# CLOSING THE GAP IN MEXICO'S UPPER SECONDARY EDUCATION SYSTEM

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| CONALEP | Nacional School for Professional and Technical Education (*Colegio Nacional de Educación Profesional Técnica*) |
| CONAPO | National Population Council (*Consejo Nacional de Poblacion*) |
| GDP | Gross Domestic Product |
| MXFLS | Mexico Family Life Survey |
| OECD | Organization for Economic Cooperation and Development |
| PISA | Program for International Student Assessments |
| PACES | Secondary Education Access Program (*Programa de Acesos a la Educación Secundaria*) |
| SEMS | Sub-Secretariat of Upper Secondary Education (*Sub Secretaria de Educacion Media Superior*) |
| SEP | Secretariat of Public Education (*Secretaria de Educacion Publica*) |
| SNB | National Upper Secondary Degree Program (*Sistema Nacional de Bachillerato*) |
| TIMSS | Trends in International Mathematics and Science Study |
| TFP | Total Factor Productivity |

# EXECUTIVE SUMMARY

**Mexico stands at the crossroads between two worlds**; it is both one of the richest countries in the Latin America and Caribbean Region and one of the poorest member countries of the Organization for Economic Development and Cooperation (OECD). Traditionally, Mexico relied on its low cost labor to produce goods for the North American market, complemented by natural resources export and remittances. Mexico's workforce lacks the education to compete with other OECD countries in the emerging knowledge economy. The education level of the Mexican workforce is one of the lowest in the OECD as is the country's performance on international education assessments. Mexico has seen its international competitiveness decline in the past decade.

**Upper secondary education in Mexico is a weak link in the national education system.** Like all education systems, the Mexico education system faces challenges at all levels. Basic education (grades 1 through 9 plus preschool) has a high level of coverage throughout the country. Most youth now finish ninth grade. The problems are the greatest at the upper secondary level (grades 10 through 12), which has by far the highest level of drop outs, with as many as 40% to 50% of students not finishing. Many of the challenges facing upper secondary education are structural. Traditionally, upper secondary education was created with a dual purpose: an extension of the university system for students planning to go on to higher education and as a technical education program for students not going to the university.

**Labor in Mexico is "undereducated" compared to other middle income OECD countries.** The percentage of the population with secondary education (particularly upper secondary education) is one of the lowest for any OECD country and is below that of several poorer countries in Latin America. More than at any other level, it is the low coverage at the upper secondary level that lowers the average education level of Mexico compared to its international peer.

**The upper secondary education system is fragmented** Until recently, federal upper secondary schools were operated as part of the tertiary education sub-secretariat.**.** Unlike basic education, which is closely regulated by the federal government, there exist many separate upper secondary sub-systems. The level of regulation of these different systems varies greatly. At the basic education level, public schools are operated exclusively by state governments. The federal government only operates schools in the federal district and private schools account for only 8% of total enrollment. But at the upper secondary level, it is another story. The federal government directly and indirectly administers schools with 28% of the total enrollment, through several sub-systems. States, through their own systems, account for around 37% of enrollment. University-run systems account for 15% of enrollment and the private sector, another 21%. There are an estimated 200 to 300 different options for upper secondary degrees and it is generally not possible to transfer from one type of study to another. There is little formal interaction between parents and the school.

In the 2005-2006 school year, there were an estimated 163,000 teachers in the public upper secondary system and another 96,000 in private upper secondary schools. More than half of teachers are hired on a contract basis (62%) and only 16% of teachers are hired on a full time basis. More than 90% of teachers have some higher education and most have university degree or better. Only in one state (Nayarit) do more than 10% of the teachers have only secondary education, while two states (Colima and Nuevo Leon), more than 20% of upper secondary teachers have post-graduate university degrees.

At the upper secondary level, enrollment has seen a large increase from a very low base of a 10% the enrollment rate in the 1970-1971 school year to 55% in the 2005-2006 school year. In 1970, only 310,000 students were enrolled at the upper secondary level, by 2005, this increased to more than 3.7 million. By 2005, the system was quite different. First, many new sub-systems were created in the intervening years. With the increase in enrollment, all sub-systems grew quickly. By far, the biggest growth was in the state system, which grew from 27,000 in 1970 (around 9% of enrollment) to 1.3 million in 2005 (around 35% of enrollment). This state system grew largely to meet the demand for general education. While autonomous schools still remain important source of upper secondary coverage, they now account for around 15% of the total coverage compared to 36% in 1970. The coverage of the private sector has also been reduced from 25% to 21%. While coverage is high, graduation rates are not; nearly half of students will never graduate. While Mexico has largely eliminated the gender gap at the upper secondary level, there is a bias against poorer students staying in school.

The federal government is the largest financier of upper secondary education in the country, although it only directly administers part of the upper secondary education system, including several sub-systems and a number of autonomous and decentralized higher education institutions. State governments also play a major role in financing upper secondary education. This ranges from providing counter-part funding to programs like the CONALEP school system to directly operating their own upper secondary school systems. States also provide financing to their own autonomous universities from their own budgets (this complements federal funding). Public upper secondary education is rarely “free” for students, although the cost varies greatly from system to system.

In its own schools, the federal government spends around 41,000 pesos per student. However the federal government spreads its resources unevenly throughout the country. In an absolute sense, Colima and Baja California Sur receive the smaller share of Ramo 11 resources (0.7% and 1.1% of total spending, respectively) while the Federal District receives the largest share, at 11.8%. This primarily reflects the population of each entity. However there are big differences in spending per student. The State of Mexico receives the smallest allocation per capita approximately 22,000 pesos per student in federal upper secondary schools while in Nuevo Leon its 81,000 pesos per students.

**A country’s competitiveness is built as much on knowledge as on hard infrastructure.** Mexico is competing with other middle income countries, ranging from Thailand, Malaysia, and Korea in Asia and the Czech Republic, Poland, and Russia in Europe among others. If current trends prevail, GDP growth in Mexico is estimated to be

about 3.4% per year from 2008 to 2012 and 3.5% per year from 2013 to 2017. However, with an increase in education at the upper secondary level, GDP could be expected to grow by 3.7% from 2008 to 2012 and 4.4% from 2013 to 2017. In total, the Mexican GDP could grow by a cumulative 5% over the next decade.

**Mexico has a major education gap at the upper secondary level.** This gap puts Mexico at a disadvantage competing with other countries in the knowledge economy and it contributes to the high level of inequality in this middle income country. Upper secondary education plays an important role for several reasons. First, having more workers with the equivalent of upper secondary level would lead to a higher level of productivity. Mexico is currently well behind other nations in its education level and upper secondary is the main difference. Second, upper secondary education is an intermediate level before higher education and if the government wants to increase its universities coverage, it needs to increase coverage at the upper secondary level. Mexico's level of coverage at the university level is typical for a country at Mexico's income level and increasing it will require more upper secondary graduates.

# I. INTRODUCTION

1. **Mexico stands at the crossroads between two worlds**; it is both one of the richest countries in the Latin America and Caribbean Region and one of the poorest member countries of the Organization for Economic Development and Cooperation (OECD). Traditionally, Mexico relied on its low cost labor to produce goods for the North American market, complemented by natural resources export and remittances (World Bank, 2007). However, since the economic recovery of 1998 unit labor costs have increased due to higher wages and slow productivity growth. Since 2000, Mexico has lost an estimated 270,000 industrial jobs (Farrell, et al, 2005).

2. **Mexico's workforce lacks the education to compete with other OECD countries in the emerging knowledge economy.** The education level of the Mexican workforce is one of the lowest in the OECD as is the country's performance on international education assessments. Mexico has seen its international competitiveness decline in the past decade. In 1998, the *Global Competitiveness Report* ranked Mexico as 34$^{th}$ in the world. By 2007, this had declined to 52$^{nd}$ place (World Economic Forum, 2007). While additional countries have entered into the global competitiveness evaluation, most of Mexico's relative decline is due to improvements seen in other countries. Mexico has stayed still while other countries have jumped ahead. Mexico needs to focus more on adding value to its production and moving from a low-cost labor-based economy to a knowledge-based economy that exploits the new global economic environment (Farrell *et al*, 2005).

3. **Within Mexico, the population is also divided; there are two worlds within Mexico.** While a significant proportion has income and education levels similar to that of the other OECD countries, the majority of Mexicans have living standards closer to Latin American averages. While there are many factors that separate these two worlds, such as urban residence or ethnic background, education is one of the sharpest barriers. There are big differences between the education levels of members of the richest and the poorest income group, as can be seen in Table 1. Although all groups have seen significant increases in the education level of all income groups, the increase in average education in Mexico in the last twenty years has been driven by increases in the education levels of the richest segment.

**Table 1: Education Level by Income Decile, Population age 25 to 64**

| Income Decile | 1984 | 2004 |
|---|---|---|
| I | 2.1 | 3.7 |
| II | 2.3 | 5.1 |
| III | 3.0 | 5.8 |
| VIII | 6.2 | 8.6 |
| IX | 7.2 | 10.1 |
| X | 8.6 | 12.6 |
| **Average** | **6.5** | **8.9** |

Source: World Bank, 2006

4. **Education also plays an important role in replicating existing inequality.** In large part, differences in education explain the big differences in earnings. Due to their family circumstances, poor children are rarely able to stay in school for as long as children from more fortunate backgrounds. Despite the fact that public education in Mexico is free or highly subsidized, many youth consider working to be a better use of their time. The schools that serve the poor are generally of lower quality and make it

difficult for students to advance to a higher level of study. The poor cannot continue with their schooling and thus their children are condemned to poverty for another generation.

5. M**exico's economy has grown slowly in recent years.** The changing global environment has affected the Mexican economy as a whole. During the past six years, Mexico's per capita growth has been slow, averaging 1.2% compared its historic rate of 2.1% in the past forty years[1]. More importantly, studies have shown that the country's total factor productivity (TFP) has been declining in the past five years at an average rate of 0.6% (World Bank, 2007b). At the same time, most countries in the region have seen growth rates at or above historical trends, making Mexico the only major economy in the region to see a decline in its TFP.

6. **The "knowledge economy" is gradually replacing the "industrial economy" in many countries.** Increasingly students will have to develop new skills and new competencies to compete within their own countries and to help their own countries to compete internationally (Farrell, et al, 2005). Preparing for the knowledge economy requires a different kind of education system that emphasizes new competencies and analytical ability.

7. **Mexico has seen increases in human capital with high rates of return to schooling, however this has not led to higher productivity.** This trend has been seen in other countries (Pritchett, 2001) and often reflects the low quality and relevance of education. It is often argued that education serves as a signaling device and primarily serves to redistribute income rather than to grow the economy or increase productivity. This appears to be the case in Mexico, where the quality of education has been low by international standards and has not been accompanied by much complementary investment in research and development.

8. This document explores the education sector and its role in promoting economic competitiveness and development. It particularly focuses on the upper secondary education system. This system is in many ways the "weak link" in the education system. Despite many problems, basic education in Mexico seems to function adequately. While enrollment rates are high and are increasing, learning outcomes seem to be low and stable. Some have increased and others have decreased in international and national assessments. At the university level, Mexico has a similar enrollment rate to that of many middle income countries. It is at the upper secondary level where Mexico falls significantly behind its peer countries.

