The Market Returns to Private High Schools: Evidence from Mexico*

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Abstract

Despite the strategic importance of the private sector to education policy reform in developing countries, very little is known on the relative efficiency of private and public schools in boosting educational attainment and wages. This paper fills this gap by building a unique dataset for Mexico that allows measuring the market returns to private high schools. The effect of private schooling is identified by a novel identification strategy that exploits the significant increase in the availability of public high schools and private colleges by State and year observed in Mexico in the 1990s. We find substantial evidence of a positive effect of private schooling on college completion and wage returns. These findings question the effectiveness of the public sector as an efficient education provider and point at the private sector as a viable alternative to absorb the increasing demand for schooling. The trade-off between increased access to education and equity in as far as quality and cost differences persist between private and public schools is discussed.

Key Words: Private and Public Schools, Returns to Education.

JEL Codes: J31, J24, C36.

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1 Introduction

In recent years, there has been a considerable debate on the privatization of the education sector in developing countries due to a growing demand for schooling under conditions of increasing financial stringency. Proponents of privatization argue that the private sector can be used as a means of expanding access to education via efficient supply (Riddell 1993). Attending a private school is associated with better test score results, increased schooling attainment and higher wages. However, the evidence for developing countries remains inconclusive and, with very few exceptions, purely descriptive.

On test scores, several studies find that students in private schools achieve better results (e.g. Somers, McEwan and Willms 2004 for Latin America; Alderman et al. 2001 and Khan and Kiefer 2007 for Pakistan; Lassibille and Tan 2003 for Madagascar; Kindgon 1996 and Muralidharan and Kremer 2008 for India), while others reach the opposite conclusion or find no significant differences between achievement of private and public schools (e.g. Knight and Sabot 1990 for Kenya; Lassibille and Tan 2001 for Tanzania; Uribe et al. 2006 for Colombia; Rubinstein and Sekhri 2010 for India). On labour market outcomes, the evidence is even less informative. Mainly due to data limitations, not only there are very few studies but also, and most troublesome, most of these studies compare differences in mean outcomes, such as wages and school attainment, without controlling for non-random selection into public and private schools (Bedi and Garg 2000 for Indonesia; Asadullah 2009 for Bangladesh and Pakistan; Calonico and Nopo 2007 for Peru).[1]

Thus, despite the importance of the issue and the policy implications that could be drawn from such an analysis, little to nothing is known on the relative efficiency of private and public schools in boosting educational attainment and wages in developing countries. This paper fills this gap by constructing a unique dataset for Mexico that allows to measure the market returns to private high schools. We focus on a sample of workers and we argue that attending a private high school could have two main effects: boost school progression from high school to college and result in higher wages. More precisely, private schooling could encourage students to attain more years of education, which would increase earnings. In addition, it could also have a direct effect on wages, that is for a given educational attainment private schools' graduates could earn more than public school graduates. This could happen because private high schools offer a more conducive learning environment (higher quality of the education provided, higher concentration of students from a privileged socioeconomic background) leading students in private schools to learn more and thus accumulate better human capital than students in public schools.

[1] A noticeable exception for wages is Bravo, Mukhopadhyay and Todd (2008). Despite not having a direct interest in estimating the impact of private and public schools on wages, they develop a dynamic model of schooling and work decisions to evaluate the effect of a school voucher program on the returns to private and public education in Chile and thus effectively estimate the wage returns in the two sectors.

On the contrary, there is an extensive literature on the estimation of the causal effect of private schools' attendance on educational attainment and wages for developed countries. Brown and Belfield (2001) provide a complete review of the US and UK studies.

In addition, the private schools' effect could be reinforced by a signal mechanism: if private high schools have a reputation of being the "good schools", attending a private high school would signal high ability, which employers reward when setting wages (Weiss 1995; MacLeod and Urquiola 2009).

The identification of the effect of private high schools on school progression and wages involves solving a multi-stage dynamic problem: individuals choose to study in a private or in a public high school, complete or not high school, attend and complete or not university. Clearly, these are all endogenous choices. Thus, a key question to address is the extent to which education outcomes and later on wages of those that studied in private and public high schools differ because of the different type of education they received or rather because of unobservable individual characteristics that determine education choices and are likely to affect the outcomes independently of the school sector.

In the absence of a randomized experimental framework, this paper uses a novel instrumental variable strategy that allows to separately identify the impact of studying in a private high school on school progression and wages. Specifically, we show that in the decade of the 1990s in Mexico there was a significant increase in the availability of public high schools and private colleges and we use this variation by State and year to identify the effect of studying in private and public high schools on school attendance and completion probabilities, and on wages. We do so by merging individual-level data on private and public high school and college attended, wages and State of residence at school entry age with historical information on the school age population, and the number of public and private students and schools, which we have collected for each of the 32 Mexican States by year between 1970 and 2000. We use these historical information to construct two measures of availability of education at public and private high school and college - the number of schools per school-age population, and the number of students per school by year and State -, and we thus obtain a sample of workers for whom we know, as key variables, wages, education choices at high school and college in the public and private sector, and the availability of education in the State of residence at the time of school enrollment.

Our main findings are two-fold. First, we estimate an overall return to completing a private high school unconditional on whether or not college is attended and completed of around 48%. Second, this overall return is due to returns to studying at college: while we find no returns to having completed a private relative to a public high school for those that enter the labor market upon high school graduation, attending a private rather than a public high school increases the probability of completing college by around 22%, and returns to graduating from college are around 58% higher if a private rather than a public high school was attended. These results are robust to a number of validity checks of the strength and exogeneity of the instruments. We thus find substantial evidence that students educated in public high schools are at disadvantage in both progression to college education and wage returns. These findings question the effectiveness of the public high school education sector as an efficient education provider.

The remainder of the paper is organized as follows. Section 2 presents a description

of private and public schools in Mexico. Section 3 describes the data and presents some summary statistics together with the main trends in availability of private and public high schools and colleges from 1970 to the year 2000. Section 4 presents the empirical framework and discusses identification. Section 5 and 6 present, respectively, the main results and some robustness checks. Section 7 concludes.

2 Public and Private Schools in Mexico

A private school in Mexico is officially recognized and legally established after having obtained an official license, the *Reconocimiento de Validez Oficial* (RVOE), that is offered by the federal and by the state government and sets basic educational and teaching standards as established by the General Education Law act of 1983. Once RVOE has been obtained, there is no further regulation as to the quality or type of academic programs offered by private institutions.[2]

The public system is funded with public resources, while the main source of financing of the private system are tuition fees. There are no public subsidies to private schooling in primary and secondary education, while there are some programs that finance poor students through private high schools and colleges. All these programs started after the year 2000 and are limited in scope and coverage. A detailed description of the Mexican education system together with the main fellowship and student-loan programs is presented in Appendix B.

While the main provider of primary and secondary education has historically been and still remains the public sector[3], the private sector has been playing an increasingly important role in the provision of high school and college education. At the high school level, both public and private schools tend to apply an entrance exam whenever the number of applicants exceeds the schools' capacity.[4] At college, a minority of public universities select entrants based on an entrance examination, while a requirement to enter most private universities is to set an exam, which can be either designed by the

[2] An exception is when a private university is affiliated to an autonomous university that is in charge of supervising the standards of the educational program offered by the private center. Most private institutions of higher education are represented by the FIMPES (*Federación de Instituciones Mexicanas Particulares de Educación Superior*), an association that was created in 1982 and organizes, coordinates and represents private universities in front of the government.

[3] At both primary and secondary education the private sector has always been of a smaller size relative to the public sector. Throughout the 1970s, 1980s and 1990s the number of students enrolled in private primary and secondary schools remained constant at around 10 thousands, while the number of students enrolled in public primary (secondary) schools increased from around 280 (25) in 1970 to around 430 (170) thousands in 2004. Likewise, while in the private sector the number of primary and secondary schools per population has remained unchanged since the 1970s, in the public sector the number of primary (secondary) schools per population almost doubled (increased seven times).

[4] An exception to this rule are public high schools in the metropolitan area of Mexico City, which recruit students through a public competition with no exception (see http://www.comipems.org.mx/).

university itself or by an external agency. In addition, several public universities do automatically guarantee a place to students from affiliated high schools (Kent 1993).

Private high schools and colleges charge high tuition fees.[5] On the contrary, public schools do not charge tuition. However, they are not for free. Students in public schools are often encouraged to give a voluntary contribution[6]; in addition, disregarding the public or private type of school attended, all students have to pay the costs of exams fees, transport and/or room to board, and schooling material. Consistently, evidence from the Mexican national Consumption and Expenditure Survey (ENIGH) for 2002 show that average costs of private high school (college) amount to around 23% (74%) of median yearly household income. The figures for the public sector are, respectively, around 15% of median yearly household income at high school and 59% at college.

At high school, the general belief is that private schools provide education of better quality. Results from a number of standardized tests support this belief. Figure 1 reports the mean math test scores from the OECD's Programme for International Student Assessment (PISA) exam for a representative sample of fifteen year old students in their final year of secondary school or in their first year of high school in 2003. On average, students in private schools achieve better scores than students in public schools at each quantile of the test score distribution. Results from ENLACE 2008 standardized examinations[7] depict a picture that is consistent with the PISA results: students in private high schools have, on average, a higher probability of better performing both in language and in math. Using UNESCO 1997 test scores data administered to third and fourth grade students in ten Latin American countries, Somers, McEwan and Willms (2004) also find similar results. They also show that the positive correlation between private school attendance and higher test scores is robust to controlling for the socioeconomic characteristics of the students and their families.

In addition to comparing students' achievement in private and public schools, we can compare the two education sectors along a number of commonly used measures of education quality such as the number of students per teacher and per class (academic department at the university level), which we can construct using data from the Mexican School Census. Figure 9 and 11 in Appendix C present, respectively, the changes over time in the students-teacher and in the students-class ratios at high school.[8] Both indicators convey the same message: school quality is higher in private than in public high schools.

[5] In 2008, average annual tuition fees charged to national students by private higher education institutions amounted to 11359 USD (OECD 2008).

[6] The amount of the suggested contribution varies depending on the poverty level of the area where the school is located, the specific needs of the school, and the school's administrative level (federal, state or autonomous).

[7] Since 2008 the Mexican Ministry of Edication runs standardized examinations (*Evaluación Nacional del Logro Académico en Centros Escolares* or ENLACE) in language and math ability that are administered to *all* students enrolled in the last year of high school.

[8] We obtain very similar results if we use alternative measures of education quality such as the number of teachers per school and per class as two measures of the effective supply of teachers (Black and Smith 2006 and Card and Krueger 1996).

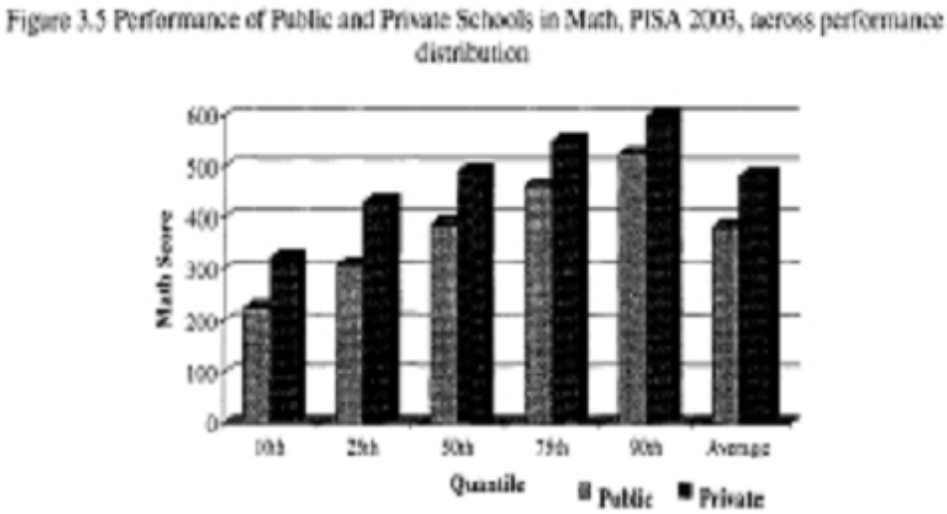


Figure 1: 2003 PISA Math Test Scores for Mexico (Source: World Bank, 2005)

Also, the quality gap has increased in the 1990s with respect to the 1980s. In the year 2000 the number of students per teacher in a public high school is double the one in a private school; likewise, in the same year, there are around ten more students per class in a public than in a private high school.

