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Strengthening Institutions to Improve Public Expenditure Accountability

Restructuring Upper Secondary Education System in Mexico: Improving Education Quality

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Abstract

This policy simulation consists in restructuring the upper secondary education system in Mexico. The main goal is to improve the quality of education at this level. The policy consists in reducing the three existing subsystems – general baccalaureate, technological baccalaureate and technical professional education – to two subsystems: general and bivalent education. Our results indicate that if the policy is accomplished, the enrolment in upper secondary education will increase; the technical professional students' performance in ENLACE will improve; students from disadvantaged backgrounds will receive better education, and there will be greater equity in educational opportunities. Finally, despite the fact that the total expenditure at this level indicates an increase, the amount does not represent an obstacle to the implementation of the policy.

Introduction

In Mexico until the school year 2011, compulsory education consisted in primary and lower secondary education. In 2012 President Felipe Calderón decreed that upper secondary education (USE) be made compulsory. This was the second reform at this level during his government. The first was the Integral Reform of Upper Secondary Education (RIEMS); with this, the National Upper Secondary System (SNB) was created. These reforms look to transforming the secondary educational system.

The upper secondary education system in Mexico is tracked by three subsystems: general or propadeutic baccalaureate, technological or bivalent baccalaureate, and technical professional or vocational education. This policy simulation proposal is based on the differences that can be observed among the tracks, principally with regard to the quality of education, inequality in access to opportunities, differences in the socioeconomic background of students, and the complex classification of the institutions according to the services offered.

In order to improve the quality of secondary education, we propose a restructuring of the system, reducing the existing tracking from three to two tracks, i.e. the general and bivalent education. In practice, the policy consists in grouped technological baccalaureate and technical professional education in only bivalent education that offers both academic education and vocational training, removing the terminal character in the technical professional programs that still exists in this subsystem. The results following the policy simulation are manifest in four principal outcomes: (1) an increase in enrolment; (2) better results in ENLACE test; (3) an increase in the public expenditure; and (4) greater opportunities and equity in terms of access to upper secondary education.

The remaining part of this paper is organized as follows: In section II we present the upper secondary education background. In section III, as preview evidence, we comment on the literature review. Section IV describes the policy goal and the alternative scenarios. Section V gives the details of how the policy could be implemented. In section VI we comment on the data used, the underlying assumptions and the steps followed to arrive at the outcomes. In section VII, we present the results with our comments. Section VIII provides a sensitivity analysis of the educational outcomes based on socioeconomic factors. Section IX gives the cost-benefit analysis. Finally, in section X we conclude with a brief discussion on the policy and our findings.

1. Background

According to the International Standard Classification of Education (ISCED) the upper secondary education, also known as level 3,[1] is designed to prepare the students for tertiary education or to provide them skills for employment, or both (UNESCO 2011). In Mexico, upper secondary education consists in three different subsystems:[2] (1) general baccalaureate; (2) technological baccalaureate; (3) technical professional education.

[1] Here in after upper secondary education and middle education are used as synonyms.
[2] Here in after subsystems and tracks are used as synonyms.

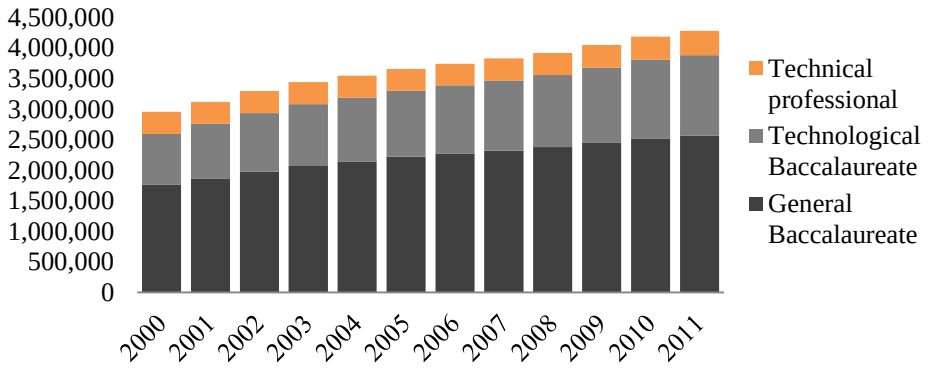
The goal of general baccalaureate (GB) is to prepare the students for entry into tertiary education. Hence, this is a propadeutic education through academic training. Usually, it is offered in three-year programs, but there are some two-year programs as well. Graduate students receive a certificate. It is necessary to enter in tertiary education. In this subsystem, there are several modalities: standard, open and distance, mixed, and through a test.[3]

Technological baccalaureate (TB) seeks that graduates receive both vocational training and academic education. This bivalent character of TB allows graduates to receive upper secondary education certificate to get into tertiary education, and a technical diploma at a semi-professional level. Most of the programs in this subsystem are completed in three years.

Technical professional (TP) education offers only vocational education. Graduates receive a diploma at the semi-professional level, with a terminal character; with this they cannot continue with tertiary education. There are several programs with different durations, varying from one to four years.

In the school year 2011, upper secondary education represented 12.3% of the total enrolment in Mexico. General baccalaureate was the largest subsystem with 59.9% of the total enrolment, followed by technological baccalaureate with 30.8%, and technical professional education with 9.2% enrolment (Figure 1). The USE enrolment presents a 44.9% growth rate in the year 2000. The higher growth during this period (2000-2011) has been in TB (58.9%), followed by GB (45.6%), and TP (9.5%) (Figure 2). In the same period, 82.7% of the upper secondary students were enrolled in public institutions and 17.3% in private. Of the public institutions, 55% were supported by states, 30% by federal government and 15% were autonomous.[4]

Figure 1. Total enrollment in upper secondary education by subsystem (2000 - 2011)

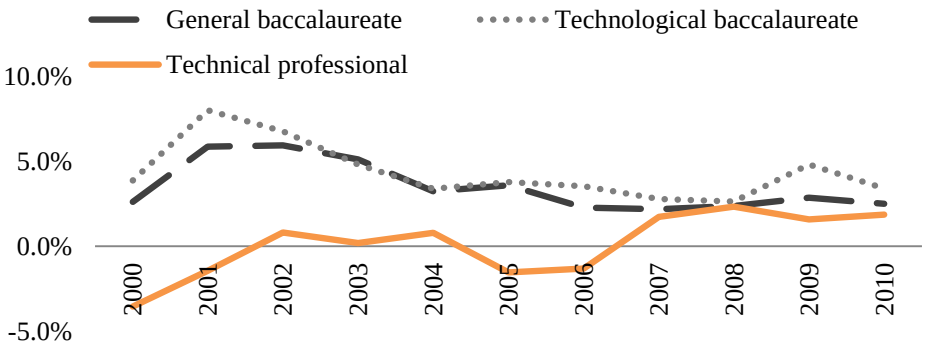


Source: Prepared by author with information from SEP (2011).

[3] In standard modality students attend school, the open and distance is a self-taught person modality, there are mixed programs which students attend sometimes to the school in order to solve doubts, and finally, there is an option in which people with lower secondary education certificate and older than 21 years old, makes a test to obtain the upper secondary education certificate.

[4] This information refers to after transfers i.e. transferences are the federal resources given to the states.

Figure 2. Enrollment growth rate in upper secondary education by subsystem (2000 - 2010)

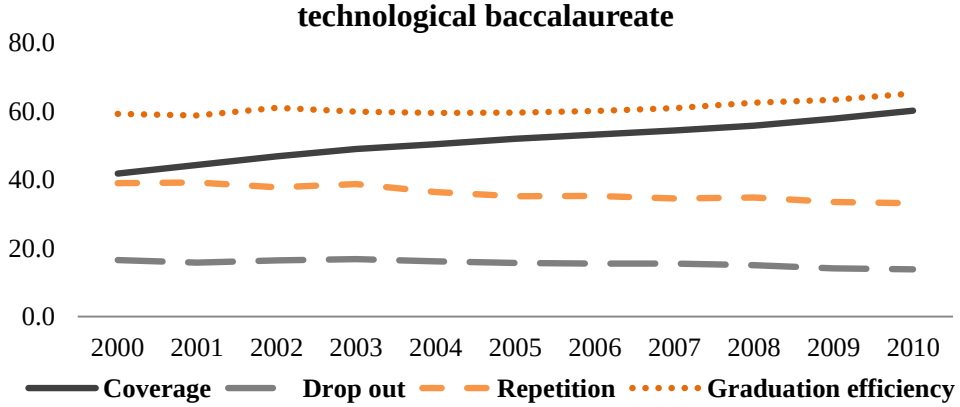


Source: Prepared by author with information from SEP (2011).

Performance indicators in the school year 2011 were: 68% coverage, 13.9% dropout rate, 32.7% repetition rate and 63.7% graduation rate. At the compulsory education level, the coverage and graduation rates are lower; the dropout and repetition rates are highest. For each subsystem, these indicators show that the coverage in baccalaureate tracks has gone up by 18.5 percentage points – from 41.8% in 2000 to 60.3% in 2010 – while in TP education the growth is only 0.1 percentage points, located within 5.9%. Similarly, the graduation rate in baccalaureates tracks increased by 6 points and TP by 1.6 percentage points.

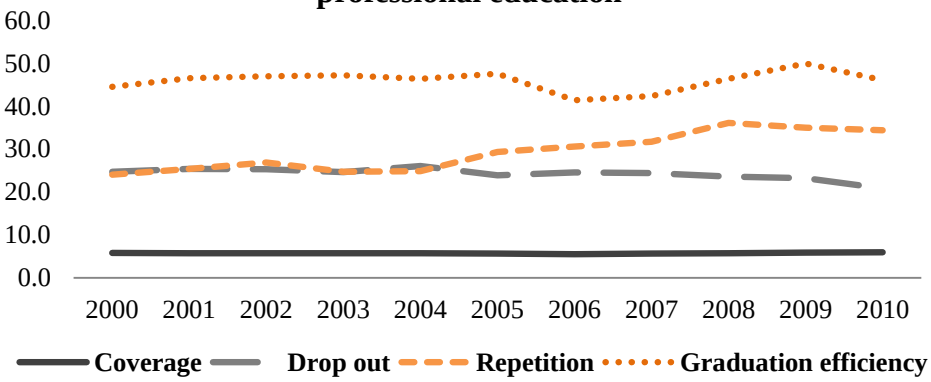
As a result, in GB and TB 7 out of 10 students completed their middle education studies, while in TP the proportion was 5 out 10 students. Although the reduction in the number of dropouts in TP was more compared to baccalaureates (-3.9 and -2.7 percentage points, respectively), the latter had a lower dropout rate. Repetition in baccalaureate subsystems reduced from 39% to 33.1%, but in TP the variation was from 24% to 34.4%, a 10.4 percentage points increase (Figures 3 & 4).

Figure 3. Performance indicators in general and technological baccalaureate



Source: Prepared by author with information from SEP (2011).

Figure 4. Performance indicators in technical professional education



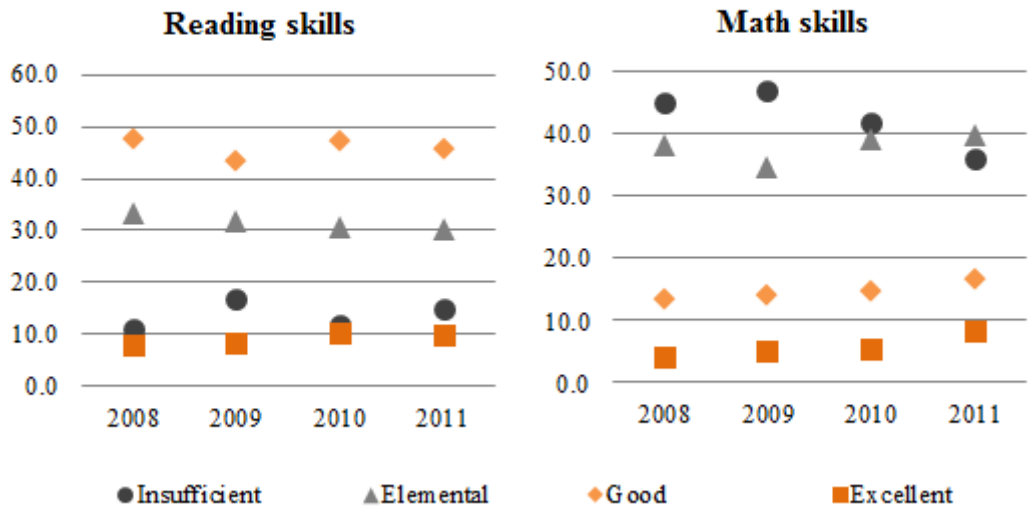
Source: Prepared by author with information from SEP (2011).