***Why Focus on Upper Secondary Education?***

9. **There is a growing consensus globally that upper secondary education has been ignored.** There is global concern that little attention has been placed at the secondary level. In many countries, the historically the focus of many education sectors was on increasing coverage at the primary level. Implicit was the belief that secondary

[1] This is calculated using per capita income from 2001 to 2006 compared per capita income from 1961 to 2006.

education students should not receive the same level of subsidies. Now there is a more nuanced approach to education, built on the understanding that all levels contribute to development in different ways and that education is key to providing opportunities both to individuals and to countries. While there is still significant debate about how to provide education and how to target subsidies, the importance of secondary education is being increasingly accepted.

10. **Upper secondary education in Mexico is a weak link in the national education system.** Like all education systems, the Mexico education system faces challenges at all levels. Basic education (grades 1 through 9 plus preschool) has a high level of coverage throughout the country and most youth now finish ninth grade. While quality is mixed and is below that of other OECD countries, recent results show some improvement. Likewise, enrollment rates at the university level are similar to many other middle-income countries. The problems are the greatest at the upper secondary level (grades 10 through 12), which has by far the highest level of drop outs, with as many as 40% to 50% of students not finishing.

11. **Many of the challenges facing upper secondary education are structural.** Traditionally, upper secondary education was created with a dual purpose: an extension of the university system for students planning to go on to higher education and as a technical education program for students not going to the university. In most countries, upper secondary education is not compulsory. Today there is a growing tendency to separate upper secondary from the university system and to strengthen its links with the basic (or compulsory) education system. At the same time, upper secondary education is focusing more on basic competencies and skills as opposed to technical skills (World Bank, 2005b). In Mexico, this process has gone slowly. While upper secondary education is being separated from the university system, this separation has left the upper secondary system without any strong champions.

12. **The upper secondary education system is crucial to improving Mexico's productivity and it has been largely ignored in policy debates.** Mexico is following global trends in seeing a large increase in the demand for upper secondary education to meet the growing number of basic education graduates, to improve the workforce's technical skills, and to prepare more students for higher education. In many ways, the low capacity and quality of upper secondary education system is a bottleneck in Mexico's competitiveness (World Bank, 2005). Mexico, like many developing countries focused extensively on increasing coverage at the basic education level with great success.

13. **Labor in Mexico is "undereducated" compared to other middle income OECD countries.** The percentage of the population with secondary education (particularly upper secondary education) is one of the lowest for any OECD country and is below that of several poorer countries in Latin America. More than at any other level, it is the low coverage at the upper secondary level that lowers the average education level of Mexico compared to its international peer. Table 2 shows this clearly. Mexico has a very low percentage of the population with upper secondary education completed.

14. **The "missing middle" in education constrains Mexico vis-a-vis other middle income and OECD countries.** The Mexican labor force is bifurcated towards those with tertiary education and those with basic education. Most advanced countries have a large number of high school graduates who work in skilled and technical jobs. This group is largely absent in Mexico. This pattern is similar to many low income countries but is unusual in Latin America. Correcting this imbalance will require effort to increase the graduation level at the upper secondary level.

**Table 2: Education levels of population, age 25 to 65**

| | Basic or less | Upper Secondary | Tertiary or higher |
|---|---|---|---|
| Mexico | 77 | 5 | 18 |
| Brazil | 66 | 27 | 8 |
| Chile | 37 | 44 | 18 |
| OECD Average | 23 | 45 | 32 |
| United States | 14 | 46 | 39 |
| Korea | 3 | 46 | 51 |

Source: OECD, 2007

15. **Inequality in education is high at the upper secondary level.** The Mexican education system is plagued by inequality that ultimately leads to income inequality. At the basic education level, coverage is close to universal but there are big differences in the quality of this education, both across states and across schools. This impacts on coverage in upper secondary education. While most youth now graduate from lower secondary school, the quality of their education is variable. Many find that they are unprepared for upper secondary education and drop out in the first year. Given the possibility of work, the opportunity cost of upper secondary school is high. This is especially true when the quality of learning is low. Thus the low quality condemns many youth to leave school early with very limited opportunities.

16. **Demographic pressures are increasing demand for upper secondary education.** Mexican families are becoming smaller, with an estimated total fertility rate of 2.1 in 2005 compared to 3.3 in 1990 and 4.6 in 1980 (CONAPO, 2006). This has several important consequences on the education system. First, the average age of children is increasing, which naturally means fewer students in basic education and relatively more students in upper secondary education. Second, as Mexicans choose to have smaller families, it is likely that they will invest more to educate their children, increasing the demand for upper secondary education.

17. Education budgets are largely allocated to finance teachers and the amount of support is quite variable across sub-systems. The upper education sector probably has more flexibility than other sectors in education because it relies heavily on part-time and hourly teachers. Basic education, on the other hand, mostly relies on teachers with permanent contracts that cannot be easily adjusted. Basic education and upper secondary are legally separated, making it difficult or impossible to transfer staff.

18. **Successful strategies in primary education cannot be directly applied to secondary education.** While there was great success in expanding primary education, many of these models are not directly applicable at the secondary level. Secondary

education tends to be more heterogeneous than primary education and requires more specialized teachers. "Purchasing" quality at the secondary level also tends to be more expensive than at the primary level and arguably more important (World Bank, 2005).

19. **There are serious concerns about the quality and relevance of upper secondary education.** Traditionally, the education sector has focused on "quantity" or enrollment. However "quality" is also important, especially in an economy where knowledge and its application play an important role in economic growth. Mexico is focusing additional resources on quality. To date, there has been no nationwide assessment of learning at the upper secondary level in Mexico. By comparison, the basic education system has had a national evaluation system for the past decade. The upper secondary system is setting up an evaluation system. The international PISA evaluation[2] does cover students in both the upper and lower secondary levels and the evaluation measures cumulative learning at the time of the test and thus is a reflection of primary and lower secondary education. Both PISA and anecdotal evidence suggest that quality is big issue for education in Mexico. Not only does Mexico have an enrollment gap, it also appears to have a quality gap.

***Organization of the Work***

20. This document aims to bring together the latest thinking and research on upper secondary education in Mexico. It is designed for use by policy makers and concerned citizens with the objective of stimulating the debate about the future of upper secondary education in Mexico. It combines both new research and analysis of the sector with existing policy work developed by the Sub-Secretariat of Upper Secondary Education (SEMS) and others. The document also brings the latest global thinking to enrich the national debate within Mexico.

21. The next section looks at the organization of the upper secondary system (*media superior*) in Mexico and at recent trends in enrollment and quality. This will serve to highlight some of the major challenges facing the system now and the role of different actors in operating the system. Section three will take a macroeconomic look at upper secondary education, focusing on the cost of low upper secondary enrollment on the economy. It will quantify some of these costs and also discuss how Mexico compares with key international peers. Finally, section four presents conclusions and recommendations based on the findings of this report.

[2] Mexico has participated in the Program of International Student Assessments (PISA) in 2000, 2003, and 2006. PISA is given to a random sample of schools for students aged 15 (regardless of their grade) and covers mathematics, science, and language.

## II. UPPER SECONDARY EDUCATION IN MEXICO

### *Organization of Upper Secondary Education*

22. **The upper secondary education system is fragmented.** Unlike basic education (pre-primary, primary, and lower secondary education), which is closely regulated by the federal government, there exist many separate and upper secondary sub-systems. The level of regulation of these different systems varies greatly. Table 3 outlines the distribution of enrollment by type of school at the primary, lower secondary, and upper secondary levels. At the basic education level, public schools are operated exclusively by state governments. The federal government transferred all of its schools to the states in 1992. The federal government only operates schools in the federal district and private schools account for only 8% of total enrollment. But at the upper secondary level, it is another story. The federal government directly and indirectly administers schools with 28% of the total enrollment, through several sub-systems. States, through their own systems, account for around 37% of enrollment. University-run systems account for 15% of enrollment and the private sector, another 21%.

**Table 3: Distribution of Enrollment by type of School**

| Type of School | Primary | Lower Secondary | Upper Secondary |
|---|---|---|---|
| Federal | 6% | 7% | 28% |
| Transferred Federal | 63% | 57% | n.a. |
| State | 23% | 28% | 37% |
| Autonomous | n.a. | 0% | 15% |
| Private | 8% | 8% | 21% |

Source: SEP, 2006
Note: Transferred federal refers to federal schools that were transferred to state governments as part of the decentralization of education. Autonomous refers to schools under the jurisdiction of autonomous public university.

23. **There is great variation in the distribution of upper secondary students at the state level.** Table 4 presents the example of six states. Nuevo Leon is one of the richest states in Mexico. There, private and autonomous school systems dominate and the federal and state systems play a small role focusing on technical education. In the State of Mexico and Zacatecas, the state system provides most of the upper secondary education,

**Table 4: Distribution of Enrollment by type of School in Selected States**

| *Type of Degree* | Colima | Mexico | Michoacán | N. León | Yucatán | Zacatecas |
|---|---|---|---|---|---|---|
| General Degree | 8.2% | 67.4% | 68.3% | 68.0% | 72.5% | 74.4% |
| ***Type of School*** | | | | | | |
| Federal | 24.1% | 16.7% | 29.3% | 8.3% | 23.4% | 22.2% |
| State | 1.3% | 55.2% | 38.9% | 8.9% | 38.4% | 56.8% |
| Autonomous | 65.0% | 7.6% | 10.9% | 45.3% | 8.9% | 14.2% |
| Private | 9.5% | 20.6% | 20.9% | 37.4% | 29.2% | 6.7% |

Source: SEP, 2006

with a small autonomous system. Colima, which has a strong, state-run, basic education system, has a very small state upper secondary with the federal government and autonomous schools providing the bulk of coverage. The private sector plays a major role in Yucatan and Nuevo Leon but is quite small in Colima and Zacatecas. Annex Table 1 presents more detailed information on the enrollment in each state.

24. **Upper Secondary Education is gradually being separated from its roots in tertiary education.** Until recently, federal upper secondary schools were operated as part of the tertiary education sub-secretariat. This reflects the roots of many upper secondary schools as preparatory institutions for students proceeding to the universities. Many schools were created by a university or were closely aligned with the university system.

**Box 1: The National Upper Secondary Degree System**

The creation of a National Degree System (*Sistema Nacional de Bachillerato*, SNB) is a major initiative of the federal government to ensure that there (i) portability across different sub-systems, allowing students to change to another sub-system or to move to another state, (ii) minimum standards and competencies, to ensure that students will receive a minimum level of education regardless of the sub-systems. These reforms aim to strengthen the diversity of the upper secondary system by allowing students to better understand the options that they can choose from and to ensure students that each sub-system has a minimum level of quality.

Setting up the SNB requires consensus and cooperation from the different sub-systems and is essentially voluntary program to improve the quality of the entire sector. To date, most stakeholders have received the SNB positively and the SNB is likely to be fully in place by the 2008-2009 school year.