If at high school the distinction between private and public schools is a good indicator of education quality, at university this distinction is not informative of the quality of education provided due to the wide range of private institutions of higher education. Together with private universities (or elite institutions) that offer a vast array of undergraduate and graduate programs in different disciplines and are staffed by well-trained academics[9], there is a vast range of private low-quality institutions of higher education, which include for profit demand-absorbing establishments, specialized training institutes and non-university business that offer low cost and popular degrees, as well as international corporations that are large for-profit providers operating campuses worldwide (Prieto 2010). While we are not aware of any available data on standardized test-scores that would allow to compare students' achievement in private and public colleges, we can measure the quality difference between private and public universities by using the School Census data. Consistently with the private/public distinction being a poor quality indicator at college, the results show that without any further information on the type of private institution the quality gap between private and public colleges is rather small and much smaller than the gap between private and public high schools: throughout the 1970s, 1980s and 1990s there are, on average, only three more students per teacher at

[9] They all have national accreditation and are mostly supported by religious orders, industrial groups or associations. Religious instruction is prohibited in public schools. However, since 1992 religious groups and associations are allowed to help establish and run private schools, which receive no public funds.

public than at private universities (Figure 8 in Appendix C).

3 Data

This paper uses two main datasets: the ENTELEMS (*Encuesta Nacional de Trayectorias Educativas y Laborales*), and the Mexican School Census data collected by the Mexican Ministry of Education. The ENTELEMS was designed as a module of the ENOE (*Encuesta Nacional de Ocupacion y Empleo*) survey.[10] The sample consists of the subset of young aged 15 to 35 that have completed at least one year of high school and live in households that were part of the third round of the 2008 ENOE.[11] The main advantage of the ENTELEMS with respect to any other Mexican survey is that it contains information on whether high school and college education was attended in a private or in a public school, and, most importantly, the location (State) where the high school was attended for a sizeable sample of workers.[12] In addition, the ENTELEMS includes demographic information on sex, age, marital status, whether the individual is the head of the household and, if working, wages, number of hours and type of employment (self-employed or wage worker) together with family background variables for the sub-sample of young that live with their parents.[13] The wage and employment information comes from the ENOE that is notoriously the best source of wage data for Mexico.

The Mexican School Census contains yearly information on the number of schools, teachers, students and classes for each of the thirty-two Mexican States by education level and type of school (public and private) since 1970. The data from 1970 to 1989 are recorded on paper and access is restricted while the data from the year 1990 are publicly available on line. The dataset that we have built includes information on the number of teachers, classes, students and schools in the private and public sector by year and State from 1970 to 2000. We merged the Mexican School dataset with yearly data on the 16-18 and 19-24 age population by State from 1970 to 2000, which we separately collected from

[10] The ENOE is Mexico's main employment survey. It is a nationally representative survey that collects detailed information on employment, education and socio-demographic information on 120,260 households every three months during a year (rotative panel sample – every trimester a fifth of the sample that has already been visited five times is replaced by a new set of households). It is collected by Mexico's statistical office (INEGI).

[11] If there were more than one household member satisfying these characteristics in any given household, the individual whose birthdate was closer to the date of the interview was sampled in. The complete ENTELEMS sample represents 8.5% of the observations included in the 2008 ENOE, this is to say 34,901 individuals.

[12] Typically household and employment surveys in Latin America do not include information on the private/public type of high school attended; or, if they do, it is only for small samples of workers as it is the case in the Mexican Family Life Survey (MxFLS).

[13] There is also some information on the number of children but this is only collected for women. In addition, the ENTELEMS includes information on the academic track of the high school and higher education attended, as well as a module on labour trajectories for individuals aged between 15 and 29.

the Mexican National Population Council, and we constructed two measures of availability of education: the per capita number of schools, as the ratio of the total number of public and private high schools and colleges in a given State and year by, respectively, the 16-18 and 19-24 age population in that State and year, that is by the size of the relevant school age population that could be enrolled at that level of education, and the number of students per school at public and private high schools and colleges by year and State. This first measure is a proxy of the potential availability of high schools and colleges in a given State and year. The second measure is a proxy of the size of the education sector: the higher the number of students per schools, the bigger the size of the sector.

We merge the sample of workers in the ENTELEMS with the measures of availability of education at private and public high school and college by, respectively, the State of residence and year at the entry age of high school and college. The ENTELEMS contains direct information on the State of residence in the year of Survey, in the year of birth, and in the year at the start of high school. For almost 90% of the sample the State of residence in 2008 coincides with the State of residence at the start of high school, including the sub-sample of college entrants and graduates; we thus assume that the State of residence at the start of high school and college are the same. The ENTELEMS also contains a direct question on the year at the start of high school. However, this question is only answered meaningfully by a small portion of the sample: most people either did not remember the year when they started high school or they did so inconsistently, that is by reporting a starting year of high school that is at odd with their age and educational achievement in 2008. Thus, the baseline merge is done by constructing the year at start of high school as the difference between the year of Survey, individuals' age and the age at the start of high school, which we assume to be equal to the average age at the start of high school in our sample. In Section 6 we will assess the robustness of our results to this assumption.

3.1 Descriptive Statistics

As key variables of interest our final sample includes wages, school choice in the private and public sector of high school and college education, and the two measures of schooling availability at the time and in the State where the schooling choices were made. Descriptive statistics are presented in Table 1, 2, 3, 4, and 5 in Appendix D. Table 2 reports the number of high school and college entrants and graduates by public and private high schools. Table 3 presents mean hourly real wages by educational attainment and type of public or private high school attended. Table 4 and 5 present, respectively, the number of students attending and completing a private and a public university.

Overall, around 4500 students entered university and only less than a thousand of these did not complete college. Table 2 shows that, disregarding the highest level of education attained, the vast majority of the sample studied in a public rather than in a private high school. Importantly, those that completed private high schools appear to have an advantage on both university attendance and completion, and on wages. Table 2 shows that while overall there is a higher proportion of public than private high school

graduates, among college entrants and graduates there is a higher proportion of those that studied high school in a private rather than in a public school. Table 3 shows that real hourly wages are on average four percentage points higher for college graduates that studied in a private rather than in a public high school. On the contrary, there seem to be no wage gains of studying in a private high school if college is not completed. Consistently with private high schools providing higher quality of education than public high schools, evidence from the ENTELEMS shows that the first most common reason to study high school in a public school is because the school is close to home, while the first most common reason to study at a private high school is because the school is prestigious.[14]

Of those enrolled at university, over 74% entered a public university. Table 4 and 5 show that the type of high school and university tends to match if a public high school was completed: over 83% and 85% of those that studied at a public high school attended and completed a public university. On the contrary, no such matching is observed for those that completed a private high school: half of the students that studied at a private high school attended and completed a public university. Thus, those attending the high quality private high schools are equally enrolling at private and public universities, which is consistent with the distinction between private and public universities not being informative of their respective quality (see Section 2).

We have State-level information on the school age population and on the number of schools and students from the year 1970 to the year 2000 and the average entry age of high school in Mexico is fifteen. Thus, in the merged dataset, we have measures of availability of private and public high schools and colleges for all individuals aged between 23 and 35 in 2008, that is for those that started high school between 1988 and 2000. These cohorts are characterized by an increasing attendance rate at private high schools: the average attendance rate at private high schools increased from 25% for the 23-age cohort to 31% for the 35-age cohort.

We will identify the effect of studying in a private or in a public high school on school progression and wages by relating the variation across cohorts and years in private and public school attendance to the changes in the availability of private and public schooling by State and year at school entry age. We now analyze these changes in detail.

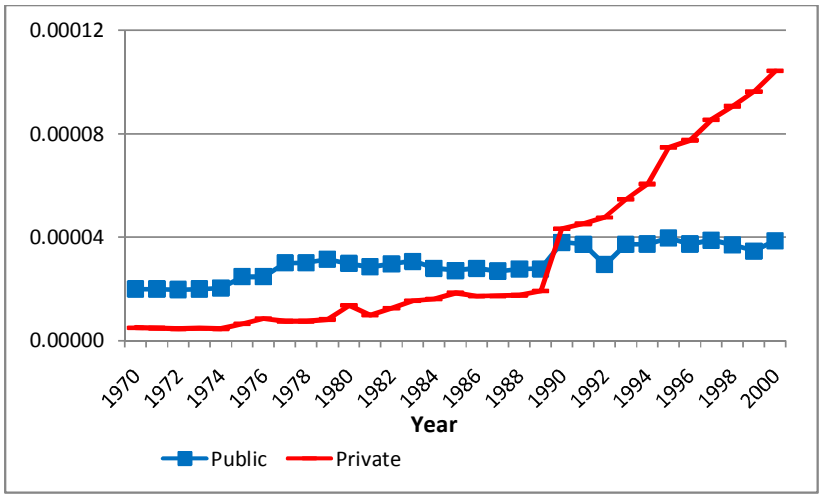
3.2 Availability of Private and Public Schools 1970-2000

Figure 2 presents the per capita number of private universities between 1970 and 2000. Private universities started to expand in the 1980s. However, it was in the 1990s that the private sector boomed: between 1990 and 2000 the per capita number of private universities doubled, which means that the annual increase in the educational offer was double the size of the demographic growth rate of those in school age so that the capacity

[14] The second most common reason to study at high school is because the school offers the subjects/courses of interest. The third most common reason to study at a public (private) high school is because is prestigious (close to home).

to cover that offer was well above potential demand. The main education provider became the private sector: the proportion of private colleges increased from around 20% in 1970 to 50% in 1990 and 70% in the year 2000.

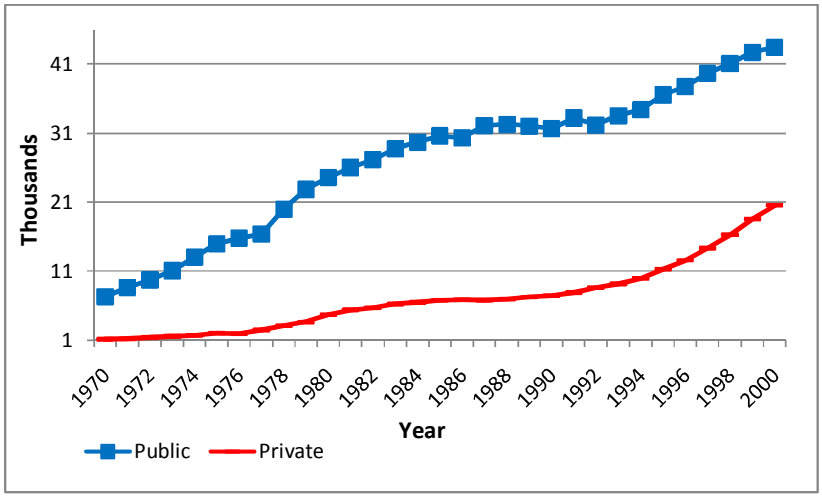
Figure 2: Number of Public and Private Universities Over the 19-24 Age Population. (Source: authors' calculations based on data from the Mexican School Census)



Both in the 1980s and in the 1990s the expansion of private universities was a response to an increasing demand for higher education. However, importantly, the two expansion periods were characterized by the growth of different types of private institutions. The 1980s were a period of restrictive fiscal policies and drastic cuts in public spending with a general crisis of confidence in public schools.[15] The private sector satisfied the unmet demand for higher education through an expansion of elite private universities. On the contrary, the 1990s were a period of resumed growth with the public sector regaining public confidence and expanding with the growth of technological institutes (Prieto 2010). At the same time, the private sector did see a window of opportunity in opening low fees non-university institutions to attract an increasing demand for post-graduate education. Thus, the boom of the private sector in the 1990s was due to the growth of institutions that were mostly competing for volume by cutting costs and providing education of low

[15] Between 1981 and 1989 public funding for higher education and research decreased by around 25%, while the student population in higher education increased by 15%. The crisis of confidence in the public sector was demonstrated by the pronounced trend on the part of business executives and high government officials to send their children to private universities (Kent 1993)

Figure 3: Number of Students at Public and Private Universities (Source: authors' calculations based on data from the Mexican School Census)



quality (Prieto 2010).