The National Evaluation of Academic Achievement in Schools (ENLACE) is a test that evaluates two basic life skills learned in schools: reading and math. The main goal is to evaluate how upper secondary education students can apply the knowledge and skills learned at this level in the real world. This annual test measures four achievement levels: insufficient, elemental, good and excellent.[5]

This test was started in 2008, so there is only four years' information about its evolution, which represents an obstacle in doing a complete analysis of the evolution of the students' achievements. Among the three subsystems, the proportion of students in insufficient, elemental, good and excellent results in reading skills changes from year to year. Due to the short time period and the differences in results between the USE generations, we cannot for sure know all the reasons for this evolution. In the case of math skills, we can observe a trend in the four achievement levels; the proportion of students in insufficient category is decreasing, while that in elemental, good and excellent categories is increasing each year (Figures 5, 6 & 7).

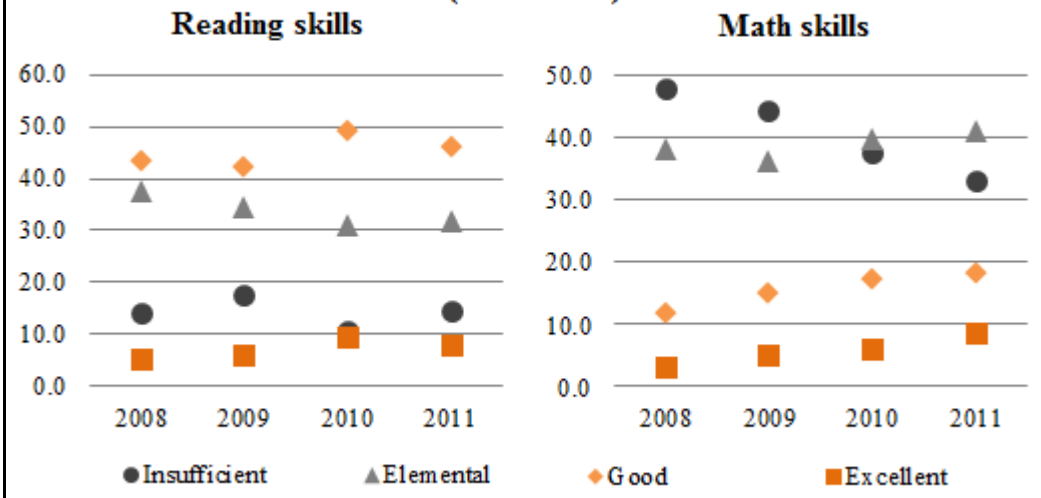
[5] For more information on this evaluation see: Reyes, S. and Alejandra Z. 2012. *Manual Técnico ENLACE Media Superior 2008 - 2010*. Centro Nacional de Evaluación para la Educación Superior (CENEVAL). México. Available on:
http://archivos.ceneval.edu.mx/archivos_portal/10680/ManualTecnicoENLACEMediaSuperior.pdf

Figure 5. General baccalaureate students' achievements in ENLACE (2008 - 2011)



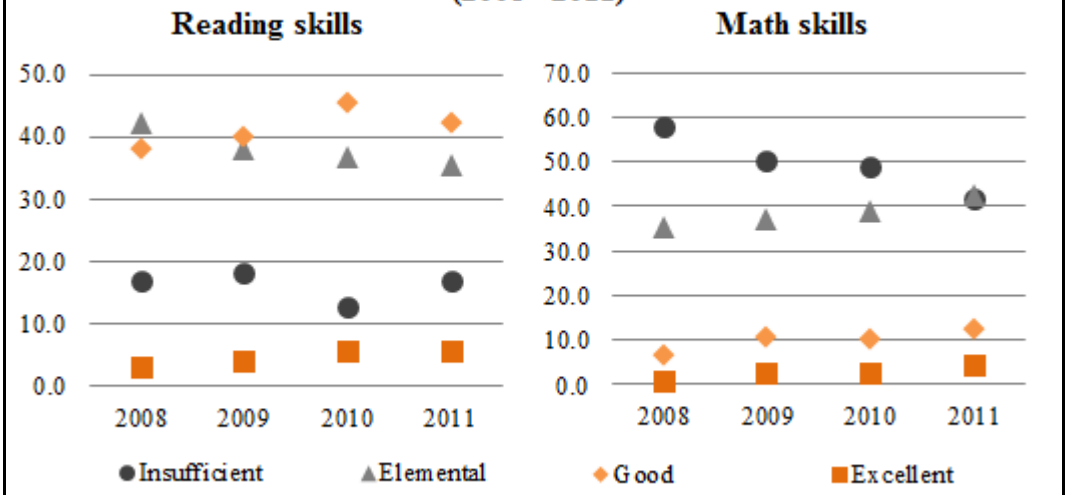
Source: Prepared by author with information from SEP (2011).

Figure 6. Technological baccalaureate students' achievements in ENLACE (2008 - 2011)



Source: Prepared by author with information from SEP (2011).

Figure 7. Technical professional students' achievement in ENLACE (2008 - 2011)

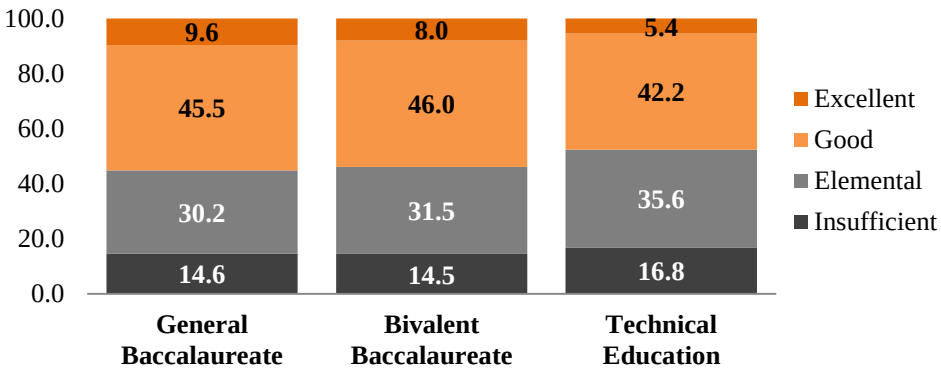


Source: Prepared by author with information from SEP (2011).

Results show that in the school year 2011, students from GB scored the highest in reading skills, with 55.1% in good and excellent achievement categories. The TB students' results, under these classifications, were 54%, while TP students obtained less than half – 47.6%. With respect to math skills, the three subsystems commonly presented more students in the insufficient and elemental categories: 83.5% for PT, 75.4% for GB and 73.6% in the case of TB (Figures 8 & 9). In math, TB students scored the highest and PT students the lowest. This students' performance indicator reflects that only one in every two students in upper secondary education has adequate achievement levels in reading skills, and only two of every ten students have adequate achievement in math skills.

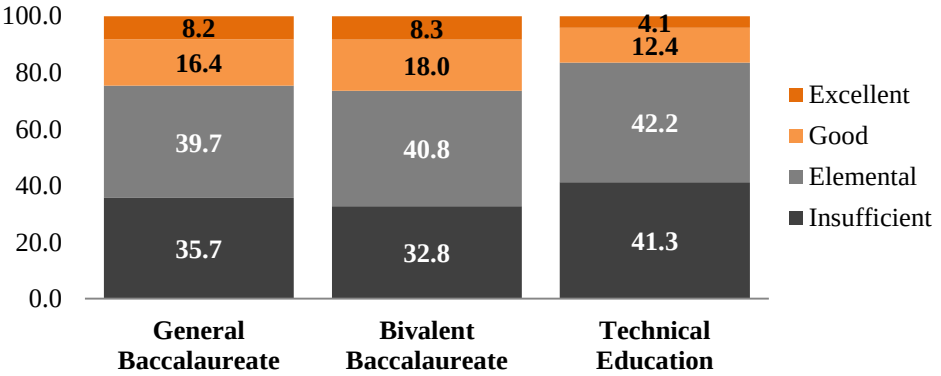
Therefore, we can conclude that upper secondary education presents some issues with regard to the quality of education. On the one hand, system indicators show a lack of coverage, a high repetition and dropout, and low graduation rate. Also, students' performance indicators present difficulties in achieving better results in reading, and especially in math skills. On the other hand, these complications vary between subsystems and are significant among baccalaureate modalities (general and technological) and technical professional education.

Figure 8. Reading skills of upper secondary students (ENLACE 2011)



Source: Prepared by author with information from SEP

Figure 9. Math skills of upper secondary students (ENLACE 2011)



Source: Prepared by author with information from SEP

Moreover, in the recent years, upper secondary education has come under great deal of pressure to increase its enrolment between all levels of education. There are several reasons for this. One is the increase in the 15-18 year old cohort, as a result of the demographic change in Mexico (CONAPO 2007). This phenomenon is shedding light on the lack of infrastructure that the Mexican education system suffers, especially with regard to offering upper secondary education, with a 13.4% potential demand[6] in the school year 2011. Also, for over three million of the young it is not possible to study at this level of education. While four out of every ten students who get a place in school drop out during the first year, only half of those who complete school are able to join tertiary education (SEMS 2008). In addition, 18.4% of youth between the ages of 15 and 19 are neither in employment nor education. This places Mexico in the third position among the Organization for Economic and Co-operation Development (OECD) members (OECD 2011).

Recently, the Mexican Government has implemented two reforms: First, the Integral Reform of Upper Secondary Education (RIEMS), aimed at creating a national upper secondary education system (SNB). The proposed SNB was based on: (1) common curricular

[6] Potential demand refers to the lower secondary graduates.

framework; (2) definition and recognition of the offered modalities; (3) professionalization of the educational services; and (4) national certification.[7] Second, the Constitutional Reform that adds the upper secondary level to the compulsory education. This reform makes it mandatory for teens to attend upper secondary education and, at the same time, makes it obligatory for the government to take on the responsibility of offering such educational services. The main goal of the latter reform is to accomplish total coverage by the school year 2021.

These reforms could be an answer to one of the main issues regarding the policies concerning the youth of the country: give them the opportunity to study and then, to continue with tertiary education; or let them have a formal job by learning some profession. Nevertheless, there are several unattended problems that are not being considered at the time of expanding such educational services, for example, the obsolete organization or the classification of the upper secondary education subsystems; the inequity in the quality of the subsystems, the tracking process in which the youth are involved at the age of 15 and the lack of regulation with regard to the mechanism to get into this level of education.

This policy simulation consists in restructuring the upper secondary education system, and proposes that it be changed from three to two subsystems, i.e. from general baccalaureate, technological baccalaureate and technical professional education, to only general and bivalent education. An alternative scenario is presented, in which the restructuring consists in keeping only the general education.

2. Literature review as preview of evidence

For this study, we were interested in two kinds of literature: One, about the several problems in upper secondary education brought on by the differences between the subsystems; two, about the implementation of a policy similar to the one proposed here, presenting changes in the middle education subsystems.