In 2005, a reform of SEP led to the creation of SEMS, with a dual role of custodian of the national upper secondary system and directly providing education through a number of different sub-systems. It also provides financial support to state-run sub-systems. Today there are an estimated 200 to 300 different options for upper secondary degrees and much like a university system, it is generally not possible to transfer from one type of study to another. The difficulty to transfer is more the result of bureaucratic obstacles than any real differences among the systems.

25. **Upper secondary education is also rooted in the tradition of technical and vocational education (TVE).** Many upper secondary schools were formed as terminal technical education institutions. These systems had a number of limitations that are common with TVE—a high unit cost of delivering technical education, the weak connections between education providers and the productive sector, and the lack of education options after graduation (Gill et al, 2000; Minowa, 2000).

26. Broadly speaking, Mexico has two types of upper secondary learning programs, the degree program (*bachillerato*) and technical professional program (*profesional tecnico*). The majority of students (about 91%) are enrolled in the *bachillerato*, which has a large number of general and technical programs. This degree is considered a

prerequisite for most higher education fields. The *profesional tecnico* is focused on career-focused education, ranging from automobile maintenance to tourism.

27. **Parent and community participation in upper secondary schools is limited.** Unlike schools in the basic education system, there is little formal interaction between parents and the school. Most schools are organized in a "system" at the state-level. The schools are treated as entities or divisions (*plantels*) of their particular sub-system as opposed to autonomous schools. In some cases, schools do not have any control of resources. Some schools are allowed to manage their revenues from fees and are even given additional budgets for their own use. Most schools do not have a formal parents' association (*Asociacion de Familias*).

28. At the basic education level, Mexico has made more progress in community participation in schools. Schools have parents' associations and federal programs such as PEC and AGEs attempt to increase the influence the role of parents in making school-level financial decisions. There does not seem to be an equivalent model or approach at the upper secondary level. Of course, it is normal to expect a different type of relationship to develop between parents and schools at the upper secondary level than at the basic education level and there is certainly more room involvement of students at this level as well.

29. **The Federal System**. The federal government operates a number of different upper secondary programs. In general, the federal systems focuses on technical education (*bachillerato tecnico*), but there are a number of general or academic degree programs (*bachillerato general*). In the 2005-2006 school year, there were 758,000 in various technical degree programs compared to 90,000 in three different general degree programs. These programs are under the direct control and supervision of SEMS.

30. The federal government also offers education through agencies outside of SEMS, such as the National Institute of Fine Arts (itself part of SEP), the Secretariat of Defense, Federal Attorney General Office, among others. Finally, the federal government operates some semi-autonomous upper secondary programs, most prominently CONALEP, which offers a technical degree and had 254,000 students in the 2005-2006 school year. CONALEP was originally a federal program but it was transferred to the states in 1999 and is now a joint state-federal program[3]. Resources are provided by both the state and federal governments, the director are appointed by the state governments, but the rules of program are set federally. The National Polytechnic Institute is a federal university that is under the direct control of SEP and it operates an upper secondary system with around 48,000 students. Finally, the federal government operates the upper secondary system (and the rest of the public education system) in the Federal District.

31. SEMS has a stewardship role over upper secondary education but it lacks formal explicit regulatory power outside of the federal system. The federal government provides financing to a large number of state schools, which gives it important influence. Likewise, it provides accreditation to some private providers. Thus SEMS has de facto

[3] In the state of Oaxaca CONALEP operates as a federal program.

authority to regulate and it has a great deal of influence over policy and it has been using its influence to reform sub-systems that are out of its direct control and influence. SEMS is promoting two key reforms for the sector: the establishment of an assessment system for upper secondary education and a framework for a nationally recognized upper secondary degree.

32. **The State Systems.** Traditionally in Mexico, states have shared the responsibility for public education with the federal government. All of the states operate their own upper secondary school systems. The federal district also operates its own upper secondary programs but relies heavily on the federal government to provide most of its education. The size of these systems varies greatly, in Coahuila and Nuevo Leon coverage is around 10% of the total population while in Tabasco and Tamaulipas the coverage of the state system is about 70%. Most of the state programs are jointly financed by the state and federal governments. This essentially allows federal regulation of the state systems and creates uniformity across the states. While the federal system mostly focuses on technical education, many state systems have a strong focus on general education. A few state systems maintained a more technical focus. Many states did not establish a state system until the 1970s.

33. **The Autonomous Upper Secondary System.** One unusual aspect of the upper secondary education is the presence of autonomous schools. These schools are run by autonomous public universities, which are organized at both the federal and state levels. The autonomous universities are outside of the direct control of the federal and state governments. They receive substantial public finance but their operation is entirely decentralized, including decisions about their internal governance and the allocation of resources. Autonomous universities strongly guard their independence.

34. The autonomous upper secondary schools are run as part of the university system. Students from these schools may be offered guaranteed or preferential admission into their "parent" university. This is an important incentive for many students to enter the system. In some states, the autonomous system is quite important but in general the relative size and importance of autonomous system has been declining as new options become available. Nine states (Baja California, Baja California Sur, Chiapas, Chihuahua, Quintana Roo, Sonora, Tabasco, Tlaxcala, and Veracruz) have very small autonomous systems or don't have an autonomous upper secondary system[4]. In addition, in two states (Nuevo Leon and San Luis Potosi), the autonomous upper secondary school covers two years as opposed to the three years that are standard throughout Mexico.

35. **The private sector.** The private sector plays a large role at the upper secondary level. As previously mentioned, there is no single regulatory framework for private upper secondary education in Mexico. Some private sector schools are accredited by the federal government, others by their state governments, and still others by an autonomous university. The private sector enrolls around 20% of all upper secondary students. This is more than the twice the level of private enrollment in the basic education system. Most of

[4] For example, the state of Veracruz had 135 upper secondary students in the autonomous system in 2006, while Tabasco had 67 and Baja California, 52.

the private students are enrolled in general education programs, although some private schools do offer technical or professional degrees.

**Box 2: Korea—Success with Upper Secondary Education**

In the 1950s, Korea was forced to rebuild its education system that was devastated by years of occupation and war. The Korean War (19550-1953) destroyed an estimated 80% of the schools and created a serious shortage of teachers. Korea responded in a systematic fashion, first focusing on enrollment and then on quality and equity at the upper secondary level.

The period from 1948 to 1960 was on one of education reconstruction and 1961 to 1980 education expansion. In the first period, coverage in upper secondary education increased from 110,000 students (1948) to 270,000 students (1960) as most of the focus was on primary and lower secondary education. By 1980, coverage increased to 1.7 million students. In 1985, more than 90% of lower secondary students advanced to upper secondary education and by 1999, total enrollment in upper secondary exceeded 90% for the first time. Korea also has one of the highest results in the PISA assessment.

*What was the secret of Korea's success in increasing enrollment?* Initially, Korea focused on simply increasing enrollment, through lost cost options. Student to teacher and students to classrooms ratios were very high during the expansion phase. From 1960 to 1980, the number of students per classroom varied between 55 and 60. It now averages around 30. After the intense effort to get "better" students in the system, Korea focused on improving the equity of coverage. This included abolishing entrance examination at the lower secondary (1968) and upper secondary (1974) levels and also included an effort to equalize spending on schools and to gradually abolish school fees.

As the Korean economy evolved, it concentrated more on general education and less on technical education. In 1970, 47% of students were in technical upper secondary schools compared to 28% in 2006. In recent year, Korea has emphasized technical college (equivalent to *universidades tecnologicas* and *institutos tecnicos*) to ensure that students have a broad general education before focusing on technical education.

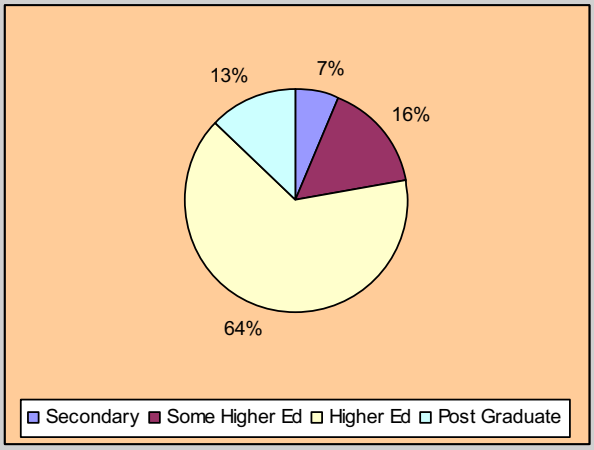
36. One interesting way of offering upper secondary education is through "subsidized schools" (*escuelas subsidiadas*). These are private schools that have their own revenues (generally from tuitions) and receive subsidies from either a state or federal government. These schools were originally set up to provide schooling options for the rural population. However, around 36% of these schools are in urban areas. In total, 2.2% of upper secondary students are in subsidized schools—57,100 in schools with federal subsidies and 17,800 in schools with state subsidies[5]. This system is one of the few examples of public-partnership in the education sector at any level.

[5] Only four states have subsidized schools paid through state subsidies: Chihuahua, Oaxaca, San Luis Potosi, and Sonora, with the vast majority of students are in Chihuahua and Sonora. There are schools with federal subsidies in a total of 21 states.

37. At the upper secondary level, the private sector can play a significant role in orientating the direction of technical education. In practice, this varies greatly from state to state. In some cases, the private sector primary contribution is through donating equipment and supplies. In some states, representatives from the private sector are active in deciding which courses are offered and fine-tuning the curriculum to meet their demands. Some states have set up apprenticeship programs with private firms as a way to promote hands-on learning.

38. **Human resources.** In the 2005-2006 school year, there were an estimated 163,000 teachers in the public upper secondary system and another 96,000 in private upper secondary schools[6]. This number includes both part time and full time teachers and some administrators. Undoubtedly, many of these teachers work in more than one sub-system. Table 5 shows the distribution of teachers by employer and type of contract. More than half of teachers are hired on a contract basis (62%) and only 16% of teachers are hired on a full time basis. Only the federal system has a large number of full time teachers but even there the largest group of teachers are part time teachers. This pattern is repeated at the state level; in almost all states, a majority of teachers are hired on an hourly basis. Annex Table 2 presents more detailed data on the number and contract type of teachers.

**Figure 1: Education Levels of Upper Secondary Teachers**




Source: Calculations from SEMS Form 911.

39. With many sub-systems, upper secondary education has a decentralized human resource system. By comparison, basic education is centralized, with each state making a state-wide arrangement with the state teacher's union on how teachers are hired and deployed. In the upper secondary system, unions generally play a more traditional role of negotiating salaries and basic working conditions. Some sub-systems do not have a teacher's unions. Informal estimates suggest that there are around 300 different unions active in the upper secondary education system nationwide.

**Table 5: Number and Contract Type of Teacher, by sub-system**

| Type of contract | Federal | State | Autonomous | Private | Subsidized | Total |
|---|---|---|---|---|---|---|
| **Full time** | 17,010 | 7,351 | 6,603 | 11,374 | 647 | 42,985 |
| **Part time** | 18,333 | 23,399 | 2,358 | 9,007 | 1,484 | 54,581 |
| **Contract** | 14,637 | 47,592 | 25,723 | 68,530 | 4,891 | 161,373 |
| **Total** | **49,980** | **78,342** | **34,684** | **88,911** | **7,022** | **258,939** |

Source: data from Form 911, for the 2006-2007 school year.

