

**MENDEL UNIVERSITY IN BRNO**

Faculty of Regional Development and International Studies

**Support of education for the knowledge-based  
economy in Mexico**

Diploma thesis

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Brno 2015

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## **Abstract**

Cvernová T. Support of education for the knowledge-based economy in Mexico.  
Diploma thesis. Brno, 2015.

The aim of this thesis is an analysis of the educational system in Mexico, the role it plays in the knowledge-based economy and the country's ability to compete globally.

The practical part of this thesis is focused on a comparison of the knowledge-based economy in Mexico with Latin American and OECD selected countries. The emphasis is placed upon education. The case study compares public and private education in Mexico and their support to the knowledge-based economy.

**Keywords:** education, knowledge-based economy, Mexico

## **Abstrakt**

Cvernová T. Podpora vzdělávání k ekonomice založené na znalostech v Mexiku.  
Diplomová práce. Brno, 2015.

Cílem diplomové práce je analýza vzdělávacího systému v Mexiku, jeho role v ekonomice založené na znalostech a schopnost Mexika konkurovat na globální úrovni.

Praktická část se v první řadě zaměřuje na srovnání znalostní ekonomiky Mexika s vybranými státy Latinské Ameriky a členy OECD. Důraz je kladen převážně na vzdělání. Případová studie srovnává veřejný a soukromý vzdělávací systém a jejich podporu k ekonomice založené na znalostech.

**Klíčová slova:** vzdělání, ekonomika založená na znalostech, Mexiko

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# 1 Introduction

In the current globalized world the knowledge economy, which replaced an economy based on industry, plays an important role. By developing and effectively managing their knowledge resources, countries thrive better and companies with higher potential knowledge gain a competitive advantage over those with weaker skills. More educated individuals get better paying jobs. The developed countries have already transformed into a knowledge economy, while less-developed nations are still struggling. Therefore, developing countries are especially prone to crisis because they lack knowledge and skills.

This thesis is focused on the support education can provide in knowledge-based economies. Education is considered as one of the most important attributes of development. Without a highly educated population, countries cannot compete in the new era of the knowledge economy. High-tech products, software and pharmaceutical patents play a more important role than commodities or goods with low added value, which are often characteristic of Latin America. Most countries in the region cannot yet be considered developed countries. The major economies such as Mexico and Brazil represent a huge potential to play the role of economic power in the future. That is the reason the author chose Mexico as a potential global competitor for the analysis. The knowledge economy in Mexico, particularly the role of education in the knowledge economy, is a principal point of this thesis. However, does Mexico effectively promote education geared towards the knowledge-based economy?

Mexico must deal with many internal problems which significantly affect its role in the global economy. One of them is rampant corruption in all spheres of public administration. In addition, security of the country is jeopardized by the drug trade, which has a strong impact on Mexico's economy. Mexico is also characterized by

widespread inequality and considerable poverty in certain regions of the country. This fact has a negative impact on access to education and its quality.

The education system is not uniform throughout all populations and regions in Mexico. Significant differences can be seen between rich and poor students, thus causing a variety of pressures and stereotypes. Differences also exist between universities themselves, especially private and public institutions. Therefore, can the Mexican human capital be competitive at the global level? Since 2012, the new government of President Enrique Peña Nieto has spearheaded many structural reforms in Mexico, including a controversial education reform bill. Only time will tell if these measures are effective.

The theoretical part of this thesis deals with the concept of a knowledge-based economy, its measurement and how Mexico is currently leading in the knowledge economy. Further, Mexican development of education and the education system with an emphasis on tertiary education with current education reform are analyzed. The author has selected two universities, one private and one public, which will be used for a case study.

The practical part is based on a comparative analysis and a case study. The analysis is focused on a comparison of the knowledge-based economy in Mexico with Latin America and OECD selected countries. The emphasis is placed upon education. The case study compares public and private education in Mexico and their support to the knowledge-based economy.



## **2 Aim and methodology**

### **2.1 Aim of the thesis**

The aim of this thesis is an analysis of the educational system in Mexico and the role it plays in the knowledge-based economy and the country's ability to compete globally. Nowadays Mexico goes through a series of structural reforms and presents itself as an economic power to the future. However, the country must contend a number of internal problems hindering any progress. Education, an important attribute for development, forms part of these challenges. For the analysis the following hypothesis were formulated:

- Mexico does not reach a level of the knowledge-based economy in order to compete in the global market.
- Mexican higher education institutions cannot meet the increasing demand for high level skills.

### **2.2 Methodology**

For elaboration of this thesis, basic methods such as description, observation and empirical-analytic approach were applied. The objective of thesis is achieved by successive steps that define each phase of the research.

In the first phase of the theoretical part a descriptive method is used for an explication of a term knowledge-based economy, its characteristics and methods of measuring. Mexico's current position in the knowledge-based economy is also outlined. This part is primarily based on English and Spanish literature and internet sources.

The second phase of the theoretical section is characterized by a description of the Mexican education system. The author focuses predominantly on the development of Mexican education, the education system itself and its quality. Last but not least, the theoretical part is formed by description of the Mexican tertiary education which is crucial for processing of the thesis and for the knowledge-based economy in general.

Also in this section a combination of multilingual literature and internet resources is applied. In addition, transformation of the educational process in Mexico is related to the current education reform. Due to a large extent of this reform, only crucial points are discussed.

The practical third phase of this work is focused on the comparative analysis of particular indexes of the-knowledge-based economy created by the World Bank. Mexico is compared with selected countries of the Latin American region and the regional average as well as the average of Organization for Economic Co-operation and Development members where Mexico is included. For the comparative analysis the World Bank data is used and subsequently processed into charts.

The fourth phase is based on the case study analyzing the public and private support to the Mexican tertiary education. This part is constructed on research that was done in Mexico during the author's four-month internship completed during May-August 2014. The research was conducted through participant observation and direct interaction with research subjects. Based on the observation, a questionnaire was created to determine student satisfaction with education in public and private institutions. The research involved 98 participants of the National Autonomous University of Mexico, representing the public sector and 106 participants of the Monterrey Institute of Technology and Higher Education, representing the private sector. Questionnaire results can be rather subjective due to the number of respondents and therefore conclusions drawn from them may not represent the views of Mexico as a whole.

For questionnaire processing, the statistical method two-sample t-test was used. This method was applied on questions based on the Likert scale ("1-5"). This type of scale is suitable for the detection of differences between groups, in this case differences between private and public universities.

The two-sample t-test is used to decide if two population means are equal. A common application is to test if a new process or treatment is superior to a current process of treatment. This t-test compares mean values and variances of two normal distributions based on the knowledge of two independent random samples taken from these layouts. At the 0.05 significance level, we test the null hypothesis  $H_0: \mu_1 - \mu_2 = 0$  against sided alternative  $H_1: \mu_1 - \mu_2 \neq 0$ . Before performing a two-sample t-test we should check that variances conform by the F-test. The F-test decides whether experimental intervention has an impact on the variability of random variables examined in the population. At the 0.05 significance level we test the null hypothesis  $F = \sigma_1^2 / \sigma_2^2 = 1$  against  $\sigma_1^2 / \sigma_2^2 \neq 1$ . The statistical analysis was processed in the software STATISTICA.

### 3 Theoretical background

#### 3.1 What is a knowledge-based economy?

The concept of a knowledge-based economy or knowledge economy has been the result of a strong recognition of the role that technology and knowledge have on economic growth. Currently there is no common consensus to produce an exact knowledge-based economy definition. However, there are some elements that help to conceptualize this phenomenon. The knowledge economy may refer to the following:

*“... one in which the generation and exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the most effective use and exploitation of all types of knowledge in all manner of economic activity”* (DTI Competitiveness White Paper 1998, according to [Brinkley, 2006])

*“The idea of the knowledge driven economy is not just a description of high tech industries. It describes a set of new sources of competitive advantage which can apply to all sectors, all companies and all regions, from agriculture and retailing to software and biotechnology”* (New measures for the New Economy, report by Charles Leadbeater 1999, according to [Brinkley, 2006]).

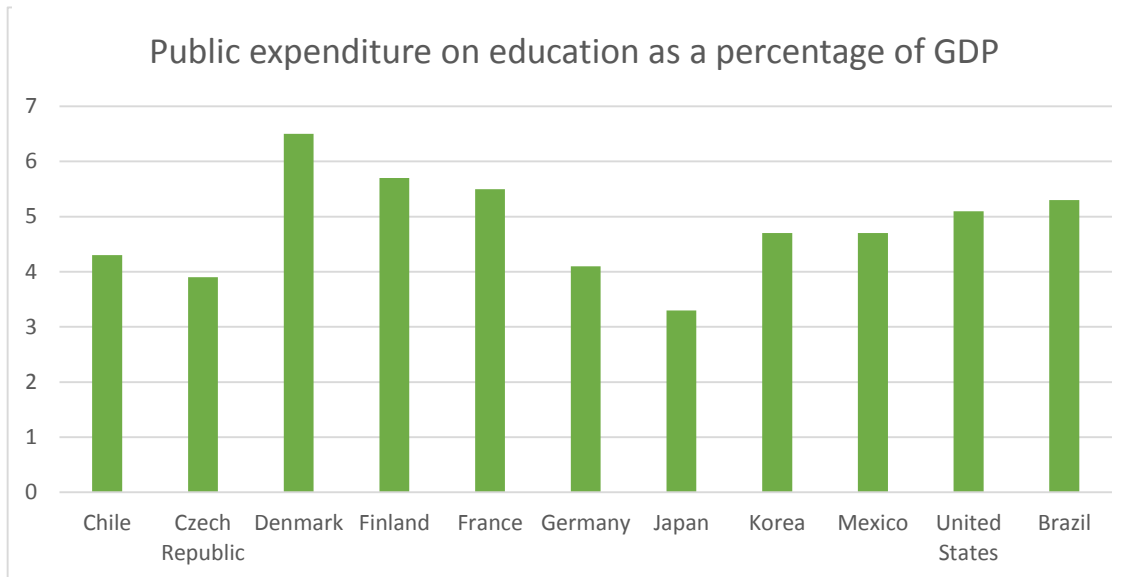
*“Economic success is increasingly based on upon the effective utilization of intangible assets such as knowledge, skills and innovative potential as the key resource for competitive advantage. The term “knowledge economy” is used to describe this emerging economic structure”* (ESRC, 2005, according to [Brinkley, 2006]).

*“The knowledge society is a larger concept that just an increased commitment to R&D. It covers every aspect of the contemporary economy where knowledge is at the heart of value added – from high tech manufacturing and ICTs through knowledge intensive services to the overtly creative industries such as media and architecture”* (Kok Report 2004, according to [Brinkley, 2006])

The Organization for Economic Co-operation and Development (OECD) defines the knowledge economies as "*those directly based on the production, distribution and use of knowledge and information*" (OECD, 1996). It is precisely the OECD that has identified the role of rapid knowledge creation and improving access to knowledge in increasing efficiency, innovation, quality of goods and services and equity (D. Herrera Guilhoux, 2008). According to the World Bank the knowledge-based economy is "*an economy in which knowledge is created, acquired, transmitted and used more effectively by individuals, organizations and communities to promote economic and social development*" (World Bank, 2003).

The difference among conventional and knowledge based economies is the following. In a conventional economy, there comes a moment when increasing investments in capital, labor and raw materials tends to reduce the profit from each new investment. On the other hand, this effect doesn't occur in the economies, industries and enterprises based on knowledge and information. The increasing investments in knowledge (see figure 1) do not lead to a decline in profits, but rather to an increase in benefits with each new investment to use, modify or generate knowledge. This leads to companies adopting knowledge inputs, increasing the demand for more skilled workers, implementing new technologies and generating new knowledge, which is all incorporated into the production process. This is the core of the knowledge revolution in the economic field. (H. Klein, F. Reyes 2005)

Figure 1: Public expenditure on education as a percentage of GDP in selected countries, 2011



Source: OECD Factbook, 2011<sup>1</sup>

### 3.1.1 Characteristics of the knowledge-based economy

The focus of people and organizations pivots toward learning. The knowledge economy consists of networks of innovative organizations and there is a very influential technological force causing high and increasingly growing intensity in the use of ICT educated knowledge workers. It is possible to say that the knowledge economy is an important scientific cooperation and is characterized by increased codification of knowledge. In the knowledge economy, there is a growing share of GDP dedicated to knowledge assets compared to physical capital. This creates a reduced dependency of organizations on the need for physical concentration of resources. Moreover, the knowledge-based economy has not clearly defined limits. Knowledge often extends beyond corporate, industrial and national borders. New technologies make it possible to transform physical organizations into virtual ones. Computers and

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<sup>1</sup> Including public subsidies to household attributable for educational institutions, and direct expenditure on educational institutions from international sources.

the Internet have brought to individual organizations and institutions unprecedented interconnectivity, cooperation and partnership. (Brinkley, 2006)

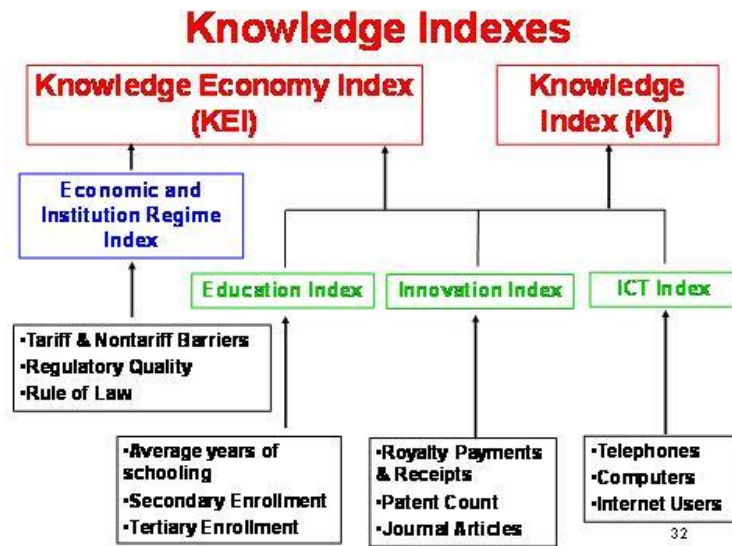
The knowledge economy also brings collaboration, merging and integration of separately functioning economic sectors. Furthermore, in the knowledge economy there exists, in comparison with classical economics, dynamic pricing. Business is conducted in real time without breaks. The knowledge economy has also enabled the creation of communities of customers in which communication occurs on a local and global level. (Brinkley, 2006)

### **3.1.2 The measuring of knowledge**

There can be many ways how to measure knowledge. In this thesis the author decided to use the measurement established by the World Bank. This institution designed the Knowledge Assessment Methodology (KAM), useful for planners and policy makers dealing with national knowledge assessments. The target of the KAM is the evaluation of the readiness of a countries participation in the knowledge economy. In this method, there are over 80 structural and qualitative variables under which the performance of over 140 countries can be measured. Within the framework of the KAM, one can display, for example, simple visual representations that expose similarities, differences, strengths and weaknesses across countries. The KAM also allows one to reveal the economic comparison of each country in several aspects of the knowledge economy. (World Bank, 2008)

This tool has led to a creation of the Knowledge Index (KI) which measures a country's ability to generate, adopt and diffuse knowledge. The KI has been further extended to the Knowledge Economy Index, taking into consideration whether the environment is favorable for knowledge to be used effectively for economic development. (World Bank, 2011)

Figure 2: Knowledge Indexes



Source: World Bank, 2011

The KEI is an aggregate index calculated based on the average of the normalized performance scores of a country or region and demonstrates the general level of development of a country or region towards the Knowledge Economy (World Bank, 2011). There are four pillars of the knowledge economy on which is the KEI based on:



Table 1: Knowledge economy pillars

Pillar 1 <b>Economic and institutional regime</b>	Pillar 2 <b>Education and skills</b>	Pillar 3 <b>Information and communication infrastructure</b>	Pillar 4 <b>Innovation system</b>
The country's economic and institutional regime must provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.	The country's people need education and skills that enable them to create and share, and to use it well.	A dynamic information infrastructure is needed to facilitate the effective communication, dissemination, and processing of information.	The country's innovation system—firms, research centers, universities, think tanks, consultants, and other organizations—must be capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology

Source: World Bank, 2008

### 3.2 Education quality

One can talk about quality of education, whether there is a congruence or consistency between fundamental axes (ideological, political, educational etc.) and whether an inconsistency in the organization of educational appliance is not perceived. In reality however there is consistency between the current overall political project in society and operated educational project. This adjustment defines the existence of “quality”. The loss of quality is perceived or measured through the fact that the definition of unifying principles in society has changed, both social representations as an academic

discourse. But what not has changed is the organization of the education structures and concrete phenomenal aspects. This rupture is experienced as loss of quality, to the extent that what is lost is the social significance of the educational system.