For Navarro (2010), the compulsory upper secondary education reform seeks to harmonize the Integral Reform of Upper Secondary Education (RIEMS) as part of the creation of the National Upper Secondary Education System (SNB). However, the National Institute for the Education Evaluation (INEE), in the 2010-2011 report, notes that there are certain factors that must be considered before extending the offer of this educational service: (1) middle education has to provide knowledge and skills that fulfill the students' aspirations as well as their needs; (2) the quality of educational services has to be equal for all; (3) the future educational and job opportunities for the population should be considered.[8]

Other issues with respect to the upper secondary education services are well documented and analyzed by Guerra (2000) and Villa (2007). They find that in México, there is nothing like equal opportunities in middle education. Since the admission process is unregulated and differences exist between the subsystems, modalities and schools, there are significant drawbacks in terms of opportunities for students. Once you are in, there is no free transit

[7] For more information on this reform visit: http://www.reforma-iems.sems.gob.mx/

[8] For more information on this report see: Instituto Nacional para la Evaluación de la Educación (INEE). 2011. *La Educación Media Superior en México. Informe 2010 - 2011*. México.

between the three different subsystems, and this does not allow you to change your mind. This may be one of the principal reasons behind the high dropout rate at this level. Above all, inequality in the quality of education offered is due to these very differences in the educational subsystems.

The OECD (2012) argues that the high performance level in education among the OECD countries is the result of a combination of quality and equity in the education system. In Mexico, the subsystems seem to be created for different socioeconomic groups; those from higher socioeconomic background go for general baccalaureate whereas students from poor socioeconomic background attend technological baccalaureate and technical professional education. Guerra (2000) analyzed this hypothesis with a case study comprising students from GB and TP.

In the same study, the OECD (2012) notes that students from low socioeconomic backgrounds tend to have twice as low performance compared to other students. This indicates that their socioeconomic condition affects their ability to realize their full potential in education. The ENLACE results (mentioned above) could indicate how this situation has actually arisen in Mexico. Youth from better socioeconomic backgrounds receive higher quality education, while those from poor environments have access to lower quality education. The latter generally attend professional technical education while looking for a job opportunity; in other cases they study through open and distance education systems – without teachers and without adequate infrastructure.

In this respect, the OECD (2012) study recommends some policies whereby inequity in education could be avoided. Two of these policies are aligned with this study: eliminate early tracking and design equivalent upper secondary education pathways to ensure completion. In the first recommendation, they propose that student selection be deferred to upper secondary education but, we think that this is not the best time to do it. Instead of calling for an irreversible and inappropriate decision at 15 years, it is necessary to allow young people the opportunity to change their minds later on, if they so wish to. In the second recommendation, the study suggests some policies to do this: making propadeutic and vocational tracks equivalent by improving the quality of vocational education and training, allowing mobility within the tracks, and avoiding the terminal character of such education. All these recommendations are closely linked with this policy proposal.

Upper secondary education in Mexico has faced the dilemma of whether or not to prepare students for tertiary education or for working life. INEE (2011) considers that nowadays the labor market requires general skills that enable the workers to learn and adapt easily. So, the idea that middle education has to prepare the young to participate productively in society is gaining ground. Meanwhile, the OECD (2011) presents some arguments that emphasize the importance of vocational education, since training in skills is necessary to create jobs and to increase productivity. Furthermore, decreasing the unemployment rate among youth by helping them acquire technological knowledge – particularly those who for different reasons may not be able to continue with tertiary education – are reasons enough to increase vocational education.

About the improvement in quality, De Hoyos et al. (2010) analyzed the determinants of academic achievement in upper secondary education using the ENLACE test. He quantifies the impact of four main components of the cognitive achievement: (1) own background; (2) family background and environment; (3) scholar factors; and (4) institutional factors. His results show that academic background is the most important determinant, followed by school resources, institutional environment, and finally the family background.

About the importance of continuing with higher education, the McKinsey Global Institute (2012), shows how among employees with better cognitive, communication, and problem-solving abilities, unemployment rates are low, coupled with rising wages, while the reverse is true for those not so skilled in these areas. Thus, the emerging markets will present, in their labor markets, behavior similar to that shown in the past decade by developed countries, e.g. Spain, UK, Canada, Germany, US and France, where employees with lower skills dropped out of the workforce entirely. These workers only had secondary education, while all those with better skills had tertiary education and were presented with better employment conditions.

The literature has shown how differences in tracking systems influence in students a priori according to their background (academic, family and socioeconomic), and a posteriori, in their performance, due to the differences in education quality between the tracks. Barg (2011) notes this phenomenon in the transition from lower to upper secondary education in France. Moreover, Ariga and Brunello (2007), analyzed whether tracking length in secondary schools impacts the students' performance, measured by standardized tests; they found that tracking does have an impact on the students' performance. Raffe (1993), talks about the crystallization of this debate with the introduction of the unified systems of post-compulsory education, leading to a single certificate under a modular framework, with academic education and vocational training options. Also, as evidence suggests, nowadays the upper secondary education system is more standardized than it was in the past; for Benavot (2006) this is because changes in the composition of the tracks is relatively easy and cheap.

With respect to the policy simulation proposal, Hall (2009, 2012), evaluated the effects of reducing tracking in upper secondary education in Sweden by using data from a pilot program. The program and the subsequent reform consisted in reducing tracking to only general and vocational education, extending the existing vocational program from two to three years with the objective of introducing the necessary academic subjects. She found that there was an increase in educational attainment in the vocational program, but among students with low academic and parents' education background, there was an increase in their chances of dropping out. Hall did not find evidence of higher transition rate to tertiary education.

De Ibarrola (2006), analyzed upper secondary tracking in four Latin American countries: Argentina, Brazil, Chile and Mexico. She found how the tracking education generates different consequences for the future of the students due to the differences of schools, goals, students' socioeconomic backgrounds, and kinds of education among tracks. In these four countries efforts were made to democratize access to education. The persisting inequality in these and other Latin American countries is caused principally by the significant

differences in students' socioeconomic backgrounds. As a result, the old objective of USE (education for higher education or for entry into labor market), has changed. Nowadays, a more comprehensive education system has to be considered, including education for citizenship, ethical social behavior, personal vocational interests and education for national requirements. These are the new main goals and the curricular design of education.

In Mexico, there is a successful but incomplete case in which technical education with a terminal character was changed by adding academic education, thus allowing the students to obtain the middle education certificate. We refer to the National College of Professional Technical Education (CONALEP), which had been reformed twice, first in 1997 and later in 2003, offering a vocational track but with the option to study some academic subjects in order to obtain a USE certificate and to continue with higher education.

The CONALEP is the most important technical education school in Mexico, and its contribution to vocational education is the largest. López-Acevedo (2003, 2004 and 2005) has, many times, evaluated its impact on the education system and in the labor market at the technical level. She has found that a higher proportion of CONALEP graduates work in their field of training compared to graduates from other schools. Also, that their wages are higher. Moreover, the reforms that this educational system has undergone have had a positive effect on the labor market's graduates. So, according to her findings, CONALEP can be considered as an effective system.

3. Policy goal and alternative scenarios

There are three central factors that Mexico's upper secondary education system will need to consider in the next ten years: (1) the demographic change, in which the proportion of the young population will be the largest in the country's history; (2) a significant increase in the demand for educational services due to the reform of compulsory upper secondary education; and (3) the construction of a National Upper Secondary Education System (SNB) as part of the RIEMS.

This policy proposal takes into account these factors, and the main goal here is to help achieve improvement in education quality. However, there are some issues in the education system itself that do not allow the accomplishment of this goal; the most important among these is: inequality in educational services. The quality of education offered by the subsystems varies, affecting the performance and learning of the students. There is evidence that this is caused by the terminal character of the technical professional education and the differences in the curricula of the subsystems. Also, the multi-track characteristic of this level is inefficient since there are two kinds of vocational education:

i. Technological baccalaureate is a bivalent program. The students receive both academic education and vocational training, allowing them the option to either continue with higher education or enter the labor market.
ii. Technical professional education is offered by two programs: One with terminal character in which students receive only vocational training, but without the opportunity to go in for tertiary education. The other is a bivalent program. This is very

similar to technological baccalaureate because it offers academic education and vocational training, but is considered as technical professional baccalaureate.

This classification may create certain problems in understanding or correctly evaluating a graduate's trajectories, performance indicators, achievements in national and international tests, expenditure efficiency analysis or the right budget distribution, among others. Also, there are several challenges that technical education faces in Mexico that could be avoided if a correct classification separates bivalent education and vocational training.

Hence, there are some assumptions that support this policy simulation. We have to suppose that:

i. The proposed change might encourage the young to remain in school because they will have access to better education and the option to continue with higher education even while working at the technical level.
ii. The policy implementation could increase participation in middle education and subsequently result in a larger population with qualifications, since the baccalaureates modalities are more in demand than technical education.
iii. A larger quantity and wider variety of courses in the technical track will help achieve a higher knowledge base and better skill sets for both professional and personal well-being.
iv. The stratification by socioeconomic background, and generalizations based on preconceptions of student abilities in academic and vocational education, respectively, could be reduced.

So, the policy proposal aims to give all upper secondary graduates the opportunity to continue with tertiary education. If they receive a baccalaureate certificate, the door to higher education will be open to them, that too without losing the option to enter the formal labor market, if they so wish to.

This policy will simultaneously accomplish the main goal of improving the quality of education, since the students in technical professional education will also receive academic education. A more comprehensive middle education will give to all students an equally qualitative education, a strong academic background, knowledge and skills to guide them through their lives as professionals and citizens.

The main outcome of this policy consists in increasing the academic achievements evaluated through ENLACE. This test has evaluated the upper secondary education in its three different tracks. Results suggest that general and technological baccalaureate are better than technical professional education, since students in the first two tracks achieved better results than those in the last track. Hence, an improvement in the evaluation results could be understood as an improvement in the quality of middle education, i.e. adding academic education in the professional technical programs through different subjects will present two principal results: first, students will be affected positively in terms of their level of achievement in ENLACE test, and second, graduates will receive an upper secondary certificate.

We simulate an alternative scenario in which upper secondary education is unified as only one track: general education. In this way, all the levels will be unified in management, policy, quality, curricula, access process, etc. The goal and purpose in this case is the same: to improve the education quality and avoid inequity in terms of access to middle education.

4. Policy simulation in practice

The policy proposal consists in modifying the curricular framework of technical professional education in order to add important subjects to its programs; the main goal is to offer better quality education. Students of technical education do not acquire a proper academic background as they only learn skills for their work life. Nevertheless, as we mentioned earlier, there are discussions as to the kind of education that the young need for their future as people of this world, as citizens and as employed members of society. Actually, the mainstream idea argued that an education program to encompass all these factors is needed to achieve a complete and successful education outcome.

This involves changing the curricula in the technical professional track with one that can be compared with technological baccalaureate, and group them together as bivalent education. So, upper secondary education in Mexico will only be general or bivalent education.

As a first step, we study several upper secondary programs (national and foreign), in order to determine and design a comparable curricular framework. We propose the inclusion of basic subjects like math, literature, sciences and history in the technical curricula; also, complementary subjects like English (foreign language), computer sciences, and vocational subjects according to the RIEMS[9] (Figure 10).

[9] For more information on the common curricular framework and skill-based education, see the RIEMS documents available at: http://www.reforma-iems.sems.gob.mx/

Figure 10. Bivalent education curricular proposal

	First semester	Second semester
Generic and disciplinary skills	Mathematics I	Mathematics II
	Reading and writing workshop I	Reading and writing workshop II
	Computer Science I	Computer Science II
	English I	English II
	Biology	Chemistry
	Literature	Philosophy
	History	Vocational guidance
	Third semester	**Fourth semester**
	Mathematics III	Mathematics IV
	English III	English IV
	Physics	Citizenship
	Human development	Arts and Culture
Professional skills	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality
	Fifth semester	**Sixth semester**
	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality
	Speciality	Speciality

Source: Own elaboration.

