described above analyzed the use of knowledge management and innovation activities in manufacturing SMEs in Aguascalientes for improved business competitiveness. The 2014 Business Directory database from the Sistema de Información Empresarial de México (the Mexican Business Information System, or SIEM) in the state of Aguascalientes (Department of Finance, 2014), was taken as the reference for the development of this study, in which are registered 5,209 businesses until 14th February of the same year, of which 793 pertain to the industrial sector, and of these, 250 are SMEs. This study, using a simple random sampling method with a 95% confidence level and a 5.1% margin of error, applied a personalized survey style measurement to a sample of 150 SMEs from the industrial manufacturing sector in Aguascalientes. Said information is presented in Table 1, which makes reference to the research design.

Characteristics	Research
Population*	250 Small and Medium Enterprises
Graphic Area	State of Aguascalientes, México
Object of the study	Manufacturing SMEs of between 11 to 250 workers
Information collection method	Personal interviews with managers
Sampling method	Simple random sampling
Sample size	150 SMEs
Sampling error	±5.1% error, 95% confidence level (p=q=0.5)
Field work	September to October 2012

Table 1

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For the preparation of the measurement instrument, 3 blocks were used: innovation activities, knowledge management, and competitiveness.

To measure innovation activities, innovation in products, innovation in processes, and innovation in management were considered (Zahra & Covin, 1993; Kalantaridis & Pheby, 1999; Frishammar & Hörte, 2005; Madrid-Guijarro et al., 2009).

The study had a reliability level of .890, in line with Cronbach's alpha coefficient, as consistency between the variables can be interpreted (Nunnally & Bernstein, 1994).

With respect to knowledge management, the four dimensions proposed by Bozbura (2007) were considered: 1) employee training, measured using a scale of 5 items adapted by Bontis (2000) and the OECD (2003); 2) policies and strategies for knowledge management measured with a scale of 13 items and adapted by Bozbura (2004, 2007); 3) the creation and acquisition of external knowledge, measured with a scale of 5 items adapted by the OECD (2003) and Bozbura (2007); and 4) effects of the organizational culture on knowledge management, measured with a scale of 4 items and adapted by the OECD (2003) and Bozbura (2007), which has a reliability level of .921, in line with Cronbach's alpha coefficient, as consistency between the variables can be interpreted (Nunnally & Bernstein, 1994).

With respect to measurement of competitiveness, the three factors presented by Buckley et al. (1988) were taken into account:

1) financial performance, measured by a scale of 6 items;

2) cost reduction, measured by a scale of 6 items; and

3) the use of technology, measured by a scale of 6 items, with a reliability level of .922, in line with Cronbach's alpha coefficient as consistency between the variables can be interpreted (Nunnally & Bernstein, 1994).

The instrument was submitted to a statistical reliability test, which was carried out using Cronbach's alpha coefficient with the constructs based on the instrument. The results drawn from said test being .952, which can be used to interpret that the study is reliable and that there is consistency between the variables (Nunnally & Bernstein, 1994).

4 Results

This study aimed to verify the applicability conditions of the multiple linear regression analysis applied to the research model in order to determine the influence of knowledge management and innovation activities on the competitiveness of manufacturing SMEs in Aguascalientes. To this end, normality, homoscedasticity and lineality tests were carried out, finding that the variables which are the objects of this study do not present any type of normality, homoscedasticity and lineality problem. What proceeds from the multiple linear regression analysis conducted using the software SPSS Statistics V21 is presented in Table 2, which gives a model summary, which was used to obtain an R value of .806, and an R^2 value of .650. This indicates that, together, the variables of knowledge management and innovation activity are matched by 80.6% with the competitiveness of manufacturing SMEs in Aguascalientes, and that, together, they explain 65% of the competitiveness of manufacturing SMEs in Aguascalientes.

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Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.756[a]	.571	.568	.526	
2	.806[b]	.650	.645	.477	1.485
a. Predictor variables: (Constant), INNOVATIONACTIVITY					
b. Predictor variables: (Constant), INNOVATIONACTIVITY, KNWOLEDGEMANAGEMENT					
c. Dependent variable: COMPETITIVENESS					

Table 2

From the results of the linear regression presented in Table 3, it can be concluded that around 62.6% of the competitiveness of manufacturing SMEs in Aguascalientes is due to innovation activities.

This significantly influences competitiveness, with a value **t** of 11.643, to a level of significance of 0.001. In same way, the knowledge management variable influences the competitiveness of the manufacturing SMEs in Aguascalientes by 30.9%, with a value t of 5.738.

Together, innovation activities and knowledge management explain 64.5% of competitiveness, with a value F of 136.297, which is significant for its value of $p < 0.001$. In terms of the collinearity statistics, an FIV of 1.214 was obtained, which indicates that the model does not present multicollinearity problems due to the proximity to the number one (Hair, et al., 1998).

Variables	Competitiveness
Innovation Activities	0.626*** (11.643)
Knowledge Management	0.309*** (5.738)
Adjusted R^2	0.645
F- statistic	136.297***
Highest FIV	1.214

***P < 0.001
The value between parentheses represents the value of "t"

Table 3

The model has also been validated by dividing the sample into two sub-samples and, on being run with the two sub-samples, the results obtained are similar in terms of R^2, due to there being no more than a 10% difference between these and the original sample (Hair, et al., 1998).

According to the results obtained, equation Y, which represents the competitiveness of manufacturing SMEs in Aguascalientes, is presented below.