(I. Aguerrondo, 2009)

### **3.3 Importance of tertiary education**

Tertiary education has a direct influence on national productivity that largely determines a country's quality of life and the ability of a country to compete in the global economy. Institutions of tertiary education are consistent with growth strategies based on economic knowledge as well as poverty reduction, as they contribute to; a) train a skilled workforce which includes scientists, professionals, technicians, teachers in primary and secondary education, and future government, business and civil society leaders; b) generate new knowledge; and c) build capacity to global knowledge access and adapt it for local use. Institutions of tertiary education are unique in their ability to integrate and synergize among those three said dimensions. Transformation and sustainable growth in a general economic level are not possible without contribution to capacity building. This is problem of low-income countries which have to face to weak institutional capacity and limited human capital.

(World Bank, 2003)

Research on the dynamics of development driven by knowledge has shown the convergence of four favorable factors analyzed in this thesis: the institutional and economic regime, the infrastructure of information and communication technology (ICT), the national innovation system (NIS) and the quality of human resources in the country. The contribution of tertiary education is vital in relation to the national innovation system and the development of human resources. In this context, there are three important considerations that justify sustained government support to tertiary education: externalities, the issue of equity and the role of tertiary education as a base, and general support of the education system. (World Bank, 2003)

## **Externalities**

Knowledge acquisition and knowledge throughout life both enriches an individual and contributes to society. Benefits for individuals are negotiable on salary and other advantages. Individual education creates positive externalities for society. In addition to raising living standards, GDP growth eliminates criminality in society, promotes participation in public life and affects social behavior. Education is thus one of the factors reflecting in economic growth and competitiveness of the economy. But measuring social returns is difficult because benefits from investment in human capital have an impact over the longer term. However, stocks of knowledge are emphasized as an important “motor” of long-term growth and therefore it is essential to increase investment in human capital. (Z. Vichorcová, 2010)

## **Equity**

Imperfections in capital markets limit the ability of individuals to obtain sufficient loans or scholarships for access to tertiary education, preventing the participation of groups with sufficient academic merits but economically disadvantaged. Students with limited resources, whose financial need is the most urgent, have little access to such credits. (World Bank, 2003)

## **Support of other levels of education**

Tertiary education plays a key role in support of basic and secondary education by strengthening economic externalities produced in these lower levels. It is essential to enhance tertiary education as the quality of basic education improves in a sustainable manner. In analyzing public benefits provided by tertiary education, it is important to draw attention to joint effects of complementarity between tertiary education and lower levels of the education system. (World Bank, 2003)

## 4 Mexico on the path towards the knowledge-based economy

The Mexican economy is underperforming. In the years 1993-2014 the GDP grew on average by 0.63 per cent. With the creation of the program of reforms *Pacto por México* in 2012 the economic outlook has been more positive. Mexican GDP grew by over 2.5 per cent in 2014 with a forecast of 4 per cent in 2015 (OECD, 2014). Although to expect an improvement with the process of structural reform in the short term is impossible. (J. Heath, 2014)

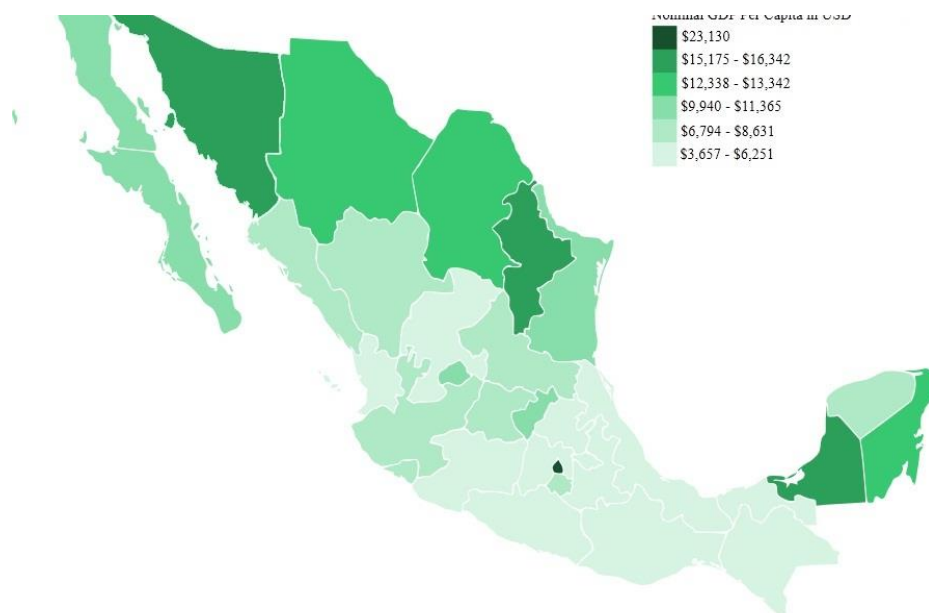
There are many factors which affect and will continue to influence the development of the economy in Mexico: the US economic situation, the price of oil, the performance of foreign markets, uncertainty in international financial markets, weak internal markets, the implementation of austerity measures, lack of structural changes and the security situation. (M. Villarreal, 2010)

The figure below presents the GDP per capita in Mexican states. States near the border with the United States have slightly higher rates. The northern states are more industrialized, urbanized, modern and wealthy. The southern part of Mexico is more characterized by rural and underdeveloped areas with a higher rate of poverty. Just some states of Yucatan can be considered an exception. In summary, developed parts of Mexico includes its northern states, Mexico City and some states in Yucatan and Baja California. (M. Villarreal, 2010)

The globalization of trade, finance and information has significantly reduced the differences in knowledge across states. But the rapid rate of change and problems in many developing areas can lead to the “knowledge divide”. If differences widen, capital and other resources flow just into states with a strong knowledge base. The differences can also be found within states. Rapid improvements in knowledge can harm unskilled workers and, thus, increase unemployment. The technology and technology-oriented organizational changes lead to differences between skilled and

unskilled labor and the greatest impact of this phenomenon is in developing states. Access to education and ICT infrastructure is even more differentiated. In addition, rural and poor areas are at risk of being excluded from the knowledge-based economy. Therefore, Mexico must create an advantageous position in the knowledge revolution and reduce the risks which it presents. (N. Kuznetsov, C. Dahlman, 2011)

*Figure 3: GDP per capita in Mexican States*



*Source: INEGI, Juan Gallegos, 2011*

#### **4.1 Economic and institutional regime**

This sub-index in the knowledge index is composed of three indicators. The first of these are tariff and non-tariff barriers that measure the level of economic freedom. The second indicator is the regulatory quality that evaluates price controls or inadequate bank supervision, as well as the perception of the burden caused by excessive regulation in areas of foreign trade and business development. The last indicator includes the rule of law, the extent to which agents have confidence in compliance with the rules of society. It consists indicators such as the perception of

the incidence of violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. (World Bank, 2008)

The value of Economic and institutional index in a scale 0-10 in Mexico is just 4.88 (World Bank, 2012). In this part of knowledge economy Mexico has the most problems. Widespread corruption in all spheres of governance, great insecurity and high crime rates are major factors. In addition, the Mexican economy was built on the basis of monopolies, oligopolies and concessions in various sectors which were given to friends or close persons to the circles of power, and now on the path to democracy, Mexico suffers from these historical errors (M. Pallares Gómez, 2014).

#### **4.2 Information and communication infrastructure**

This index is composed of three indicators. The first of them is represented by telephones per 1,000 inhabitants, the sum of fixed lines and mobile phones. Another indicator includes computers per 1,000 inhabitants, personal computer access and its use. The last indicator contains Internet users per 1,000 people. This index or pillar is based on nationally reported data. (World Bank, 2008)

In Mexico, this index represents a value 5.59 (World Bank, 2012). The digital gap is still enormous and it is not enough that everyone has internet access if citizens cannot use this information and transform it into knowledge. A computer and Internet access are not sufficient to fulfill this pillar like thousands of empty libraries in Mexico. A computer with Internet access can put the world on a screen but the thirst for knowledge is achieved in a classroom and in a lifestyle that requires it. (J. Castillo, 2006)

#### **4.3 Innovation system**

The innovation system is measured according to three parameters: researchers in the SNI (National System Researchers) per 100,000 inhabitants, patent applications per 100,000 inhabitants and scientific articles and technical publications per 100,000

inhabitants. In order to reach a Knowledge Economy Index, there are 14 typical indicators used and in a scale of 0-10, Mexico averaged 5.59 (World Bank, 2012) The most advanced state is the Federal District and the most underdeveloped is the whole south of Mexico except Yucatan and Quintana Roo. (J. Castillo, 2006)

#### **4.4 Education and skills**

The Education and skills index includes the average years of education (15 years old and above). This variable is used as an aggregate measure of educational standards in the country. In some sources it is also used as a literacy rate, as well as a fundamental indicator for development of population. Moreover, the sub-index consists of the gross enrollment ratio for secondary and tertiary education (ratio of total enrollment, regardless of age, to the population in the age group that officially corresponds to the level of education). (World Bank, 2008) In this index Mexico holds a value of 5.16 (World Bank, 2012) and this is the second worst index value in the knowledge economy in Mexico.

Education is one of the most important indicators in creating, acquiring, adapting, sharing, and using knowledge. Basic education is essential for developing a capacity to learn and use information. Technically based secondary education and tertiary education in engineering and basic sciences is essential for getting to know what is relevant for the companies and the economy, just is using new technologies. Lifelong learning also plays a large role in the knowledge-based economy. Learning just in universities and on the job is not enough. It is necessary to educate yourself in other environments and other ways as well (education courses, self-learning on the internet, etc.). While literacy in Mexico has improved significantly, secondary enrollment rates and even worse tertiary enrollment rates are below the average of Latin America. (N. Kuznetsov, C. Dahlman, 2011)

The education in Mexico for the knowledge-based economy, like the key point of this thesis, will be discussed further and subsequently analyzed in the next chapters.

Table 2: Knowledge indexes in selected countries of Latin America

Country	KEI	Economic Incentive Regime Index	Innovation Index	Education Index	ICT Index
Chile	7.2100	9.0100	6.9300	6.8300	6.0500
Uruguay	6.3900	6.6000	5.9400	5.9900	7.0200
Brazil	5.5800	4.1700	6.3100	5.6100	6.2400
Argentina	5.4300	2.0900	6.9000	6.3600	6.3800
Mexico	<b>5.0700</b>	<b>4.8800</b>	<b>5.5900</b>	<b>5.1600</b>	<b>4.6500</b>
Peru	5.0100	5.4800	4.1100	5.2500	5.1800
<b>Latin America</b>	<b>5.1500</b>	<b>4.6600</b>	<b>5.8000</b>	<b>5.1100</b>	<b>5.0200</b>

Source: Knoema, World Bank data, 2012



## **5 Transformation of the educational system in Mexico**

Mexico has failed to appreciate the importance of education for development. Neither the government nor the Mexican people have come to understand that education is an important tool to achieve economic and industrial development. The problem is that Mexicans still believe that education is not so necessary for development, but there is not development without education. Mexican indifference leads to an inaccessible and poor quality of education which is ensured by government. (M. Terreros, 2014) On the path to become an economic power it is important that primary education be available to all, secondary mainly for those learning technical knowledge and tertiary for scientific and engineering areas. University research is also important for development. (N. Kuznetsov, C. Dahlman, 2011)

### **5.1 Development of education in Mexico**

Education in Mexico has not significantly changed over the past 50 years. Strong unions, lack of accountability, poor performance and central access to local problems characterize the Mexican education. Moreover, there is no support for innovation. While all other industries developed and enhanced their productivity, education has remained unaffected. Among many challenges there is also a lack of parent involvement which is an example of the government central monopoly on education. For this reason it is impossible to recognize different problems throughout the country. (G. Gutierrez Mendez, 2015)

However, Mexico has made significant achievements in access to education in recent decades. The coverage of primary education in Mexico has become almost universal. It reflects a significant improvement of national public policy towards education in recent years. On the other hand, there is still a great number of children and adolescents between the ages of 5 and 17 not attending school, about 211,000 boys and 80,000 girls (WDI, World Bank, 2012). These children don't attend school primarily for agricultural reasons or because of physical disabilities. But there are also

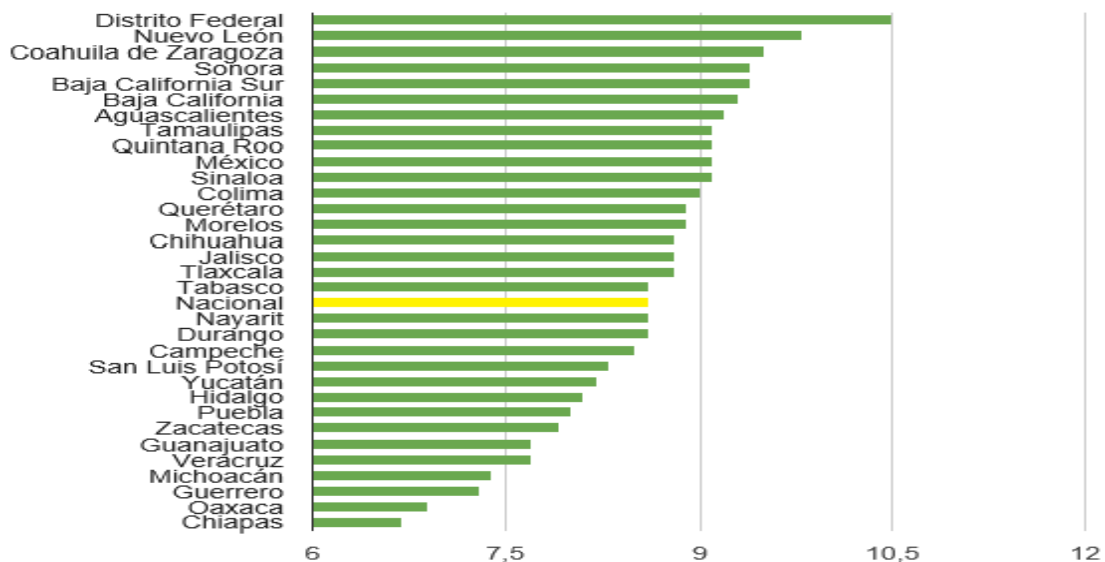
strong disparities and social exclusion in the country which reflect significant gaps mainly in the primary, secondary and upper secondary education levels. These are areas where the most poor and vulnerable members of society have no access.