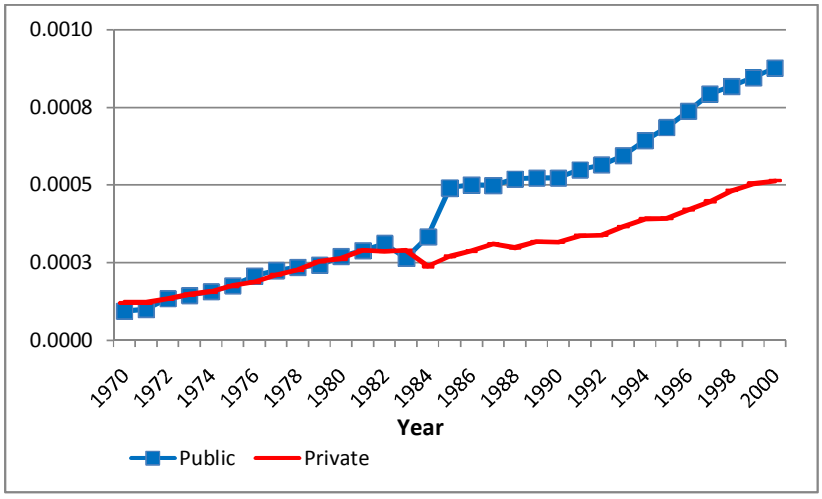
The increased availability of private universities, in turn, resulted in rising enrolment rates. Figure 3 presents the evolution of the number of college entrants in the 1970s, 1980s and 1990s. Enrolment rates in public universities started increasing in the 1980s and peaked in the 1990s. In 2000, the number of college entrants was more than six times the one in 1970 for public universities and twenty times the one in 1970 in the private sector.

The provision of high school education also expanded: after a period of sustained growth in the 1970s, between 1985 and 2000 the per capita number of private and public high schools almost doubled (Figure 4). Differently from what happened at university, the public sector experienced a faster expansion and remained the main education provider: while the proportion of private high schools over the total number of private and public high schools was at around 50% until the early 1980s, it dropped to less than 40% during the 1990s.

The expansion of public high schools in the mid 1980s was the result of a change in education policies' priorities.[16] Mexico faced the economic crisis of the 1980s not only by

[16]The expansion of access to high school has been a government priority since the 1970s due to the social pressures generated by demographic changes, the urbanization and the emergence of the middle class, and the effects of public education policies in the 1950s and 1960s that favored the growth of basic and secondary education and thus increase the potential demand for high school education (Gomez 1999).

Figure 4: Number of Public and Private High Schools Over the 16-18 Age Population (Source: authors' calculations based on data from the Mexican School Census)



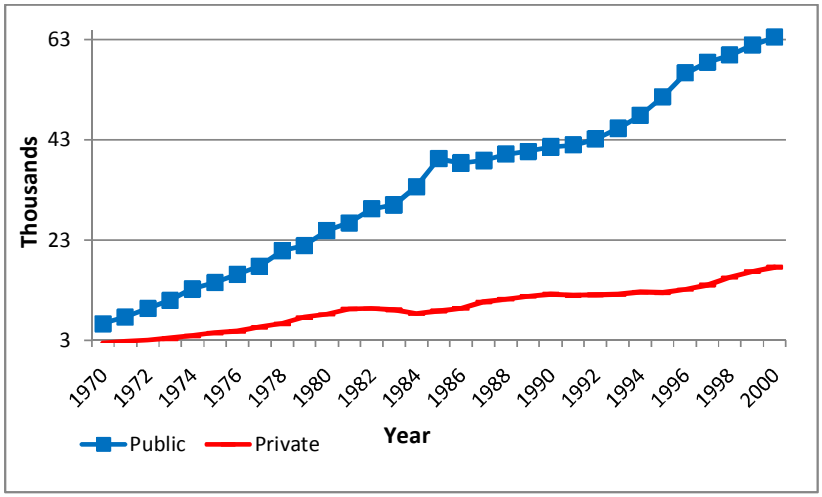
cutting public expenses, but also by changing its focus. Public investment in education was concentrated primarily on primary education and on developing new types of high school education with a technological focus so that students could enter the qualified work force immediately.[17]

The sustained growth of high school provision resulted into steadily increasing enrollment rates. Figure 5 presents the evolution of the number of high schools entrants in the 1970s, 1980s and 1990s. Enrolment rates have been increasing steadily in both the public and the private sector since the decade of the 1970s with a steep increase in public high schools' enrollments in the mid 1990s. In 2000 the number of high school entrants was over eight times the one in 1970 for private high schools and over ten times the one in 1970 in the public sector.

The growth of private colleges and public high schools resulted into a reduction of the size of the public sector: the number of students in public high schools and colleges significantly decreased from the mid 1980s until the year 2000 (Figure 6 and 7). At university, the fast growth of private colleges in the 1990s increased the provision of college education and thus resulted into a drastic reduction of the number of students

[17] This change in education policy is congruent with the changes in priorities that, in the same decade, were being set forth by international organizations such as UNESCO and the World Bank recommending to channel funds to basic and technological education where the highest rate of return could be obtained (Gomez 1999).

Figure 5: Number of Students at Public and Private High Schools (Source: authors' calculations based on data from the Mexican School Census)



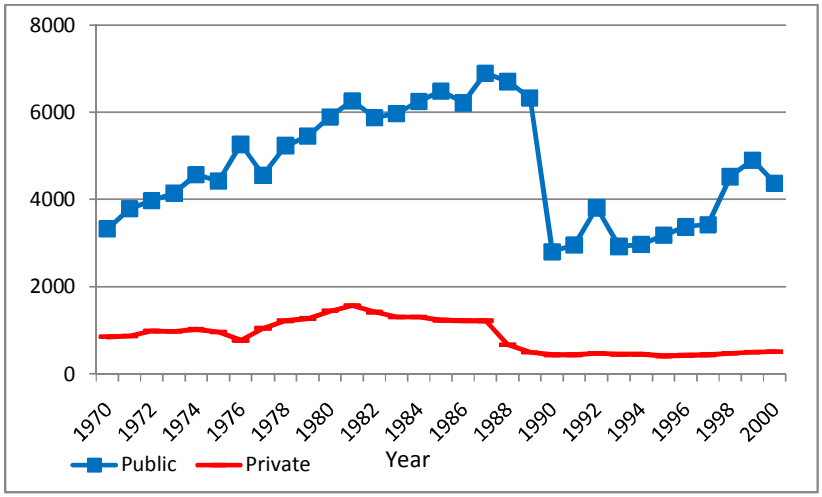
in public universities, which in the year 2000 is around two thousand students lower than in 1980 (Figure 6). On the contrary, at high school, the provision of education increased mainly due to the growth of public schools and this growth was able to offset the rising enrollment rates, thus resulting into a steady monotonic decrease of the number of students per public high schools since the mid 1980s (Figure 7). In contrast, the number of students per private high schools and colleges has remained almost unchanged since 1970.

The cohorts aged between 23 and 35 in 2008 are made of individuals that started high school between 1988 and 2000 (and college between 1992 and 2003), that is in the years of the most significant changes in high school and college availability: these are the cohorts exposed to both the fast increase in public high schools and private universities and to the resulting decrease in the size of the public education sector. We will use this significant variation in school availability to identify the impact of attending a private and a public high school on school progression and wages.

4 Empirical Framework

Our goal is to quantify the market returns to completing a private relative to a public high school. Given the differences in the quality of education offered by private and public high schools (Section 2), the main question to ask is whether and to which extent earning

Figure 6: Number of Students per Public and Private Universities (Source: authors' calculations based on data from the Mexican School Census)



a private high school degree gives an advantage for school progression and wages. Clearly, an answer to this question can only be given under a valid identification strategy that isolates the causal effect of studying in a private school from self-selection into the school of choice. We thus develop an empirical framework that accounts for the endogeneity of school choices and allows to decompose the overall returns to private high schools into the different components of school progression and wages. The equations characterizing the returns' decomposition are directly derived from the multi-period dynamic model that underlies the individuals' decision problem (see Appendix A).

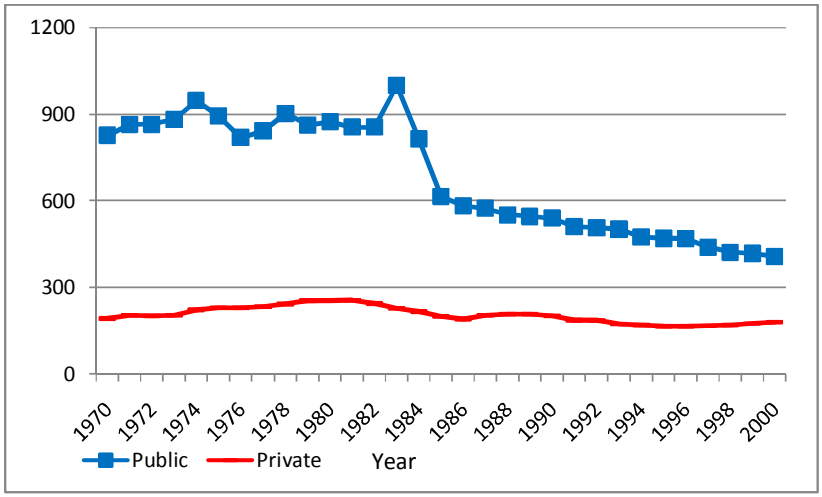
4.1 Overall Return to Private High School

We start by considering the overall return to attending a private high school, that is the differential wage return earned if high school was attended in a private or in a public school unconditional on the post-high school education choices, that is disregarding whether or not college is attended and completed.

Let s be the highest level of completed education: $s = h$ (high school), or c (college). Let w_{ia}^{s} represent the logarithm of real hourly earnings for individual i age a with education level s living in State r at the entry age of high school $\overline{a}$. Suppose that earnings are determined by the following equation:

$$w_{ia}^{s} = \delta Pvh_{ia} + X_{ia}^{'}\beta + \omega_{ia}^{s} \tag{1}$$

Figure 7: Number of Students per Public and Private High Schools (Source: authors' calculations based on data from the Mexican School Census)



where $Pvh = 1(0)$ is an indicator function that equals one (zero) if the individual has (not) attended a private high school. X is a matrix of observable individual characteristics including age, gender, marital status, a dummy for being a head of household, work type, rural/urban location, and a full set of dummies for the State of current residence. The State dummies control for any permanent regional difference and labor market trend in the current State of residence that could affect wages. ω is the error term.

The estimated effect of private high school $(\widehat{\delta})$ is biased if there is a correlation between having attended a private high school (Pvh) and the unobservables in ω, that is if students sort into private and public high schools based on unobservable factors such as their own ability that enter ω and matter for wages. If this is the case, $\widehat{\delta}$ would reflect the predetermined quality of the students sorting into private high schools rather than the effect of private schooling on wages.

Our strategy for identifying the causal effect of studying in a private high school on wages is to use the two measures of availability of schooling in the year and State of residence at school entry age, which we have constructed from the Mexican School Census. Specifically, we use the log of the per capita number of private and public high schools, $SC^{pv}_{r\overline{a}}$ and $SC^{pb}_{r\overline{a}}$, and the log of the number of students per private and public high school, $ST^{pv}_{r\overline{a}}$ and $ST^{pb}_{r\overline{a}}$, in the State of residence r at the entry age of high school $\overline{a}$.

We thus estimate equation (1) together with the following schooling choice equation:

$$Pvh_{ia} = X'_{ia}\beta + Z'_{r\overline{a}}\gamma + d_{i\overline{a}} + d_{ir} + \varepsilon_{ia} \tag{2}$$

where $Z_{r\bar{a}} \equiv \{SC^{pv}_{r\bar{a}}, ST^{pv}_{r\bar{a}}, SC^{pb}_{r\bar{a}}, ST^{pb}_{r\bar{a}}\}$ is the vector of the schooling availability measures. $d_{i\bar{a}}$ and d_{ir} are, respectively, cohort and State dummies for the year and State of residence at the entry age of high school. The inclusion of the year and State dummies is important: they control for aggregate time trends and permanent regional differences that might distort the effect of school availability on education choices. ε is the error term.

4.2 Returns' Decomposition

The joint estimation of equations (1) and (2) allows to obtain an estimate of $\widehat{\delta}$, that is the market returns to high completion unconditional on having attended or completed college. This overall return can be decomposed into five different components.

The first component of $\widehat{\delta}$ is given by the probability of completing high school relative to dropping out of high school:

$$h_{ia} = \delta_1 Pvh_{ia} + X'_{ia}\beta + \eta_{ia} \tag{3}$$

where h is an indicator function that equals one (zero) if high school has been (not) completed and Pvh is given by equation (2). η is the error term. If we estimate equation (3) for the full sample, we obtain an estimate of the unconditional probability of high school completion, that is the probability of completing high school disregarding whether college is attended and completed; if, on the contrary, we restrict the estimation sample to those that have up to completed high school education, we can estimate the conditional probability of high school completion, that is the probability of completing high school for those that enter the labor market upon high school graduation.