A second step is the teachers' contract to provide the proposed new subjects, which should be through an evaluation test for the interested candidates. A third step consists in coordinated management control of schools in only two directions or departments, one for general and the other for bivalent education. In the fourth step, government (federal and states) will have to add to the infrastructure. This is an obligatory action because of the compulsory upper secondary education reform. Finally, the budget distribution by subsystem has to be equitable.

We suppose four outcomes as a result of this policy simulation:

i. A change in enrolment in upper secondary education: As will be shown later, the average growth rate in enrolment in technical education is negative in the last 15 years. The next increase in enrolment is expected after the implementation of the policy.
ii. Better results in ENLACE test: At present, technological baccalaureate students produce the best results in ENLACE, overall in math skills, while technical professional students present the worst results. So, once the latter receive the same education as the former group, an improvement in their ENLACE results is expected.
iii. A change in the total and the per student expenditure in upper secondary education by track: Since there are differences in resource allocation based on the enrolment in each subsystem, the reorganization of schools in general and bivalent education, in addition to modification of the management structure, will change the budget distribution among the tracks and subsequently the cost per student by track will be different. An increase in total expenditure is expected after policy implementation. Bivalent education costs, compared with technological baccalaureate and technical professional education will be higher.

iv. Redistribution of benefits between groups: An incidence analysis is carried out to show how the young from lower socioeconomic backgrounds benefit from higher quality education and subsequently, have equal opportunities as those open to groups from higher socioeconomic backgrounds. It is to be noted that before the policy, technical professional education mainly had students from lower socioeconomic backgrounds.

5. Methodology

For the policy simulation construction, we are first going to simulate the change in enrolment, explaining the data, steps and assumptions. Second, we present the estimated improvement in ENLACE results. Third, we calculate the changes in the total expenditure, per student expenditure and expenditure by subsystem. Finally, we present the incidence analysis.

i. Enrolment in upper secondary education

In order to estimate the expected changes in upper secondary enrolment, once this policy is implemented, we use the educational indicators and databases of forecasts provided by the National System of Educational Information (SEP 2011). We show how the enrolment by track gets altered depending on whether or not the policy proposal is implemented. Also, the results of both the scenarios (status quo and policy proposal) are compared with the alternative scenario results.

The procedure involves calculating the enrolment variations following the reduction in tracks from three to two in the first case, or to only one in the second case. To do this, we replace the expected growth rate of professional technical students in the next ten years with the expected growth rate of technological baccalaureate students in the same time period. We then estimate, through simple linear regression, the new enrolment rate for technical education. Finally, we add the expected enrolment for technological baccalaureate to obtain the bivalent education enrolment rate. In the alternative scenario the procedure is the same, except that we replace the enrolment growth rate for technological baccalaureate and technical professional education with the expected growth rate for general baccalaureate. Then, we estimate the enrolment for each track, and add the GB enrolment rate.

We assume the increases in enrolment for two reasons: first, because of the expansion of the USE offer and the increase in the 15 - 18 year old cohort; second, because the new educational offer (bivalent education) will attract more students compared to the status quo option, making it possible for a greater number of students to obtain the baccalaureate certificate, and subsequently, access to higher education.[10]

[10] It is possible that the underlying assumption looks strong, and may be it is, because nobody knows how youth is going to react to this kind of policy. However, as shown later (Figure 11), in more than ten years, the number of schools, teachers, and students from technical education has declined. This negative trend turns into a positive one in 2006, and this change probably occurred due to policies accomplished within the upper secondary education. So, the supposition of a higher growth in this subsystem, because of the combination of the expansion of the USE offer, the increase in the number of youth, and policy implementation, should not be surprising.

ii. ENLACE test results

As mentioned earlier, the ENLACE test results show how technological baccalaureate students perform better than technical professional students, and even better than students from general baccalaureate (SEP 2011). So, the implementation of this policy helps improve the technical professional students' performance in this test. This is because the TP students will receive extra academic subjects (similar to the technological baccalaureate program) once they are in a bivalent education subsystem. Similarly, if all the students were to come together under the general baccalaureate program, all of them would receive just academic education. In this alternative scenario, students from the technical track should perform better, because they will receive academic education instead of vocational training. However, because technological students obtain better scores than general baccalaureate students, the effects of this scenario on students from technological subsystem are not clear.

To calculate the proportion of students in each achievement classification, we used the ENLACE results database (SEP 2011), and followed the guidelines for educational forecasting (SEP 2004). The followed methodologies are simple linear regression and linear interpolation.[11] The procedure involved calculating the evolution of the students' achievements in the two test areas (reading and math skills) for the three tracks, based on their own trends. We then input the evolution of the technological baccalaureate students' results into the results of the technical education students, when the policy is implemented. In the alternative scenario, the input for technical students comes from the evolution of the general baccalaureate results.

In this sense, we assume that the performance of the technical education students in this test will at least be the same as the performance of the technological baccalaureate students, three years after the policy implementation. We decided on this three-year period after policy accomplishment because by this time the first batch of students under the new organization and program will appear in the ENLACE test as third-grade students. Similarly, in the alternative scenario we assume that both technical and technological education students will obtain similar scores as those of general baccalaureate students. So, the proportion of students in good and excellent achievement classification will at least be the same as of students from general baccalaureate.[12]

With regard to the procedure, may be it is simplistic and mechanical, but it takes into account several factors that are implicit in the enrolment estimations of the ministry of education (SEP), such as the demographic drift, enrolment trends, dropout and repetition rates, coverage, etc. In addition, we followed the guidelines for educational forecasts. Finally, in this case, we think that the parsimony principle has benefits over complex models, in which both statistical significance and robustness are issues in themselves.

[11] In the first case we use the equation: $\hat{y} = mx + b$ and for the second case we use the equation: $y_t = y_0 + \left(\frac{y_n - y_0}{n}\right) t$

[12] These assumptions may have several implications with respect to the differences between students from the three different tracks, especially in terms of students' aptitudes, capabilities, and cognitive level. Nevertheless, test scores have shown marginal differences between the tracks (Figures 5, 6 & 7) despite the observed differences in socioeconomic and educational background, curricula, schools, subsystems, among others.

iii. Expenditure in upper secondary education

There is no available information as to how much the government spends on public upper secondary education by each subsystem. Federal government reports the expenditure per student but this is only divided between baccalaureate and technical education, while the total expenditure groups the three subsystems together. In order to approximate the total expenditure and the expenditure per student by subsystem, we developed an institutional budget approach. The data comes from the Federal Public Account and the Federal Expenditure Budget (SHCP 2000-2012). The institutional classification is based on López-Acevedo (2005), Villa (2007), SEP (2010), INEE (2011), and SEP (2011) in order to classify the different upper secondary institutions according the three different subsystems (Table 1).

Once the institutions are classified under the three subsystems, some that are not classifiable remain, so these are divided between the three tracks according to their enrolment proportion; this allows us to calculate the total expenditure by subsystem. To calculate the public expenditure per student by subsystem, we divide this expenditure by the number of students in public upper secondary schools in each subsystem. Since there are different unit costs for each track because of the differences in enrolment and the budget, we re-calculate the costs for the policy proposal and alternative scenario, so we could compare these with the status quo scenario.

The followed procedure consists in replacing the unit cost of technical education with the unit cost of technological baccalaureate in the policy proposal case. In the alternative scenario, the technological baccalaureate and technical education unit costs are replaced by the general baccalaureate costs. In this way, we can obtain the total expenditure by track using the expenditure per student and the enrolment of each stream for the three scenarios: status quo, policy proposal and the alternative scenario.

The underlying assumption here is that the unit cost for technical education, once the policy is implemented, will be the same as the unit cost for technological baccalaureate education. In the alternative scenario the professional technical and technological baccalaureate unit costs will be the same as in general baccalaureate. We assume this because the unit cost represents the real cost to provide the educational services according to the kind of education offered, i.e. these costs are actually the operating costs with which the education system in Mexico works. So, they include all kinds of education-related expenditures: scholarships, infrastructure, wages of teachers and other employees, books, transfers, investment in new schools, and several programs. The unit cost to provide bivalent or general education to professional technical students should, therefore, be very similar to the unit cost in the status quo, since the students are receiving the same kind of education.

Table 1. Upper secondary education system in Mexico			
Baccalaureate		Technical Professional	Not classifiable
General	Technological		
Baccalaureate College (COBACH)	Centers for Agricultural Technological Baccalaureate (CBTA)	Centers for Industrial and Services Technological Baccalaureate (CBTIS)	National Council for Educational Development (CONAFE)
Centers of Art Education (CEDART - INBA)	Centers for Continental Water Studies (CETAC)	Centers for Industrial and Services Technological Studies (CETIS)	Ministry of Education [several departments] (DGAIR, DGESU and DGPP - SEP)
Federal High schools by cooperation	Centers for Forestry Technological Baccalaureate (CBTF)	Centers for Industrial Technical Studies (CETi)	Ministry of Education [Upper Secondary Education] (SEMS - SEP)
High school of Autonomous Universities	Centers for Industrial and Services Technological Baccalaureate (CBTIS)	Centers of Art Education (CEDART - INBA)	
Mexico City High schools	Centers for Industrial and Services Technological Studies (CETIS)	College of Professional Technical Education (CONALEP)	
National Baccalaureate School (ENP - UNAM)	Centers for Ocean Technological Studies (CETMAR)		
Open and distance education (EMSAD)	Centers for Scientific and Technological Studies (CECYT - IPN)		
Science and Humanities Colleges (CCH - UNAM)	Centers for Technological Baccalaureate (CBT)		
States High schools	State Colleges for Scientific and Technological Studies (CECYTE)		
Centers for Baccalaureate Studies (CEB)			

Source: Prepared by author with information from SEP (2000), López-Acevedo (2005), Villa (2007), SEP (2010), INEE (2011) and COMIPEMS (2012)

iv. Incidence analysis

With the objective to illustrate how benefits (seen as higher access to better education), are distributed between populations, we classify the participation in baccalaureate and technical education by income decil. To do this, we have used information from the National Household Income and Expenditure Survey (ENIGH) carried out by the National Institute of Statistics and Geography (INEGI 2011). This survey contains information about the participants at all education levels in public and private schools in Mexico in 2010, as well as their household income.

As already mentioned, there is evidence that students from poor socioeconomic backgrounds usually participate in TP education. So, we grouped students from baccalaureate and technical education according to their family income. Our assumption here is that the implementation of the policy proposal is going to further benefit those from poor or vulnerable socioeconomic backgrounds, because they will receive far better education than they actually receive. Besides, they will have the opportunity to access higher education. In the alternative scenario the assumption is the same, but only under the

standard modality, because the open and distance education, despite being more academic, has proved to be of lower quality.

6. Results

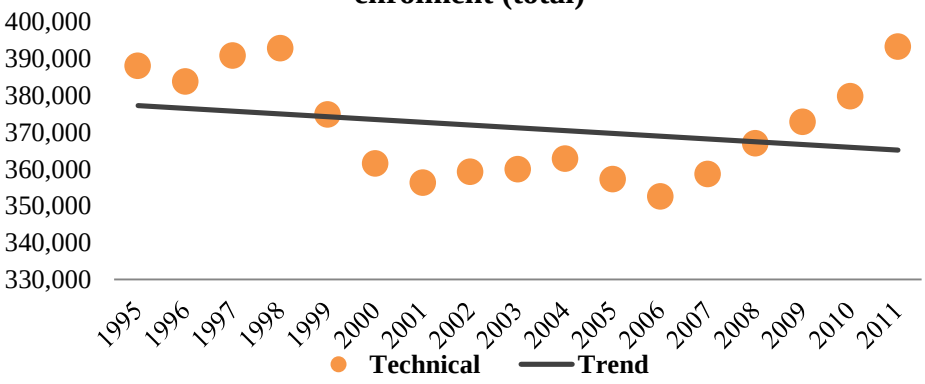
In this section we present the policy simulation results in four central areas of the education system: enrolment, quality, expenditure and incidence. Through these, we try to show the anticipated impact of the policy.

i. Policy simulation: Enrolment in public upper secondary education

In the last 15 years, the upper secondary education enrolment in Mexico has grown by 70.8% (1995-2010). Going by the subsystems, the general baccalaureate increased by 77.9% during the same period. The technological baccalaureate was the subsystem with the highest growth in enrolment (99.3%), whereas the technical professional subsystem showed a 2.1% decrease in 2010 compared to 1995, though this did not present a significant variation in its enrolment during the period (Figure 11).