(G. Gutierrez Mendez, 2015)

Mexico is divided into various regions full of contrasts which are different from one to another, but the education system remains centralized and local problems are not seen. Furthermore, there is an inequality in the supply of services provided in diverse states, in rural and urban areas, as well as in private and public schools. General schools or indigenous schools especially suffer from a lack of services. (UNICEF, 2010)

Illiteracy (see figure 4) is a structural problem closely related to poverty. The highest rates of illiterate population are concentrated in the less-developed regions of the country. From the last census in 2010, the highest rates of illiteracy among the population aged 15 and above were present in Chiapas, Guerrero and Oaxaca, with levels above 16 per cent. (INEGI, 2011)

Figure 4: Illiteracy rate (per cent of people ages 15 and above) in Mexican states, 2010



Source: INEGI, 2011

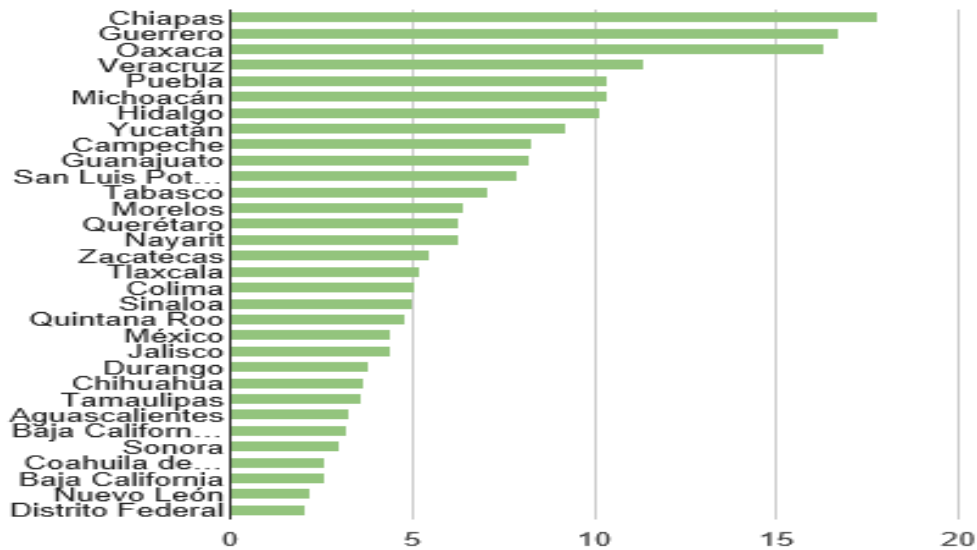
In Chiapas, education has traditionally been the instrument of indigenous policies struggling to assimilate indigenous Mexicans to national culture, without development of their own culture. In addition, a large number of indigenous communities have never had access to public education. For these reasons, education became one of the main challenges of the Zapatista movement (Ejército Zapatista de Liberación Nacional, EZLN).

The EZLN is a movement of indigenous people of the Lacandon jungle in southeastern Mexico and politicized indigenous who have to face its problem of land, living conditions and political rights. After almost a century of protests without any effort of government to recognize their rights, the movement opted for armed struggle in 1994. This movement emerged in the mountains of Chiapas in 1983 and unveiled to the world in 1994 by a military uprising. Currently the Zapatistas still have the same principles of distribution of land and demands for health and education they had at first, but they do not fight and their impact is smaller. (A. Meneses, 2012) The Zapatista education has sought to recover and develop the indigenous worldview and consolidate its rebellious project far away from the official model. (T. Ulloa Ziáurriz, 2009)

The average level of education (see figure 5) shows the level of education of a population. Values for average years of schooling are the lowest for the poorest states: Chiapas, Guerrero and Oaxaca. On the contrary, the capital has logically the highest value.

Although the educational gap among males and females has significantly decreased, girls still have fewer opportunities for school involvement in the poorest regions. This is due to restrictive traditional gender roles with which girls must comply. Such compliance is reinforced by family and social expectation. (T. Ulloa Ziáurriz, 2009)

Figure 5: Average years of schooling in Mexican states, 2010



Source: INEGI, 2011

At present, the challenges for education in Mexico are enormous. It is essential to substantially increase basic education, achieve completion of secondary education, make higher education more of a reality, and improve the coverage, equity, quality and relevance of all types of education. (L. Chehaibar Náder, 2012) Mexico as a potential global player should start to resolve its internal problems in education.

## 5.2 Mexican educational system

The Ministry of Public Education (SEP) is the institution responsible for managing various educational levels in the country since 1921 when it was set-up. After nearly 200 years of independence it has achieved good results in literacy of children and youth, as well as education participation that were unimaginable 50 years ago. But as already mentioned, there are serious problems of equity in access for many groups of the population in different regions. Also, each of states has a similar body that regulates and administers education provided in its territory. (L. Chehaibar Náder, 2012)

Another important institution in the Mexican education system are unions. There exists a strong teachers union called Mexican National Educational Workers Union (SNTE). The union absorbs most of the education budget in Mexico. It is no exaggeration that the SNTE has become an obstacle for general policy in Mexico. An organization that receives over three billion pesos in membership fees is undoubtedly a power in all areas. There is no political party with similar resources. It is also well known that the SNTE controls other organs of state power that have nothing to do with education. Moreover, several states come easily to be governed by union members or their relatives as a result of enormous political influence on the national scene. Additionally, the SNTE came to acquire some kind of autonomy which allows it to act independently on the state or the SEP. (A. Córdova, 2012) Proof that the SNTE is problematical can be the arrest of Elba E. Gordillo, the head of the teachers union, on suspicion of embezzling the union's funds in February 2013 (G. Stargardter, 2013).

Another problem related to the SNTE is that Mexico has a lot of teachers who are unable to teach adequately due to a lack of proper qualifications. Until recently, it was not known how many teachers in Mexico exist nor their teaching quality. There was no control of resources flowing to them. (A. Oppenheimer, 2010) This would change with current educational reform.

Table 3: General scheme of national education system

<b>Educación básica</b>	Preescolar	Preescolar general Preescolar comunitario Preescolar indígena
	Primaria	Preescolar general Preescolar comunitario Preescolar indígena
	Secundaria	Secundaria general Secundaria técnica Telesecundaria
<b>Educación media</b>	Profesional técnico	Profesional técnico
	Bachillerato	Bachillerato general Bachillerato técnico
<b>Educación superior</b>	Técnico superior	Técnico superior
	Licenciatura	Educación normal Licenciatura universitaria Licenciatura tecnológica
	Posgrado	Especialidad Maestría Doctorado

Source: SEP, 2003

Primary education consists of three levels. *Preescolar* level is a program for children four and five years old. *Primaria* includes all schools with grades 1-6. *Secundaria* with grades 7-9 is divided into three schools. *Secundaria general* mostly enrolls non-rural students who are preparing to enter university upon graduation. Contrarily, *secundarias técnicas* are vocational training institutes for students who plan to work upon graduation. *Telesecundarias* are rural schools using televised curriculum to achieve long-distance learning. (N. Kuznetsov, C. Dahlman, 2011)

Secondary education with grades 10-12 includes *bachilleratos* or *preparatorias*, upper secondary schools for students who are going to university and *tecnológicas* to prepare students for a vocational career. Upper secondary students must choose one of four academic paths: physics-mathematics, chemistry-biology, economic-business administration, or the humanities. (N. Kuznetsov, C. Dahlman, 2011)

Tertiary education in Mexico corresponds to higher education in three levels: *técnico superior* (3 years), *licenciatura* (4-5 years) and *posgrado*. The *posgrado* is a level after *licenciatura* and is sub-divided into *especialidad*, *maestría* and *doctorado*.

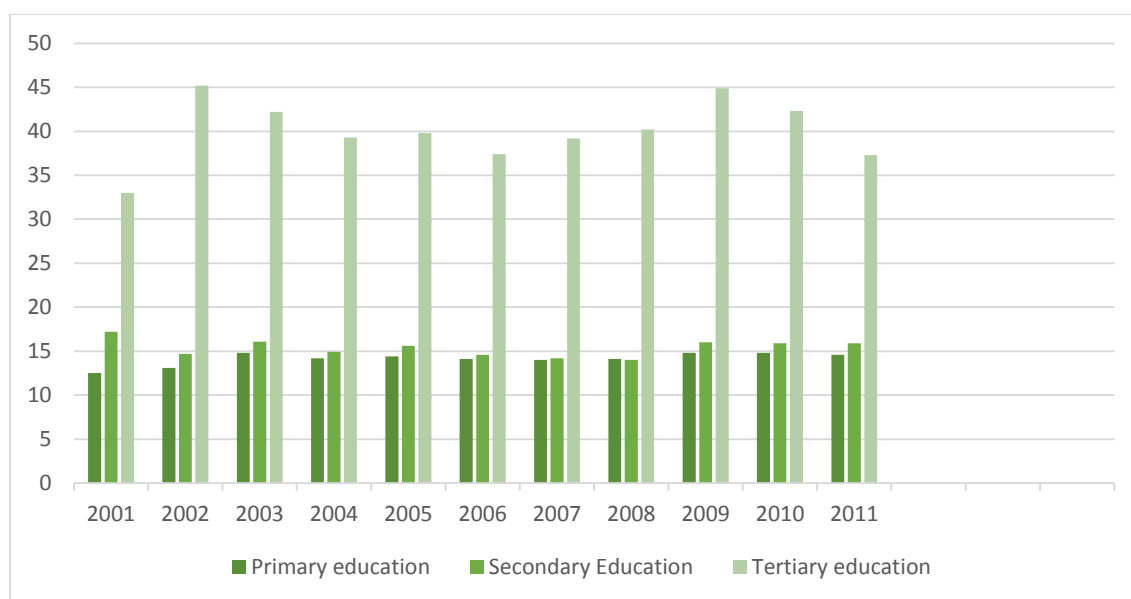
(J. A. Córdova, 2012) By its legal status, there are state-dependent institutions, federal government institutions, autonomous universities and private institutions. Public universities are created by congresses as public organizations with legal personality. They can be decentralized of state, but do not have an autonomy. On the other hand, autonomous universities are decentralized organizations which gained an autonomy from the Union Congress or state congresses. Federal government universities are dependent institutions. Its authorities are designated by the Federal Executive or the executive power of the corresponding state and depend largely on the SEP. (OEI, 2013)

Education policy in combination with the demographic composition of the country has allowed a greater number of children to attend obligatory basic education, mainly at the primary level. But, as mentioned before, indigenous peoples and those living in rural areas are disadvantaged in nationwide basic education coverage. (R. Castellanos, 2013)

An enrollment in secondary and tertiary education (see figure 6) has increased in recent years, but is still insufficient. The secondary education system has similar problems to the primary education system with the difference that secondary education is not compulsory. Although the average number of persons aged 25 to 34 who have not completed their high school decreased to 8 per cent among member countries of the OECD, Mexico is among the five nations with the highest percentage of students with low qualifications, 52 per cent of them have failed to complete their secondary education. (L. Solano, 2015)

The importance of this cycle of study is indisputable, because of its quality depends on the proper training of generations of young people expected to enter the workforce or continue their education as professionals and technicians. However, it is important to note that this level is a formative level which develops essential aspects of the person that will define their life. Nevertheless, there are 10,000 schools in the country without necessary infrastructure. Besides, plans and programs of study do not correspond to job opportunities in the region or state. A fundamental problem of secondary education is that there is no specific training for teachers, no set salaries and their recruitment for hours are not defined as full or part time. (J. L. Almazán, 2012)

Figure 6: Total enrollment in primary, secondary and tertiary level of education in Mexico, 2000-2014



Source: Own work based on SEP, 2015

### 5.3 Education quality control in Mexico

In Mexico, the most significant information source about the quality of education is the yearly exam taken by over six million basic education students. The teachers of these students have applied for the *Carrera Magisterial*, a program that combines



promotion and salary increases to improved academic outcomes in their classes. Another usable source is OECD's Programme for International Student Assessment (PISA) which allows to compare assessments of the quality of education in Mexico and other countries. The aim of the program is to evaluate how well students have developed the knowledge and skills associated with the global knowledge economy necessary for full involvement in society. Students finishing the compulsory education cycle are tested on mathematical, reading and scientific literacy. In this measurement, Mexico as well as other Latin America countries, performs poorly in the exam compared to other OECD countries. Mexico's rank is the lowest among PISA-participating countries and economies in these three indicators in 2012, ranking 58/64 in mathematics, 58/64 in reading and 60/64 in science (OECD, 2012). For this reason, the National Council for the Promotion of Education (CONAFE), established in 1971, created an initiative "quality school" in 2001. The objective of this program is to improve the physical infrastructure and pedagogical equipment of each school. Moreover, the CONAFE provides extra resources to schools that enroll disadvantaged students. In 2002, the Mexican government created another important initiative to improve the quality of public schools called the National Institution of Education Evaluation (INEE) which is focused on the evaluation of basic and secondary education. (N. Kuznetsov, C. Dahlman, 2011)

#### **5.4 Expenditure on education**

The importance of education in Mexico is translated in an increase in education spending during the last two decades. In 1990, expenditure accounted for 4.1 per cent of GDP, while in 2010 this figure amounted to 6.7 per cent. (E. Jaime, 2011) Although the expenditure per student by primary and secondary education increased by 4 per cent between years 2005-2010, this rate of increase is much lower than the OECD average of 17 per cent. In the same period, the expenditure per student in tertiary education increased 5 per cent, but also below the OECD average of 8 per cent. (OECD, 2013)

Although there are no specific studies into how much the country looks to invest in higher education students, the head of Higher Education of the Ministry of Public Education (SEP), Salvador Malo Álvarez, said that in Mexico the return on investment is high but wages are lower than before. Even though wages are lower, for each grade level the youth can earn more than the previous level, i.e. have a better income than baccalaureate and in that sense the remuneration in the country is profitable. However, current income in Mexico is very low and while the government spends more, this does not guarantee that graduates are successful in improving the national development. Due to this situation, universities are qualified as “factories of unemployed” because universities do not have responsibility to solve the economic problems of the country. (J. Rodríguez, 2014)

## **5.5 Equity**

Today more than ever before, the lack of clear and sustained social policy towards young Mexicans is evident. In recent years, the situation of youth has been put on the table for discussion highlighting the lack of public attention. Gaps and strong segmentation for those who have prematurely left the education system, the inhabitants of rural areas (especially women), migrants, students, and the unemployed, greatly hinder the ability to target youth as public actors. Young people (with their different identities) are not publicly seen as a social actor but they are reduced to receive public attention through compensatory programs and by short range. (D. Miller, 2012)

Every third university student in Mexico, on average, has some sort of financial assistance to complete higher education studies. However, this aid is not enough. In 2001, the federal government began to run the National Grants and Scholarships Program for Higher Education (PRONABES), currently one of the largest programs carried out by the SEP, which provides financial support for students enrolled in a public institution of higher education. Nevertheless, the amounts have remained

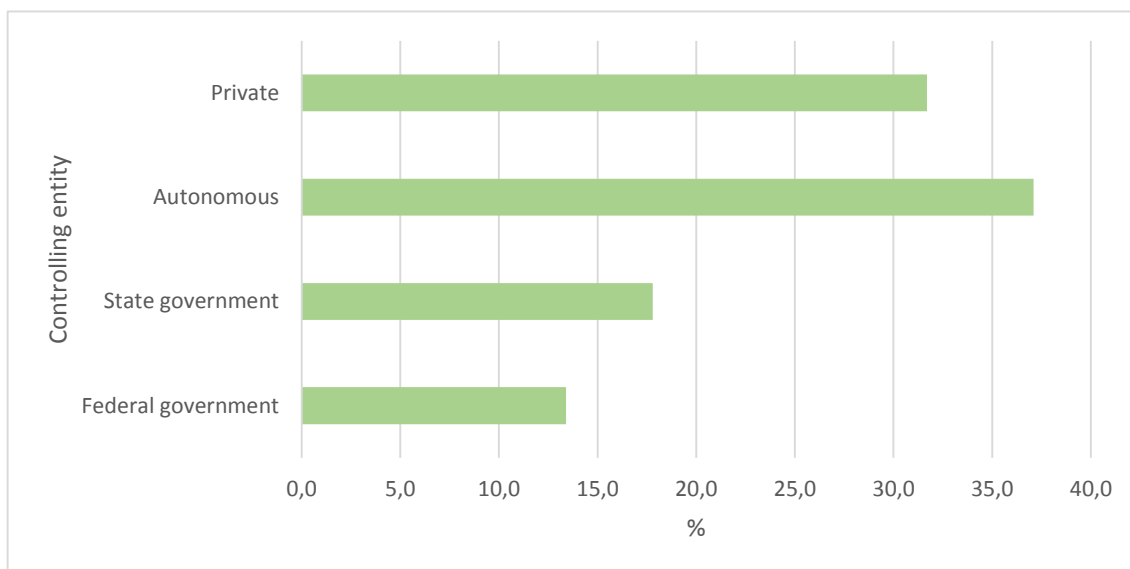
without increase since the program's inception. The amount of scholarship varies according to the school year that student is enrolled in and ranges between 50 to 65 USD per month. This program is probably the most ambitious on a global level in which the government offers very low cost education (not free because it always has a cost) by providing financial support to the population with insufficient resources. A purpose of extending the coverage of higher education is required to strengthen the scholarship system because new populations that integrate into the public higher education institutions will correspond mainly to the most vulnerable economic sectors. (A. Rezc, 2013)