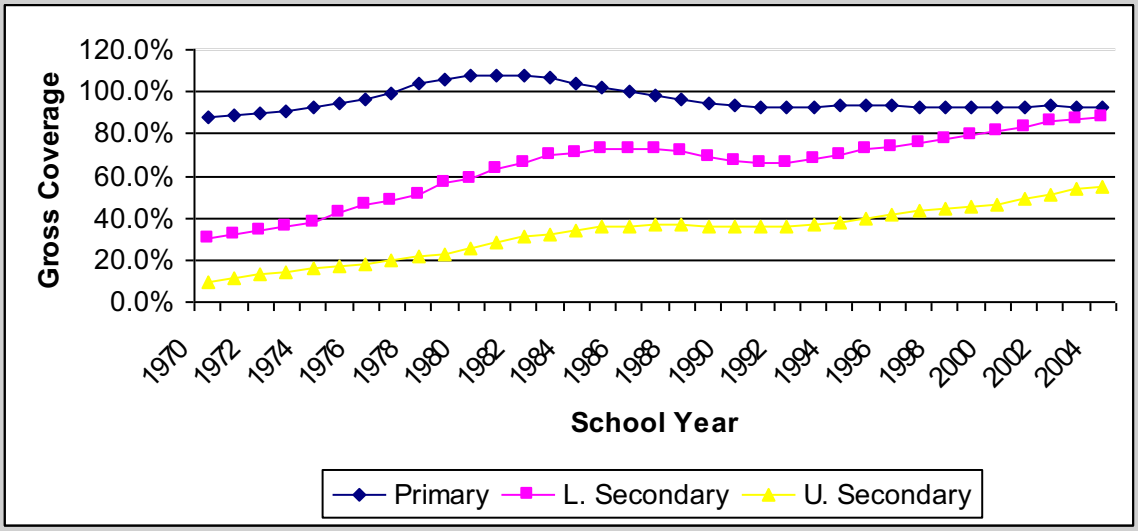
[6] This includes around 7,000 teachers in subsidized private schools.

40. **Upper secondary teachers are relatively well educated.** Figure 1 shows the education level of upper secondary teachers. More than 90% of teachers have some higher education and most have university degree or better. This national distribution is repeated in most states. Only in one state (Nayarit) do more than 10% of the teachers have only secondary education, while two states (Colima and Nuevo Leon), more than 20% of upper secondary teachers have post-graduate university degrees. Annex Table 3 has more details on the education background of upper secondary teachers by state.

***Enrollment in Upper Secondary Education***

41. **Mexico has seen a rapid increase in enrollment at all levels.** As can be seen in Figure 2, coverage of basic education (primary and lower secondary) has effectively reached 100%. At the upper secondary level, enrollment has likewise seen a large increase from a very low base of 10% in the 1970-1971 school year to 55% in the 2005-2006 school year. In 1970, only 310,000 students were enrolled at the upper secondary level, by 2005, this increased to more than 3.7 million.

**Figure 2: Gross Enrollment Rates**




Source: SEP, 2006
Note: School years refers to the full school year (Sept. to June).

42. **Upper secondary education in Mexico has seen a number of structural changes in the past three decades.** In 1970, when the coverage of upper secondary was quite small, the federal system, with 20% of the total enrollment, focused almost entirely on technical education. The state system was also small, only accounting for 9% of total enrollment. General education accounted for 37% of total enrollment and was largely provided through autonomous and private schools.

43. By 2005, the system was quite different. First, many new sub-systems were created in the intervening years. With the increase in enrollment, all sub-systems grew quickly. By far, the biggest growth was in the state system, which grew from 27,000 in 1970 (around 9% of enrollment) to 1.3 million in 2005 (around 35% of enrollment). This state system grew largely to meet the demand for general education. While autonomous schools still remain important source of upper secondary coverage, they now account for around 15% of the total coverage compared to 36% in 1970. The coverage of the private sector has also been reduced from 25% to 21%. The reduction of the role of autonomous and private schools is driven by the available of other options for general education at the upper secondary level, particularly from the different state systems.

44. **While there has been a significant increase in coverage at the upper secondary level, nearly half of students will never graduate.** In the 1977-1978, around 77% of lower secondary graduates entered upper secondary education and by the 1979-1980 school year, around 67% of those had graduated ("the terminal efficiency"). In all, an estimated 39% of 18 year olds in that year graduated from upper secondary school. More recently, the transition from lower secondary school to upper secondary school has averaged around 95%. However, the terminal efficiency of the upper secondary level has decreased to 59%.

45. **Mexico has largely eliminated the gender gap in Upper Secondary education.** Current data show that there is no significant difference in enrollment or graduation by gender. Boys and girls have the same expected education life expectancy. According to household data[7] 54% of 16 year old girls are in school compared to 59% of 16 year old boys. At age 17, however 53% of girls are in school, compared to 45% of boys.

**Table 6: Enrollment by Income Quintile**

| Quintile | Age 15 to 16 | Age 17 to 18 |
|---|---|---|
| 1 | 63% | 41% |
| 2 | 56% | 36% |
| 3 | 62% | 35% |
| 4 | 65% | 44% |
| 5 | 76% | 54% |
| Total | 64% | 42% |

Source: MXLFS 2002
Note: These estimates tend to over-estimate the number of people in school as many school drop-outs leave the household.

**46. Poor students are less likely to stay in school.** While coverage remains high through lower secondary school, there is a bias against poorer students staying in school. Table 6 summarizes enrollment by income quintile. It shows that enrollment in the upper secondary system is relatively low for all income groups except for the richest 20$^{th}$ percentile of the population.

47. **Coverage of the indigenous population is limited.** There are very little data on the coverage of education among the indigenous population. The single best source of data is from the 200 population census. The evidence shows quite clearly that indigenous youth are disadvantaged in finishing school. In addition, there are significant gender gaps in terms of education achievement. Using the census, for the population aged 15 to 19, 6.6% of the male population is illiterate compared to 10.5% of

[7] From 2002 Mexico Family Life Survey (MXFLS), a national household sample with multiple foci.

the female population. For non-indigenous youth, the proportions are 2.4% and 2.0% respectively.

**Box 3: Poland—Increasing Quality in Upper Secondary Education**

As Poland rebuilt its society after World War II under Soviet tutelage, it focused on increasing secondary education enrollment with a strong emphasis on technical and vocational education. By the 1980s coverage of the upper secondary education was high and around 80% of students were in some sort of vocational system, generally run by state-owned enterprises or "functional" ministries (agriculture, mining, etc.). This model was no longer viable after 1989, as the country began to significantly reform its economic and political system. Firms could not maintain their own school systems and there were increasing demands for modern skills and greater access to general education. By the 1995-1996 school year, around 30% of students were in general secondary schools up from 23% in the 1990-1991 school year.

In 1999, the Government launched a major reform of secondary education that introduced a core curriculum for all schools, an independent assessment system, and demand-based financing for schools. Many types of technical education were merged. By the 2003-2004 school year, enrollment in general upper secondary schools rose to 42%. Additional reforms were carried out at the lower secondary level.

At the same time, Poland started participating in PISA. Poland has become one of the fastest improvers on PISA, increasing from a score of 479 in 2000 to 500 in 2006. The distribution of PISA scores is quite equitable as well. Poland is one of the poorest OECD countries, with a GDP per capita below Mexico's. Although research is on-going on this phenomenon, it is clear that the 1998 with its emphasis on a more unified secondary education system and the greater role for independent assessments.

***Education Finance for Upper Secondary***

48. **There have been few attempts to estimate the size and equity of public expenditure in upper secondary education.** In large part this is due to the complexity of the financing model for upper secondary education, with its numerous sub-systems and joint funding arrangements. The attempt here will take the best available data and estimate the distribution of spending at the upper secondary level.

49. The federal government is the largest financier of education in the country, although it only directly administers part of the education system, including several sub-systems at the upper secondary level and a number of autonomous and decentralized higher education institutions. The principal means that the federal government finances upper secondary are:

- **Ramo (Budget Chapter) 11**, which includes spending for learning institutes under the direct control of the federal government. This includes the *Colegio de Bachillers* (a general education program) and several types of technological

programs, including CECYTES and *Tecnologicos-SEMS*. This budget chapter also finances the financial transfers from the federal government to federal universities. Schools in the CONALEP system in the Federal District are also financed by Ramo 11.

- **Ramo 25**, which includes the provision of education in the Federal District. Although this is mostly focused on the basic education sector, it supports counter-part funding for CONALEP.
- **Ramo 33,** which includes transfers to states for technological education, in particular for CONALEP.
- **Federal agreements,** Public state universities receive federal resources from federal agreements (*convenios federales*), which are included as part of Ramo 11. This aims to support their current expenditures. In 2006, the federal government financed around 62% of spending at state autonomous universities, the state governments around 27% and the remaining 12% from other sources including fees. The exact distribution differs from state to state[8].

Annex table 4 has a detailed table explaining the financing sources of the different types of upper secondary school systems in Mexico.

50. State governments play a major role in financing upper secondary education. This ranges from providing counter-part funding to programs like the CONALEP school system to directly operating their own upper secondary school systems. States also provide financing to their own autonomous universities from their own budgets (this complements federal funding) Autonomous universities also finance upper secondary education directly, using their own budgets, which in turn comes from the state and federal governments. Autonomous universities generally do not receive any additional direct subsidies for their upper secondary schools.

51. Public upper secondary education is rarely "free" for students, although the cost varies greatly from system to system. However many systems offer scholarships and financial aid, typically in the form of a tuition waiver or reduction. In addition the *Oportunidades* program supports many poorer students in upper secondary school[9]. SEP has also recently introduced a scholarship program aimed at poor upper secondary students who do not qualify for *Oportunidades*. These students are a better off but still require financial assistance. The scholarship program is directly managed by SEP and the students receive a cash transfer as long as they stay in school with acceptable grades[10]. SEP also offers a small number of special scholarships for talented students, including

[8] Poorer, small states, like Oaxaca and Yucatan, make a small contribution to their autonomous university system (in the range of 10% of the total budget) while larger states like Nuevo Leon and Mexico are contributing around 25% to 33% of total expenditures.

[9] Oportunidades has a special program for upper secondary students known as *Jovenes con Oportunidades*. Under this program, students receive cash scholarships ranging from 635 pesos to 825 pesos per month, depending on their grade level and sex. In addition, they can receive a bonus of around 3,500 pesos when they graduate from upper secondary school.

[10] *Becas de apoyos* are available for students above "patrimonial poverty line" that do not qualify for *Jovenes en Oportunidades*. The scholarships pays between 500 pesos to 625 pesos per month, depending on grade and age level.

those with high grades and students with artistic and sport talents. All of these scholarship programs are reserved for students in public schools.