The second component of $\widehat{\delta}$ is given by the wage returns to completing a private or a public high school relative to dropping out of high school:

$$w^h_{ia} = \delta_2 Pvh_{ia} + \delta_3 Pbh_{ia} + X'_{ia}\beta + \omega^h_{ia} \tag{4}$$

where w^h_{ia} denotes log hourly real wages if high school has been completed. Pvh is given by equation (2); Pbh is an indicator function that equals one (zero) if a public high school has been (not) completed and is defined by an equation alike (2).

The third and fourth components of $\widehat{\delta}$ are given by the probability of attending college relative to completing high school and by the probability of completing college relative to entering but not completing college:

$$c_{ia} = \delta_4 Pvh_{ia} + X'_{ia}\beta + \xi_{ia} \tag{5}$$

where Pvh is given by equation (2) and ξ is the error term. When we estimate the probability of attending college, c is an indicator function that equals one if college is attended and zero otherwise. When we estimate the probability of college completion, c equals one if college is completed and zero if college is entered but not completed.

The fifth component of $\widehat{\delta}$ is given by the wage returns to graduating from college having attended a private/public high school relative to having entered but not completed college:

$$w_{ia}^{c} = \delta_5 Pvh_{ia} + \delta_6 Pbh_{ia} + X_{ia}^{'}\beta + \omega_{ia}^{c} \tag{6}$$

$$Pvh_{ia} = X_{ia}^{'}\beta + Z_{r\overline{a}}^{'}\gamma + Z_{r'\overline{a}'}^{'}\lambda + \widetilde{D}_i^{'} + \mu_{ia} \tag{7}$$

$$Pbh_{ia} = X_{ia}^{'}\beta + Z_{r\overline{a}}^{'}\gamma + Z_{r'\overline{a}'}^{'}\lambda + \widetilde{D}_i^{'} + \varphi_{ia} \tag{8}$$

where w_{ia}^{c} denotes log hourly real wages if college has been completed. $\widetilde{D}_i^{'}$ is the vector of year and State of residence dummies at high school and college entrance, that is $\widetilde{D}_i^{'} \equiv \{d_{i\overline{a}}, d_{ir}, d_{i\overline{a}'}, d_{ir'}\}$, where $d_{i\overline{a}'}$ and $d_{ir'}$ denote, respectively, year and State of residence dummies at college entry age, $\overline{a}^{'}$. $Z_{r'\overline{a}'}$ denotes the vector of the measures of schooling availability at the college level, that is $Z_{r'\overline{a}'} \equiv \left\{SC_{r'\overline{a}'}^{pv}, ST_{r'\overline{a}'}^{pv}, SC_{r'\overline{a}'}^{pb}, ST_{r'\overline{a}'}^{pb}\right\}$ where $SC_{r'\overline{a}'}^{pv}$ and $ST_{r'\overline{a}'}^{pv}$ are, respectively, the log of the per capita number of private colleges and the log of the number of students per private college, and $SC_{r'\overline{a}'}^{pb}$ and $ST_{r'\overline{a}'}^{pb}$ are the same measures for public colleges. μ and φ are the error terms.

The three equations' system made by (6), (7) and (8) shows that wages of college graduates depend on the full set of variables that affect the choice of attending a private or a public high school. This is a direct consequence of the multi-period dynamic nature of the model from which these equations are derived (see Appendix A).

4.3 Identification

In any instrumental variable (IV) strategy, the validity of the instruments rests on two main conditions: "relevance", that is the instruments have to be strongly correlated with the endogenous variables, and "excludability", that is the instruments have to be correlated with the outcome variables only through their impact on the endogenous variable.

The correlation between our instruments and the choice of studying in either a private or a public high school is intuitive: if the availability of schools increases, individuals are more likely to attend school and graduate. A potential threat to the strength of this correlation is the use of availability measures that are taken as averages at the State level. If, on the positive side, constructing these measures at the State-level increases the chances that they are exogenous to individual choices,[18] on the negative side it could weaken their correlation with individual choices if these choices depend on the availability of schools at a more local level such as the province or the town of residence. This would

[18] By using measures of availability of schooling in the location where the education choices were actually made, we can avoid making assumptions on individuals' location choices and educational attainment which, on the contrary, Behrman and Birdsall (1983) and Binelli, Meghir, Menezes-Filho (2010) have to do. Neither Behrman and Birdsall (1983) nor Binelli, Meghir and Menezes-Filho (2010) have information on the location where the educational choices were made. Binelli, Meghir and Menezes-Filho (2010) assume that individuals' education choices depend on availability and quality of education in the State of birth.

be the case if internal migration was uncommon or difficult to pursue so that the actual municipality of residence would be the effective education provider. On the contrary, in Mexico within-State migration is widespread and it has significantly increased since 1970, especially towards medium-size cities (CONAPO 1999). Thus, it is reasonable to assume that the supply of education at the State level is a relevant measure of education supply that impacts on individuals' education choices. The first stage estimation results will measure the strength and size of this relationship.

On the contrary, as in any IV design, the exclusion restriction is much harder to assess and remains, by definition, ultimately untestable. In our context, this assumption states that school availability in a State at school entry age impacts on school progression and wages only through its effect via education. The approach that we will take to assess the validity of this assumption is to perform a series of robustness checks to the threat of potential correlation of the instruments with some important unobservables in the outcome equation (see Section 6).[19]

Finally, and to reiterate an important point made earlier, the model includes dummies for the State and year when the schooling choices were actually made. These dummies control for aggregate trends and permanent regional differences that are correlated with the education choices and may confound the effect of school resources on educational choices. Thus, the effect of school availability on schooling choices is identified by differential changes across cohorts and States, very much like in a difference in differences framework.[20]

5 Main Results

We quantify the market returns to study in a private high school by first estimating the unconditional wage returns to private high school attendance, that is δ in equation (1), and then each of its components described in Section 4.2. Together with the IV results we report the standard OLS estimates for comparison. For parsimony and because the estimates are virtually the same, we report the results obtained by using as instruments the availability measures at private high schools only, that is by setting $Z_{ra} \equiv \{SC_{ra}^{pv}, ST_{ra}^{pv}\}$.[21]

[19] It is also worth noting that there is a vast empirical literature on the estimation of the returns to schooling that uses supply-side measures of education as an instrument for educational attainment on the presumption that it is hard to find reasons why the availability of schools in a given State would have a direct impact on earnings once its effect via education has been taken into account. A commonly used supply-side measure is distance to school (Card 1999).

[20] We include dummies for the actual State of residence and for the State of residence at the entry age of high school and college. However, since the State of residence in 2008 differs from the State of residence at the entry age of high school only for around eleven per cent of the sample, we fail to reject the null hypothesis of the F-test of joint significance for the State of residence at the entry age of school's dummies. For this reason, we report the results obtained by including the dummies for the actual State of residence only.

[21] All results obtained with $Z_{ra} \equiv \{SC_{ra}^{pv}, ST_{ra}^{pv}, SC_{ra}^{pb}, ST_{ra}^{pb}\}$ are available from the authors upon request. They almost coincide with the results reported in the paper since the two measures of public

We estimate the wage equations with a standard two stages least square (2SLS). On the contrary, for attendance and completion probabilities both the outcome variable and the endogenous variable are binary, which means that, unless the model is saturated, the first stage conditional expectation function is likely to be non-linear violating the linearity assumption imposed by the 2SLS estimator (Angrist 2001). We thus estimate attendance and completion probabilities by following Wooldridge (2002, Chapter 18): we first estimate a probit for the decision to study in a private or in a public high school as a function of school availability at school entry age, and we then use the estimated probabilities as the instrumental variable for the choice of going to a private or to a public school in the attendance/completion equation.[22]

5.1 Overall Returns to Private High School

We start by considering the full sample of workers aged 23-35 and jointly estimate equation (1) and (2) to obtain an estimate of $\widehat{\delta}$, that is the overall market return to completing a private high school. Table 6 reports the results.

While the OLS estimates show no differential returns to studying in a private relative to a public high school, the IV estimates report significant and sizeable returns to private schools: wage earners that studied in a private high school earn around 48% more than those that studied in a public high school. Both instruments are very strong predictors of the private/public high school choice and in the expected direction: an increased availability of private high schools and a bigger size of the private high school sector increase the probability of studying in a private relative to a public high school.

In order to quantify the different components of the private high school's effect, we proceed to separately estimate the effect of studying in a private high school on the probability of high school completion, the wage returns for high school graduates, the probability of college attendance and completion, and the wage returns to graduating from college.

5.2 High School Completion and Returns

We start by estimating the unconditional probability of high school completion, that is equation (3).[23] We then restrict the sample to those that stopped studying after high school and we estimate the wage returns to having completed a private and a public high school relative to dropping out of high school, that is equation (4). Tables 7 and 8 report the results.

high schools' availability are found to be statistically insignificant in the first stage of most specifications.

[22] We also estimate attendance and completion probabilities via the standard 2SLS estimator. The results are very similar, which suggests that the probit functional form is not contributing to stronger identification of the model.

[23] We have also estimated the probability of high school completion conditional on stopping studying at high school. We find similar results, which are available from the authors upon request.

When we estimate the probability of high school completion, the instruments are very powerful and, consistently, the estimated first stage probability that we use as an instrument is also very strongly and significantly correlated with the endogenous variable. We find that having studied in a private high school does not have any significant impact on high school completion, which contrasts with the significant negative effect estimated with a probit regression that does not account for the endogeneity of the private/public high school choice. Since most students that study in a private high school go to college, the non-instrumented probit coefficient is downward biased by the negative selection of the private high school students that stop studying at high school.

Consistently with the insignificant effect on high school completion, we find that there are no differential wage returns to completing a private relative to a public high school for those that enter the labor market upon high school graduation. In the first stage only the per capita number of schools is significant and in the expected way: more private high schools increase (decrease) the probability of graduating from a private (public) high school.

The results so far show that studying in a private high school does not give an advantage to those that enter the labor market upon high school graduation. Thus, it must be that the overall returns to private high school of 48%, which we estimated in Section 5.1, is due to returns to continuing studying at college.

5.3 College Attendance and Completion

We consider the sample of those that continue studying at college and we estimate the probability of college attendance and completion, that is equation (5). Table 9 presents the results.

The instruments are very powerful and in the expected direction; consistently, the estimated first stage probability that we use as an instrument is also very strongly and significantly correlated with the endogenous variables. We find that attending a private high school has a strong positive effect on the probability of completing college, while it has a positive but insignificant effect on the probability of attending college. This result reinforces the findings of the previous Section that studying in a private high school does not benefit those that enter the labor market with a high school degree: unless college is completed, studying at a private rather than at a public high school does not give an advantage on school progression and wages. On the contrary, the significant positive effect on college completion suggests that private high school attendance could matter for college returns.

5.4 Returns to College

We consider the sample of those that enter college and we estimate the wage returns to graduating from college having attended a private or a public high school relative to

having entered but not completed college, that is the three equations system made by equation (6), (7) and (8). Table 10 reports the results.

While an OLS regression estimates returns to college of around 10% disregarding the private/public type of high school completed, the IV results show a very different picture: college returns after completion of a private high school are at a high and significant 71%, and they are statistically significantly different from returns to college after completion of a public high school, which are estimated at a statistically insignificant 13%.

In the first stage the measures of high school availability are highly significant and in the expected direction: more private high schools and a bigger size of the private high school sector increase (decrease) the probability of attending a private (public) high school and college. On the contrary, the measures of college availability are insignificant with the exception of the availability of public colleges, which has a positive impact on the school trajectory "public high school and college".

Confirming a common finding in the literature on the returns to schooling, we find that the size of the IV estimates of the wage returns is significantly bigger than the corresponding OLS counteparts. Since the IV estimates can be interpreted as the return for the individuals induced to change their schooling by the instrument, finding higher returns for "switchers" suggests that these individuals face higher marginal costs of schooling than the sample average (Card 2001). Thus, albeit only suggestive,[24] one interpretation is that the marginal returns to education among those that attend public high schools are relatively high reflecting their higher marginal costs of schooling due, for example, to binding credit constraints.