Private education forms a third of all higher education in the country and about 29 per cent is paid for by families but not all can afford to pay these fees. In Mexico, there are about 900,000 private universities validated by relevant authorities and each has different types of financial support. (A. Rezc, 2013)

## **5.6 Demand for private universities**

Until recently, higher education in Mexico was supplied only by the state. This fact established an undersupply of education and rapid demand for private universities. Between the years 1990 and 2000, the growth of enrollment in public schools amount to 32.7 per cent while the enrollment of students in private schools increased by 165 per cent. In the same period, 74 per cent of newly created higher education schools were characterized as private, mostly due to lax government regulations which stimulated more private opportunities. But there are some problems which must be considered to compete in the global knowledge economy; the mismatch between course works, skills and labor market conditions, the geographic distribution of existing and future facilities, the static socioeconomic characteristic of entering students, the quality of higher education and the ties between universities and industry. (N. Kuznetsov, C. Dahlman, 2011)

Figure 7: Enrollment in higher education (%) in Mexico 2011/12



Source: SEP, 2012

## 5.7 Social service

All university students have to fulfil some practice during their studies, so-called *servicio social*. The social service is a mandatory academic period for all students and it is a prerequisite for certification. Its main purpose is to link students with their environment and give back to society benefits in the form of social action that students have received during their studies. It is a set of theoretical, practical, temporary and obligatory activities contributing to the formation of students that allows them to apply their knowledge, skills and abilities to understand the social basis of their academic profile as well as conducting educational activities, research, attendance, broadcast, technological, economic and social development for the benefit of society. (UNAM, 2015)

## 5.8 Education reform

*"We want for Mexico, an education that promotes inclusion, tolerance and peace; a quality education that fosters innovation, competitiveness and productivity of every Mexican"*

Enrique Peña Nieto

With the new office of President Enrique Peña Nieto (EPN) in 2012 there also came structural reform efforts which should positively transform Mexico. One of them is education reform which is a constitutional reform presented within the framework of the agreements and commitments in the Pact for Mexico. It was approved by the House of Representatives and by the Senate in December 2012. In February 2013, the reform was declared constitutional by the Federal Legislature promulgated by the Executive. In September 2013, Peña Nieto enacted reform to the General Education Law, the Law of the National Institute for Educational Evaluation and General Teaching Professional Service Act. With the introduction of the education reform there should begin a new era in the quality of education received by children in Mexico. (Excelsior, 2014) There are three main benefits of the reform:

First, the reform will allow pupils to have increasingly better prepared teachers. It establishes clear rules for merit to be the only way to enter and ascend as a teacher, director or supervisor. In this way, it is ensured that only the best teachers and the most prepared will be able to teach in the classrooms of the country. As an example, for the recently allocated 14,830 teaching posts, the first national competitive examinations for admission to basic and high school education were conducted for the school year 2014-2015. (R. Garduno, 2014)

Second, the education reform can detect areas of opportunity where is necessary to improve. Thanks to the reform, the National Institute of Statistics and Geography (INEGI) implemented the first Census of Schools, Teachers and Students of Basic and

Special Education, forming a clear diagnosis for educational improvement. This census is the initial point to create the Educational Information System and Management and to better understand the needs of primary and secondary level of education.

(F. Reséndiz, 2014) This initiative also proposes that the National Institute for the Evaluation of Education (INEE), has the authority to evaluate the performance and results of the National Education System in the field of preschool, primary, secondary and high school education. (Pacto por México, 2012)

Third, existing programs to support schools are expanded, and new ones created. The reform strengthens the autonomy of school management so that directors, parents and teachers from each school will decide together how to improve their roster and avoid a bureaucratic effort of the union and the education authorities. Now all school teachers themselves can make immediate decisions to make arrangements at each school. (J. Contreras, 2014)

Nevertheless the reform faces some problems since its inception such as the rejection by specialists and teachers of the National Coordinator of Education Workers (CNTE) throughout 2013. There are also the Mexican states which have boycotted the adaptation of the law to their local regulations because the reform brings them more responsibility they are not prepared to handle, among other things. Such states that rejected these reforms belongs to governments of Oaxaca, Chiapas, Michoacán, Sonora, Zacatecas and Baja California. This prevents the harmonization of the laws of each entity with the mandates of the reform and the secondary laws of education and Professional Teaching Service - the most controversial because it modifies the working conditions of the teacher and proposes continuous assessment of them. This is a problem in the structure of Mexican federalism and that the education system is based mostly on clientelism, especially in the allocation of positions. (P. Chouza, 2014)

According to the tertiary education in the frame of reform, there are three programs; A Funding model based on performance criteria in 2000, the National Scholarship

Program and Financing in 2001 and the Integral Programs of Institutional Strengthening. The implementation of these programs seems like a continuation of the programs and funds that the federal government implements to promote education. (L. Hernández, 2013)

## **6 Analysis of the Mexican knowledge-based economy in a global context**

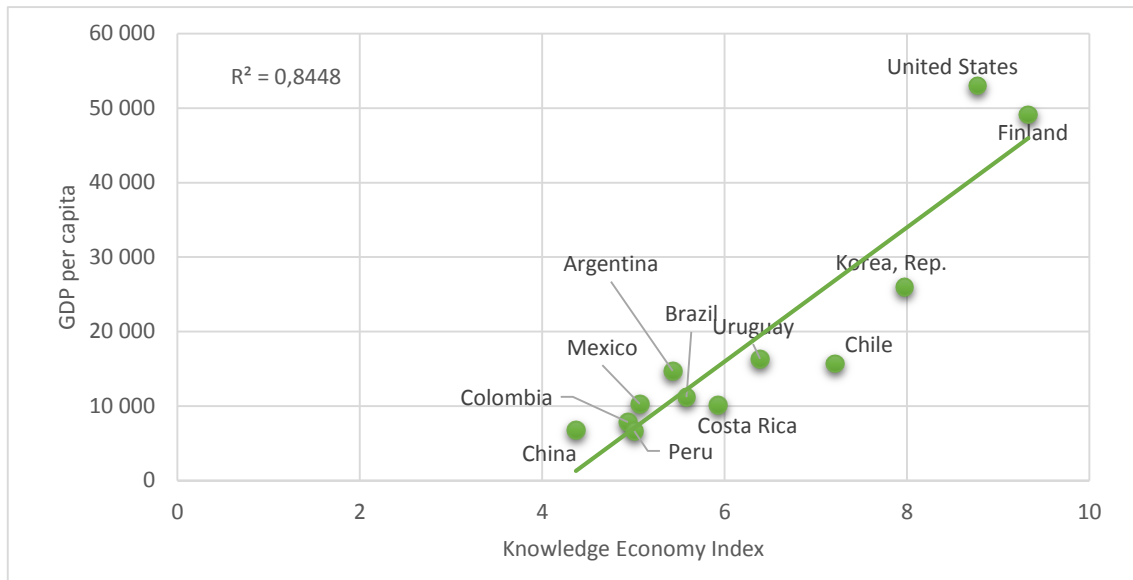
This chapter deals with a comparative analysis of a particular knowledge economy sub-indexes among Mexico and selected Latin American countries. Average index values of the Latin America region are then compared with the OECD average, of which Mexico is member.

### **6.1 Knowledge economy index and GDP per capita**

Intuitively, higher developed economies have higher scores of KEI but less developed countries can use this knowledge-based economy to further development. There is a positive correlation between KEI and GDP per capita. This means that by focusing on improving the 4 pillars of the knowledge economy, this can lead to economic development. Figure 8 shows the correlation between KEI and GDP per capita in selected Latin American countries and stronger economies; South Korea, the United States and Finland. It is obvious that Latin American countries are still lagging behind in the knowledge-based economy with many challenges still to solve.



Figure 8: Correlation between Knowledge Economy Index and GDP per capita (2013)



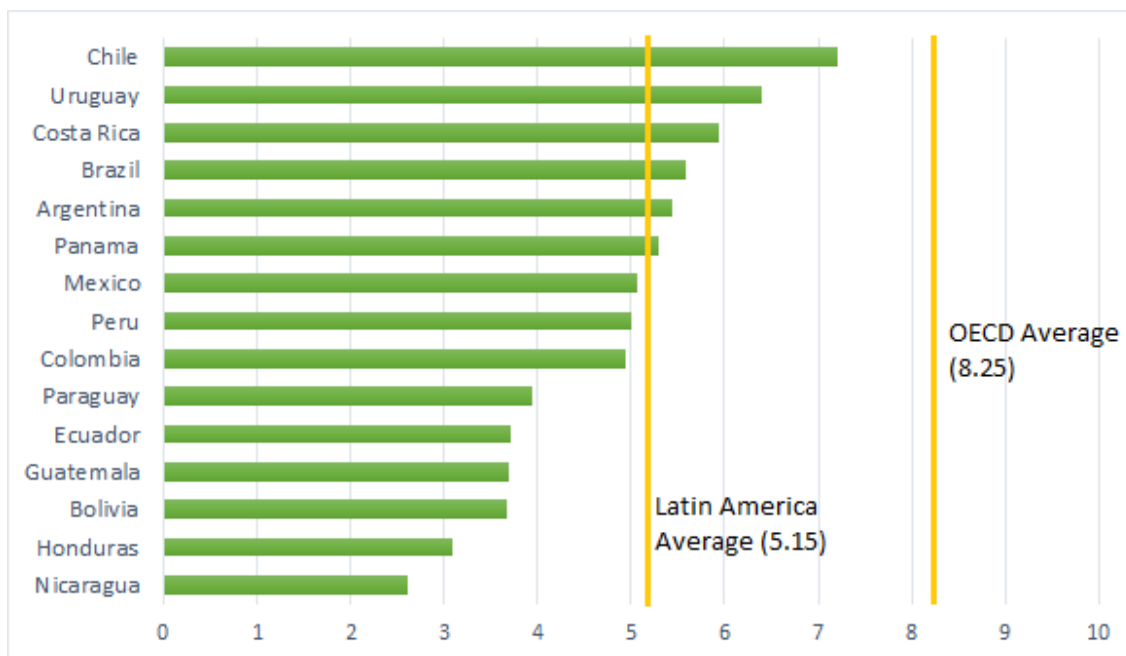
Source: Own work based on World Bank World Development Indicators Database

Figure 9 illustrates the Knowledge Economy Index Scores of selected countries in Latin America with a comparison of the OECD countries average. A chart below demonstrates that Latin American countries, in terms of KEI, do not achieve nor average of OECD economies. In this case Mexico does not exceed the Latin America average. Higher scores of KEI is shown by Chile and as it seems, it has the most advanced knowledge-based economy in the region according to this measure. KEI represents a useful instrument to help improve particular areas of a knowledge-based economy for countries including mainly Latin America and less developed countries.

However, Latin America is a large region with different problems and it is essential to divide regions into sub-regions. Mexico and Central America are closely tied to the recovering United States economy. Moreover, Mexico has improved on a number of fronts in recent years and with current structural reforms and a more open economy, it is expected to continue its economic growth. However, Mexico has to face too many internal problems affecting the economy and society. The second sub-region

represents South America where most of the countries economies are predominantly based on exports of commodities and energy in which they are highly dependent upon and the demand it brings. The third sub-region includes Bolivia, Venezuela and Argentina with problems related to their populist policies. The fourth sub-region is the Caribbean with a current significant role thanks to the recent economic and diplomatic approaches to Cuba by the Obama Administration. (Wharton, 2015)

Figure 9: Knowledge Economy Index Scores: Selected Economies of Latin America



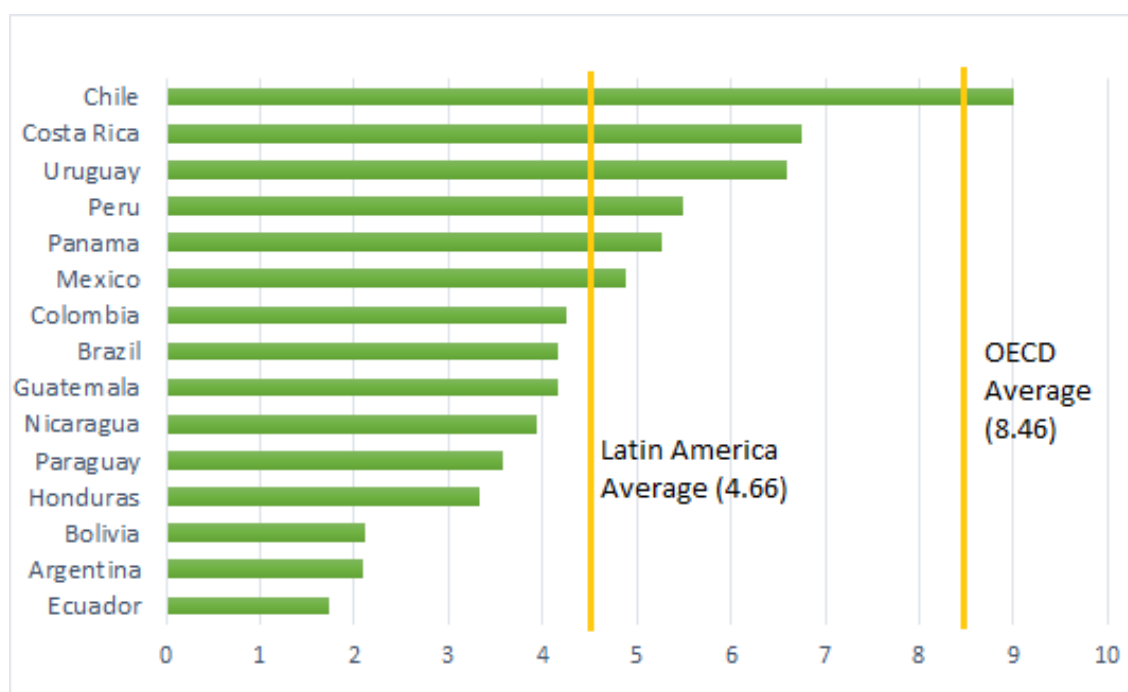
Source: Own work based on Knoema, World Bank data, 2012

## 6.2 Economic incentive and institutional regime

Mexico is situated behind the average of Latin American countries in the economic incentive and institutional regime sub-index but it occupies one of the lowest ranks in the sub-index among OECD countries. For example Chile has the best score of the sub-index in the region. The OECD countries have better regulatory processes with robust legal institutions compared to Latin America. Mexican institutional regulatory structure seems rigid and should be modernized. The government, with ongoing reform processes in Mexico, wants to create higher legal tools necessary to identify and punish dominant market positions in all sectors of the economy, which has been well known during recent decades. For example, companies like Bimbo, Bancomer, Banamex, Aeroméxico, Televisa and América Móvil, among others, are not only suspicious in their size but in their impact and influence on competitive price (M. Pallares Gómez, 2014). With the reform process and government steps in

legislation however, the days are numbered for these monopolies. But as already mentioned, Mexico faces many internal problems. Strong corruption occurs in all spheres of government. In 2014, Mexico occupied 103rd place out of 175 countries in the Corruption Perception Index (Transparency International, 2014) because of drug trafficking and politicians involvement in that, the rule of law is not working effectively. Mexico is one of the countries with the highest crime rates in general. Nevertheless, the Mexican economy, as all OECD economies, is market-oriented. In the last two years with the energy reform, Mexico has opened up to the private sector as well its oil industry. Therefore, this sub-index can move to higher values in the future. The question remains whether foreign companies are willing to invest in Mexico if the country is ridden with many problems (corruption, crime, insecurity, etc.).