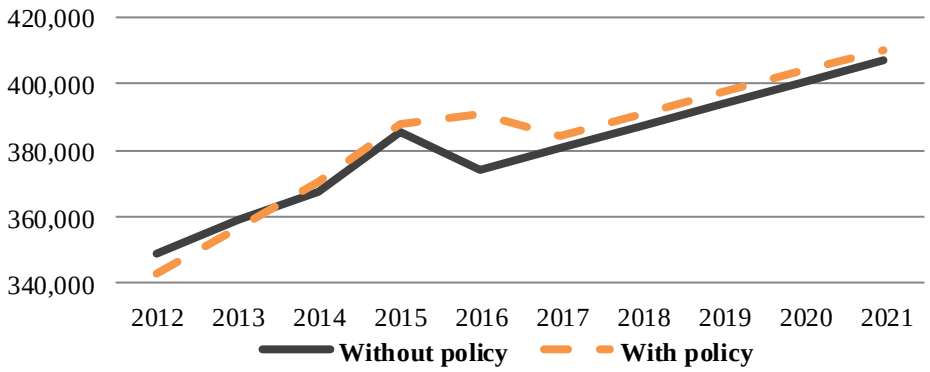
The policy simulation results indicate that enrolment in public technical professional (converted now to technological baccalaureate) schools will increase during the next ten years – by 30,631 students – due to the implementation of the policy (Figure 12). This is the first positive effect of the proposed policy. Clearly, bivalent education is more attractive to students than the technical professional education, because it allows them to obtain a middle education certificate and continue with tertiary education, or even to enter the labor market. Therefore, we assume that technical professional enrolment will have the same growth rate as technological baccalaureate, once these two are grouped under bivalent education. At the end of the period (school year 2021) the middle education students will be distributed thus: 56.8% in general education and 43.2% in bivalent education (Figure 13). Without the policy implementation, the distribution in the same year will be: 56.8% in general baccalaureate, 34.2% in technological and 8.9% in technical professional education.

Figure 11. Trend in technical professional education enrolment (total)



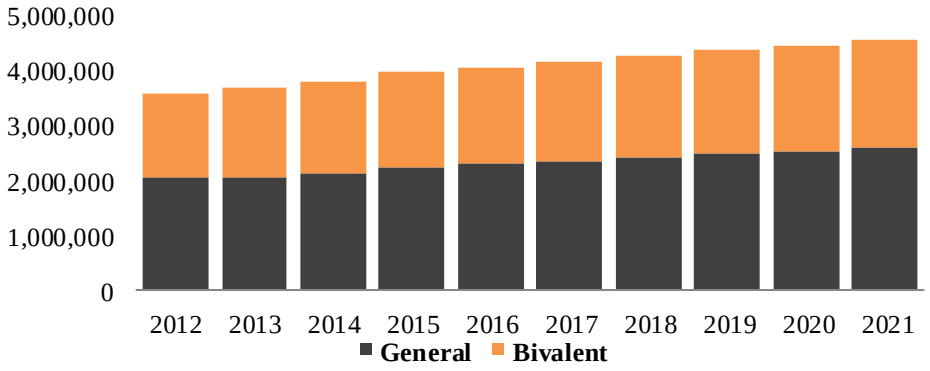
Source: Prepared by author with information from SEP

Figure 12. Enrolment change in technical professional education



Source: Own calculations based on information from SEP (2011).

Figure 13. Upper secondary education enrolment by track



Source: Own calculations based on information from SEP (2011).

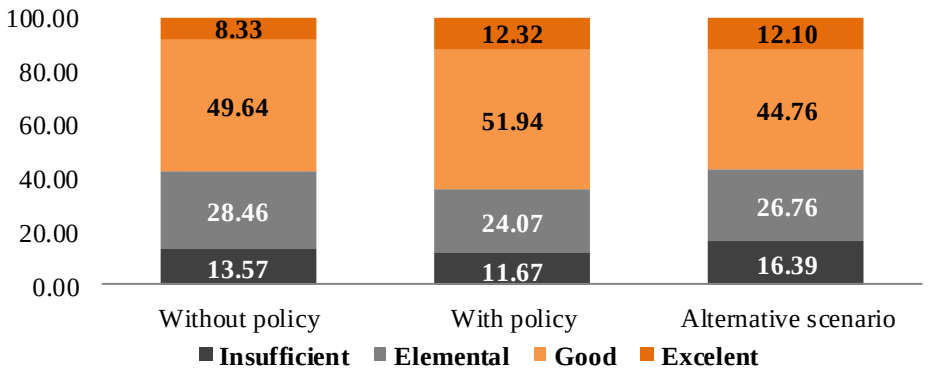
In the alternative scenario, the three tracks are reduced to only one: general education. The enrolment growth rate in general baccalaureate is applied across technological baccalaureate and technical professional education. The results show an increase of 13,110 students in public middle education enrolment, compared with the status quo, but this enrolment is 17,521 less than that shown in the original policy proposal.

ii. Policy simulation: Improvement in education quality. Better results in ENLACE test

From the time the ENLACE test was introduced in 2008, students from the technological baccalaureate subsystem have shown better performance, while the performance of those from technical professional education has been the worst. This could be indicative of the fact that students in technological baccalaureate, due to several reasons are developing better skills. So, we assume that the reduction in tracks, whereby technological baccalaureate and technical professional education are grouped under the bivalent education category, could improve the performance of the latter as they will consequently receive better academic education.

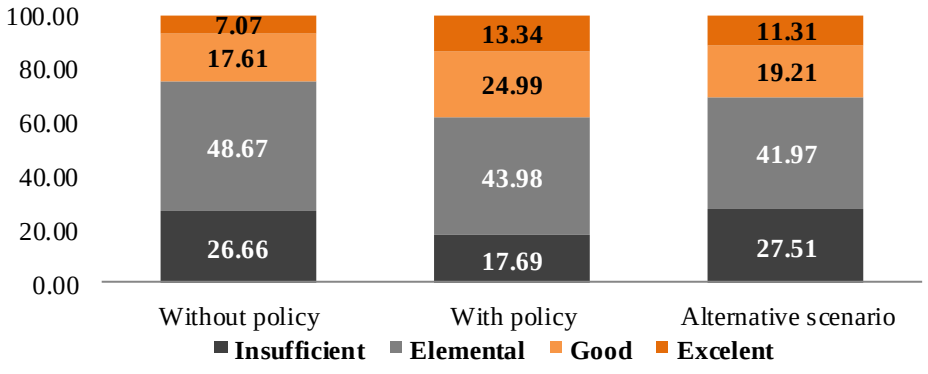
The policy simulation results show that the achievement trend in ENLACE favors the technological baccalaureate students. So, we rely on the assumption that the performance of the technical professional students will, at least, be comparable to that of technological baccalaureate students once the policy is implemented. In the same way, results of students from the three tracks will be comparable to those of students from general baccalaureate, once the alternative scenario policy is implemented (Figures 14 & 15).

Figure 14. Reading skills results in technical professional education



Source: Own calculations based on information from SEP (2011).

Figure 15. Math skills result in technical professional education



Source: Own calculations based on information from SEP (2011).

These results may look optimistic, but in the four years that this evaluation has been carried out, the variations in reading and math skills are very similar, and even greater than our estimations. During the period 2008 to 2011, the results pertaining to reading skills showed that the proportion of TP students in insufficient and elemental categories had decreased by 5.53 and 6.71 percentage points, respectively, while the proportion of students in good and excellent categories had increased by 7.45 and 2.42 percentage points, respectively. With regard to math skills, the proportion of students in insufficient and elemental categories

showed a -16.35 and -7.04 variation, respectively, and that in good and excellent categories presented a 6.0 and 3.32 variations, respectively.[13]

Actually, there are inadequate subjects in TP curricula for students to develop skills in these evaluation areas. Instead, GB and TB offer the kind of subjects that are meant for academic or propadeutic education. Because of this, we assume that the quality of education (measured by ENLACE) will improve.

iii. Policy Simulation: Expenditure in upper secondary education

Federal expenditure in public upper secondary education was divided using an institutional approach. The objective was to estimate the total expenditure by subsystem and the per student expenditure in each subsystem (Table 2). Once this information was estimated, we calculated the total expenditure by subsystem in three ways: first, as per the status quo that represents the federal expenditure for each track without the policy implementation (Figure 16); second, we present the expenditure for general and bivalent education with the policy accomplished (Figure 17); and third, the expenditure under the alternative scenario is presented, that consists of only general education (Figure 18). The three scenarios are compared in order to analyze the combination of enrolment and expenditure for each scenario (Figure 19).

The results show that the highest cost per student is in the technological baccalaureate subsystem followed by professional technical education, while general baccalaureate presents the lower unit cost. The combination of enrolment and unit cost by track results in three different total costs according to each of the three scenarios. The alternative scenario is the cheapest, since general education has the lowest unit cost and the second place in enrolment. The status quo is the intermediate scenario because it has the lowest enrolment and the unit costs are "normal". Finally, the policy proposal is the most expensive scenario, because it has the largest enrolment with higher unit cost, i.e. bivalent education that represents almost half of the total enrolment.

The total cost of each scenario during the estimated ten years is stated as follows: 793,792.6 million pesos if the policy is carried out; 774,617.3 million pesos if the status quo prevails; the lower cost is in the alternative scenario (because it has the lowest unit cost) with 565,230.8 million pesos. With the enrolment and total cost of each scenario we calculated the unit cost of the implementation of the policy proposal, the alternative scenario, and compared them with the status quo. The result of the first comparison (status quo vs policy proposal) is 4,999.3 pesos per student. This is the unit cost for each of the 3,835,595 students expected in the next ten years because of the policy implementation in the status quo. For the same reason, in the alternative scenario, the government will be saving 54,644.6 pesos per student. These savings are the result of the reduced unit cost consequent to the alternative policy implementation for 3,831,788 students.[14]

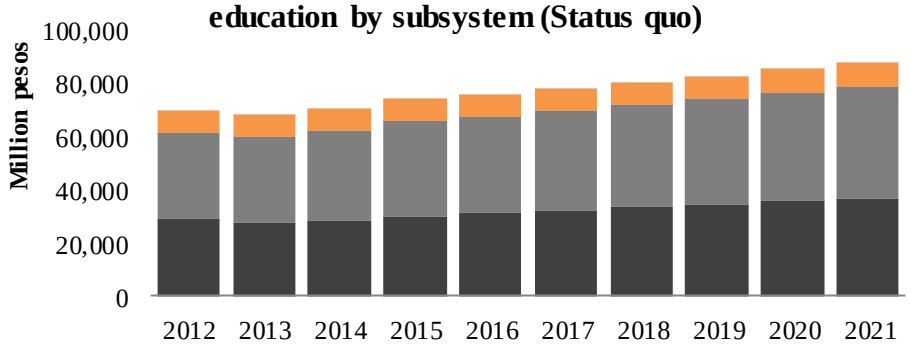
[13] In the next section we present a sensitivity analysis in which we involve the relation between socioeconomic background and students' performance for a more "realistic" approach.

[14] For these comparisons we refer to students from technical professional education, once they are in the bivalent (general) subsystem due to the implementation of the policy (alternative) scenario.