As discussed in Section 2, at college the private/public distinction is not a good proxy of education quality because private institutions of higher education are a very heterogenous group that includes both academic and non-academic establishments. Having no information on the type of private college actually attended makes it difficult to interpret results that distinguish between public and private colleges in a meaningful way. However, heuristically and for completeness, we also estimate the model allowing for the full private/public high school and college education trajectories. In practice, we estimate equation (6) by replacing Pvh and Pbh with four education dummies corresponding to the four different school trajectories defined by the public/private high school and college combinations and we model each education trajectory as a function of the availability measures at private and public high school and college. Moving from two to four school trajectories significantly decreases the number of observations per school trajectory and thus results in a loss of precision. We find that only the returns to private college and public high school are statistically significantly estimated and they are higher in magnitude than the returns to any other private/public high school/college school trajectory.[25]

[24] In the presence of heterogenous returns, OLS do not measure the average returns to schooling (Heckman, Lochner and Todd 2006), which makes the IV-OLS comparison difficult to interpret.

[25] All results are available from the authors upon request.

6 Robustness Checks

In this Section we discuss the important issue of the validity of our instruments, which we briefly introduced in Section 4.3. The strong correlation of our instruments with the endogenous variable is apparent from all first-stage results discussed in Section 5. On the contrary, there are two main threats to the validity of the exclusion restriction: first, there could be some observable variables that, if omitted, would induce a correlation between the instruments and the unobservables in the outcome equation; second, there could some intrinsically unobservable variables that matter for wages and are correlated with the instruments. On the first threat, an important category of variables that are omitted from the baseline model and could bias the impact of the school availability measures are family background variables; on the second threat, individual motivation and unobservable tastes could drive some individuals to change State in search for better schools, so that the impact of the school availability measures would reflect self-selection of highly motivated individuals rather than the effect of school provision. Finally, we assess the robustness of our results to some important changes in the construction of the estimation sample. For all robustness checks we only report the IV results.

Family background variables are an important determinant of education choices: the level of parental education and income could be one of the main reasons why private high schools are chosen over public ones. If private high schools are perceived to offer a higher quality education, it could be that students in these schools come from families with a greater interest in education, so that higher earnings later on in life could be the result of parental inputs rather than of private high schools' attendance. In addition, families who prefer private high schools could enjoy better social networks, which would help finding better jobs and thus achieving higher earnings. In short, parental background variables are likely to influence wage and education outcomes independently of the private/public school sector.

As already discussed, the ENTELEMS only reports parental background information (level of education and work status) for the sample of young living with their parents, which represents less than half the size of the full sample and it is clearly non-random. In particular, the data show that those living with their parents are younger, less likely to be married and to be heads of households, and they go more to private high schools and colleges than the young that do not live with their parents.

Despite this data limitation, we re-estimate all the different components of the returns to private high schools described in Section 4 for the sub-sample of individuals for whom we have parental background information, by including mother's education in the schooling equation.[26] All results are presented in Table 11, 12, and 13 in Appendix D.

[26] Ideally, we would like a dataset that includes a rich array of family background variables for the entire sample. To the best of our knowledge, the only available Mexican dataset that contains information on the private and public type of school attended together with detailed information on family background for all individuals in the sample is the MxFLS (*Mexican Family Life Survey*). However, despite the richness of the information, both the MxFLS 2002 and 2005 waves that are currently available only

As expected, we find mother's education to have a positive significant impact on private school attendance; at same time, the per capita number of private high schools remains positive and significant. Despite a sizeable drop in the sample size, we find a significant overall return to private high school of around 46%, which is very close to the magnitude estimated in the baseline sample where we do not control for family background. When we estimate the returns to completing a private high school relative to dropping out of high school, the sample size drops to only 1423 observations. Mother's education remains significant in the first stage but, with the exception of the per capita number of private high schools, the instruments become insignificant, and we find that there are no differential returns to private and public high school. Similarly, when we estimate the returns to college completion after a private and a public high school relative to having entered and dropped out of college, the reduction of the sample size inevitably increases noise: both mother's education and the availability measures at high school remain significant but the second stage results become imprecisely estimated. However, the magnitudes of the coefficients are consistent with the main results: returns to college after a public high school are much lower than returns to college after a private high school has been attended. When we estimate the attendance and completion probabilities, we allow mother's education to enter both the first and the second stage. We find mother's education to be significant both in the first and in the second stage, and the per capita number of private high school to be positive and very significant in the first stage despite a drastic reduction in the sample, which reduces to 3264 observations. We find that attending a private high school has an insignificant negative effect on high school completion, and an insignificant positive impact on both the probability of college attendance and of college completion. We obtain very similar results if, together with mother's education, we add mother's work status as an additional parental background variable. Keeping the sample-selection caveat in mind, these results show that even if parental inputs are an important determinant of educational outcomes, attending a private rather than a public high school has an additional and independent impact on wages and labor market outcomes.

We now turn to the second issue of a possible between-States migration in search for better schools. In the ENTELEMS dataset we have information on the State of residence in 2008, the State of residence at the start of high school, and the State of birth. The proportion of individuals that change State is very low: 89% of the sample lives in the same State where they attended high school, and 84% of the sample attended high school in the same State where they were born. Also, the proportion of those that attended high school in a State that is different from the State where they were born did change very little over time and, most importantly, the changes were not correlated with the changes in schools' availability: the proportion of movers remained stable until 1994, slightly increased in 1995 and decreased between 1996 and 2000.[27]

It is thus apparent that, if it happened at all, changing State in search of better schools

contain a couple of hundreds of observations on workers with completed private high school, which makes this dataset unusable for the research question that we investigate in this paper.

[27] All results are available from the authors upon request.

did happen for a very small proportion of the sample, which is a too small proportion to have been driving the estimation results. However, as a further robustness check, we estimate the model for the sample of those that attended high school in the same State where they were born. All results are presented in Table 14, 15, and 16 in Appendix D. The restriction of having attended high school in the State of birth reduces the sample size by around 1300 observations, which results in a loss of precision. However, the magnitude of the estimates remains consistent with the baseline results. We find that the unconditional returns to private high school relative to high school drop-outs are at around 27% and in the first stage the instruments are both significant and with the expected sign. When we estimate the returns to high school completion the sample size further drops to 3612 observations, which results into a loss of instruments' power: only the per-capita number of private schools is a significant determinant of the choice of completing a public high school. We find that relative to dropping out of high school returns to completing high school in a private and in a public school are respectively over 100% and 88% both significant at the five percent level but not statistically significantly different from each other. When we estimate the returns to completed college given a private/public high school relative to college drop-outs the sample size drops to 2661 observations. While the instruments keep their significance in the first stage, the second stage results become imprecisely estimated. We find an almost zero returns for college and public high school and a return (albeit insignificant) of around 43% for college and private high school. As for attendance and completion probabilities, in the first stage only the per capita number of private high school is significant and with the expected positive sign. We find an insignificant and almost zero effect of attending a private high school on the unconditional probability of high school completion, and an insignificant positive effect of around 6% and 22% on, respectively, the probability of college attendance and completion. Thus, overall, the main results obtained with the baseline sample are confirmed, despite the expected loss in precision due to the significant sample size's reduction.

Finally, we perform two main robustness checks to changes in the construction of the estimation sample. First, we exploit the information provided in the ENTELEMS on the academic/technical type of high school attended. In Mexico there are important differences between an academic track (*bachillerato general*, *bachillerato tecnologico*) and a non-academic technical track of high school (*profesional tecnico*) (see Appendix B for details). We re-estimate the model by dropping the individuals that studied in a technical high school (*professional tecnico*). If attending a private high school provides a high-quality education that allows to more easily enter and better perform at university, we would expect to find stronger effects of studying at a private high school in this sample than in the overall sample that we used to estimate the baseline model. As a matter of fact, we do. All results are presented in Table 17, 18, and 19 in Appendix D.

When we estimate the overall returns to a private high school, despite the drop in sample size, both instruments remain very significant and we estimate a return of around 69%, that is almost 20% higher than the average returns that we estimate in the baseline model. We find a positive insignificant impact of studying in a private high school on the

unconditional probability of high school completion and a very significant positive impact of around 42% and 43% on the probability of college attendance and completion, the former being significantly higher than the 22% impact estimated in the baseline model. When we estimate the returns to completing a private and a public high school relative to dropping out of high school, the sample size drops significantly to 3075 observations. As a consequence, the instruments lose power and the second stage results become imprecisely estimated. However, despite the loss in precision, the magnitude of the estimated coefficients is consistent with the baseline results: the size of the returns to private high schools is more than double the one of the returns to public high schools and of a very similar magnitude to the one estimated in the baseline model. Interestingly, and importantly, when we estimate the returns to completing college after having studied in a private and in a public high school relative to dropping out of college, despite the sample size reduces to 2755 observations, both the impact of the instruments in the first stage and the private schools' effect in the second stage remain significant: we find that returns to college if a private high school has been completed are at around 78%, which is 7% higher than the average returns estimated in the baseline model and statistically significantly different from the returns to college if a public high school has been completed, which we estimate at an insignificant 31%.

Second, we address a potential problem with our results. As discussed in Section 3.1, the ENTELEMS contains a direct question on the year at the start of high school. However, this question is only answered by part of the sample and a thoughtful check of the reported answers reveals that a significant proportion of these answers are outliers, since they are inconsistent with the individuals' educational achievement and age in 2008. By considering the valid self-reported answers, the sample size reduces drastically: for each of the four education groups reported in Table 1, the number of observations drops from 636, 2156, 845 and 2717 to, respectively, 272, 868, 253 and 692, which means that we lose around 60% of the total observations for those with a high school degree and around 75% for those with a college degree.

Of the valid self-reported answers around 50% report to have started high school at age fifteen, 20% at age 16, 13% at age 17, 7% at age 17, 3% at age 18 and 2% at age 19 and 20, and 3% at age 20 or later. This means that 90% of the sample for which we have valid self-reported information on the age at start of high school entered high school either at age fifteen or two years later.[28] If we consider the sample of those for which we have valid information on the self-reported year at the start of high school and we re-estimate the model, we obtain results that are very similar the baseline estimates, despite a predictable loss in precision due to the significant sample size's reduction.[29]

[28] People can start high school at a later age than fifteen if they repeated grades at primary and secondary education and/or if they worked for some years before starting high school.

[29] All results are available from the authors upon request.

7 Conclusion

Assessing the relative efficiency of private and public schools in developing countries is important for a number of reasons. First, the private sector can be used as a means of expanding educational provision under conditions of increasing demand for schooling and stringency of funding for social development. Second, private schools are often regarded as more efficient than public schools, so much that families are willing to pay high tuition fees, sometimes because of the greater choice on offer, which satisfies particular educational preferences (e.g. single-sex, religious schools or different language alternatives). Hence, a number of large-scale education reforms have been proposed where public schools are encouraged to mimic the technologies of private schools. A leading example is the nationwide school voucher program implemented in Chile in 1980 (Bravo, Mukhopadhyay and Todd 2008).

This paper measures the impact of private schooling on school progression and wages. Quantifying the size of this impact is an important way of assessing the efficiency of the education system. We use the significant increase in the availability of public high schools and private colleges in Mexico in the 1990s by State and year at school entry age to identify the effect of studying at private and public high schools on school attendance and completion probabilities, and wages. We find that attending a private high school increases the probability of completing college by around 22% and that returns to graduating from college are 58% higher if a private rather than a public high school was attended.[30] This is a substantial wage premium, which has important implications.[31]

In a number of developing countries attendance and completion rates at college are low despite high returns to college education (e.g. Binelli, Meghir and Menezes-Filho 2010 for Brazil; Schady 2001 for the Philippines; Söderbom, Teal, Wambugu and Kahyarara 2006 for Kenya and Tanzania; Liu 2006 for Vietnam). Mexico is no exception and the main reason appears to be binding credit constraints at college education: the costs of college attendance and completion are unaffordable for high returns individuals (Binelli 2009; Kaufmann 2009). An important determinant of the opportunity costs of studying at college is the amount of learning acquired at high school. Even more so when, as common in many countries, students have to pass an entrance exam to enroll at university. The substantial differential wage premium to college education if a private rather than a public high school is attended means that in Mexico the opportunity costs of college

[30] The studies reviewed by Brown and Belfield (2001) show that for the US returns to private schools vary between 10.2% and 23.4%, while for the UK most estimates are clustered at 7-10%. The difference with the size of the wage premium that we estimate for Mexico could be due to a number of reasons including the different country and sample in terms of age and level of education considered.

[31] This wage premium corresponds to a sizeable internal rate of return for any reasonable estimates of the costs of private high school education. We can calculate the internal rate of return from investing in private high school and college as the rate which equalizes the net present value of the costs against the benefits of such investment. The benefits are the wage premia taking into account the attainment effects; the costs are the average annual tuition fee for each year of private schooling.

education are much lower for private high school graduates, which suggests that the extent of credit constraints at college crucially depends on the private or public type of high school attended.