Figure 10: Economic Incentive and Institutional Regime Sub-index Scores



Source: Own work based on Knoema, World Bank data, 2012

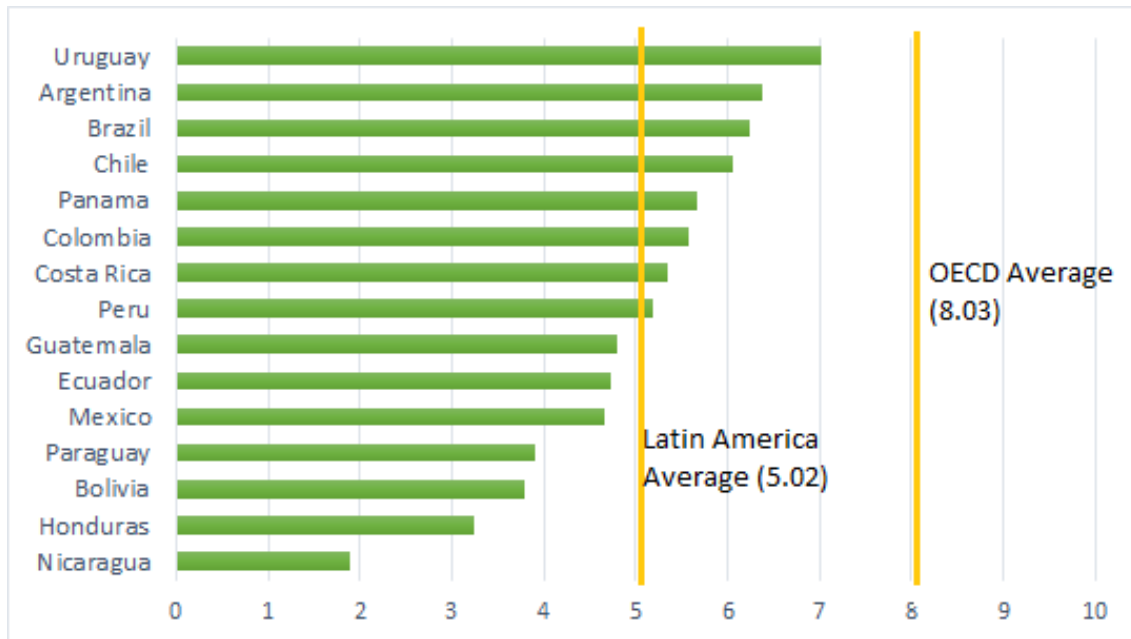
### **6.3 Information and communication infrastructure**

Mexico's information and communication technologies (ICT) sector has developed considerably during the last few decades (N. Kuznetsov, C. Dahlman, 2011) but it does not achieve the average of the region in the ICT sub-index. According to the World Economic Forum, Mexico ranked 79<sup>th</sup> out of 149 countries in 2014, a decrease of 16 positions from 2013 (F. Rubio, 2014).

This fact can be explained by the lack of access to information and communication technologies in many marginalized parts of Mexico. Another problem in which Mexico has dropped in competitiveness against other nations is broadband access. Mexico is last in the ranking of access to mobile broadband but with the telecommunication reform from 2012/13, it is expected to close the "digital divide" (at least access) through measures to correct market failures and deployment of public programs focused on connectivity. (J. Romo, 2014)

Besides, in the field of telecommunications, it is necessary to generate more competition. The state-owned monopoly Telmex, privatized in 1990 (C. Salinas de Gortari, 2014), or Televisa which has more than 50 per cent of the market (A. Martínez, 2015), still complicate the entry of new companies on the market. The reform should destroy this monopoly power.

Figure 11: Information and Communication Technology Sub-index Scores



Source: Own work based on Knoema, World Bank data, 2012

#### 6.4 Innovation system

In terms of innovation, Mexico is behind many of its main competitors in the region with Brazil, Argentina, Costa Rica and Chile which are significantly better in innovation. Mexico is weak in its capability to turn knowledge into business. The number of researchers and scientists is insufficient within Mexico. Although Mexico is the fourteenth largest economy, it contributes only 1 per cent of scientific research (J. Asbun, 2014). Mexico is 79th among 141 nations in the Global Innovation Index (J. A. Lara, 2014) and therefore there must be some urgency to promote businesses based on knowledge and innovation.

There are some reasons for weakness in innovation processes in Mexico. Firstly, an allocated budget is not enough. The country's spending on science and technology reached 0.77 per cent of GDP in 2011, of which 42.8 per cent comes from the private sector, 51.9 per cent from the public sector and 5.4 per cent from institutions of

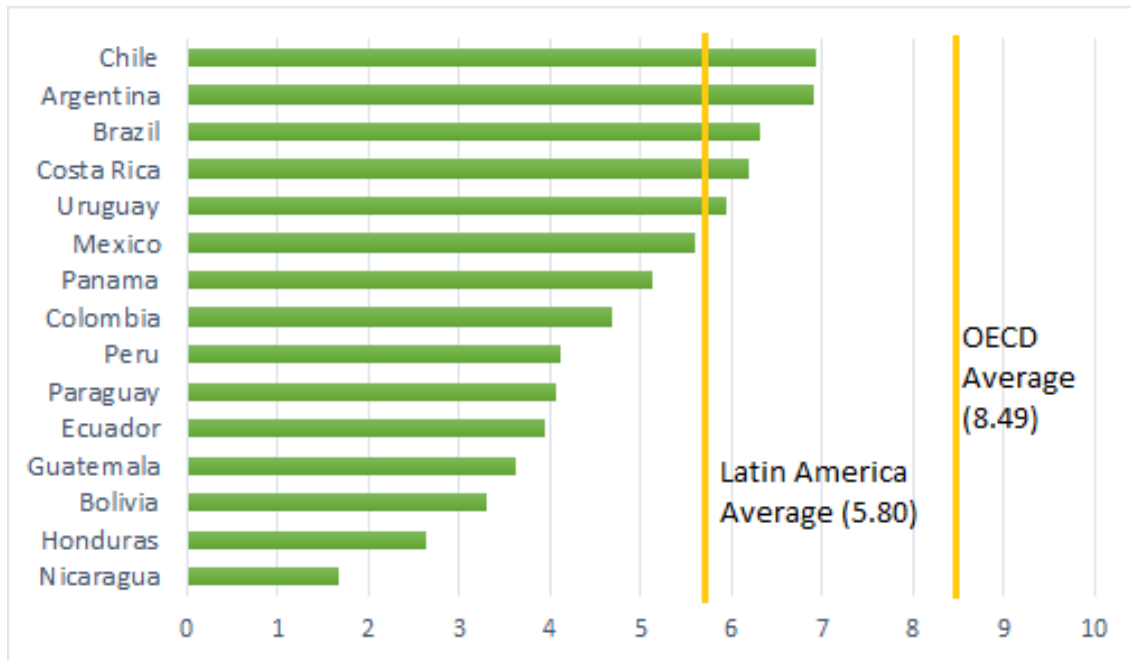
higher education. This means the coverage by the public sector barely exceeds half of the total 0.77 per cent of GDP allocated to scientific research. Secondly, the scientists are prepared, but not employed. There is a low budget dedicated to research, of which 22.7 per cent goes to graduate fellowships, which is a success, no doubt. However, many of those studying master or doctorate programs in science cannot find sufficient incentives to fully engage in scientific and technological development. (J. Asbun, 2014)

One of the signs of the enormous challenge that lies ahead in terms of incentives for innovation is the low growth of Mexican patents granted in Mexico while patents to foreigners granted in the country was over 10,000 in 2008, those granted to Mexicans were 681 according to the Scientific and Technological Consultative Forum. Therefore, not all research conducted in Mexico can be considered as an innovation because normally it is not used by most of the entities to which it is addressed. For that to happen, innovation should provide a better alternative solution to a problem. In this sense, the research is not 100 per cent focused on solving problems in Mexico.

(J. Asbun, 2014)

Within the framework of reform processes in Mexico, the government makes efforts to increase funding for scientific research and technological development. Regards to the future, the intense involvement of productive sectors in scientific research should be encouraged. In addition, the support of researchers and growth of research centers is expected. These changes should increase the number of patents and help develop Mexico's ability to innovate.

Figure 12: Innovation sub-index scores



Source: Own work based on Knoema, World Bank data, 2012

## 6.5 Education and skills

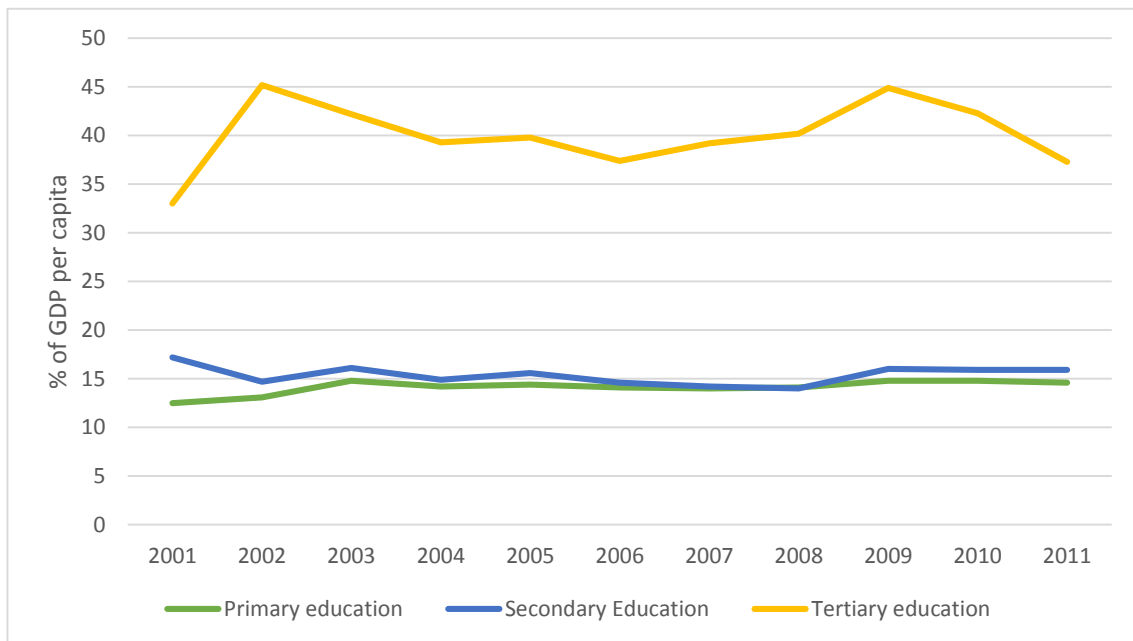
As in above mentioned sub-indexes, Mexico does not occupy a good position in both education and skills sub-index scores. Mexico barely reaches the average value of the sub-index of Latin American countries. So how could Mexico play a global role when it does not have a strong position in education in its own region?

For starters, Mexico must solve many difficulties in its own education. There is a great problem in access to education at all levels. It is necessary that primary education be available to all. Secondary education should be mostly created in a technical direction. Mexican students tend to prefer studying humanities over technical fields (A. Oppenheimer, 2010). This means there is no initiative to promote these fields leading to the knowledge-based economy. Also higher education should be moving into scientific and engineering areas along with strong university research. (N. Kuznetsov, C. Dahlman, 2011)



There is a big gap between government expenditure on secondary and tertiary education. Secondary education (*bachilleratos* or *preparatorias*) has been, until recently, optional. The previous president Felipe Calderón, made secondary education mandatory at the end of his presidency in 2012 but there are not sufficient resources or enough space to cover 100 per cent of demand and many students are not able to finish it despite it being obligatory.

Figure 13: Government expenditure per student as % of GDP per capita in Mexico



Source: Own work based on UNESCO Institute for Statistics, 2015

The challenges for Mexican education represent inequality, quality and evaluation methods of Mexican schools. This evaluation problem is being solved by the current educational reform which has threatened the traditional monopoly in education, typical for developing countries, and could improve the transparency which practically had not existed before. However, the problems of inequality and quality need more time and effort to solve. Mexico still has a low capacity to manage the education system which is mainly to improve primary and secondary education (the

problem of unqualified teachers). It is necessary to support those sectors that will fill up a gap in the labor market and there will be no brain drain<sup>2</sup>, so typical for less developed countries. Also a robust bureaucracy in the system makes its efficiency more difficult. Another problem with learning is during and after studies. The information absorbed from the media is mostly useless and there is barely promotion to stimulate people's willingness to learn.

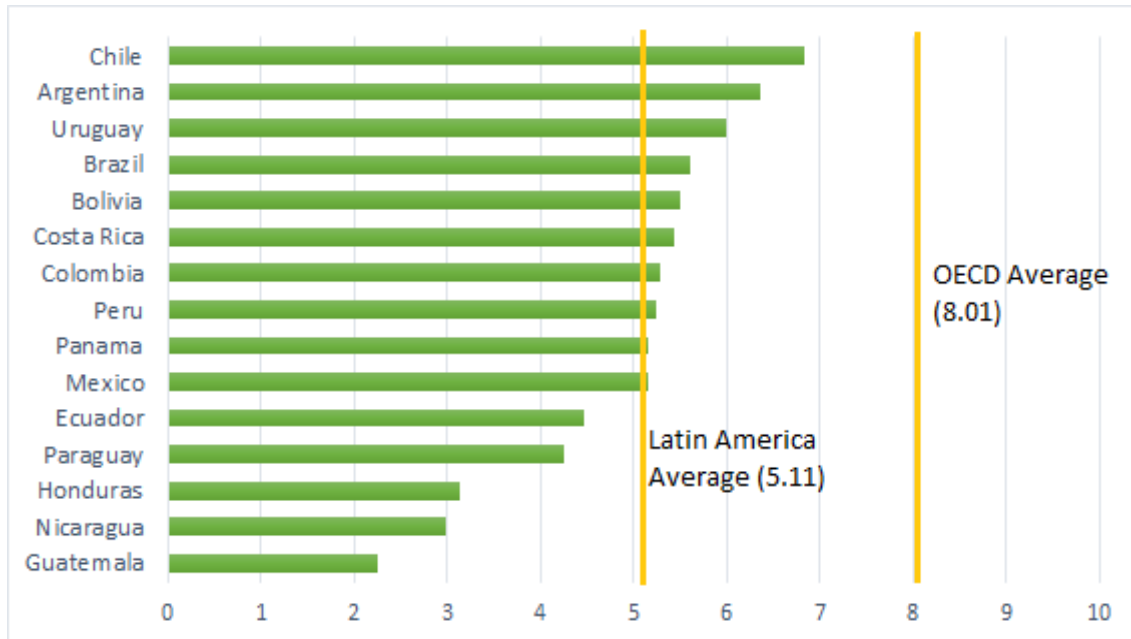
The position of Mexico in the sub-index can also be affected by the quality of the social infrastructure. Social fragmentation, distrust in institutions and corruption have measurable costs and it can be difficult to fix them (World Bank, 2003) but there are some attempts to repair that with educational reform.