Table 2. Federal expenditure per student by subsystem			
Year	**General Baccalaureate**	**Technological Baccalaureate**	**Technical Professional**
2012	14,290.0	26,925.0	23,190.1
2013	13,292.8	26,401.3	22,074.9
2014	13,415.0	26,472.7	21,997.7
2015	13,537.1	26,544.2	21,920.4
2016	13,659.2	26,615.6	21,843.2
2017	13,781.3	26,687.0	21,766.0
2018	13,903.5	26,758.5	21,688.8
2019	14,025.6	26,829.9	21,611.5
2020	14,147.7	26,901.4	21,534.3
2021	14,269.9	26,972.8	21,457.1

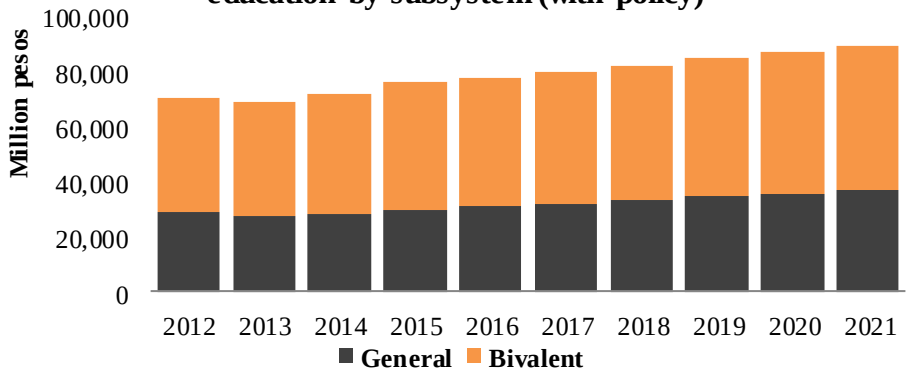
Source: Own calculations with information from SHCP (several years) and SEP (2011).

Figure 16. Federal expenditure in upper secondary education by subsystem (Status quo)



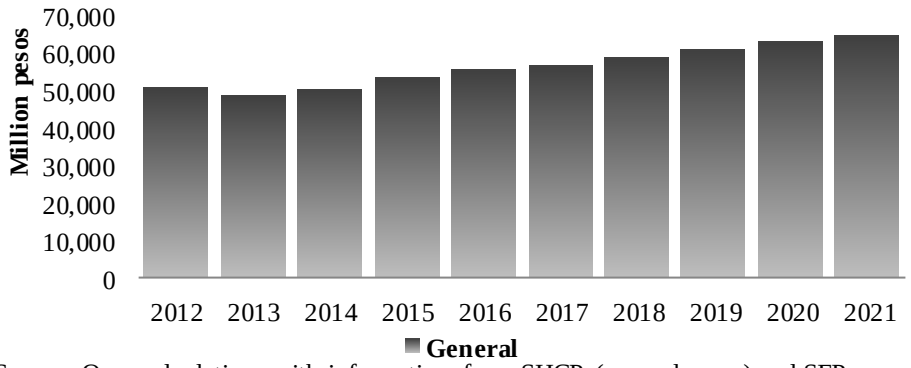
Source: Own calculations with information from SHCP (several years) and SEP (2011).

Figure 17. Federal expenditure in upper secondary education by subsystem (with policy)



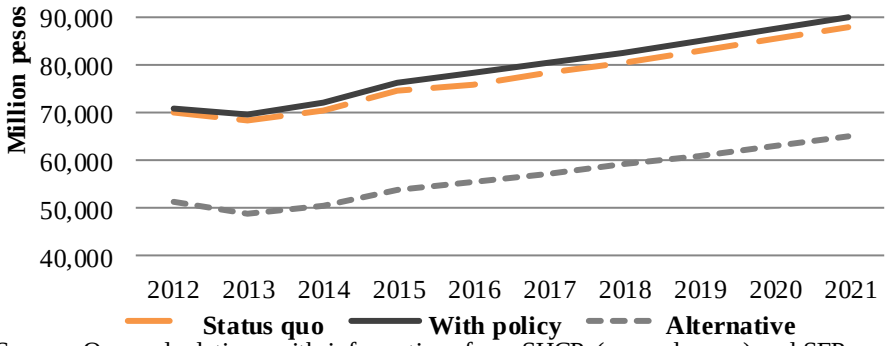
Source: Own calculations with information from SHCP (several years) and SEP (2011).

Figure 18. Federal expenditure in upper secondary education (alternative scenario)



Source: Own calculations with information from SHCP (several years) and SEP (2011).

Figure 19. Federal expenditure in upper secondary education (comparative)



Source: Own calculations with information from SHCP (several years) and SEP (2011).

These resources have to be provided by federal and state governments, irrespective of the chosen scenario. The implementation of the said reforms is already being carried out, and the accomplishment of the total coverage goal can only be achieved through greater investment in infrastructure (schools, equipment and teachers). Also, the expansion of the social programs, principally the scholarships, will be necessary to keep the dropout rate under check. The expenditure presented above includes the additional resources for the new essential infrastructure (most of which will be used for hiring new teachers) to offer, in the existing technical professional schools, the new bivalent program. Thus, governments at all levels will need to participate in this process through the allocation of the required resources.

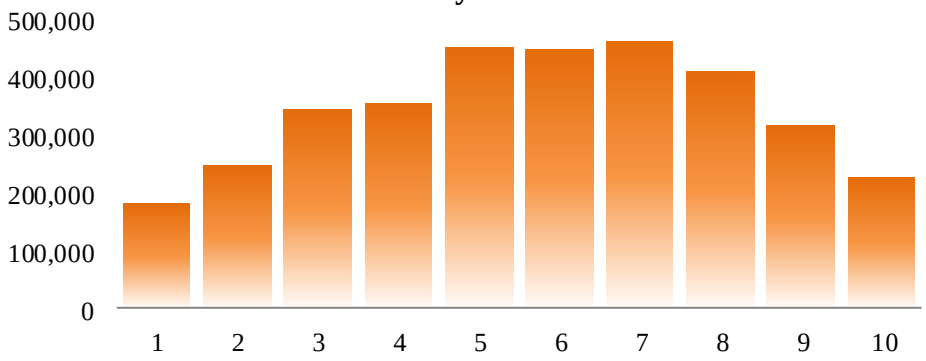
Furthermore, the management harmonization process between the organizations in TB and TP will help reduce the spending on administration. So, these resources could be reallocated to provide scholarships for the TP students, the main goal being to reduce the number of students dropping out of school due to economic reasons. Right now there are six departments and two decentralized organizations operating the management activities within the Undersecretary of Upper Secondary Education (SEMS); with this policy proposal dependence on the bureaucracy can be reduced.

iv. Policy simulation: incidence analysis

It is common knowledge that populations with higher income usually have greater access to education. Those from poor socioeconomic backgrounds have lower access even to public education. While at the primary education level the coverage is almost total, in upper secondary and tertiary education the coverage level, on the whole, is low.

Here, we present the participation of students in public upper secondary education by track and income level. This incidence analysis shows the distribution of the public education services among the population groups according to their income. Our findings indicate that of the 20% of the poorest population, 12.5% participated in public middle education institutions in the year 2010, while among the 20% of the richest the participation was 15.8% in the same year (Figure 20). In this sense, the participation among the highest income groups is greater. If we divide this participation into two parts, one for the first five deciles (lower income levels) and the other for the last five (higher income levels), the former present a 45.9% (less than half) of the total participation.

Figure 20. Participation in public upper secondary education by income decil



Source: Own calculations with information from INEGI (2011), CONEVAL (2011) and SEP (2011).

Regrettably, in this case we cannot divide the USE by the three subsystems, we can only divide it into two tracks: baccalaureate (general and technological) and technical education. Results show how participation in technical education is higher among those from the lower income deciles (15.5%), while those in the higher deciles show lower participation (10.5%). On the other hand, participation in baccalaureate (general and technological), is higher (15.8%) among the richest 20%, and lower (12.5%) in the poorest 20% group (Table 3).

Table 3. Participation in public upper secondary education by track and income decil		
Decil	**Technical education**	**Baccalaureate**
1	3.0%	5.3%
2	12.5%	7.2%
3	8.8%	10.0%
4	8.7%	10.3%
5	18.7%	13.1%
6	8.4%	13.0%
7	19.4%	13.4%
8	10.0%	11.9%
9	8.6%	9.2%
10	1.9%	6.6%
Source: Own calculations with information from INEGI (2011) and CONEVAL (2011).		

If with this policy implementation, the TP students get the opportunity to get into bivalent education, their education and its quality will simultaneously improve, benefiting the poorest population groups. So, the regressive character in middle education will reduce, and those belonging to the vulnerable groups will be compensated.

v. The socioeconomic background and its role in educational outcomes: A sensitivity analysis

Since educational outcomes are among the main tools to evaluate the quality of education and student performance, to investigate their determinants and the extent to which they contribute to the outcomes is a central problem in this policy simulation. Furthermore, based on the evidence of the negative relation between the socioeconomic background of students and their performance in standardized tests, such as ENLACE and Program for International Student Assessment (PISA), there is reason to believe that the underlying assumptions to calculate the expected results of this simulation may be too optimistic. So, we include a sensitivity analysis in order to test the robustness of these assumptions.

Before starting with the sensitivity analysis we reviewed some empirical literature on the impact of the students' socioeconomic background on their performance; this through a study of the educational outcomes from standardized tests. Most of such analyses have been developed using data from PISA because of its many advantages, including access to international data and an index of economic, social, and cultural status (ESCS).

The correlation between educational outcomes (from PISA) and the students' socioeconomic background is especially important in countries where a large proportion of students are from poor or vulnerable backgrounds, as is the case in Mexico. Fortunately, according to the PISA results, despite Mexico being one of the countries with the broadest variability range in students' socioeconomic background, their performance is not guided by this factor. Indeed, the correlation between their performance in reading and their socioeconomic background has decreased during the period 2000-2009, improving equity in

terms of access to opportunities in education. So, evidence from PISA shows that overcoming socioeconomic barriers is possible; and a large number of excellent students come from disadvantaged environments (OECD 2010b).

As Schulz (2005) suggests, the socioeconomic background of the parents does not change much during the PISA periods. So, when there are dramatic changes from one cycle to another, such as changes in coverage, measurement, etc., an exogenous factor is probably responsible. Nevertheless, the variations in the impact of the students' socioeconomic background with regard to their performance, especially in reading, are found to be greater in the selective or tracked systems, whereas this is not the case in countries with more comprehensive education systems.

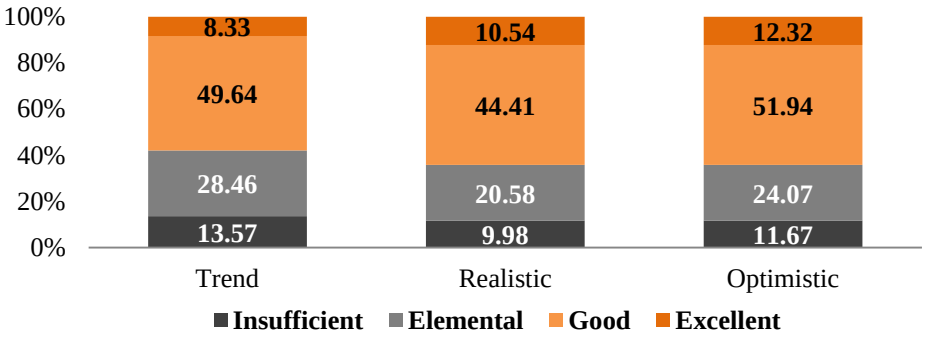
Hence, it is necessary to consider the role and significance of the students' socioeconomic status vis a vis their performance. So, we implement a sensitivity analysis to show how and to what extent the background of the technical education students affects their performance in ENLACE. To do this, we calibrate the model used, adding a socioeconomic status coefficient for each subject – one for reading and another for math skills. These coefficients remove the socioeconomic status aspect of the estimated outcomes.