We interpret the positive effect of private schooling on college completion and earnings as the result of the high quality of education provided by private high schools so that students learn more and thus accumulate better human capital when studying in the private sector. The policy implications, however, require some notes of caution.

First, the positive effect of private schooling on earnings may not be generalized to students who are attending public schools. Enrollment in private schools is very expensive and those currently attending private schools are likely to have access to relatively low-cost financing. For others, the cost of private schooling may be prohibitive. Thus, while private schools improve access to education and can do so efficiently,[32] the route to increase access and equity relates to the implementation of programs that address the equity concerns, such as scholarships directed at the students that are unable to afford the high-cost private alternatives covering both the direct and the indirect costs of schooling attendance such as foregone wages and the effort costs of studying in high quality demanding schools. A step in the direction of assessing the dynamic effects of alternative policy interventions is the development of a fully structural model of schooling and work decisions in the public and private sector of education to evaluate the impact of different education policies that affect the costs of school attendance in the two education sectors. This is left for future research.

Second, a note of caution for policy analysis relates to the actual channels through which attending a private school impacts on school progression and wages. In particular, if it is the case, as some studies have shown, that peer group effects are very important to explain the differences in the performance between private and public schools (Somers, McEwan and Willms 2004 and Riddell 1993), then the effectiveness of the private alternative could become questionable since, inevitably, if some schools are able to attract students from a more privileged background, others will be less able to do so. Also, and similarly, if private schooling is mainly beneficial through a signaling effects in the labor market, an expansion of the private sector is likely to dilute these signaling effects gradually (Brown and Belfield 2001). Overall, collecting detailed data on schools, students, their peers and families will be crucial to ascertain in exactly what ways studying at a private high school impacts on educational achievement and labor market outcomes, and thus how an effective policy should be designed.

[32] Bravo, Mukhopadhyay and Todd (2008) find that the school voucher program induced individuals affected by the program to attend private subsidized schools at a higher rate, achieve higher educational attainment, receive higher wages and to participate more in the labor force. Returns to both public and private education increased after the introduction of vouchers. They also find that the voucher program benefitted individuals from both poor and non-poor backgrounds, but that the non-poor experienced greater benefits.

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Appendix A - Dynamic Model

The equations that characterize the returns' decomposition described in Section 4.2 are derived from the multi-period dynamic model that underlies the individuals' decision problem. Let us define $\widetilde{s} = \{0, 1, 2, 3\}$ as the individual school level/type with $\widetilde{s} = 0$ being uncompleted high school, $\widetilde{s} = 1$ being completed public high school, $\widetilde{s} = 2$ completed private high school, and $\widetilde{s} = 3$ completed college, and denote with $U_{ia}^{\widetilde{s}}(.)$ the lifetime utility of worker i age a that has achieved schooling level/type $\widetilde{s}$. We assume that utility at age a given school level/type $\widetilde{s}$, $U_{ia}^{\widetilde{s}}(.)$, is given by the wage $w^{\widetilde{s}}$ corresponding to the schooling level/type $\widetilde{s}$:

$$U_{ia}^{\widetilde{s}} = w_{ia}^{\widetilde{s}} \qquad \widetilde{s} = 0, 1, 2, 3 \tag{9}$$

$$w_{ia}^{\widetilde{s}} = X_{ia}'\beta + \widetilde{Z}'\gamma + \widetilde{D}_i'\nu + \varepsilon_{ia}^{\widetilde{s}} \tag{10}$$

where Z is the vector of the schooling availability measures and D_i' is the matrix of the year and State dummies at the entry age of school level/type $\widetilde{s}$. X is the matrix of individual characteristics including a full set of dummies for the current State of residence. ε is the error term. When $s < 3$ $\widetilde{Z} \equiv \left\{SC_{r\overline{a}}^{pv}, ST_{r\overline{a}}^{pv}, SC_{r\overline{a}}^{pb}, ST_{r\overline{a}}^{pb}\right\}$ and $\widetilde{D}_i' \equiv \{d_{i\overline{a}}, d_{ir}\}$; when $s = 3$, $\widetilde{Z} \equiv \left\{SC_{r'\overline{a}'}^{pv}, ST_{r'\overline{a}'}^{pv}, SC_{r'\overline{a}'}^{pb}, ST_{r'\overline{a}'}^{pb}, SC_{r\overline{a}}^{pv}, ST_{r\overline{a}}^{pv}, SC_{r\overline{a}}^{pb}, ST_{r\overline{a}}^{pb}\right\}$ and $\widetilde{D}_i' \equiv \{d_{i\overline{a}}, d_{ir}, d_{i\overline{a}'}, d_{ir'}\}$.

The decision rule associated with this very simple model is given by:

$$\text{choose schooling level/type } \widetilde{s} \qquad \text{if} \quad U_{ia}^{\widetilde{s}} \geqslant U_{ia}^{\widetilde{s}'}$$

Denoting with β the discount factor and taking the expectations over the possible outcomes of the random shock $\varepsilon_{ia}^{\widetilde{s}}$ and the school completion probabilities, the value of completing a public high school is:

$$V_{ia}^1(\widetilde{s}_{ia} = 0|G) = U_{ia}^0 + \beta E\left\{P_a^0(\widetilde{s}_{ia} = 1)U_{i,a+1}^1(\widetilde{s}_{ia} = 1) + (1 - P_a^0(\widetilde{s}_{ia} = 1))U_{i,a+1}^1(\widetilde{s}_{ia} = 0)\right\} \tag{11}$$

where $G \equiv \{X_{ia}, \widetilde{D}_i, \widetilde{Z}\}$ and $P_a^0(\widetilde{s}_{ia} = 1)$ is the expected probability of public high school completion.

Likewise, the value of completing a private high school is:

$$V_{ia}^2(\widetilde{s}_{ia} = 0|G) = U_{ia}^0 + \beta E\left\{P_a^0(\widetilde{s}_{ia} = 2)U_{i,a+1}^2(\widetilde{s}_{ia} = 2) + (1 - P_a^0(\widetilde{s}_{ia} = 2))U_{i,a+1}^2(\widetilde{s}_{ia} = 0)\right\} \tag{12}$$

where $P_a^0(\widetilde{s}_{ia} = 2)$ is the expected probability of private high school completion.

The value of completing college after a private high school is:

$$V_{ia}^3(\widetilde{s}_{ia} = 2|G) = U_{ia}^2 + \beta E\left\{P_a^2(\widetilde{s}_{ia} = 3)U_{i,a+1}^3(\widetilde{s}_{ia} = 3) + (1 - P_a^2(\widetilde{s}_{ia} = 3))U_{i,a+1}^3(\widetilde{s}_{ia} = 2)\right\} \tag{13}$$

The value of completing college after a public high school is:

$$V_{ia}^3(\widetilde{s}_{ia} = 1|G) = U_{ia}^1 + \beta E\left\{P_a^1(\widetilde{s}_{ia} = 3)U_{i,a+1}^3(\widetilde{s}_{ia} = 3) + (1 - P_a^1(\widetilde{s}_{ia} = 3))U_{i,a+1}^3(\widetilde{s}_{ia} = 1)\right\} \tag{14}$$

where $P_a^{\widetilde{s}}(\widetilde{s}_{ia} = 3), \widetilde{s} = 1, 2$ is the expected probability of college completion, which is a function of the private/public type of high school completed.

The difference between the first terms of equation (13) and (14) reflects the difference in current utility from having completed a private and a public high school, while the difference between the second two terms reflects the future benefits and costs of completing college. Any given school trajectory will be chosen if the associated value function is equal or higher than the alternative. As an example, the school trajectory "private high school and college" is chosen over the trajectory "public high school and college" if and only if:

$$V_{ia}^3(\widetilde{s}_{ia} = 2|G) \geqslant V_{ia}^3(\widetilde{s}_{ia} = 1|G) \tag{15}$$

Equation (15) implies that the expected utility of college completion depends on the full set of variables that impact on the private/public high school choice, which is a direct consequence of the sequential dynamic nature of the decision problem.

Appendix B - The Mexican Education System

The Mexican education system is one of the largest education systems in Latin America. According to the Mexican Secretariat of Education (*Secretaria de Educacion Publica* or SEP), in the school year 2007-08 it covered 33.3 million students (31.5% of the country's population). There is a mixture of public and private institutions. The public institutions depend on federal, state, or municipal governments for funding. Usually, twelve years of formal education are completed prior to college: six years of primary, three of secondary and three of high school. Primary and secondary education are compulsory. Since 2004 one year of pre-school is also compulsory. College takes four to five years to complete, although the actual duration depends on the type of degree. At the post-graduate level, there are one or two years master programs and three years doctoral programs. At each level of education there is a wide range of different programs and degrees offered. Parallel to the formal education track, analogous levels of technical education exist, which provide a similar curriculum to the formal school system and are complemented by vocational training.

Education is administered at three different levels: basic education (*educacion basica*), high school education (*educacion media superior* or *preparatoria*) and higher education (*educacion superior*). Basic education is compulsory from age 6 to 14 and includes both primary and secondary schools. There is a range of primary schools, from urban and rural primary schools of the kind found in most countries, to special schools providing education for indigenous groups, community schools and distance learning schools. Special programmes are also provided for adults who have returned to education. Primary school attendance and completion is close to universal. Secondary school attendance became mandatory in 1993 when the Agreement for the Modernization of Basic Education (*Acuerdo Nacional para la Modernizacion de la Educacion Basica*) came into law. While enrollment rates are close to universal, completion rates remain below 80% (SEP 2008). Secondary education consists of traditional schools, technical schools, community schools and a number of schools that use distance learning techniques through the use of television, called *telesecundarias*. *Telesecundarias* provide education in remote areas and/or in parts of the country with low population density. Starting in 2004, one year of pre-school has been added as part of compulsory education. Pre-school education has fast expanded: in the school year 2007-08 there was universal coverage at age 5 (SEP 2008).

High school lasts for two or, more often, three years from age 15 to 18. There is a considerable number of diverse institutions and study plans that differ in nature, provision and quality. Broadly speaking, we can group them in three main types: *bachillerato general*, *bachillerato tecnologico*, and *profesional tecnico*. *Bachillerato general* leads students on an academic track in preparation for higher education. *Bachillerato tecnologico* teaches more technical and vocational skills, preparing students for either vocational work, or for higher education to become qualified technicians in specific areas of agriculture, industry, forestry, services, and marine sciences. *Profesional tecnico* is a two years program designed for students that wish to obtain a markedly more technical or vocational training.

It used to be a terminal degree that did not allow continuation into higher education. However, since the beginning of the 1990s students in this system can opt to obtain a *tecnico bachiller* degree, which, conditional on completing certain courses, will allow them to enrol at university. All these degrees can be offered in school or via distance education. In 2009, the Integral Reform of Higher Education (*Reforma Integral de la Educacion Media Superior*) came into law to consolidate all the different study plans, set common standards, improve their curricular content and allow for students' mobility.

High school enrollment rate has increased from 36% in 1990 to 61% in 2008, of which about 19% were enrolled in a private center (SEP 2008). Even if since 2005 transition rates from basic to high school education have been very high, graduation rates remain at 47% in 2010, which is below the average rate in OECD countries in the 1960s (OECD 2006). Thus, while the system is able to absorb students from lower levels, it fails to keep them in school. Also, while high school attendance is close to universal among teenagers 16-18 in the highest income deciles, it is below 20% in the bottom 20% of the income distribution (World Bank 2005).

Higher education comprises of two main levels: graduate education (*licenciatura*, that is bachelor's degree), and post-graduate education that includes *maestria* (one or two years master programs) and *doctorado* (three years doctoral programs). There are three main types of graduate education: *tecnico superior universitario*, *licenciatura normal* and *licenciatura universitaria*. *Tecnico superior universitario* is a two or three years program during which students continue their technological degree to obtain a terminal professional degree. *Licenciatura normal* leads to a professional degree in teaching upon completion of four to six years of education at a teacher training college. *Licenciatura universitaria* (including *licenciatura tecnologica*) lasts for four to five years depending on the field of study. In order to graduate from university students have to complete all coursework, one year of social service, and, depending on the type of university degree, either prepare a thesis or take a professional exam. At the postgraduate level enrollments are very low: at the beginning of the 1990s there were only 45,000 students out of a total of more than one million enrolled in post-university programs, and only several hundred enrolled in doctoral programs (Kent 1993).