According to figure 14, Mexico has a lot to do to catch up with their regional competitors like Chile, Argentina or Brazil and even more work to reach the education level of more economically developed countries in the world. However, thanks to the KEI instrument, Mexico can follow models of more successful countries and get inspiration for creating its own model to improve more problematic areas forming these sub-indexes, which are so crucial for the knowledge-based economy. The effort should be especially focused on education but the education cannot work without a functional social infrastructure. With strong corruption and increasing criminality there are insufficient efforts to change something and it can be almost impossible to reach further development.

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<sup>2</sup> The emigration of highly trained or qualified people from a particular country.

Figure 14: Education and Skills Sub-index Scores



Source: Own work based on Knoema, World Bank data, 2012

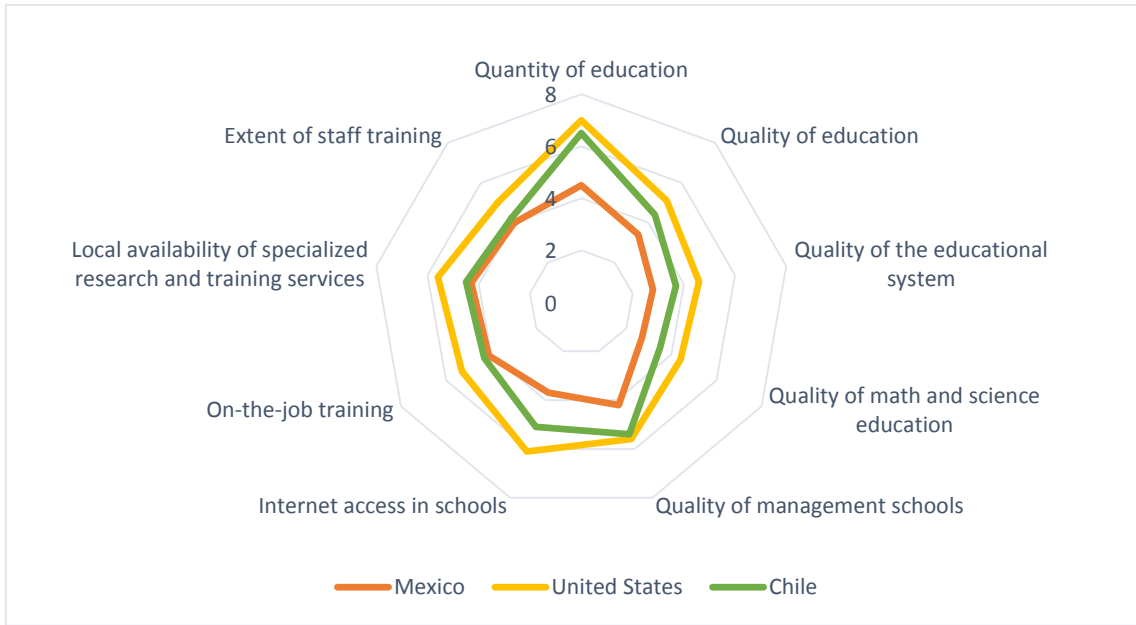
There is a comparison of higher education and skills as a source of competitiveness in three countries (see figure 15). The United States was selected because it belongs to the most developed economies with a strong knowledge-based economy. Also the United States is a Mexican neighbor and with Mexico and Canada share the free trade area in the framework of NAFTA. Chile was chosen because KEI scores showed it has a more developed knowledge-based economy in the Latin American region. It is therefore significant to see what Chile has done different in its own education and what Mexico could learn to improve.

According to the Mexican competitiveness, it is essential to mention that Mexico in comparison with Chile and the United States and other countries in general, it has a lack of competitiveness due to different labor costs. Mexico does not take into account the close relationship between performance and technological capabilities which leads to loss of productivity. (N. Kuznetsov, C. Dahlman, 2011)

Higher education and skills have a great impact on a country's competitiveness. Figure 15 shows some education indicators as a source of competitiveness. It is evident that the US indicators have the highest scores, followed by Chile. Mexico on the other hand has the lowest scores. Quality of education in Mexico represents, apparently, the most problematic field as compared to Chile and the United States. The quality of the educational system and internet access to all schools in Mexico are the main challenges to resolve.

In comparison, Mexico has similar values with Chile in relation to specific issues such as; extent of staff training, local availability of specialized research and training services and on-the-job training. However, this fact has great deal to do with the quantity of education, and in particular the higher education sector in this case. As the chart shows, Chile is very close to the United States value while Mexico's quantity of education is very low. This means there are less enrolled students in higher education in Mexico than in Chile or the United States. The Chilean success proves that success resides primarily in political stability and the rule of law which are extremely problematic in Mexico. In addition, since the 90s Chile tripled its budget on education and increased hours of study in schools (C. Cox D., 2004) which no doubt, among other circumstances, led to success. Mexican education expenditures have increased in recent years, however, it has not substantially improved the quality of education, labor inequality, and study time or enrollment rates. It seems that current education reform improves the educational structure, but not the quality of education.

Figure 15: Higher Education and Skills as a Source of Competitiveness (scale 1-7)



Source: Own work based on World Economic Forum, 2015

## **7 Analysis of the private and public support to the Mexican tertiary education**

### **7.1 Public and private universities**

One of the points of this thesis is to compare private and public education in Mexico. For the analysis two universities were chosen. The National Autonomous University of Mexico (UNAM) is a public institution and the largest university in Latin America. The UNAM formally known as The Royal and Pontifical University of Mexico, was founded in 1551. It is one of the oldest universities in the Americas with the highest academic prestige in Latin America. The university produces more than 50 per cent of the research carried out in Mexico. The organization of knowledge at the colonial university followed the traditional model of European medieval universities with the four power faculties of Theology, Canons, Law and Medicine and the Arts. Clerics and members of the fledgling novohispanic bureaucracy were educated there. With difficulties, the University survived the Independence of Mexico in 1810 and a new contemporary institution was founded in 1910 as the National University of Mexico uniting different national schools. In 1929, the Organic Act was amended to give limited autonomy to the University through the complete autonomy provided in the Organic Law of 1933. This law disassociated it from the Mexican state allowing a normalization of relations between the state and the UNAM. This allowed development through three functions; teaching, research and extension of culture. (R. Marsiske, 2006)

From the nineties onwards, the UNAM noticed a positive reaction in the effort to create a new academic project; agreements and joint activities with the State institutions, private businesses and international cooperation, more attention and resources to the masters and doctorates, the establishment of evaluation mechanism and financial academic control as well as better management of available resources. The internationalization of higher education, the development of academic staff, the

relevance and linkage to the productive sectors and the diversification of funding resources are also important to take into account to enable it to become globally competitive. (R. Marsiske, 2006) At present, the UNAM counts at approximately 338,000 students, 38,000 academics and 15 departments. The researchers at the UNAM make up 30 per cent of scientific articles published by Mexican scholars alone. (UNAM, 2014)

The Monterrey Institute of Technology and Higher Education (ITESM) represents private education with a strong economic power at present. The ITESM was founded in 1943 thanks to the vision of Eugenio Garza Sada and a group of Mexican businessmen headed by himself. They desired to create a vanguard educational institution which over time remained and grew into one of the best universities. Although the university is technological, it currently also covers all fields of study such as humanities and others. (ITESM, 2013)

Through its educational programs, research and development the ITESM wants to form integrate and ethical persons with humanistic vision internationally competitive in their professional field. The ITESM aims to transfer knowledge to promote international competitiveness of enterprises based on knowledge, innovation, technological development and sustainable development. (ITESM, 2015) The university has 31 campuses situated across Mexico. The number of students is approximately 91,000 and there are almost 9,000 academics. (ITESM, 2014)

*Table 4: Enrolled students in academic year 2014/15*

	UNAM	ITESM
Upper Secondary	112,565	27,326
Graduate	201,206	55,211
Postgraduate	28,018	12,587

*Source: ITESM, UNAM official statistics, 2015*

## **7.2 Analysis of the public and private universities**

The National Autonomous University of Mexico (UNAM), a representative of the public sector, is considered to be the largest university in Latin America. On the contrary, the Monterrey Institute of Technology and Higher Education (ITESM) is not so extensive but as a private institution it has the greatest economic power at present. Both universities are major stakeholders which influence the direction of Mexico in the knowledge-based economy.

In the questionnaire survey the following areas have been investigated; cost of studies, quality of education, internationalization of education and the cooperation with public and private sectors. Comparing the size of both universities in the number of enrolled students does not make sense because it is more than clear the UNAM is the largest university and therefore has a considerable quantitative advantage.

### **7.2.1 Study costs**

First of all, it is more important to consider difficulties that students have to face and eventually the facts that prevent them from studying at a particular university. It can be assumed that the ITESM is a private institution therefore access to its higher education is determined mainly for students coming from *wealthier* backgrounds.

In the survey, 64 per cent of students and graduates that were asked responded with their annual costs, including tuitions, transportation and accommodation amounting to more than 100,000 Mexican pesos (around 7,000 USD). Half of these students even said that their annual expenditure is greater than 200,000 MXN (14,000 USD approx.). On the contrary, 80 per cent of students asked from the UNAM responded that they spend less than 50,000 MXN (around 3,350 USD) per year. The majority of students from both universities have to rely on assistance from their parents in the first place.



At the UNAM, 91 per cent of persons reported that they finance their studies with the support of parents. In comparison at the ITESM it is a little lower with 89 per cent.

This puts parents from lower socioeconomic classes into a sensitive position when taking into account that Mexico has a minimum monthly salary equivalent to 161 USD, one of the lowest in region. For example countries such Chile and Uruguay have salaries of up to 411 USD (Red Política, 2014). In Mexico, the minimum wage barely satisfies the normal requirements of householders in the material, social and cultural order to ensure a compulsory education for their children (CAM, 2014). There is an unfavorable financial situation of parents and it is the main reason why many students do not finish their studies. In general, of every 100 children who enter primary school, only 50 finish their high school studies, 21 graduate from university and only 13 receive a title (M. Dimayuga, 2013)

Another important role in financing studies are scholarships. The 35 per cent of the UNAM respondents finance their studies also thanks to a scholarship along with the assistance of their parents. In this group, 16 per cent are university scholarships and 15 per cent are scholarships provided by the government. The ITESM respondents on the other hand represent a share of 41 per cent of those interviewed. This means that at the ITESM, more students obtain scholarships than at the UNAM. Most of this scholarships are however offered by the university. The student can obtain a scholarship at different levels mostly depending on their previous academic records and proven financial needs. Receiving the scholarship can be often associated with a long bureaucratic process which is especially evident at public institutions.

The current education reform in Mexico is setting up some changes regarding to scholarships offered by the government. For example, scholarships will be returned if 50 per cent of required credits are not approved (V. Sánchez, 2013). This means that scholarship requirements are stricter than they were before the reform. This should motivate public studying students to finish their studies successfully.

Moreover, due to the social status of many families in Mexico, there is too low a number of tertiary enrolled students ready to compete in the knowledge-based economy for the future. Students from higher income families extremely outweigh those from lower socioeconomic statuses in the Mexican educational system.

An important phenomenon that the survey has shown is that all the UNAM respondents are students or graduates of just graduate programs. There is nobody studying or finishing postgraduate programs in the questionnaire. On the contrary, the ITESM postgraduate respondents amounted to 23 per cent of responses. This fact can be explained by the following reasons:

Firstly, a socio-economic status plays a great role in the financing of studies. Many students cannot finish their graduate program or study a master program because of this reason. Also, many of these students are not motivated to continue. They are satisfied just with a bachelor degree because it opens the door to the labor market for them. Moreover, approximately after 4 years of supporting their children through university, parents prefer that they start to work and help to increase the family budget.

Secondly, students are not encouraged to achieve higher degrees because of the minimum salary which they can obtain in Mexico. The graduate degree is enough for them because they can be hired by great international companies and work for them. These companies like hiring such a cheap labor force which are primarily fresh graduates. Also, it is not so easy to enroll in a master program and many students are discouraged to try it.

There is another significant phenomenon in the survey according to the question how long it takes to receive a degree after graduation. The high percentage of graduates from both universities received a title more than one year after graduation. At the UNAM there is no one who received a title less than one month after their finishing

studies. However, 48 per cent of graduates obtained their degree one year after studies. In comparison, the ITESM includes 34 per cent of graduates who gained their title after one year since graduation. Nevertheless, there are 11 per cent of persons receiving a degree less than one month after studies. This points to an enormous bureaucracy in the system. Graduates must go through many bureaucratic obstacles in order to acquire a document which proves that they have successfully completed their studies at the university. Due to this long bureaucratic process on the path to be officially graduated, many graduates give it up mainly for labor reasons realizing that they do not need a title to be able to get a job. This however prevents them from getting a better paid job later on and they are sometimes also disadvantaged in their jobs in comparison to colleagues with a title. For example, they must work overtime without adequate financial evaluation which is often justified by their employer that they are in an initial work period.

It seems that the ITESM students have this bureaucratic path easier than the UNAM students but it may be also for the reason that the ITESM students are more motivated to finish their studies with all the obstacles it presents. This is especially because of the high costs they have to pay during their studies. Also, more students of this university continue in master studies so they prefer to obtain their documents as soon as possible.

### **7.2.2 Quality of education**

In Mexico there has been progress in the coverage of higher education among young people which in previous decades was the privilege of just a few. Schooling however is not equal to human capital. In other words, to accumulate years of studying does not guarantee learning. At present, a quality education system should equip its graduates for relevant skills (e.g. English language proficiency, teamwork, leadership, decision-making initiative, self-learning and much more) for their professional life but when it does not, their job prospects are severely limited.

In the last few years, technological innovation in higher education has been closely linked to the development and use of information and communication technologies at different stages of the technological evolution in the country. The UNAM and the ITESM in particular have driven a technological development by creating virtual education systems in order to meet information and knowledge demands of various productive sectors of society as well as new national and international labor markets (M. Moreno, 2010).

For example, the UNAM has the Department of Distance Education which generates and supports development of educational projects through videoconferencing, internet, multimedia, television and video. Other fundamental objectives are training of electronic media, advising on implementation of technology in teaching-learning processes, and promotion and dissemination of distance education in general. The ITESM, through the Virtual Technology University of Monterrey, offers innovative educational models and cutting edge technologies to support the development of Mexico and Latin America. (M. Moreno, 2010)

On the basis of the research, students of both universities were questioned as to what extent they are satisfied with access to media information in their university. By performing a t-test, the null hypothesis was rejected about an equality of opinions on access to information media at universities because a p-value (see table 5) is less than the selected significance level of 0.05, with the same variance of both groups confirmed by an F-test. The t-test demonstrated that in this case there is a significant difference in perception of access to information media between the UNAM and the ITESM respondents. Students from the ITESM are more content with access to media information than the UNAM students.

The ITESM respondent's satisfaction can be explained by better financing of the university. This is because the university is a private institution and it is totally independent of government support like in the case of the UNAM. The ITESM is a

young university and it is therefore driven by competition not only at home but also abroad and therefore the motivation exists to develop a quality education system that is higher and more efficient than in universities which largely depend on financial resources provided by the government.

*Table 5: Access to media information at universities*

<b>t-test for independent samples</b>				
	<b>t-value</b>	<b>p</b>	<b>F-ratio Variances</b>	<b>p Variances</b>
<b>UNAM vs. ITESM</b>	2.8208	<b>0.005</b>	1.0672	<b>0.749</b>

Furthermore, the student's satisfaction with the quality of teachers at their university was also analyzed. A t-test was performed and it was proven again that there is a difference in perception of the quality of teachers between selected universities, although the p-value (see table 6) is not so far from the selected significance level of 0.05. According to the analysis it seems that respondents of both universities perceive the quality of their teachers almost equally and they are more or less satisfied with their teacher's qualities. However in comparison with Chile (see figure 15), as other states in general, the quality of education, also including the quality of teachers, appears insufficient. Although students opinions on the quality of teachers through this questionnaire can be rather subjective. Oppenheimer (2010) claims that satisfaction with the education quality of Latin Americans in general is enormous.