The coefficients, derived from the work done by De Hoyos, et al. (2010) show that the main determinants of performance in ENLACE test, for math skills, are: individual factors (61.1%); school resources (18.2%); institutional environment (14.5%); and family background (6.2%). With regard to reading skills, we used the OECD (2010a) estimations that show the proportion of the explained variance in student performance – by his/her socioeconomic background – as 14.5%.

Once the socioeconomic background is set as the determinant of the students' performance in ENLACE for reading and math skills, we can contrast the achievements of technical education students under the status quo, the policy proposal, and the alternative scenario. At the same time, we can compare the proportion of the students in each estimated achievement classification by three kinds of results – trend, realistic, and optimistic – each based on different assumptions, once the policy proposal or the alternative scenario is accomplished. By *trend*, technical education students obtain the same results as those in the status quo; higher but *realistic* scores are obtained by students because they receive better education, but as they come from disadvantaged situations there is a "discount rate" in their performance; and finally in the *optimistic* results, students´ performance, irrespective of their socioeconomic background is equal – a phenomenon known as education resilience.

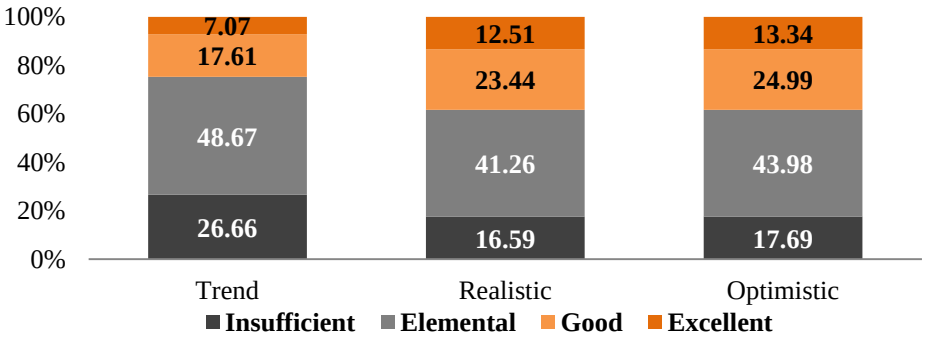
The expected results are from the policy scenario. The optimistic approach – in which students from technical education obtain the same results as students from technological baccalaureate, once grouped together because of the policy implementation – show that 64.2% of the students have good or excellent scores in reading evaluation, while under a realistic approach only 55% of the students achieve this score (Figure 21). Similarly, 38.3% of the technical education students obtain the required scores in math skills to belong to the good and excellent group under an optimistic perspective, while from the realistic standpoint just 36% of the students get that score (Figure 22).

Figure 21. Comparative results of reading skills in technical professional education within the policy scenario



Source: Own calculations based on information from SEP (2011).

Figure 22. Comparative results of math skills in technical professional education within the policy scenario



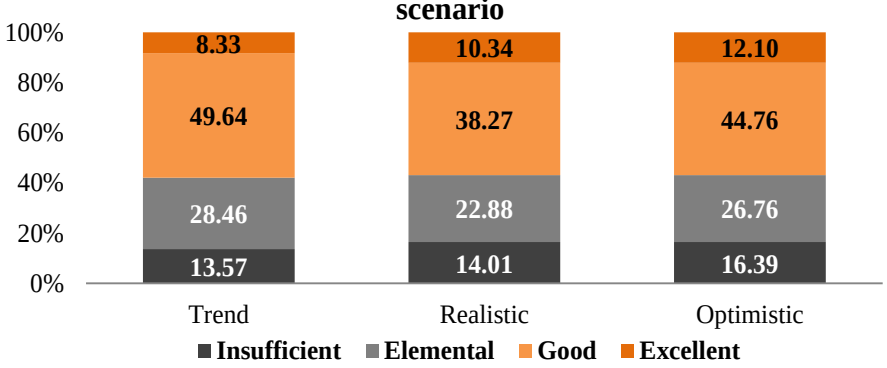
Source: Own calculations based on information from SEP (2011).

In the alternative scenario the simulation is very similar; the main difference is that the students from technical education and technological baccalaureate are grouped with the general baccalaureate students. All upper secondary students should academically perform pretty much the same under the optimistic perspective, but differently from the realistic approach because of the differences in the backgrounds of the technical education students. Nevertheless, in terms of performance, since students from technological baccalaureate score over those from general baccalaureate – despite their lower socioeconomic status – to consider any "discount rate" on socioeconomic grounds for these students is meaningless.

Similarly, the results for technical professional students show that the status quo scenario is the best when it comes to reading skills. This is because the proportion of students with good and excellent performance levels is at 58%, which is 1.1% above the optimistic results, and 9.3 points above the realistic scenario (Figure 23). However, in relation to student performance in math, the expected results are obtained; the optimistic approach is 1.9 points higher than the realistic approach, which in turn is 4 points higher than the status quo (Figure 24).

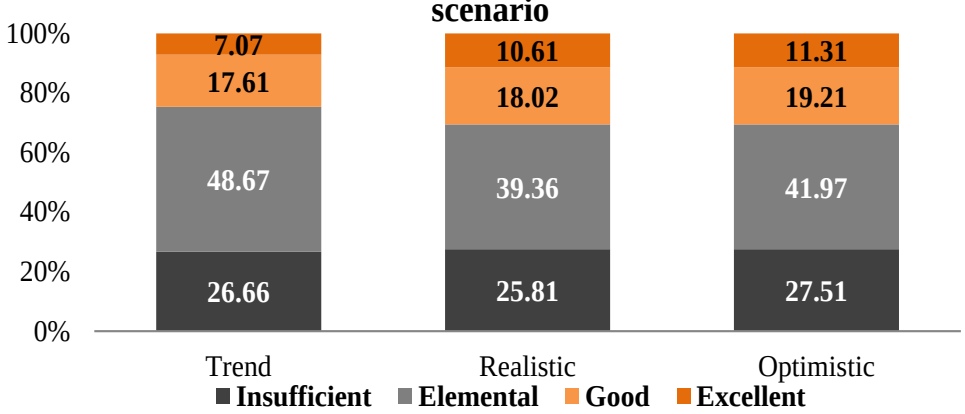
In brief, the sensitivity analysis shows that the results presented in the previous section are in fact very optimistic from the standpoint of the negative relation between the students' educational outcomes and their socioeconomic situation. Nevertheless, once their 'disadvantaged' status is removed, a better education system can break the socioeconomic barriers and result in improved performance by the students.

Figure 23. Comparative results of reading skills in technical professional education within the alternative scenario



Source: Own calculations based on information from SEP (2011).

Figure 24. Comparative results of math skills in technical professional education within the alternative scenario



Source: Own calculations based on information from SEP (2011).

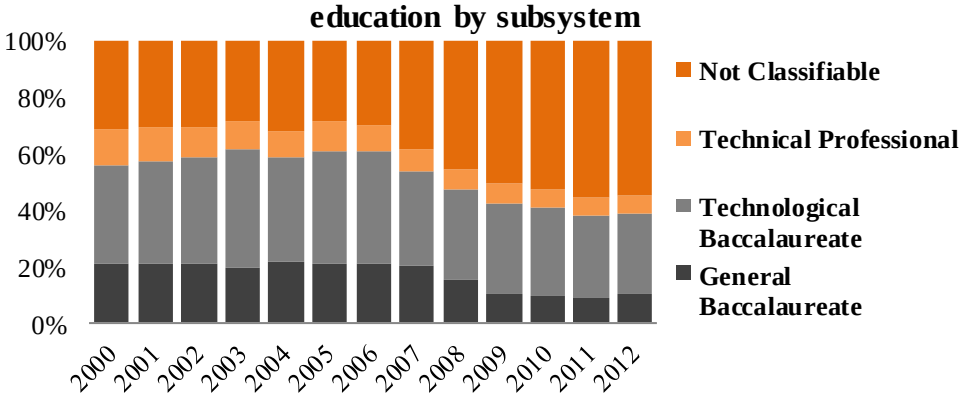
Finally, as we have argued, evidence shows that it is indeed an important challenge to do away with the negative association between the students' performance and their socioeconomic status. The OECD (2010a) findings highlight the fact that many students face a double barrier as a result of coming from poor or vulnerable backgrounds, and then attending school with inferior quality education. Hence, the UNESCO (2010) makes several recommendations to the decision makers to improve the quality of education in Latin American countries. Among these, one of the main policy lessons that we consider as highly related to our policy proposal is the differential funding for students in poverty conditions, so as to avoid and balance the inherent disadvantages of the most vulnerable of the young.

vi. Cost-Benefit Analysis

In this section we show the relation between public expenditure in USE and the graduates' labor trajectories for each subsystem. To do this, the Cost-Benefit Analysis (CBA) is presented. To estimate the public expenditure, we used the same approach presented before. For the labor trajectories, the analysis is based on the National Survey of Educational and Labor Trajectories of Upper Secondary Education (ENTELEMS), a module of the National Occupation and Employment Survey (ENOE). While ENOE is a regular quarterly labor survey carried out by the National Institute of Statistics and Geography (INEGI), ENTELEMS was designed to understand the characteristics of upper secondary education recipients and their labor paths. A full description of ENTELEMS can be found in Espino (2009).

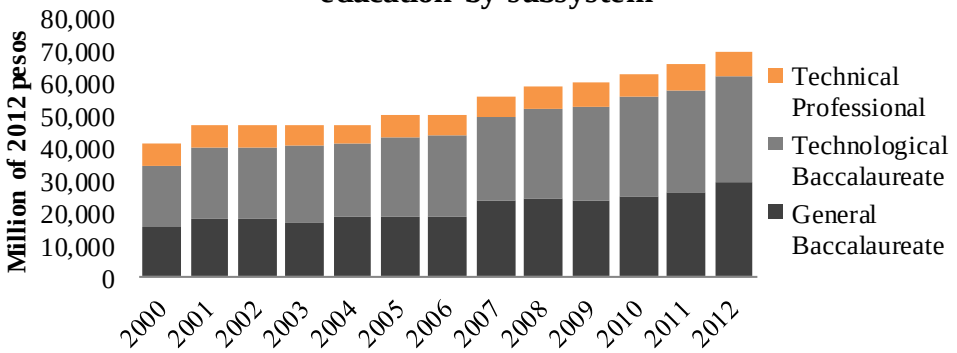
During the period 2000-2012 a large part of the public expenditure in USE was allocated to TB (34.4%), followed by GB (16.1%), and TP (8.7%). The rest of the resources were distributed within the not-classifiable category (40.8%), under which different departments of the SEP are grouped (Figure 25). After the distribution of these not-classifiable resources between the three tracks, the student participation changed to 48% in TB, 39.2% in GB and 12.8% in TP education. As expected, the order in the resource participation is the same, both before and after the distribution of the not-classifiable resource (Figure 26).

Figure 25. Federal expenditure in upper secondary education by subsystem



Source: Own calculations with information from SHCP (several years) and SEP (2011).

Figure 26. Federal expenditure in upper secondary education by subsystem



Note: In this graph the *not classifiable* resources are already distibuted among tracks.
Source: Own calculations with information from SHCP (several years) and SEP (2011).

We proceed to work out the cost for an enrolled student by dividing the total public expenditure by the overall enrolment in public schools for each track. The costliest track, it is found, is the technological baccalaureate (TB) track. The cost of this kind of education is higher than general and technical education since it offers both propadeutic and vocational instruction. The technical professional (TP) track is the second in line in terms of cost, as was expected, since this kind of education needs a more sophisticated infrastructure. General baccalaureate (GB), the least expensive track, still has the maximum enrolment. There is a group of several institutions that are found to be relatively cheaper compared to the rest, like the open and distance education (EMSAD) in which a large infrastructure is not necessary (Table 4).