Competitiveness = β_0+ (β_1*innovation activities) + (β_2*knowledge management) + e

With the objective of presenting anomalous observations, Figure 2 shows the studentized residuals and whether there are data that serve as outliers. These are presented in the upper part of the graph above the red line, and below the red line in the lower part, which shows the limits of the two standard errors.

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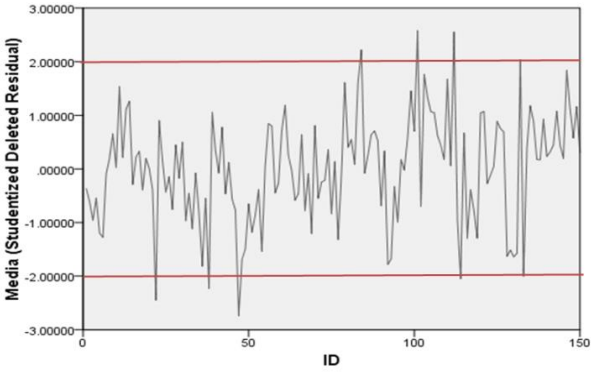

Graphic1

Therefore, the results obtained in this study verify its hypotheses. Regarding H_1, the results ($\beta = 0.626$, $p < 0.001$) indicate that innovation activities have significant effects on the competitiveness of manufacturing SMEs in Aguascalientes. This is due to the fact that innovation activities positively influence the competitiveness of manufacturing SMEs in Aguascalientes by 62.6%, and that, therefore, H_1 is accepted. With regard to H_2, the results obtained ($\beta = 0.309$, $p < 0.001$) indicate that knowledge management has significant effects on the competitiveness of manufacturing SMEs in Aguascalientes. This is by virtue of the fact that knowledge management positively influences the competitiveness of manufacturing SMEs in Aguascalientes by 30.9%, and that, therefore, H_2 is accepted.

5 Conclusion

In an ever globalized environment, it is important to be prepared to face the challenges of a dynamic, and even unstable, market. Aspects such as innovation and knowledge management represent factors of great importance to the competitiveness of organizations, and, considering the factors shown here, represent a more effective way of confronting the challenges posed by the external environment.

In terms of innovation, great interest in this area has been awoken in researchers, who have taken it into consideration as part of their research, reaffirming it as a determinant in business performance and an influence on competitiveness, a reality shared by manufacturing SMEs in Aguascalientes. The results obtained in this study allow the inference that innovation activity positively influences the competitiveness of the sample of SMEs from the manufacturing industry featured here.

Within innovation activities, it is possible to emphasize the importance of the intervention of specialized external consultancy as an agent of innovation performance, which has repercussions on the competitiveness if the company.

Owing to their high level of specialization in particular themes, specialized external consultancy services, also known as "outsourcing", commonly have greater knowledge of the current situation in the industry itself, which is then manifested in both the organization in question and others. These consultants also provide a more objective perspective, as well as maintaining up-to-date information and future trends useful for the decision-making process, enabling the explosion of innovation activities in SMEs.

On the other hand, SME managers must maintain an awareness of the importance of the generation and consolidation of knowledge in various functions and processes in the company. This enables the motivation of employees in order that the innovations developed are converted into useful knowledge for the organization.

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Moreover, innovations can be transmitted to colleagues horizontally, diagonally and vertically, both on descending and ascending axes, without leaving to one side their transfer to new staff, who will be able to apply this new dexterity to their functions and facilitate their incorporation into the company.

Finally, it is relevant to emphasize the necessity of establishing mechanisms, through policies and programs, which facilitate and incentivize the generation and development of knowledge. This is with the objective of ensuring that this is consolidated in the company and that those employees who possess this knowledge achieve permanency in their post, and, in the case of retirement, the knowledge generated is passed on and continues being developed in the company.

6 Limitations

Within the limitations, it should be emphasized that the surveys were answered from the point of view of managers from the companies, which is likely to have lent subjectivity to their answers. Furthermore, the quantity of companies studied may not be representative on comparing them with all the companies in the manufacturing industry in the state of Aguascalientes, which is only slightly above thirty percent.

Future research could evaluate the possibility of widening the focus of the study, considering that, with companies of different dimensions, a comparative industrial analysis can be carried out in other geographic areas and/ or sectors of production in order to increment the validity of the theoretical model used. Finally, it is advised that new constructs are established with the variables used to amplify the results and compare them with the conclusions presented in this article.

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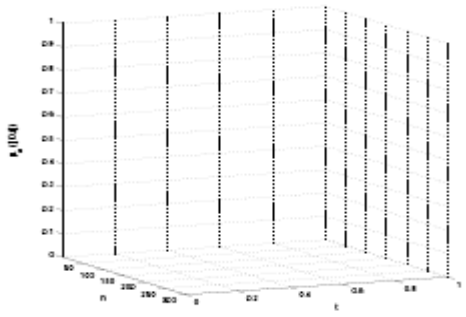

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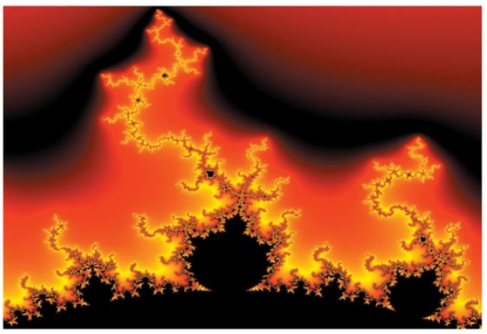

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