*Table 6: Quality of teachers at universities*

<b>T-test for independent samples</b>				
	<b>t-value</b>	<b>p</b>	<b>F-ratio Variances</b>	<b>p Variances</b>
<b>UNAM vs. ITESM</b>	2.5066	<b>0.0130</b>	1.2695	<b>0.2417</b>

In terms of the education level that universities provide in the area of theoretical knowledge, most of the respondents answered with 69 per cent of the UNAM and 70 per cent of the ITESM students by saying that theoretical knowledge is fully sufficient at their university. Nevertheless, a practical knowledge with which the universities make available is not at such a good level. 40 per cent of the UNAM and 39 per cent of the ITESM respondents suggested that the level of practical knowledge is incomplete. On the other hand, 37 per cent of the UNAM and 43 per cent of the ITESM persons asked consider that the practical knowledge offered by the university is fully sufficient. These extreme differences may be explained by the field of study which the respondents come from. There is some contrast, for example, between humanities and engineering fields which impose different requirements on students. It should be noted however that a good level of practical knowledge should be included in humanities as well as engineering or technical studies for the knowledge-based economy.

As values of these issues came out at these universities almost identically, we can specify that public and private institutions in Mexico provide theoretical and practical knowledge in equal measure but this does not tell us at what level. Such a result requires a deeper analysis of the problem which would go beyond the scope of this work.

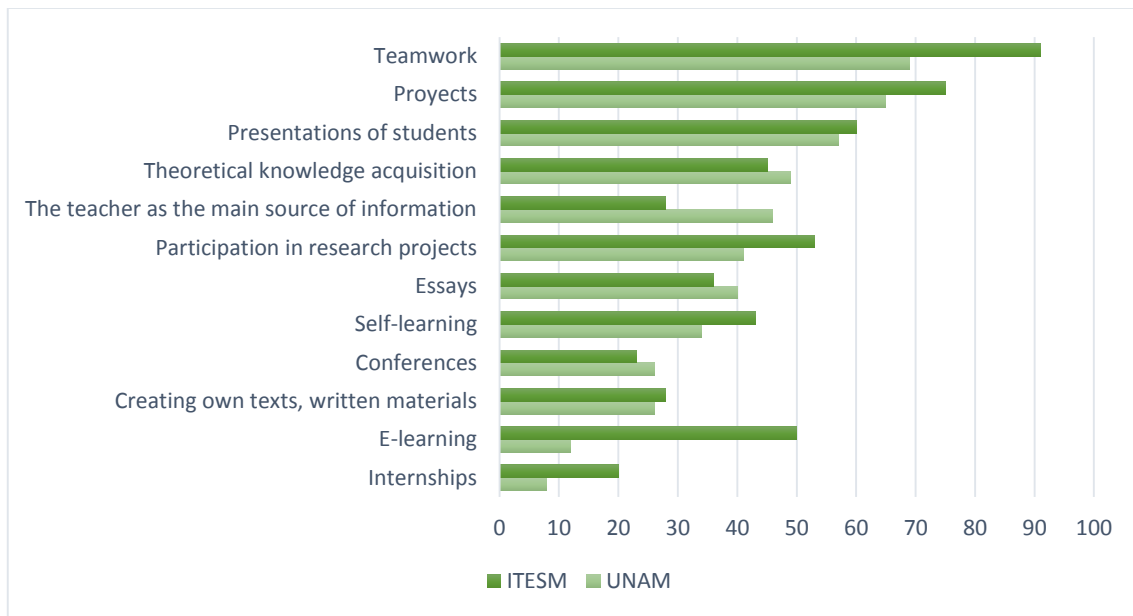
To evaluate the quality of education it is also important to take into account the teaching methods used in universities. Based on the results of the questionnaire (see figure 16), rather tentative due to sample size, we can assess which teaching methods are the most commonly used and the emphasis being placed on them in Mexican universities.

There are some differences between the UNAM and the ITESM. Firstly, a teacher as the main source of information is more typical rather for public institutions than private if we generalize. At present a teacher serves like a provider of information but not as the

main source. The teacher's role is to show their students how to use information. They are more supporters than they are educators. As expected, the UNAM as a traditional institution, uses this method more than the ITESM. Secondly, according to the responses, the participation in research projects is a more common method at the ITESM. Thirdly, E-learning, another important merit for the quality of knowledge barely occurs at the UNAM. On the contrary, the ITESM uses this teaching method extensively. Also, students participating in various internships are more prevalent at the ITESM. This also affirms the fact that the ITESM as a private institution has greater ties with private companies which provide these internships.

The last mentioned methods can be considered very important for support of education for the knowledge-based economy and in this case the ITESM has a predominance.

Figure 16: Teaching methods at universities



Source: Author

Another important characteristic concerning the education quality leading to the knowledge-based economy are language skills and in particular knowledge of English is important for the knowledge-based economy. However English language proficiency is a common weakness in Mexico (G. Rivera, 2012). English is widely taught language at Mexican universities but the problem is to reach the necessary proficiency level. According to the survey, the ITESM students are more satisfied with the level of taught languages than the UNAM students. Davies (2009) claims that upper socio-economic levels of the Mexican society, comprising the majority of the ITESM students, acquire English more rapidly and effectively while lower socio-economic levels of society acquire English more slowly, especially in public universities.

Language proficiency is still insufficient in Mexican universities and more so at the public ones. This is a problem that students are rather limited to because if they are



not able to speak a foreign language they will write badly for foreign journals. Their work can therefore not be classified among professional, foreign or as part of an international globalized elite. This fact greatly undermines the competitiveness.

In addition the survey showed that the ITESM students learn more languages than at the UNAM. For example, 50 per cent of the ITESM respondents learn French whilst at the UNAM this share is just 12 per cent.

### **7.2.3 Internationalization of education**

Currently the globalization presents a set of technological innovations placed in the ICT activities that produce significant changes in a generation of knowledge. One of the characteristics of the globalization process is a dynamic diffusion of knowledge out of universities. In this context, national logic of providing education services and pedagogical practices has changed. The basis on how higher university education was structured in the last few centuries has transformed. There is a new phase of higher education marked by internationalization which includes policies and practices accepted by academic systems and institutions, including individuals, to deal with the global academic environment. Incentive factors for internationalization include commercial advantage, knowledge and language acquisition, improving the curriculum with international content and others. This part of internationalization should form cross-border collaborative arrangements, programs for international students as well as English-medium programs and degrees among others. (P. Altbach, J. Knight, 2011)

According to the international cooperation and mobility, the UNAM has 103 agreements signed with foreign agencies and higher education institutions in 2014 (UNAM, 2014). On the contrary, the ITESM cooperation with foreign universities is more extensive. In 2014 it had signed 569 agreements with universities abroad (ITESM, 2014).

Based on the research, it was found that the ITESM students participate in international mobility programs more than the UNAM students. Just 11 per cent of the UNAM graduates responded that they took part in some international program abroad while the ITESM respondents formed 43 per cent of the answers.

Statistics of both universities shows there is just 2,706 UNAM students participating in some international program in a foreign country and 6,012 students from abroad studying at the UNAM in 2014. At the ITESM the number of students participating in international programs abroad is higher at 10,697. On the other hand, the ITESM receives just 4,892 foreign students. (UNAM, ITESM, 2014) There is a very significant number of foreign students that the university accepts because a growth in the number of foreign students can contribute to economic development. Also public institutions can reap benefits of foreign students to compensate financing by the state.

To dispatch students abroad is also important because students can acquire skills and beneficial experiences for their future as well as for the development of their country. However, the most of them come back to finish their studies and then move to a foreign country because now they are more qualified and experienced. In addition, with prospect of a better salary they decide to stay abroad. In other words this leads to the phenomenon called brain drain. This is a problem of less developed countries in general.

In the questionnaire, comments were mostly provided by the students of ITESM concerning which areas of study abroad was rewarding. Most of the respondents mention that studying abroad improved their language skills. They had an opportunity to compare learning in Mexico and a foreign university. Moreover, the majority considers that teaching methods at universities in the United States or Europe are noticeably better but they do not overtly criticize their home university. However, studying abroad is also deemed to be more practical than theoretical and not all is about memorizing. The students with foreign experience appreciate new

opinions, acquiring new knowledge in their specialties which they cannot obtain in Mexico, participating in foreign media is of great relevance and above all, to obtain some global vision.

Respondents also express their opinion on the quality of teachers. According to their comments, teachers in foreign universities, mostly in Europe, are more committed to their profession while in Mexico they teach just for pay which is then reflected in the education quality. Furthermore, the questionnaire showed that respondents participating in some kind of international program are less satisfied with the quality of teachers than those who have never been to study abroad.

Although the UNAM respondents barely expressed themselves about benefits of a foreign university experience, they consider study abroad as more rewarding than in Mexico. On the contrary, the ITESM respondents who provided many comments about their experience abroad said they are very satisfied with their home university.

It is not only important to receive the greatest number of students for universities but to also send home students abroad in order to acquire valuable experience which could improve the existing education system in Mexico among other things. However it is also crucial to motivate students to stay in their own country.

#### **7.2.4 Cooperation with public and private sectors**

To reach the knowledge-based economy, there must be greater interaction between industry, government and universities. This new system of production flows, transmission and transfer of knowledge between different areas of society shapes the national innovation systems and knowledge networks molded as hybrid organizational configuration (P. Solís, C. Pérez, 2004).

Co-operation between universities and companies makes an important contribution to sustainable economic growth, employment and prosperity of the country.

Universities collaborating with the private sector can help students to acquire

practical experiences and awareness of how it works in a corporate environment. This co-operation can help improve quality scientific research and solve the problems of transfer of knowledge into practice that is often complicated at universities.

Companies profit from co-operation as well because they can obtain qualified staff. Moreover, long-term collaboration will permit firms to improve competitiveness. The government involvement is also essential through this promotion of alliances and joint ventures by buying down initial launch costs. This will guarantee that public-funded research produces economic benefits. (N. Kuznetsov, C. Dahlman, 2011)

The UNAM through the Innovation and Development Coordination works on building strategic alliances with companies that help reinforce academic skills of the university community and establish collaborative networks that favor the development of joint projects, exchange of knowledge, human, financial and technology resources. At the ITESM, moreover, this cooperation with companies has been strengthened with the creation of the Research Department which began with the aim of generating financial resources for scientific projects in the eighties. Incubation cells are the most recent for ties with industry and governments in a fundraising strategy (UANL, 2010).

Students at Mexican universities have to undertake an obligatory social service during their studies as mentioned before. In the survey, the graduate's opinion was asked on whether social service or professional experience helped them to get their current job. The results showed a significant difference in opinion on this question between these universities. The UNAM graduates claim on average that social service helped them to acquire a current job. On the other hand, the ITESM graduates assume this kind of practice did not facilitate them to get a job.

From the comments in the questionnaire it was found that the social service, which students have to fulfill, did not exactly contribute to their academic formation. A professional benefit for students is not therefore foreseen as may have been expected. According to the survey this is the case mainly of the ITESM students. This opinion

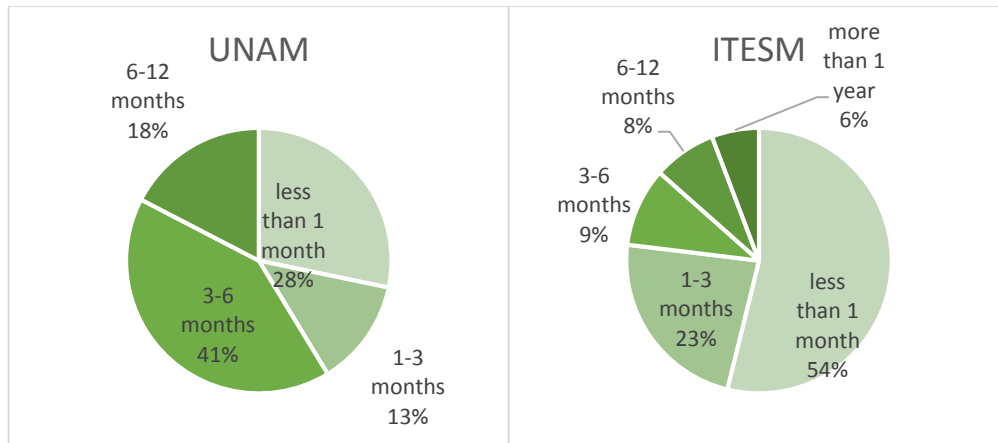
also depends on students expectations during their studies and after that.

Performance of the job not related to their specialization does not mean that students cannot get a job they want in the future. By this argument it is necessary to deny the correlation between performing social service and future employment. It seems that the social service serves, indeed, only as a way on how to reward the university or the state, in case of the UNAM, for providing education and benefits associated with that. However, the ITESM students have an option to receive some remuneration, but it depends on each company or institution.

It was also investigated how long after graduation the graduates got a job. At the UNAM, 41 per cent, a considerable part of respondents, mentioned that they got a job between 3 and 6 months after graduation. But 28 per cent of persons asked answered that they received a job less than one month after studies. On the other hand, for the majority of the ITESM respondents, forming 54 per cent, the path to receiving a job was less than one month. However, there 6 per cent of respondents say they got a job more than 1 year after their graduation.

Based on the obtained data, we can approximately assess that the ITESM students have better opportunities to get a job after studies than the UNAM students but if this statement is really valid, it would be essential to receive more data.

Figure 17: Duration of getting a job after graduation



Source: Author

Currently working graduates of both universities were also asked the extent as to which they believe their knowledge and skills acquired at university are applied in their present job. For the analysis of this question the t-test was used again. In this case, the null hypothesis was confirmed. The p-value (see table 7) significantly exceeded the selected significance level of 0.05. This means there is no difference among universities according to the perception of applying university knowledge and skills in their current job. Moreover, graduates from the UNAM as well as the ITESM consider their knowledge and skills obtained during their studies more or less as useful in their professional life.

Table 7: Knowledge and skills for job

T-test for independent samples				
	t-value	p	F-ratio Variances	p Variances
UNAM vs. ITESM	0.7840	0.4348	1.3333	0.3080

Last but not least, it was analyzed how graduates, of those which currently work, are satisfied with remuneration. As mentioned before, the minimum salary in Mexico is

generally very low. This circumstance does not mean absolutely that it also concerns and affects university graduates as a whole.

The t-test showed a significant gap between opinions of both universities respondents. The p-value (see table 8) is strongly lower than the selected significance level of 0.05. Therefore the null hypothesis that graduates of both universities are equally satisfied with their job remuneration had to be rejected. This means that responses from both groups asked greatly differ. The survey proved the ITESM working graduates are more satisfied with their salary than the UNAM respondents. Although this result has to be taken rather for orientation, it has been demonstrated a fact that the ITESM students get a better paid job or at least they are more satisfied with their remuneration. It should be mentioned that among the ITESM respondents there are more graduates of master programs. Due to the Mexican higher education remaining profitable (G. Rivera, 2012), a wage gap exists between someone who concluded graduate program and someone who finished postgraduate program.

*Table 8: Job remuneration*

<b>T-test for independent samples</b>				
	<b>t-value</b>	<b>p</b>	<b>F-ratio Variances</b>	<b>p Variances</b>
<b>UNAM vs. ITESM</b>	3.9346	<b>0.0001</b>	1.6989	<b>0.0555</b>

### **7.3 Summary and recommendation**

Based on the obtained results we can evaluate that the ITESM, a private university with a great economic power in Mexico and in the entire Latin American region, it has a better set learning system to create an internationally competitive workforce. Nevertheless, the ITESM as well as the UNAM have to face some problems in providing higher education. In Mexico, there is still a huge gap between income groups. Study at the ITESM is a privilege just for the people from high-income groups because the scholarships provided are barely enough to cover all costs of the study. The UNAM has to solve a similar problem. Although access to education is higher for all groups of society, most of the students do not complete their studies due to financial reasons as their parents are unable to pay costs associated with study of their children (transport, materials, etc.).