In 2008, 2.6 million Mexicans were enrolled in higher education, which represents 25% of those aged 19 to 23. Out of these, 33% were enrolled in a private center. Transition rates into higher education were relatively high at approximately 80% of those graduating from high school (SEP 2008) and completion rates were at around 61% (OECD 2008). As it happens at the high school level, at university family income is a main determinant of the probability to graduate (Hopkins et al 2007).

B1. High School and College Fellowship Programs

All the fellowship programs at high school and college started in Mexico after the year 2000. At college the main program is PRONABES (*Programa Nacional de Becas para la Educación Superior*), which started in the school year 2001-2002 and is a government-run

program that finances students from low-income families that intend to continue their studies at public institutions of higher education. Eligibility for a fellowship depends on satisfying three conditions: first, a maximum level of parental income; second and third, the students need a minimum GPA and they have to have been accepted at a public university or at a technical institute. At the end of each year the student has to prove that economic eligibility criteria are still met and that she is in good academic standing. According to the Ministry of Education, in 2005 5% of the undergraduate student population received a fellowship compared to 2% in 2002 (SEP 2008).

At high school the main fellowship program is offered in the context of *Oportunidades*, that is the biggest Mexican anti-povery program: in 2003 it covered twenty per cent of the entire Mexican population (Parker 2003). The education component provides cash transfers to poor families conditional on children's regular school attendance. Since 2001 the education grants have been extended to the final grade of high school. In addition, since 2003 *Oportunidades* has an additional component (*Jovenes con Oportunidades*), which is designed to provide additional incentives to complete high school. It consists of depositing a certain amount of points (equal to pesos) for each high school grade in an account under the student's name. At the end of high school the student can either wait two years and have the account balance plus interests or have immediate access to the funds if they are used to attend college, purchase a health insurance, get a loan to start a business, or apply for public housing. In 2003 the total amount that will be deposited in an account at the end of high school corresponded to about 3000 pesos (300 USD) (Parker 2003).

Not only fellowship programs but also student loan programs are very limited. In 2007 only about 2% of the national student population benefit from a student loan (Educafin 2007), which is a very small proportion even relative to other Latin American countries such as Colombia (9%) and Brazil (6%). There are four different programs that offer student loans. The largest program, SOFES, offers loans to 1.5% of students and was implemented by a collaboration of private universities. It is need and merit based, but students that can provide collaterals are preferred. There are also three additional very small programs, ICEES in Sonora State, ICEET in Tamaulipas, and Educafin in Guanajuato.

Appendix C - Students-Teacher and Class Ratios 1970-2000

Figure 8: Students-to-Teacher Ratio at Public and Private Universities (Source: authors' calculations based on data from the Mexican School Census)

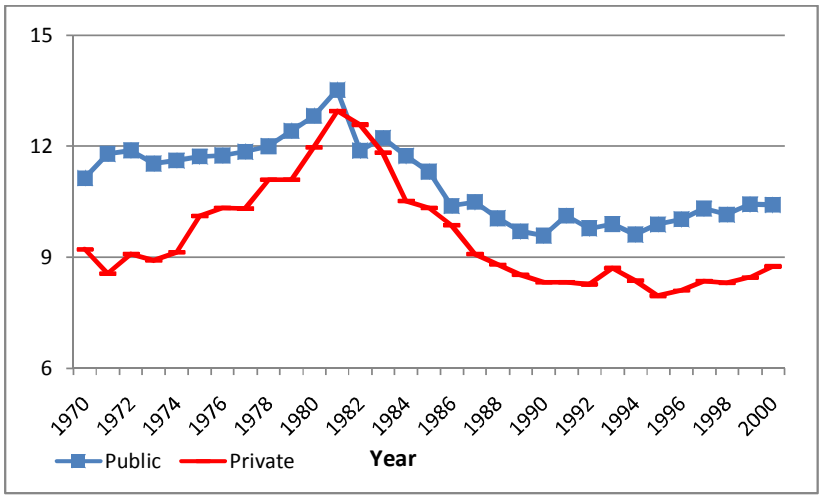


Figure 9: Students-to-Teacher Ratio at Public and Private High Schools (Source: authors' calculations based on data from the Mexican School Census)

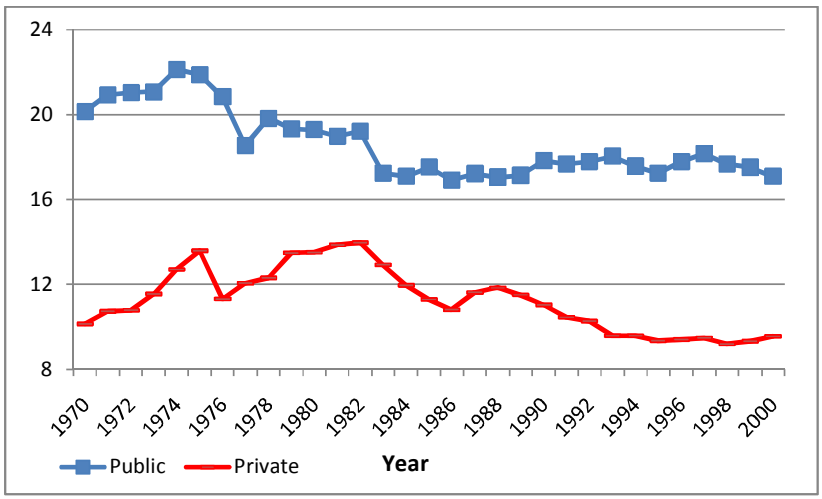


Figure 10: Students-to-Department Ratio at Public and Private Universities (Source: authors' calculations based on data from the Mexican School Census)

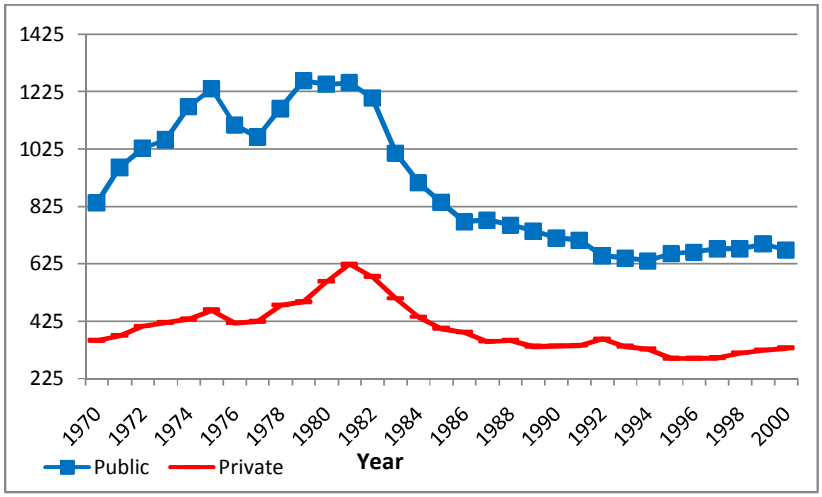
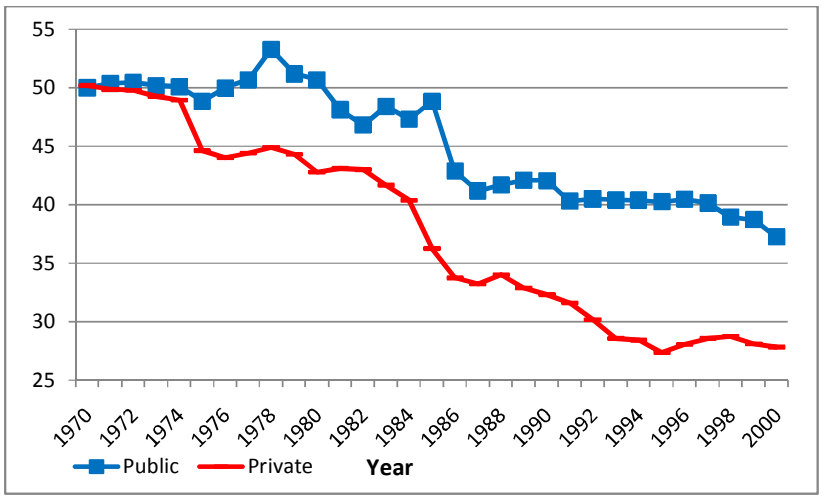


Figure 11: Students-to-Class Ratio at Public and Private High Schools (Source: authors' calculations based on data from the Mexican School Census)



Appendix D - Descriptive Statistics and Main Results

	High School				College			
	Private		Public		Private		Public	
	N=636		N=2156		N=845		N=2717	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log hourly real wage	3.990	0.673	3.987	0.682	4.142	0.652	4.127	0.639
Age	29.296	3.721	28.385	3.569	28.483	3.420	28.660	3.450
=1 if female	0.643	0.479	0.439	0.496	0.527	0.500	0.531	0.499
=1 if married or in partnership	0.558	0.497	0.607	0.489	0.346	0.476	0.418	0.493
=1 if head of household	0.297	0.457	0.392	0.488	0.291	0.455	0.294	0.456
=1 if salaried worker	0.838	0.369	0.859	0.349	0.847	0.360	0.890	0.313
Log per capita number of private high schools	-7.928	0.598	-8.006	0.655	-7.900	0.604	-8.018	0.652
Log number of students per private high school	5.087	0.347	5.007	0.337	5.056	0.318	4.990	0.341
Log per capita number of public high schools	-7.531	0.536	-7.370	0.505	-7.489	0.535	-7.369	0.497
Log number of students per public high school	6.122	0.448	6.096	0.421	6.136	0.500	6.091	0.423
Log students-class ratio private high schools	3.368	0.201	3.351	0.193	3.352	0.188	3.357	0.194
Log students-class ratio public high schools	3.655	0.123	3.652	0.119	3.657	0.127	3.645	0.116
Log students-teacher ratio private high schools	2.249	0.249	2.193	0.251	2.215	0.211	2.189	0.258
Log students-teacher ratio public high schools	2.826	0.189	2.838	0.198	2.851	0.187	2.830	0.195

Table 1: Selected Descriptive Statistics. Workers Aged 23 to 35 by Private and Public High School and College.

	Type of high school		
	Public	Private	Total
Uncompleted high school	1,617	712	2,329
Column %	19.94	25.29	21.32
Completed high school	3,285	848	4,133
Column %	40.50	30.12	37.83
Uncompleted college	627	319	946
Column %	7.73	11.33	8.66
Completed college	2,582	936	3,518
Column %	31.83	33.25	32.20
Total	8,111	2,815	10,926
	100.00	100.00	100.00

Table 2: Total and Percentage Number of High School and College Entrants and Graduates by Public and Private High School (Source: authors' calculations based on the ENTELEMS 2008 dataset)

	Type of high school	
	Public	Private
Uncompleted high school	69.69	68.30
Number of observations	1617	712
Completed high school	65.20	65.71
Number of observations	3285	848
Uncompleted college	71.53	69.12
Number of observations	627	319
Completed college	74.98	78.60
Number of observations	2582	936

Table 3: Mean Hourly Real Wages by the Highest Level of Education and Public and Private High School (Source: authors' calculations based on the ENTELEMS 2008 dataset)

	Type of high school		
	Public	Private	Total
Private college attended	497	602	1,099
Column %	16.46	51.02	26.17
Public college attended	2,523	578	3,101
Column %	83.54	48.98	73.83
Total	3,020	1,180	4,200
	100.00	100.00	100.00

Table 4: Total and Percentage Number of Private and Public College Entrants by Public and Private High School (Source: authors' calculations based on the ENTELEMS 2008 dataset)

	Type of high school		
	Public	Private	Total
Private college completed	352	440	792
Column %	14.15	48.83	23.37
Public college completed	2,136	461	2,597
Column %	85.85	51.17	76.63
Total	2,488	901	3,389
	100.00	100.00	100.00

Table 5: Total and Percentage Number of Private and Public College Graduates by Public and Private High School (Source: authors' calculations based on the ENTELEMS 2008 dataset)

	Dependent variable: log hourly real wage June 2008 prices.	
Independent variables	OLS	IV
Private high school	0.020	0.484*
	(0.017)	(0.202)
=1 if female	-0.096***	-0.131***
	(0.016)	(0.023)
=1 if married or in partnership	-0.003	0.021
	(0.015)	(0.018)
=1 if head of household	0.035*	0.045*
	(0.017)	(0.018)
=1 if living in semi-urban location	0.061*	0.085*
	(0.025)	(0.028)
=1 if living in rural location	0.014	0.058
	(0.031)	(0.038)
=1 if salaried worker	-0.077***	-0.039
	(0.021)	(0.028)
First Stage		
Log per capita number of private high schools		0.061***
		(0.013)
Log number of students per private high school		0.093***
		(0.024)
Sargan chi2 for IV		27.37
Prob > chi2		0.011
R-squared	0.06	
Number of observations	8454	8454

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5% of the hourly real wage distribution.