52. This financial support is important for many students because the cost of upper secondary education can be significant. Using the 2002 MXSFLS household survey, around 20% of 15 and 16 years olds and around the same number of 17 and 18 years olds reported that school expense was the main reason that they dropped out of school. In fact this was the single biggest cause cited after the generic "did not want to go back to school." Evidence from the same survey suggests that cost of upper secondary education was indeed costly. On average, a student in the 2nd income quintile would have to pay around 17% of their income for the average upper secondary education (including tuition, books, uniforms, and other supplies), 7% in the 3rd quintile, and 4% in the 4th quintile.

53. Table 7 presents a summary of public expenditure on upper secondary education. Total expenditure is estimated to be 59.0 billion pesos. The federal government plays a dominant role in financing secondary education in the public sector, accounting for around 72% of estimated total spending. This includes direct federal financing to the federal sub-systems and to UNAM and to state autonomous universities. The federal government also provides a large proportion of state financing through direct transfers to state governments. Annex Table 6 presents the state by state results of allocation of spending by source of financing.

**Table 7: Estimated Public Expenditure on Upper Secondary Education in 2005, millions current pesos.**

| | Federal | | | State | Autonomous Universities | |
|---|---|---|---|---|---|---|
| | Ramo 11 | | Ramo 33 | | | |
| | Technical | Academic | | | Federal | State |
| Total spending | 30,139.7 | 3,430.2 | 1,964.9 | 13,343.2 | 2,479.8 | 7,656.7 |

Source: Government data on education finance and enrollment, modified by authors. Note: Academic budget under Ramo 11 refers to the federal Colegio de Bachillers. There are other federal general education programs at the upper secondary level. Data from autonomous universities come from a variety of sources. The federal autonomous university is from UNAM source directly, based on their estimated expenditures on upper secondary. State statistics are taken from state sources and when no direct information is available on spending on upper secondary education, it is imputed treating each upper secondary student as the equivalent of 0.4 university students. For states with no budget data, the national average is used.

54. More important than the total expenditure on upper secondary education is how resources, particularly federal resources, are distributed throughout Mexico. In its own schools, the federal government spends around 41,000 pesos per student.[11] However the federal government spreads its resources unevenly throughout the country. In an absolute sense, Colima and Baja California Sur receive the smaller share of Ramo 11 resources (0.7% and 1.1% of total spending, respectively) while the Federal District receives the largest share, at 11.8%. There are big differences in spending per student. The State of Mexico receives the smallest allocation per capita approximately 22,000 pesos per

[11] The organization of the data makes it difficult to accurately break down spending per sub-system. It is also likely that total federal spending (and hence per student spending) is slightly higher than reported here.

student in federal upper secondary schools[12]. Students in Nuevo Leon receive an average of 81,000 pesos per students, the highest in the nation. Nuevo Leon has one of the smallest federal upper secondary systems, which suggests that there are certain fixed costs in running the federal system in each state. Other states with high per capita allocations tend to have relatively small federal systems.

55. Spending by the states on upper secondary education also varies greatly. On average, states spend 10,100 pesos per student. However in Oaxaca, the state only spends 2,900 pesos per student and in Baja California, 4,300 pesos per student. At the other extreme, Jalisco spends 86,600 pesos per student for its upper secondary education system[13]. However, the federal government provides significant resources to complement states and in the case of Oaxaca directly operates parts of the upper secondary system that are normally under the control of the state government.

[12] The Federal District also appears to receive low financing per student, but this likely represents the difficulty in properly calculating the transfers to the district.

[13] The state of Colima, which has only one state upper secondary school, spends even more on a per student basis.

## III. Upper Secondary Education in the Mexican Economy

56. **A country's competitiveness is built as much on knowledge as on hard infrastructure.** Mexico is a middle income country with a large gross domestic product (GDP) of $839 billion, making it the 13th largest economy in the world[14]. Mexico is competing with other middle income countries, ranging from Thailand, Malaysia, and Korea in Asia and the Czech Republic, Poland, and Russia in Europe among others. Each country has its own set of endowments and strengths but as the global economy moves in the direction of an information- and service-focused economy, there will be increasing demand for a highly educated work force as a factor of production. How does Mexico compare to its peers and its competitors?

57. This paper argues that upper secondary education represents a major gap in Mexico's education system. In most middle and high income countries, the plurality of workers has completed upper secondary education. Table 8 reviews education from a selection of middle and high income countries. It is clear that Mexico is behind other countries. Mexico has a significant number of people with higher education but lags behind other countries in the percentage of the population with upper secondary education. It also has a low enrollment rate at the upper secondary level. While the level of education of the Mexican workforce will increase, at currents rates of increase, at its present rate it will leave Mexico behind other countries.

**Table 8: Summary Education Statistics for Selected Countries**

| Country | GDP per capita | Percentage of Labor Force with | | | Average education of adults | GER in Upper Secondary |
|---|---|---|---|---|---|---|
| | | Primary | Upper Secondary | Tertiary | | |
| Bulgaria | 1,658 | 21.7 | 55.0 | 23.3 | | 102 |
| Canada | 23,392 | 18.0 | 31.0 | 51.0 | 11.6 | 115 |
| Cyprus | 13,574 | 28.4 | 40.7 | 27 | 9.2 | 88 |
| Czech Rep. | 5,684 | 10.2 | 78.1 | 11.6 | | 90 |
| Finland | 23,478 | 24.7 | 43.7 | 31.6 | 7.9 | 150 |
| Hungary | 4,900 | 18.2 | 65.2 | 16.5 | 9.1 | 98 |
| Ireland | 26,409 | 30.9 | 40.6 | 25.8 | 9.4 | 112 |
| Israel | 17,890 | 14.4 | 35.1 | 49.6 | 9.6 | 110 |
| Korea | 11,220 | 14.2 | 43.7 | 24.9 | 10.8 | 93 |
| **Mexico** | 5,864 | **60.6** | **15.7** | **15.4** | **7.2** | **48** |
| Panama | 3,887 | 45.4 | 26.0 | 16.0 | 8.6 | 54 |

Source: World Bank Education Database, EdStats.
Most data are from 2000 and 2001. GER refers to gross enrollment rate. GDP per capita is in current 2001 US dollars.

### *Economic Theory and Education*

[14] Based on estimates from the World Bank's global development indicators using data and current exchange rates from 2006.

58. **What does the low level of upper secondary education mean for Mexico's competitiveness?** Here, competitiveness refers to increases in a country's productivity and the country's attractiveness to domestic and foreign investors. It can be a very subjective term. As previously mentioned, the World Economic Forum publishes a global competitiveness report (World Economic Forum, 2007). Mexico ranks 52nd out of 131. Mexico is considered to be relatively stable economically (ranked 35th out of 131), however it has many problems with education that weakens Mexico's ratings. This includes the quality of the education system (92nd out of 131), quality of math and science education (113th out of 131), and secondary education enrollment (73rd out 131). Descriptions of competitiveness in Mexico emphasize the cost of the low level of education to competitiveness (Farrell et al, 2005). Clearly investors are worried about the low level of education of the Mexican workforce.

59. **Education and human capital development play a major role in different theories of economic growth.** Krueger and Lindahl (2001) in their careful review of the literature on growth and education identify two approaches to understanding education's role in producing growth. One approach sees education as *human capital* and increasing human capital leads to more economic growth, much in the same way as increase physical capital creates economic growth. This approach focuses on the *flow* of education. However, a second approach focuses on the *stock* of education. High levels of education lead to faster technological growth which in turn fuels economic growth. One implication of this approach might be that bigger countries (such as India or Mexico) may have an inherent advantage in technology-lead economic growth.

60. The classic Solow (1956) growth model is based on increases in labor, capital, and technical progress. Although technical progress is treated as determined outside the model, many economists have used education as a determinant of technical progress. Technical progress is usually described as an increase in productivity in inputs (principally labor and capital). However, in classic models of growth most variables are exogenously determined and there is little role of education (or any sector) in promoting growth and productivity. More recent variations, such as the "enhanced Solow model" (Mankiw, et al, 1992) do include education as a form of capital, although without the positive externalities that many models associate with education.

61. In the 1980s, economists began to explore more sophisticated models of growth, known collectively as "models of endogenous growth." As the name suggests, the variables within the models are determined internally as a result of various investments and decisions. In the simplest models, the level of education plays a direct role in growth by increasing the productivity of labor. More complicated models also have a role for learning by doing and knowledge spillovers, which call for a higher level of education (Aghion and Howitt, 1998; Barro and Sala-i-Martin, 1999). This would imply that a combination of basic education (for workers) and higher education (for innovation) are important to ensure sustainable growth.

62. Another influential model was developed by Kremer (1993), known as the O-Ring Theory. This theory essentially posits that productivity is only as good as the

weakest link in the production function. If a country (or a firm) is deficient in one or more key inputs, all of the other inputs will be less productive and wages will be driven down. Highly educated workers tender to work together, thus creating further scarcity for the rest of the economy. One clear implication for developing countries is the importance of balancing human capital investments with physical capital investments. At the same time, it is important to balance investments in higher education and research with investments in basic and secondary education. It is easy to see that secondary education plays an important key role here. For a middle income country, it is probably the ideal education level for the labor force. At the same time, it is a bridge for higher education. Without a good strong secondary education system, the tertiary education system may not be able to grow.

63. **The empirical evidence on the impact of education is mixed.** First, Krueger and Lindahl (2001) point out that commonly available databases have significant differences in their estimates of education levels across countries. This alone leads to important differences in estimates across studies[15]. In many cases, the empirical relationship between education and growth is unclear. Estimates of the rates of education suggest that education is a good investment, with average rates of return in the range of 10% (Psacharopoulos and Patrinos, 2002). Mehta and Villarfeal (2004) estimate a series of rates of return for Mexico for the year 2000. These rates of returns are summarized in Table 9. From this table, it is clear that for men, education only has a significant value at the upper secondary level, while for woman education appears to become important at the lower secondary level. This is not surprising given that basic education is largely universal and is increasingly expected for employment. On average, an upper secondary graduate would expect wages that are 3.2 times higher than somebody with no education and 2.3 times higher than somebody with primary education.

**Table 9: Estimated Rates of Return for Different Levels of Schooling in Mexico, 2000**

| | Total | Male | Female | Rural | Urban |
|---|---|---|---|---|---|
| Primary | 5.8% | 5.0% | 7.8% | 7.0% | 3.8% |
| Lower Secondary | 10.8% | 6.1% | 21.3% | 6.7% | 8.2% |
| Upper Secondary | 19.1% | 17.1% | 22.8% | 23.0% | 14.2% |
| University | 19.6% | 19.8% | 19.2% | 19.3% | 18.9% |
| Post Graduate | 22.1% | 21.1% | 22.6% | 29.4% | 21.8% |

Source: Mehta and Villarreal, 2004.

64. Using the data presented in this paper and a method suggested by Pritchett (2001), it is possible to estimate that share of the total wage bill due to education capital is 0.59. That means that 59% of the wage bill is due to the education level of the work force. If the labor market is competitive (a reasonable assumption in the aggregate), it probably means that the education of the Mexican work force which worth more than the physical capital of the country[16]. Of that amount, 10% is due to the basic education, 14% to upper

[15] The correlation in education levels in major datasets is estimated around 0.90. The correlation between changes in education level is estimated to be lower.