To analyze the effects of participating in different upper secondary education tracks, the focus will be on two factors: salary level and participation in the formal sector (vs. the informal sector), recognized as benefits. Also, we explore the diploma effects, analyzing the cases of those who obtain a technician title in bivalent and technical education vs. those who do not. While the salary level is important for individuals and households, participation in the formal sector is a critical variable for public policy.

To carry out this exercise, we only consider those who their maximum educational level is upper secondary, and those who have worked, at least, three months in their lifetime i.e. we are not taking into account participants with tertiary education studies nor without work experience (less than three month). In the same way, we only worked with the results from the first job in order to avoid issues related with professional experience and other factors that could influence the analysis.

Table 4. Federal expenditure per student in upper secondary education by subsystem (2012 pesos)			
Year	**General Baccalaureate**	**Technological Baccalaureate**	**Technical Professional**
2000	12,279	24,510	24,177
2001	13,311	27,056	25,295
2002	12,271	26,402	23,257
2003	10,887	26,605	21,700
2004	11,673	24,277	20,124
2005	11,225	25,642	23,380
2006	11,070	24,850	20,706
2007	13,325	25,259	21,607
2008	13,292	26,260	22,206
2009	12,315	26,281	22,410
2010	12,589	26,459	22,902
2011	13,164	26,191	23,047
2012	14,290	26,925	23,190
Source: Own calculations with information from SHCP (2000 - 2011) and SEP (2011).			

Results show that on an average, baccalaureate graduates spend more time in work (186 hours per month). Graduates from TP education work less (183 hours per month). The latter earn the highest wage per hour (18.5 pesos). Baccalaureate graduates have a more or less similar wage per hour (17.8 pesos). The initial salary is higher among graduates from TP (3,037.7 pesos per month), followed by GB and TB graduates (2,943.2 and 2,916.7 pesos, respectively). The perceived salary at the end of the month is greater in the three tracks but TB graduates earn a higher wage than GB. The diploma effect is positive in TP graduates but negative in the TB case (Table 5).

Table 5. Avergae income indicators by subsystem (pesos)				
Modality	**Wage/Hour**	**Hours/Month**	**Initial income (month)**	**Final income (month)**
General Baccalaureate	17.83	186	2,943.23	3,056.26
Technological Baccalaureate	17.84	186	2,916.79	4,263.37
Technical Professional	18.57	183	3,037.75	4,981.61
Diploma effect				
Technological Baccalaureate	16.62	183.6	2,776.02	3,314.93
Technical Professional	19.33	185.2	3,274.17	6,131.04
Source: Own calculations with data from ENTELEMS (2008).				

It is possible that these results may be influenced by the position held by the graduates in their respective jobs. In order to reduce the position factor we calculate the same results by job description. In this case, there are several possible combinations between job position, track and indicator. On an average, the higher wage is estimated in the case of employers with GB (6,851 pesos). On the other hand, the lower wage (2,498.1 pesos) is presented in

the case of the self-employed graduates from the same subsystem. At the end of the month, again, the higher wage (12,000 pesos) is presented for GB graduates who are employers. Lower wages are perceived for graduates from the same track; however, their job status is self-employed (Table 6).

Table 6. Average income indicadotrs and job position by graduates' subsystem (pesos)

Indicator	Job position	General Baccalaureate	Technological Baccalaureate	Technical Professional
Wage/Hour	Employee	16.42	16.67	18.81
	Worker	13.82	17.49	11.37
	Self-employed	32.86	25.61	28.23
	Employer	32.10	19.51	26.50
Hours/Month	Employee	189.7	189.1	186.3
	Worker	182.3	189.3	202.2
	Self-employed	170.4	164.7	153.2
	Employer	228.5	160.4	246.8
Initial income (month)	Employee	2,777.10	2,909.34	3,122.89
	Worker	2,506.37	2,597.86	2,226.85
	Self-employed	2,498.18	3,026.24	3,219.88
	Employer	6,851.04	3,027.15	5,128.21
Final income (month)	Employee	3,071.04	4,373.42	5,196.03
	Worker	3,003.85	3,368.58	3,207.91
	Self-employed	1,394.40	3,040.65	2,943.78
	Employer	12,000.00	9,000.00	4,757.76

Source: Own calculations with data from ENTELEMS (2008).

With regard to participation in the informal labor market, two findings are worth highlighting. First, participation in the informal sector is very high (21.2%). While there is a common belief that the informal sector captures mostly unskilled people, the population described in this research has an educational level above the national average. Second, the pattern is very similar across tracks, with slight variation in the case of graduates from TP (Figure 27).[15]

[15] In this case, the informal sector definition takes into account three kinds of activities: (1) the economic activities that operate with household resources; (2) paid housemaid; and (3) subsistence farming.

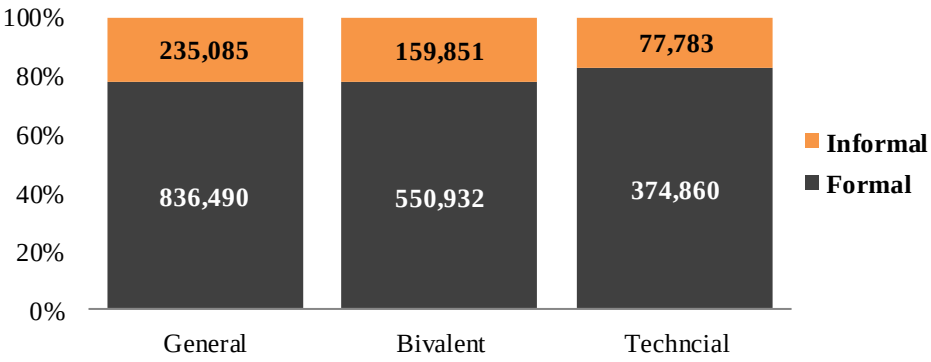


Figure 27. Graduates' labor market condition by subsystem

Source: Own calculations with information from ENTELEMS and ENOE (2008).

Participation in the informal sector, in absolute terms, is most common among GB graduates; in relative terms, the participation is very similar. Graduates from GB working in informal settings represent 49.7% of the total informal labor, followed by TB graduates whose representation is 33.8% and 16.5% for graduates from TP. In participation between the tracks, GB has 78.1% of their graduates in formal jobs, TB 77.5%, and in the case of TP 82.8% graduates have a formal employ.

According to Lindert et al. (2006), non-participation in the formal labor market is an important cause of inequality in the Mexican context, through regressive social transfers. With a dramatic demographic transition occurring in the country, this adverse situation is expected to escalate (CEFP 2010). From a public finances standpoint, the low wage structure among high-school graduates and the current tax subsidies on low incomes, the contributions of many of those who are currently on the informal labor market would be marginal if not negative.

The averages presented above are an initial picture; a fundamental starting point for policy analysis. Nevertheless, it is important to take into consideration several caveats: unobserved and endogenous relations are surely present (Card 2001); measurement errors are hardly avoidable in such surveys (Deaton 1997); what may be accurate at an aggregated national level may not necessarily be true at regional levels. Also, important indirect effects may be present; while returns may be similar as those of a terminal degree, the three tracks have very different admission rates at the tertiary education level. The returns in the case of those who complete higher education are higher; their job quality is better too.

vii. Discussion

The upper secondary education in Mexico has seen two important reforms in recent years. First, in 2007 began the development of the Integral Reform of Upper Secondary Education (RIEMS) with the objective to offer a more comprehensive middle education to meet the increasing demand created by the demographic change in the country. Then, to complement this reform, secondary education became mandatory. So, since the school year 2012 government has the obligation and responsibility to provide this kind of education to

all those in need of it and who fulfill the basic eligibility criteria. The main goal is: total coverage by the school year 2021.

Nevertheless, this effort should not be limited merely to increasing the number of schools or spaces in the existing schools. There are certain issues that have not to continue with the expansion of the educational services. These issues were not served when the RIEMS was conducted. As already mentioned, there are quality-related differences between the subsystems and modalities.

The actual upper secondary education system is creating a vicious circle in which students from poorest backgrounds have access to only lower quality educational services. On the other hand, students from better socioeconomic backgrounds attend better quality educational programs. Talking about subsystems, both the baccalaureate subsystems (general and bivalent) have shown better educational quality since their students reflect higher performance levels in evaluation tests (ENLACE). The literature presents studies on the backgrounds of students who attend these subsystems and has found that their socioeconomic situation is better than of students attending technical professional education. Even among baccalaureate subsystems, students from general baccalaureate seem to come from higher-income households as compared to those from technological baccalaureate. So, the future of the most vulnerable students depends on effecting significant improvement in the quality of their education; they should be helped through the use of better educational tools to enable them to make choices for their future.

In this sense, we propose the restructuring of the upper secondary system as a policy to improve the quality of education. Hence, we propose the reduction of the actual tracking from three subsystems to only two, to achieve the main goal of the policy which is to improve the quality of education by removing the existing differences in the education quality among subsystems, and with that putting an end to the vicious circle that entraps the lower socioeconomic background students. This policy leads to greater equality in access to middle education, better management and expenditure efficiency, and better student performance resulting from higher quality education for all.

We have to recognize that the presented results may seem very optimistic in terms of increasing enrolment and improving the ENLACE test results. This can be justified in several ways: first, the methodology is very simple and is aligned to the SEP guidelines for educational forecasts; second, the government has made important efforts to avoid dropouts in middle education through several scholarship programs towards which it allocated about 3,000 million pesos in the year 2012; third, because bivalent education is more attractive as it offers both better quality education and the option to continue with higher studies. Together with the compulsory reform, a high increase in the upper secondary services demand is expected. About the ENLACE results, the arguments are very similar. The presented results follow up on the actual trend, but overall, we think that achieving improvement in education quality through better curricula is very possible. Nevertheless, we have to recognize that imputing the existing trend and rates to different tracks can be a big assumption, due to which we do not incorporate behavioral changes resulting from external factors.

We decided to pay more attention to the original policy simulation proposal (changing from three to two tracks) than the alternative scenario because the former presents several advantages over the latter. One of the main reasons we should be looking at is that, if all the students were concentrated in only general education then those who cannot join tertiary education would not have the necessary skills to find employment. So, their future in the short term will be uncertain. Also, the labor market requires technicians for semi-professional activities. The vocational guidance that the bivalent education offers is another advantage over the general education, i.e. students can, if they wish to, change their minds during the course of their studies in bivalent education; they will thus have the opportunity to choose from other career options.

The proposed outcomes point out that there will be an increase in enrolment because the bivalent education is more attractive to students compared to technical professional education; the latter has a terminal character and is not quite recognized by the potential employers. Moreover, the bivalent education students will have better test results (ENLACE), since they will receive better and more complete academic education than they actually receive in technical education. Although the total expenditure in our proposal is higher compared to the status quo, the amount is not so high as to be rejected. Furthermore, the compulsory reform requires a budget increase in the next ten years to accomplish the total coverage goal. Finally, the future generations of students will have better opportunities in terms of access to higher quality education, regardless of their socioeconomic background.

This public policy could face some hurdles as there are those who argue that not everyone is interested in middle education, but since this level is compulsory, the lack of this certification represents a big disadvantage within the formal labor market. Moreover, the public education system will keep offering vocational training. Then there are options for people without secondary education and for those who are not interested in an academic program and just want to learn and develop skills for work.

Considering that this policy complements and improves the upper secondary reforms (RIEMS and Constitutional), one recommendation that we would like to point out refers to the selection of the vocational programs. They have to be aligned in order to satisfy the basic requirements of the formal labor market. A necessary next step would be that the access modality to upper secondary level be regulated by allowing equal opportunities.

Concerning the ex-post evaluation, another advantage that this policy presents is the auto-evaluation through the ENLACE results. This outcome is at the same time a way of evaluating policy without the extra costs or the need to design a particular evaluation, allowing one to know and to keep track of the evolution of the results year by year. This evaluation cannot be done presently because the implementation of the approved reforms is very recent and the proposed policy had not yet been applied.

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