Even though the government provides more financial resources to universities in recent years, the proportion is still insufficient. It is necessary that the state spends appropriately on public universities.

Moreover, in order to improve access to education at both universities, it is essential to change a social status of families, but this brings us to the situation this work does not cover.

The fact money plays an enormous role also affects the duration of receiving a degree after graduation. This period is characterized by a long bureaucratic process connected with financial costs for students to obtain their title.

The groups analyzed are particularly satisfied with the education quality, mainly with the quality of teachers. Although it has been proven that students who studied abroad are less satisfied with the teacher's quality at both universities. According to the practical level of education, the ITESM students are more content with access to information media and also use of teaching methods such as e-learning, participation



in research projects and internship opportunities which are more widely used than at the UNAM. In case of the UNAM it is essential to promote more practical teaching methods but mainly to develop student's skills because more education does not necessarily translate into economic progress. Lack of skills leads to problems of companies finding human capital they need. There should exist better ties between universities and company needs.

Level of languages, especially English, is also higher at the ITESM according to student's perceptions. The UNAM should recover this area, for example, improve the qualification of teachers because insufficient knowledge of English greatly undermines the competitiveness of graduates.

The ITESM has a better cooperation with foreign institutions. There are more students participating in international mobility programs than at the UNAM. They can bring more experiences from abroad to their *alma mater* and develop the existing system. However, the UNAM would need to provide more funds in order to send more students abroad.

Regarding the career of university graduates, the ITESM graduates get a job faster after graduation and are also more satisfied with their salary. The UNAM should deepen cooperation with the private sector to increase job opportunities for their students and also make participation possible on education processes for companies to ensure them a more skilled workforce.

## 8 Conclusion

The objective of this thesis was to analyze the support of education for the knowledge-based economy in Mexico. Education, no doubt, represents one of the most important components of the knowledge economy and development in general. On the other hand, a knowledge-based economy is an actual topic for developed economies and deserves more attention.

The author decided to analyze the path of Mexico to the knowledge-based economy because almost in the last 3 years, since the election of a new president Enrique Peña Nieto, Mexico has acted very ambitiously on the international scene. With the implementation of structural reforms and a more opened economy to private investors, Mexico expects to become a global player to the future. The author assumed that these reform efforts could really improve Mexican prospects, not only economic, but also social problems despite protests in the country during recent years. This point of view changed after the author's four-month internship in Mexico where could truly understand the challenges that the country faces.

First of all, there are many internal problems Mexico should resolve. Mexico is a large country by its area and this causes a problem as Mexican states are differently developed. The government must ensure more support to the less developed regions like Chiapas, Guerrero or Oaxaca which currently have a lack of access to education and other public goods.

Another problem that has a significant impact on political stability that is so important for development is organized crime penetrating even more into different *fields* (drugs, kidnapping, money laundering, arms and people smuggling, prostitution, piracy-infringement of intellectual rights etc.). This is also related to strong corruption. The Mexican population feels desperate and the government does not make a lot of effort to solve these problems.

Mexico has also problems in turning knowledge into business. There are a lack of scientists in Mexico and weak support from the state. Under these circumstances it is more complicated to innovate and create a competitive economy. The president promises to change this issue and invest more into the development of science but there is a question how effectively this will be done.

Information and communication technologies are not accessible everywhere. There is a problematic entry for new companies into the sector. Dominant market positions present another challenge on the way to the knowledge-based economy although reform efforts should put an end with monopolies. Whether it will be effective, time will tell.

When we look at the Mexican education system, it does not have a very strong position in the Latin American region. Chile, Argentina or Brazil all accomplish much better scores in education and the skills index.

We can confirm that the hypothesis Mexico does not reach a level of the knowledge-based economy in order to compete in the global market. First of all, it is necessary to strengthen its political stability, rule of law, security and effectiveness of institutions. Current structural reforms could change something for the better if they are as effective as the president promised.

Education is the biggest obstacle for Mexico on the path of development. Firstly, there is an enormous number of unqualified teachers in all levels of education but a lack of teachers training, evaluation and also poor wages and half part jobs should be resolved with education reform. The problem is that the majority of federal states see education issues in a different manner and it significantly complicates realization of education reform in the whole country.

Secondly, secondary education has been, until recently, optional. Great attention should be paid to the secondary education in Mexico because it is a point that forms a

person and mainly their future. Without secondary education is not possible to create a more qualified labor force nor increase quality tertiary education. There must be spending of more public funds to satisfactorily cover the demand.

Thirdly, tertiary education should change the system of scholarships. For example, students from higher socio-economic levels should pay tuition fees higher than those coming from lower socio-economic levels. Moreover, Kuznetsov (2008) mentions that Mexican higher education could be stimulated through the establishment of a state-supported market for student loans. The Author of this thesis partially agrees with this concept but it can be dangerous if students then won't be able to pay with such low wages in Mexico. Also, co-operation between public and private institutions must be deepened but it is important to synchronize the needs of companies with universities and ensure an effective collaboration. However it has not happened yet so we can confirm the second hypothesis that Mexican higher education institutions cannot meet the increasing demand for high level skills.

The National Autonomous University of Mexico is the largest and oldest university. The Monterrey Institute of Technology and Higher Education is a young and flexible university that is better equipped to adapt to demand of the knowledge economy. In the case of the UNAM there is some change that it will improve to the future, especially with the current education reform. Although there is a question whether the institutions are controlled by right people and thus whether they work effectively. The transparency is the key, as well as the university financing. The ITESM seems as a university that is well prepared for the knowledge-based economy but there are some doubts about its quality. The ITESM strives to recruit the best professionals but to be professional does not involve being a "good" teacher. The ITESM has a system of internal evaluation of their teachers but whether there is pressure on the quality assurance it is not clear as well as whether measurements or parameters determine the quality of a teacher. Currently the position of the ITESM can be considered better

than a position of the UNAM in some aspects but this does not mean the ITESM can compete globally.

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## **10 List of abbreviations**

CAM – Centro de Análisis Multidisciplinario

CNTE – Coordinadora Nacional de Trabajadores de la Educación

CONAFE – Consejo Nacional de Fomento Educativo

EZLN – Ejército Zapatista de Liberación Nacional

GDP – Gross Domestic Product

ICT – Information and Communications Technologies

INEE – Instituto Nacional para la Evaluación de la Educación

INEGI – Instituto Nacional de la Estadística y Geografía

ITESM – Instituto Tecnológico y de Estudios Superiores de Monterrey

KAM – Knowledge Assessment Methodology

KI – Knowledge Index

NAFTA – North American Free Trade Agreement

NIS – National Innovation System

OECD – Organisation for Economic Co-operation and Development

PISA – Programme for International Student Assessment

PRONABES – Programa Nacional de Becas para la Educación Superior

SEP – Secretaría de Educación Pública

SNTE – Sindicato Nacional de Trabajadores de la Educación

UANL – Universidad Autónoma de Nuevo León



UNAM – Universidad Nacional Autónoma de México

UNESCO – United Nations Educational, Scientific and Cultural Organization

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## 12 Appendix

**Appendix 1:** Questionnaire for university students and graduates of the National Autonomous University of Mexico (UNAM) and the Monterrey Institute of Technology and Higher Education (ITESM) translated into English

Estimadas señoras/Estimados señores:

Soy estudiante de la Universidad de Mendel en Brno en la República Checa.

Me dirijo a ustedes para solicitarles de la manera más atenta que me apoyen respondiendo la siguiente encuesta, cuyos resultados servirán para la realización de mi proyecto de tesis. El objetivo de la misma es analizar el apoyo otorgado a la educación para la economía basada en conocimiento por parte de los sectores públicos y privados en las siguientes universidades: la Universidad Nacional Autónoma de México (UNAM) y el Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM). La encuesta es anónima. Completarla les tomará diez minutos aproximadamente.

Muchas gracias por su colaboración y tiempo.

Terezie Cvernová

*Dear Sirs / Dear Madams:*

*I am a student of the Mendel University in Brno in the Czech Republic.*

*I am writing to you to request in the most attentive way to support me answering the following survey, the results of which will serve for the completion of my thesis project. The purpose is to analyze the support of education for the knowledge-based economy in public and private sectors in the following universities: the National Autonomous University of Mexico (UNAM) and the Monterrey Institute of Technology and Higher Education (ITESM).*

*The survey is anonymous. Completing it will take about ten minutes.*

*Thank you very much for your help and time.*

*Terezie Cvernová*

**1. Edad/Age:**

**2. Sexo/Sex:**

- Masculino/*Male*
- Femenino/*Female*

**3. ¿De cuál de las siguientes universidades eres estudiante/graduado?**

*Which of the following universities are you a student/graduate of?*

- UNAM
- ITESM

**4. ¿Cuál es tu estado actual en relación con la universidad?**

*What is your current status in relation to the university?*

- Estudiante/*Student*
- Graduado/*Graduate*
- Estudios inconclusos/*Incompleted studies*

**5. ¿En caso de haber respondido “estudios inconclusos”, por qué no completaste**

**los estudios? *In case you have answered "incompleted studies," why did you not complete the studies?***

- Situación financiera desfavorable/*Unfavorable financial situation*
- Dificultad de estudios/*Difficulty of studies*
- Oferta de empleo/*Job Offer*

## **Graduados/Graduates**

### **6. ¿Cuál es tu nivel más alto de educación que conseguiste?**

*What is your highest level of education you have achieved?*

- Bachillerato/*Upper secondary*
- Licenciatura/*Bachelor*
- Maestría/*Master*
- Doctorado/*Doctorate*

### **7. ¿Después de cuánto tiempo de la graduación recibiste el título?**

*How long after your graduation did you receive the title?*

- Menos de 1 mes/*Less than 1 month*
- Entre 1 y 3 meses/*1-3 months*
- Entre 3 y 6 meses/*3-6 months*
- Entre 6 y 12 meses/*6-12 months*
- Más de 1 año/*More than 1 year*

## **Gastos de estudios/Study costs**

### **8. Estima, ¿cuáles son/fueron tus gastos anuales durante los estudios**

**(matrícula, transporte, alojamiento)?** *Estimate, what are/were your annual costs during studies (tuition, transportation, accommodation)?*

- Menos de \$50,000 MXN/*Less than \$50,000 MXN*
- Entre \$50,000 y \$100,000 MXN/*Between \$50,000 and \$100,000 MXN*
- Entre \$100,000 y \$150,000 MXN/*Between \$100,000 and \$150,000 MXN*
- Más de \$200,000 MXN/*More than \$200,000 MXN*

### **9. ¿Cómo financias/financiabas tus estudios?**

*How do you finance/ did you finance your studies?*

- Padres/*Parents*

- Trabajo temporal/*Temporary work*
- Beca de gobierno/*Government scholarship*
- Beca de universidad/*University scholarship*

**Calidad de la educación/*Education quality***

**10. ¿Estás satisfecho con el acceso a los medios de información (computadoras, bibliotecas, etc.) durante tus estudios?** *Are you satisfied with the access to information media (computers, libraries, etc.) during your studies?*

Muy satisfecho/*Very satisfied* ○ ○ ○ ○ ○ Muy inconforme/*Very unsatisfied*

**11. ¿Estás satisfecho con la calidad de los maestros en la universidad?**  
*Are you satisfied with the quality of teachers at university?*

Muy satisfecho/*Very satisfied* ○ ○ ○ ○ ○ Muy inconforme/*Very unsatisfied*

**12. ¿Crees que el nivel de la educación que la universidad proporciona en el área de conocimiento teórico es:** *Do you think that the level of education that the university provides in the area of theoretical knowledge is:*

- Redundante/*Redundant*
- Totalmente suficiente/*Fully sufficient*
- Incompleto/*Incomplete*
- Muy insuficiente/*Very insufficient*
- Totalmente inadecuado/*Totally inadequate*

**13. ¿Crees que el nivel de la educación que la universidad proporciona en el área de conocimiento práctico es:** *Do you think that the level of education that the university provides in the area of practical knowledge is:*

- Redundante/*Redundant*
- Totalmente suficiente/*Fully sufficient*
- Incompleto/*Incomplete*

- Muy insuficiente/*Very insufficient*
- Totalmente inadecuado/*Totally inadequate*

**14. ¿En cuáles de los siguientes métodos de enseñanza se pone énfasis durante los estudios?** *Which of the following teaching methods are emphasized during studies?*

- Conferencias/*Conferences*
- Trabajar en grupos/*Teamwork*
- Participación en proyectos de investigación/*Participation on research projects*
- Las pasantías, prácticas/*Internships,*
- Adquisición de conocimientos teóricos/*Theoretical knowledge acquisition*
- El maestro como la principal fuente de información/*Teacher as the main source of information*
- Creación de tus propios textos, materiales escritos/*Creating own texts, written materials*
- Presentación oral de los estudiantes/*Presentations of students*
- E-learning
- Autoaprendizaje/*Self-learning*
- Ensayos/*Essays*
- Proyectos/*Projects*

**15. ¿Estás satisfecho con la enseñanza de lenguas extranjeras en la universidad?** *Are you satisfied with the foreign language teaching at university?*

Muy satisfecho/*Very satisfied* ○ ○ ○ ○ ○ Muy inconforme/*Very unsatisfied*

**16. ¿Qué lenguas extranjeras manejas?**

*Which foreign languages do you speak?*

- Inglés/*English*
- Japonés/*Japanese*
- Francés/*French*



- Alemán/*German*
- Otra/*Other*

### **Internacionalización de la educación/*Internationalization of education***

**17. ¿Participaste en el programa de intercambio en el extranjero durante los estudios?** *Did you participate in the exchange program abroad during studies?*

- Sí/*Yes*
- No/*No*

**18. ¿Fueron los estudios para ti más benéficos en el extranjero que en México?** *Were your studies more beneficial abroad than in Mexico?*

Muy benéficos/*Very beneficial* ○ ○ ○ ○ Nada benéficos/*Nothing beneficial*

**19. ¿En qué fueron los estudios en el extranjero gratificantes para ti?** *How were you being rewarded during your studies abroad?*

### **Co-operación con los sectores públicos y privados/*Co-operation with public and private sectors***

**20. ¿Durante tus estudios la universidad exige la realización de la práctica profesional/servicio social?** *University requires the completion of professional practice/social service during studies?*

- Sí/*Yes*
- No/*No*

**21. ¿Cuál es tu estado actual en relación con el trabajo?** *What is your current status in relation to work?*

- Estudiante/*Student*
- Trabajador/*Worker*
- Buscando un trabajo/*Looking for a job*

**22. ¿Crees que la experiencia de las prácticas profesionales/servicio social te ayudó a conseguir tu trabajo actual?** *Do you think that the experience of professional practice/social service helped you get your current job?*

Sí/Yes ○ ○ ○ ○ ○ No/No

**23. ¿Después de la graduación, cuánto tiempo tardaste en conseguir trabajo?** *After graduation, how long did it take to get a job?*

- Menos de 1 mes/*Less than 1 month*
- Entre 1 y 3 meses/*1-3 months*
- Entre 3 y 6 meses/*3-6 months*
- Entre 6 y 12 meses/*6-12 months*
- Más de 1 año/*More than 1 year*

**24. ¿En qué medida, son tus conocimientos y habilidades adquiridos en la universidad utilizados en el trabajo actual?** *To what extent are your knowledge and skills acquired at university used in your current job?*

Muy utilizados/*Widely used* ○ ○ ○ ○ ○ Nada utilizados/*Nothing used*

**25. ¿En qué medida estás satisfecho con tu remuneración de pago?** *To what extent are you satisfied with your job remuneration?*

Muy satisfecho/*Very satisfied* ○ ○ ○ ○ ○ Muy inconforme/*Very unsatisfied*