[16] This would be the case if share of physical capital is less than 36% of the total GDP. This is likely to be the case.

secondary education, and fully 35% due to higher education. Since the share of the work force with only basic education has been declining in recent years, much of the recent economic growth has been due to an increase in upper secondary and tertiary education. In contrast, using data from reported in Pritchett (2001), education accounts for 73% of the total wage bill in OECD countries. The benefits of education are better distributed, with about 29% due to higher education and 33% due to upper secondary education.

65. While these rates of return to education are impressive, they seem inconsistent with the macro-level data. Mexico has recently seen a large increase in enrollment (as can be seen in figure 2). At the same time, economic growth has been slow, averaging 1.5% over the past two decades. It is not at all clear that education has productive investment for the economy. Indeed, both Psacharopoulos and Patrinos (2002) and Pritchett (2001) discuss the inconsistency between macro-level estimates of the impact of education and micro-level estimates of rates of returns.

66. Macro economic estimates of the impact of education on growth are unclear. Barro and Sala-i-Martin (1999) find a positive impact for education on economic growth as do Krueger and Lindahl (2001), using different approaches and datasets. Pritchett (2001) however shows that education often has a negative or no impact on economic growth and in any case cannot justify the high rate of private returns. There are many possible reasons for this contradiction, ranging from low marginal demand for educated labor (newly educated workers do not get the same opportunities as older workers) to education as a tool for rent seeking (educated workers redistributing resources to their benefit).

67. **The quality of education plays a key role in determining the value of education.** Many recent studies have shown that taking into account the differences in education quality substantially improves empirical analysis. Hanushek and Wobmann (2007) show that by controlling for education quality they are able to explain differences in growth much better than by using only information on education "quantity." These results have been found in other empirical studies of both the education level and quality of the population and of the labor force on economic growth. Likewise, studies of education quality and wages show that income is affected by the quality of learning and that including a quality of education variable improves estimates of the rates of return to education (Vegas and Petrow, 2008).

***Costs and Benefits of Increasing Upper Secondary Education***

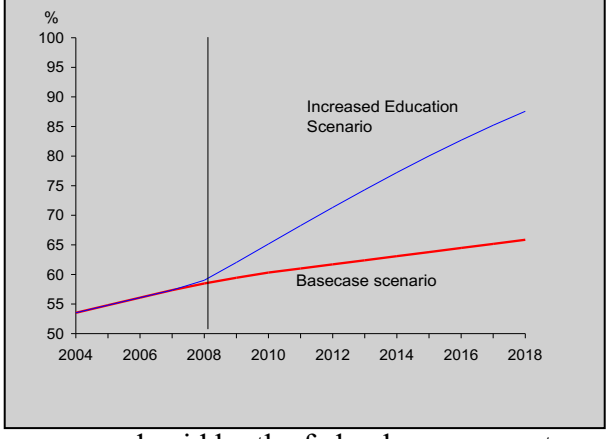
68. **Education brings many positive benefits to the economy and to individuals**. As noted in the previous section, education has a major impact on an individual's earnings and also on the growth path of an economy. At the same time, a more educated country may have fewer social problems, including less crime and more public participation in the government. Quantifying all of these impacts is difficult and most economic analysis has focused on the positive effects of education on earnings, using a Mincer (1974)-style regression and calculating the rates of returns for the individual to

invest in education. Understanding the value of education requires looking and quantifying other benefits to education.

69. This section considers a simulation of the impact of an increase in upper secondary education in Mexico on the economy[17]. Using an economic forecast model, it is possible to estimate the impact of increasing the education level in the country during a specific time. The forecast model generates a number of key output variables such as economic growth, the inflation rate, the trade balance, the government's fiscal balance, among others. The strategy is to look at the current trends in the economy, including enrollment trends to develop a *baseline scenario* for the Mexican economy. This baseline scenario is then compared to an *increased enrollment scenario* where upper secondary school enrollment has grown faster than expected from current trends. The difference between the baseline and the scenario gives an estimate of the impact of education on the economy.

70. In the baseline scenario, enrollment in upper education is assumed to rise to 65.2% (around 7.6 million people) in 2017 compared to 54.6% (around 5.7 million people) in 2005[18]. This follows existing demographic and enrollment trends. In the increased education scenario, enrollment rate is assumed to increase to 85.2% (around 10.3 million people) in 2017. This large increase in enrollment has several major impacts on the Mexican economy:

**Figure 3: Upper Secondary Enrollment Rate**




- The cost of upper secondary education will increase. For these forecasts, the assumption is that the marginal cost for educating a new student is fixed and paid by the federal government.

- The enrollment rate for tertiary education is assumed to remain at current levels. However with the increase in upper secondary enrollment (in both scenarios), this will lead to an absolute increase in tertiary graduates.

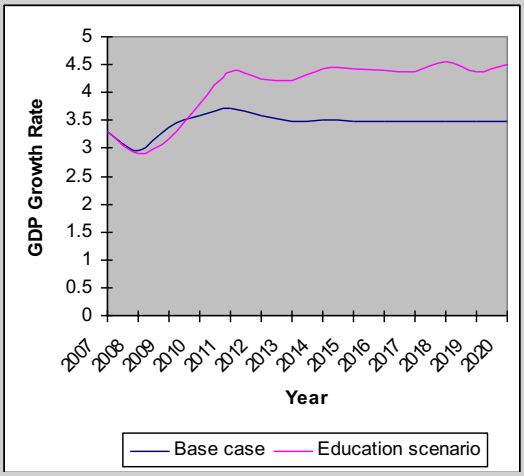
- Increasing the number of students in upper secondary school will decrease the number of available workers in the market, however with the large availability of workers in Mexico, the scenario assumes no major impact on wages. After the students graduate, they will be available for the work force.

[17] These estimates were done using the Oxford Economic Foresting Model, a sophisticated multi-country macroeconomic forecasting model.
[18] These rates are essentially the gross enrollment rates.

71. **This increase in upper secondary leads to a number of quantifiable economic outcomes.** In the baseline scenario, GDP growth is estimated to be about 3.4% per year from 2008 to 2012 and 3.5% per year from 2013 to 2017. However, with the increase in education, GDP could be expected to grow by 3.7% from 2008 to 2012 and 4.4% from 2013 to 2017. In total, the Mexican GDP could grow by a cumulative 5% over the next decade. The graph in figure four outlines the potential growth to the Mexican economy.

72. **The changes in GDP growth are mostly driven by increases in productivity.** As discussed above, Mexico has had relatively low increases in productivity. In the base case scenario, TFP is expected to increase by around 1.0% per year in the next decade, compared to 1.8% growth in the increased education scenario. Towards, the end of the scenario, Mexico's level of productivity will approach the levels seen in Chile. Personal income and consumption will increase and it is likely that inequality will ease. Although the size of the labor will remain about the same (51.7 million in 2017), unemployment is likely to decrease by around 370,000 workers.

**Figure 4: Forecast GDP Growth**




73. **While the benefits are substantial, the reform does have costs.** As enumerated above, increasing the coverage of upper secondary has direct costs and indirect costs. The reform would lead to an increased budget deficit would increase modestly from 2009 to 2013 but starting in 2014, the program would start to contribute to the government's budget as the income of the workforce increases.

74. **Increasing learning and education quality is another input in increasing productivity.** The results here are built around an increase in coverage that goes in parallel with an increase in education quality, so that Mexico's graduates are more or less on par with those of the Chilean education system. While the quality of education quality in Chile is not high by world standards, it is one of the highest in Latin America. At the upper secondary level, Mexico has to work on both fronts to increase productivity: increase coverage and ensure that the quality of graduates is adequate.

75. **Investing in education can be a good investment for the economy.** A gradual improvement in the upper secondary segment would lead to an increase in economy activities and would lead to more government revenues. As an investment for the government, the returns are attractive. Based on the results of the model, the investment will yield 17% netting out the costs of the reform from the additional revenues generated by the boost to the economy. From an economy-wide perspective, the returns would be more impressive, yielding a rate of return of 92% from the initial government investment in increasing coverage at the upper secondary level.

## IV. Conclusions and Recommendations

76. **Mexico has a major education gap at the upper secondary level.** This gap puts Mexico at a disadvantage competing with other countries in the knowledge economy and it contributes to the high level of inequality in this middle income country. Upper secondary education plays an important role for several reasons. First, having more workers with the equivalent of upper secondary level would lead to a higher level of productivity. Mexico is currently well behind other nations in its education level and upper secondary is the main difference. Second, upper secondary education is an intermediate level before higher education and if the government wants to increase its universities coverage, it needs to increase coverage at the upper secondary level. Mexico's level of coverage at the university level is typical for a country at Mexico's income level and increasing it will require more upper secondary graduates.

77. **Improving education coverage and quality will reduce inequality and poverty.** In many ways, Mexico's income distribution replicates the inequality in education, with upper secondary education the glass ceiling for too many Mexicans as they enter the work force. The evidence on the differential in earnings also clearly shows the benefits of finishing upper secondary or using upper secondary education as a stepping stone into higher education. The benefits to primary and lower secondary education are small compared to what can be gained by finishing upper secondary. Increasing the number of well-education people in Mexico will both lower the wage differential and also ensure that more Mexicans move out of poverty.

78. The government is making an effort to provide incentives so that more people will finish upper secondary education. At the upper secondary level, economic barriers start to become important. At the upper secondary level, public schools can charge tuition and most sub-systems do. Private schools are far more prominent as well at the upper secondary level. In addition, students at the upper secondary level always have the option to leave school and work. As lower secondary graduates, they will receive better wages than those without education or with primary education. The federal government now has two relatively new scholarship programs that pay cash subsidies to poor students. In addition many upper secondary sub-systems offer tuition waivers and other forms of financial assistance.

79. **The upper secondary sector is fragmented.** While diversity is important to allow the upper secondary system respond to the different needs of the work force, the lack of coordination creates inefficiency in the sector. The Mexican government has a reform program that aims to standardize requirements across different sub-systems through the *Sistema Nacional de Bachillerato*. The new universal assessment of upper secondary graduates will also help monitor the results of different sub-systems. In addition, the federal government is working to improve the governance of the different federal sub-systems. This includes transparent selection of school directors and increased training of staff, among others.

80. **Recommendations and Next Steps.** Mexico is focusing significant attention on upper secondary education. This is a welcome change after many years when the sector was *de facto* part of higher education and was largely ignored. The reforms proposed by the federal government are based on careful analysis of international trends and the political economy of education in Mexico. These reforms aim to create minimum standards in the upper secondary sector by creating a common framework for upper secondary programs and through the introduction of national assessments of graduates.

81. The establishment of the SNB is an important step in bringing together the often fragmented upper secondary sector. This requires care to strengthen diversity in the sector while avoiding centralization that has plagued other education sectors. The federal government, in particular, will have to consider what its role should be in the upper secondary sector, balancing the different needs of financing, regulation, and provision.

82. The goal of the Mexican government is to create a strong and competitive upper secondary education system, with well-established standards. The upper secondary system should respect and reflect the diversity of the country and the diversity of the economic needs of the students. While there are lessons that can be taken from reforms at the basic education and university levels, it is important to recognize the inherent differences between these three levels. These recommendations build on these objectives:

- **Rationalize the role of the federal government.** At the basic education level, the federal government plays a major role in financing education and also in providing a stewardship role for the sector[19]. The same is true for the upper secondary level, except that the federal government also directly runs a large number of schools. The federal government should consider transferring some federal sub-systems to the state and gradually stop the direct provision of upper secondary education. Generally, sub-systems should not be transferred in a "big bang" fashion and should be transferred to the states when they are ready to receive them. The federal government should focus on regulating, evaluating, and financing the sector. In particular, the federal government should ensure that it provides adequate finance to the states for transferred systems.

- **Block financing for upper secondary education**. As part of a reform of the upper secondary sector, governments should move more towards block or capitation financing. The upper secondary system is well suited to receive block grants at the sub-system or school level. The upper secondary has many similar sub-systems, implying that there is likely to be competition among different options. Unlike basic education, upper secondary education relies heavily on part-time and contract teachers, which allow schools to increase or decrease their teaching staff quickly. The introduction of assessments will allow students to better make decisions about which type of school to attend. Allowing moneys to follow students makes sense in diversified system that needs to respond quickly to needs of the economy.

[19] Federal basic education providers were transferred to the states in 1992. In practice many states administers the former federal system differently than that old state-run system.

- **Define the role of the school**. The role of the school varies greatly from sub-system to sub-system. In many sub-systems, the school has little formal authority and is essentially seen as an extension of the sub-system administration. While there is no single ideal model for school-based management or participation, the upper secondary sector should move to promote more school autonomy including giving schools some independent authority and control of some portion of their budget. Likewise, schools should establish a parents' association that can provide feedback and support to the school administration. School-based management requires a different type of regulation, as proposed above.

- **Ensure that students have the full three years of upper secondary education and a smooth transition to the SNB.** For most students, upper secondary education is three years long but the autonomous systems of Nuevo Leon and San Luis Potosi offer two year degrees. This probably puts the graduates of these systems at a disadvantage both in entering universities and in the work force. The creation of the SNB may facilitate supporting these sub-systems to introduce a third year. The federal government may have to provide one time financial support for the transition to introduce the third year. Likewise, additional resources may be needed (on a one time basis) to help sub-systems adjust to the requirements of the SNB including offering new curriculum or meeting minimum quality levels.

- **Continue to promote scholarships.** The scholarship program offered by SEMS is new and is being evaluated carefully. It meets an important gap, helping potential students by providing them alternatives to working. The federal government should take into account the lessons from the *Oportunidades* cash transfer program and from the PRONABES program[20] at the higher education level. Future changes may need to take into account the impact of different family sizes and local market conditions. Administrative changes may involve decentralizing parts of the program to ensure that complaints can be received and resolved at the local level.

- **Improve communication and dissemination.** Communication is weak within the different sub-systems in upper secondary education and it is weak between the upper secondary education sector and other sectors. Under the lead of the federal government, the sector should make a concerted effort to disseminate information about different upper secondary options and scholarships at the lower secondary level. At the same time, the upper secondary sector should work with the higher education sector to ensure that there is effective dissemination of university programs and scholarships to upper secondary students. Finally, the sector should disseminate widely the results of the upper secondary assessment when they are available. SEP should also develop a protocol to release the assessment scores at a

[20] PRONABES is a joint state and federal program that gives monetary scholarships to university students. It is largely administered at the state level.

school level when they are available. These results will help new students choose among the options in an informed fashion.

- **Promote public-private partnerships.** The upper secondary sector has relatively strong relations with the private sector, including some private sector partnerships in operating schools and cooperation from the private sector to support technical education. The sector should promote these ties as much as possible. For technical education, the sector should try to encourage firms to "adopt" schools throughout the country. Not only does this help to provide employment for school graduates, it also helps to ensure that the school is focusing on relevant technical material. Additional options include promoting qualified private sector employees to serve as teachers on an hourly basis, perhaps through a subsidy program and basic training in teaching. Finally given the expected growth in upper secondary enrollment, the sector should consider experimenting with vouchers to take advantage of the existing private sector supply.

83. Upper secondary education is the fastest growing education sector in Mexico. More students are graduating from basic education and continuing their education at the upper secondary level. At the same, the federal government's efforts to increase graduation are likely to have a positive impact. Meeting this increased demand will require additional resources. The results in Chapter 3 show that public upper secondary education is a good investment for the government. As discussed, upper secondary education relies on contract teachers, which gives the sector some flexibility as it grows. This raises an important question about relying on part time instructors. Policy makers have to consider options to meet the increased demand. This might include building more facilities but might also include greater reliance on school transportation and on distance education.

84. **Priorities need to be set and decisions need to be made.** Mexico is in the process of reforming its upper secondary education system, which requires making decisions about conflicting priorities. Discussing these priorities requires an understanding of the different options given the government's limited resources. Additional research can help set these priorities and understand the cost associated with each one. The new learning assessment will allow an improved understanding of the efficiency of different sub-systems. Additional work on understanding how upper secondary education is financed will also given a clearer picture of the economic cost of the system and trade-off to improve coverage and quality.

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**Annex Table 1: Basic Enrollment Information, by state**

| | | Enrollment by type of Sub-System | | | |
|---|---|---|---|---|---|
| | | Absorption in Upper Sec. | Drop-out rate in Upper Sec. | Terminal Efficiency in Upper Sec. | Gross Enrollment Rate |
| Aguascalientes | | 95.9 | 17.1 | 58.0 | 53.9 |
| Baja California | | 98.7 | 19.2 | 57.4 | 52.4 |
| Baja California Sur | | 119.7 | 19.4 | 55.7 | 71.8 |
| Campeche | | 110.0 | 17.7 | 55.4 | 58.5 |
| Coahuila | | 91.2 | 18.5 | 60.5 | 56.6 |
| Colima | | 94.8 | 14.9 | 63.0 | 56.1 |
| Chiapas | | 94.7 | 15.5 | 66.4 | 49.3 |
| Chihuahua | | 110.9 | 20.4 | 51.8 | 54.6 |
| Distrito Federal | | 121.2 | 16.1 | 57.1 | 88.5 |
| Durango | | 102.9 | 18.8 | 56.0 | 57.2 |
| Guanajuato | | 80.4 | 19.0 | 54.6 | 43.5 |
| Guerrero | | 98.5 | 14.3 | 64.8 | 46.6 |
| Hidalgo | | 89.6 | 17.6 | 56.9 | 59.1 |
| Jalisco | | 83.7 | 15.9 | 57.7 | 49.7 |
| México | | 84.4 | 18.5 | 54.6 | 46.7 |
| Michoacán | | 80.0 | 24.0 | 48.9 | 37.1 |
| Morelos | | 101.0 | 16.0 | 62.3 | 61.6 |
| Nayarit | | 94.3 | 16.1 | 61.4 | 58.8 |
| Nuevo León | | 108.6 | 20.6 | 56.2 | 57.7 |
| Oaxaca | | 92.5 | 17.1 | 55.8 | 51.2 |
| Puebla | | 90.7 | 13.4 | 67.0 | 52.9 |
| Querétaro | | 92.4 | 15.9 | 59.8 | 52.9 |
| Quintana Roo | | 106.6 | 18.2 | 57.4 | 56.0 |
| San Luis Potosí | | 82.8 | 15.0 | 65.8 | 49.8 |
| Sinaloa | | 116.3 | 16.3 | 59.5 | 67.4 |
| Sonora | | 111.3 | 17.2 | 57.2 | 62.5 |
| Tabasco | | 99.7 | 15.4 | 61.0 | 66.0 |
| Tamaulipas | | 104.7 | 15.4 | 64.4 | 57.8 |
| Tlaxcala | | 98.1 | 14.3 | 63.5 | 55.5 |
| Veracruz | | 96.4 | 14.4 | 64.0 | 56.6 |
| Yucatán | | 104.5 | 21.0 | 52.4 | 58.9 |
| Zacatecas | | 80.8 | 15.9 | 62.0 | 48.9 |
| **National** | | **96.0** | **17.0** | **58.6** | **54.9** |

Source: Secretariat of Public Education database. All data are for the 2005-2006 school year. Gross enrollment rate estimates are based on the population aged 16 to 18 years.

**Annex Table 2: Enrollment by Sub-System by State, 2005**

| | | | Enrollment by type of Sub-System | | | |
|---|---|---|---|---|---|---|
| | | Total Enrollment | Federal | State | Autonomous | Private |
| Aguascalientes | | 33,382 | 44.2 | 23.3 | 3.7 | 28.8 |
| Baja California | | 81,968 | 35.2 | 40.2 | 0.0 | 24.5 |
| Baja California Sur | | 19,043 | 58.3 | 32.5 | 0.0 | 9.2 |
| Campeche | | 18,802 | 25.2 | 1.3 | 63.2 | 10.4 |
| Coahuila | | 26,939 | 33.2 | 42.1 | 15.4 | 9.2 |
| Colima | | 69,298 | 44.1 | 9.9 | 12.3 | 33.7 |
| Chiapas | | 147,834 | 15.5 | 73.2 | 0.0 | 11.3 |
| Chihuahua | | 100,219 | 32.2 | 37.9 | 0.1 | 29.9 |
| Distrito Federal | | 358,799 | 50.0 | 0.0 | 27.1 | 22.9 |
| Durango | | 54,386 | 38.9 | 43.6 | 7.4 | 10.1 |
| Guanajuato | | 124,484 | 24.0 | 30.8 | 8.0 | 37.2 |
| Guerrero | | 96,028 | 28.2 | 29.1 | 38.7 | 3.9 |
| Hidalgo | | 89,303 | 33.1 | 37.2 | 11.0 | 18.8 |
| Jalisco | | 193,381 | 13.8 | 9.6 | 51.6 | 25.0 |
| México | | 374,266 | 17.5 | 53.5 | 7.9 | 21.2 |
| Michoacán | | 104,306 | 30.1 | 36.3 | 12.1 | 21.5 |
| Morelos | | 55,247 | 41.9 | 21.3 | 10.9 | 26.0 |
| Nayarit | | 30,615 | 34.3 | 12.1 | 41.7 | 11.8 |
| Nuevo León | | 100,554 | 7.9 | 8.2 | 47.2 | 36.7 |
| Oaxaca | | 121,823 | 29.5 | 55.1 | 7.9 | 7.4 |
| Puebla | | 180,891 | 12.4 | 62.4 | 5.7 | 19.5 |
| Querétaro | | 52,164 | 13.0 | 50.7 | 9.7 | 26.6 |
| Quintana Roo | | 33,693 | 22.9 | 64.6 | 0.0 | 12.5 |
| San Luis Potosí | | 74,910 | 20.6 | 63.7 | 0.9 | 14.8 |
| Sinaloa | | 102,276 | 17.7 | 32.0 | 40.8 | 9.6 |
| Sonora | | 79,840 | 36.5 | 45.3 | 0.0 | 18.2 |
| Tabasco | | 85,951 | 18.6 | 71.6 | 0.0 | 9.8 |
| Tamaulipas | | 92,407 | 58.8 | 15.0 | 1.3 | 24.9 |
| Tlaxcala | | 35,952 | 30.7 | 56.8 | 0.0 | 12.5 |
| Veracruz | | 257,973 | 24.2 | 55.3 | 0.0 | 20.5 |
| Yucatán | | 60,907 | 24.0 | 36.5 | 9.3 | 30.2 |
| Zacatecas | | 43,914 | 21.3 | 56.7 | 15.6 | 6.3 |
| National | | 3,301,555 | 27.5 | 37.7 | 14.3 | 20.4 |

## Annex Table 3: Number and Contract Type of Teachers, by State

| | | Number of teachers, by employment type | | | |
|---|---|---|---|---|---|
| | | Full time | Part time | Contract | Total |
| Aguascalientes | | 576 | 438 | 1,925 | 2,939 |
| Baja California | | 802 | 872 | 4,941 | 6,615 |
| Baja California Sur | | 171 | 415 | 989 | 1,575 |
| Campeche | | 351 | 384 | 1,450 | 2,185 |
| Coahuila | | 1,129 | 982 | 4,587 | 6,698 |
| Colima | | 201 | 125 | 1,122 | 1,448 |
| Chiapas | | 1,177 | 3,206 | 4,470 | 8,853 |
| Chihuahua | | 1,160 | 1,669 | 4,167 | 6,996 |
| Distrito Federal | | 6,069 | 7,248 | 17,718 | 31,035 |
| Durango | | 1,053 | 1,038 | 2,280 | 4,371 |
| Guanajuato | | 2,338 | 1,219 | 7,638 | 11,195 |
| Guerrero | | 1,409 | 1,072 | 3,860 | 6,341 |
| Hidalgo | | 500 | 2,008 | 2,896 | 5,404 |
| Jalisco | | 3,814 | 2,809 | 14,230 | 20,853 |
| México | | 3,941 | 4,867 | 23,557 | 32,365 |
| Michoacán | | 1,314 | 1,563 | 5,105 | 7,982 |
| Morelos | | 953 | 1,039 | 3,068 | 5,060 |
| Nayarit | | 939 | 560 | 1,051 | 2,550 |
| Nuevo León | | 2,314 | 962 | 5,804 | 9,080 |
| Oaxaca | | 2,436 | 1,791 | 2,457 | 6,684 |
| Puebla | | 1,135 | 3,385 | 9,618 | 14,138 |
| Querétaro | | 653 | 849 | 2,330 | 3,832 |
| Quintana Roo | | 273 | 655 | 1,478 | 2,406 |
| San Luis Potosí | | 834 | 856 | 4,156 | 5,846 |
| Sinaloa | | 907 | 661 | 5,676 | 7,244 |
| Sonora | | 1,273 | 1,397 | 3,034 | 5,704 |
| Tabasco | | 901 | 1,864 | 2,382 | 5,147 |
| Tamaulipas | | 770 | 2,242 | 3,824 | 6,836 |
| Tlaxcala | | 308 | 380 | 1,815 | 2,503 |
| Veracruz | | 1,716 | 6,499 | 9,107 | 17,322 |
| Yucatán | | 574 | 1,137 | 3,149 | 4,860 |
| Zacatecas | | 994 | 389 | 1,489 | 2,872 |

## Annex Table 4: Source of Financing for Different Education Sub-Systems

| System | Provider | Type of degrees | Enrollment | Source of Finance |
|---|---|---|---|---|
| **Federal** | Instituto Politécnico Nacional | Technological | | • 100% Federal (Ramo 11) |
| | Bachilleratos Tecnológicos. | Technological | | • 100% Federal (Ramo 11) |
| | CONALEP Federal | Technical | | • 100% Federal (Ramo 11) |
| | Colegio de Bachilleres México | Academic | | • 100% Federal (Ramo 11) |
| | Escuelas Preparatorias Federales por Cooperación | Academic | | • Federal (Ramo 11) with private financing |
| **State** | Bachilleratos DF | Academic | | • 100% DF Government |
| | Colegio de Bachilleres | Academic | | • 50% Federal (Ramo 11)<br>• 50% State |
| | CECYTES | Technological | | • 50% Federal (Ramo 11)<br>• 50% State |
| | CONALEP | Technical | | • 100% Federal (Ramo 33) |
| | Bachilleratos Estatales | Mostly academic | | • 100% State |
| | Escuelas Preparatorias Estatales por Cooperación | Academic | | • State with private financing |
| **Autonomous** | Federal Autonomous University (UNAM) | Academic | | • 100% Federal (Ramo 11) |
| | State Autonomous Universities | Mostly academic | | • 40% to 90% Federal (Ramo 11)<br>• 10% to 60% State |

Note: Bachillerato técnico is focused on the needs of the job market, with clear job skills. Bachillerato tecnológico has a more academic approach but provides technical training at the same time.

## Annex Table 5: Education level of Teachers, by State

| | | Percentage, by education level | | | |
|---|---|---|---|---|---|
| | | Secondary | Some Higher Education | Higher Education | Post-Graduate |
| Aguascalientes | | 256 | 239 | 1,866 | 524 |
| Baja California | | 499 | 894 | 4,462 | 696 |
| Baja California Sur | | 97 | 435 | 883 | 143 |
| Campeche | | 96 | 217 | 1,570 | 299 |
| Coahuila | | 641 | 644 | 4,393 | 963 |
| Colima | | 52 | 154 | 964 | 262 |
| Chiapas | | 269 | 1,758 | 5,964 | 810 |
| Chihuahua | | 517 | 1,100 | 4,544 | 761 |
| Distrito Federal | | 2,405 | 3,869 | 21,041 | 2,769 |
| Durango | | 339 | 487 | 2,838 | 688 |
| Guanajuato | | 921 | 1,805 | 6,719 | 1,562 |
| Guerrero | | 264 | 873 | 4,233 | 944 |
| Hidalgo | | 460 | 895 | 3,404 | 405 |
| Jalisco | | 1,257 | 2,494 | 13,045 | 3,696 |
| México | | 1,875 | 5,427 | 20,970 | 3,526 |
| Michoacán | | 581 | 1,666 | 4,910 | 743 |
| Morelos | | 460 | 582 | 3,281 | 626 |
| Nayarit | | 359 | 363 | 1,535 | 269 |
| Nuevo León | | 638 | 863 | 5,070 | 2,458 |
| Oaxaca | | 381 | 1,815 | 3,815 | 550 |
| Puebla | | 906 | 2,657 | 8,735 | 1,694 |
| Querétaro | | 249 | 415 | 2,597 | 519 |
| Quintana Roo | | 164 | 441 | 1,509 | 255 |
| San Luis Potosí | | 490 | 1,201 | 3,608 | 474 |
| Sinaloa | | 404 | 874 | 4,769 | 1,150 |
| Sonora | | 395 | 866 | 3,402 | 1,006 |
| Tabasco | | 327 | 513 | 3,728 | 540 |
| Tamaulipas | | 287 | 626 | 4,560 | 1,299 |
| Tlaxcala | | 164 | 367 | 1,681 | 286 |
| Veracruz | | 667 | 5,218 | 9,860 | 1,499 |
| Yucatán | | 400 | 690 | 3,281 | 470 |
| Zacatecas | | 154 | 290 | 1,697 | 697 |

## Annex Table 6: Education Financing by Source, by State

| | Federal | | | State | Autonomous Universities | |
|---|---|---|---|---|---|---|
| | Ramo 11 | | Ramo 33 | | | |
| | Technical | Academic | | | Federal | State |
| Aguascalientes | 488,093.2 | 1,283.1 | 29,519 | 35,648 | | 27,811,978 |
| Baja California | 925,114.0 | 186,895.2 | 67,164 | 141,726 | | 1,813,635 |
| Baja California Sur | 336,561.7 | 35,243.7 | 16,750 | 123,996 | | |
| Campeche | 446,223.8 | 76,563.0 | 21,829 | 171,926 | | 47,787,767 |
| Coahuila | 1,175,421.3 | 1,968.1 | 67,522 | 179,076 | | 154,700,335 |
| Colima | 222,044.0 | 1,005.7 | 18,035 | 54,546 | | 235,441,062 |
| Chiapas | 902,019.0 | 317,726.4 | 68,985 | 873,816 | | |
| Chihuahua | 1,191,910.6 | 99,935.7 | 68,499 | 415,111 | | 3,783,282 |
| Distrito Federal | 3,967,170.1 | 991.9 | 0 | 530,839 | | |
| Durango | 915,791.1 | 103,655.3 | 18,435 | 135,027 | | 102,762,462 |
| Guanajuato | 1,057,003.8 | 722.6 | 98,779 | 523,954 | | 315,522,256 |
| Guerrero | 857,497.5 | 136,431.4 | 61,284 | 162,430 | | 464,498,459 |
| Hidalgo | 714,850.9 | 124,434.6 | 28,411 | 264,241 | | 133,924,562 |
| Jalisco | 925,917.8 | 61,383.7 | 114,726 | 1,611,381 | | 1,742,303,829 |
| México | 1,380,303.5 | 86,207.2 | 350,025 | 1,786,692 | | 271,152,406 |
| Michoacán | 1,196,142.3 | 186,098.8 | 89,710 | 356,233 | | 198,477,302 |
| Morelos | 695,815.3 | 61,339.8 | 35,188 | 80,461 | | 127,589,497 |
| Nayarit | 530,018.3 | 1,894.7 | 19,487 | 40,424 | | 229,538,288 |
| Nuevo León | 640,915.9 | 0.0 | 85,538 | 152,557 | | 931,854,937 |
| Oaxaca | 1,513,724.6 | 232,236.4 | 0 | 195,000 | | 83,892,105 |
| Puebla | 649,385.7 | 113,438.8 | 75,167 | 1,008,194 | | 281,631,829 |
| Querétaro | 426,879.0 | 113,266.1 | 19,402 | 350,549 | | 106,970,400 |
| Quintana Roo | 447,233.9 | 113,121.6 | 40,949 | 146,757 | | |
| San Luis Potosí | 616,838.2 | 105,109.4 | 43,548 | 241,469 | | 13,182,983 |
| Sinaloa | 694,638.3 | 239,043.9 | 95,952 | 384,224 | | 743,785,335 |
| Sonora | 1,097,588.5 | 138,161.9 | 108,223 | 244,320 | | |
| Tabasco | 596,442.7 | 355,049.1 | 50,269 | 858,628 | | 2,944,720 |
| Tamaulipas | 1,988,398.1 | 74,997.8 | 83,655 | 66,521 | | 33,191,476 |
| Tlaxcala | 371,428.1 | 93,938.6 | 21,202 | 97,627 | | |
| Veracruz | 1,968,801.2 | 173,127.5 | 104,967 | 1,683,594 | | 2,437,682 |
| Yucatán | 804,825.1 | 103,893.8 | 45,510 | 255,530 | | 161,586,219 |
| Zacatecas | 394,728.1 | 91,062.2 | 16,160 | 170,668 | | 147,133,799 |