Table 6: Wage Equation: Overall Returns to Completing a Private High School.

	Probability of high school completion.	
	Probit	IV
Private high school	-0.221***	0.026
	(0.037)	(0.098)
=1 if female	0.144***	0.029*
	(0.037)	(0.012)
=1 if married or in partnership	-0.190***	-0.043***
	(0.036)	(0.009)
=1 if head of household	-0.012	-0.001
	(0.040)	(0.010)
=1 if living in semi-urban location	-0.040	-0.007
	(0.057)	(0.015)
=1 if living in rural location	0.015	0.011
	(0.072)	(0.020)
=1 if salaried worker	0.155***	0.045**
	(0.046)	(0.015)
First Stage		
Log per capita number of private high schools		0.214***
		(0.043)
Log number of students per private high school		0.309***
		(0.080)
Predicted probability		1.032***
		(0.114)
F-statistic for IV		81.31
Prob > F		0.000
Pseudo R-squared	0.08	
Number of observations	8453	8453

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5% of the hourly real wage distribution.

Table 7: Probability of High School Completion.

	Dependent variable: log hourly real wage June 2008 prices.		
Independent variables	OLS	IV	
Private high school	0.019	1.444*	
	(0.032)	(0.624)	
Public high school	-0.011	0.995*	
	(0.023)	(0.417)	
=1 if female	-0.161***	-0.267***	
	(0.023)	(0.061)	
=1 if married or in partnership	0.020	-0.006	
	(0.022)	(0.031)	
=1 if head of household	0.033	0.027	
	(0.025)	(0.032)	
=1 if living in semi-urban location	0.069*	0.029	
	(0.032)	(0.049)	
=1 if living in rural location	0.016	-0.074	
	(0.038)	(0.067)	
=1 if salaried worker	-0.239***	-0.304***	
	(0.028)	(0.044)	
First Stage		Private High School	Public High School
Log per capita number of private high schools		0.029*	-0.038+
		(0.015)	(0.021)
Log number of students per private high school		-0.005	0.017
		(0.030)	(0.042)
Sargan chi2 for IV		9.42	
Prob > chi2		0.80	
Wald test private=public	1.04	1.04	
Prob > Wald Stat	0.31	0.31	
R-squared	0.09		
Number of observations	4261	4261	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 8: Wage Equation: Returns to Completing a Private and a Public High School Relative to High School Drop-outs.

	Probability of college attendance and completion.			
	Attendance		Completion	
	Probit	IV	Probit	IV
Private high school	0.021	0.124	-0.076*	0.223+
	(0.033)	(0.127)	(0.033)	(0.127)
=1 if female	0.006	-0.003	0.104***	0.023
	(0.031)	(0.016)	(0.031)	(0.016)
=1 if married or in partnership	-0.436***	-0.160***	-0.440***	-0.148***
	(0.030)	(0.013)	(0.031)	(0.013)
=1 if head of household	-0.060	-0.018	-0.066	-0.016
	(0.034)	(0.013)	(0.035)	(0.013)
=1 if living in semi-urban location	-0.294***	-0.105***	-0.266***	-0.083***
	(0.049)	(0.019)	(0.050)	(0.019)
=1 if living in rural location	-0.474***	-0.167***	-0.362***	-0.104***
	(0.063)	(0.026)	(0.065)	(0.026)
=1 if salaried worker	0.126**	0.055**	0.135**	0.068***
	(0.041)	(0.019)	(0.042)	(0.019)
First Stage				
Log per capita number of private high schools		0.214***		0.214***
		(0.043)		(0.043)
Log number of students per private high school		0.309***		0.309***
		(0.080)		(0.080)
Predicted probability		1.032***		1.032***
		(0.114)		(0.114)
F-statistic for IV		81.31		81.31
Prob > F		0.000		0.000
Pseudo R-squared	0.04		0.04	
Number of observations	8453	8453	8453	8453

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of college and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 9: Probability of College Attendance and Completion.

	Dependent variable: log hourly real wage June 2008 prices.		
Independent variables	OLS	IV	
College and private high school	0.096**	0.713*	
	(0.036)	(0.339)	
College and public high school	0.082**	0.128	
	(0.030)	(0.336)	
=1 if female	-0.034	-0.069*	
	(0.024)	(0.033)	
=1 if married or in partnership	-0.010	0.038	
	(0.025)	(0.037)	
=1 if head of household	0.070*	0.075*	
	(0.028)	(0.029)	
=1 if living in semi-urban location	0.090*	0.109*	
	(0.042)	(0.046)	
=1 if living in rural location	0.077	0.154	
	(0.061)	(0.079)	
=1 if salaried worker	0.106**	0.148**	
	(0.036)	(0.047)	
First Stage		Private high school	Public high school
Log per capita number of private high schools		0.095***	-0.079**
		(0.024)	(0.029)
Log number of students per private high school		0.145**	-0.203***
		(0.048)	(0.059)
Log per capita number of private colleges		0.005	-0.003
		(0.017)	(0.021)
Log number of students per private college		0.008	0.008
		(0.024)	(0.029)
Log per capita number of public colleges		-0.020	0.087+
		(0.038)	(0.046)
Log number of students per public college		0.003	0.055
		(0.035)	(0.042)
Sargan chi2 for IV		21.95	
Prob > chi2		0.15	
Wald test private=public	0.21	4.14	
Prob > Wald Stat	0.65	0.04	
R-squared	0.08		
Number of observations	3185	3185	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of college and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 10: Wage Equation: Returns to Completing College and Private/Public High School.

	Dependent variable: log hourly real wage June 2008 prices.		
	Overall	High school graduates	
Private high school	0.457***	0.0197	
	(0.133)	(0.375)	
Public high school		-0.107	
		(0.249)	
=1 if female	-0.117***	-0.152**	
	(0.0246)	(0.0498)	
=1 if married or in partnership	0.0411	0.0745	
	(0.0361)	(0.0482)	
=1 if head of household	0.0137	-0.0759	
	(0.0678)	(0.0923)	
=1 if living in semi-urban location	0.111**	0.105+	
	(0.0419)	(0.0562)	
=1 if living in rural location	0.0107	-0.0385	
	(0.0554)	(0.0736)	
=1 if salaried worker	-0.0724+	-0.320***	
	(0.0427)	(0.0580)	
First Stage		Private High School	Public High School
Mother's education	0.041***	0.021***	-0.026**
	(0.0041)	(0.006)	(0.008)
Log per capita number of private high schools	0.0826**	0.058	-0.088+
	(0.0279)	(0.037)	(0.049)
Log number of students per private high school	0.074	-0.084	0.052
	(0.0497)	(0.066)	(0.089)
Sargan chi2 for IV	11.52	18.15	
Prob > chi2	0.64	0.25	
Wald test private=public		0.19	
Prob > Wald Stat		0.66	
Number of observations	3265	1423	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 11: Wage Equation: IV Estimates of the Returns to Completing a Private and a Public High School Relative to High School Drop-outs. Mother's Education Included.

	Dependent variable: log hourly real wage June 2008 prices.	
	College graduates	
College and private high school	0.157	
	(0.374)	
College and public high school	-0.0926	
	(0.424)	
=1 if female	-0.0483	
	(0.0350)	
=1 if married or in partnership	0.0197	
	(0.0692)	
=1 if head of household	0.246*	
	(0.116)	
=1 if living in semi-urban location	0.0716	
	(0.0696)	
=1 if living in rural location	0.0782	
	(0.104)	
=1 if salaried worker	0.0161	
	(0.0651)	
First Stage	Private high school	Public high school
Mother's education	0.043***	-0.035***
	(0.005)	(0.006)
Log per capita number of private high schools	0.123*	-0.113
	(0.050)	(0.059)
Log number of students per private high school	0.233*	-0.175
	(0.097)	(0.116)
Log per capita number of private colleges	-0.021	0.033
	(0.034)	(0.041)
Log number of students per private college	0.01	0.024
	(0.048)	(0.057)
Log per capita number of public colleges	-0.029	0.142
	(0.083)	(0.098)
Log number of students per public college	-0.051	0.14
	(0.076)	(0.091)
Sargan chi2 for IV	21.95	
Prob > chi2	0.15	
Wald test private=public	4.14	
Prob > Wald Stat	0.04	
Number of observations	3185	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of college and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 12: Wage Equation: IV Estimates of the Returns to College and Private/Public High School. Mother's Education Included.

	Probability of high school completion and college attendance and completion.		
	High school completion	College attendance	College completion
Private high school	-0.0368	0.0118	0.0854
	(0.130)	(0.172)	(0.176)
=1 if female	0.0464**	0.0123	0.0282
	(0.0148)	(0.0196)	(0.0200)
=1 if married or in partnership	-0.0125	-0.124***	-0.145***
	(0.0196)	(0.0259)	(0.0264)
=1 if head of household	-0.0413	-0.00888	-0.00373
	(0.0368)	(0.0487)	(0.0497)
=1 if living in semi-urban location	-0.00247	-0.0783*	-0.0912**
	(0.0236)	(0.0313)	(0.0320)
=1 if living in rural location	0.0397	-0.153***	-0.111**
	(0.0315)	(0.0417)	(0.0426)
=1 if salaried worker	0.0308	0.0258	0.0322
	(0.0261)	(0.0346)	(0.0354)
Mother's education	0.0269***	0.0729***	0.0603***
	(0.00626)	(0.00830)	(0.00847)
First Stage			
Mother's education		0.129***	
		(0.013)	
Log per capita number of private high schools		0.275***	
		(0.094)	
Log number of students per private high school		0.224	
		(0.166)	
Predicted probability		0.956***	
		(0.150)	
F-statistic for IV		40.51	
Prob > F		0.000	
Number of observations		3264	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 13: IV Estimates of the Probability of High School Completion and College Attendance and Completion. Mother's Education Included.

	Dependent variable: log hourly real wage June 2008 prices.		
	Overall	High school graduates	
Private high school	0.269	1.140*	
	(0.276)	(0.561)	
Public high school		0.884*	
		(0.354)	
=1 if female	-0.112***	-0.245***	
	(0.0299)	(0.0638)	
=1 if married or in partnership	0.00263	-0.0167	
	(0.0201)	(0.0315)	
=1 if head of household	0.0426*	0.0334	
	(0.0192)	(0.0324)	
=1 if living in semi-urban location	0.0729*	0.00484	
	(0.0311)	(0.0519)	
=1 if living in rural location	0.0414	-0.0757	
	(0.0441)	(0.0679)	
=1 if salaried worker	-0.0778**	-0.300***	
	(0.0294)	(0.0428)	
First Stage		Private High School	Public High School
Log per capita number of private high schools	0.041**	0.0101	-0.061*
	(0.016)	(0.019)	(0.026)
Log number of students per private high school	0.051+	-0.029	0.049
	(0.029)	(0.036)	(0.051)
Sargan chi2 for IV	30.41	9.23	
Prob > chi2	0.004	0.82	
Wald test private=public		0.33	
Prob > Wald Stat		0.56	
Number of observations	7096	3612	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 14: Wage Equation: IV Estimates of the Returns to Completing a Private and a Public High School Relative of High School Drop-outs. Sample of Those Born in the Same State Where They Lived at Age 15.

	Dependent variable: log hourly real wage June 2008 prices.	
	College graduates	
College and private high school	0.414	
	(0.314)	
College and public high school	-0.0173	
	(0.397)	
=1 if female	-0.0512	
	(0.0328)	
=1 if married or in partnership	0.0126	
	(0.0351)	
=1 if head of household	0.0748*	
	(0.0336)	
=1 if living in semi-urban location	0.109*	
	(0.0488)	
=1 if living in rural location	0.135	
	(0.101)	
=1 if salaried worker	0.0878	
	(0.0537)	
First Stage	Private high school	Public high school
Log per capita number of private high schools	0.091**	-0.037
	(0.029)	(0.036)
Log number of students per private high school	0.139*	-0.175*
	(0.058)	(0.071)
Log per capita number of private colleges	-0.003	-0.004
	(0.019)	(0.024)
Log number of students per private college	0.003	0.027
	(0.028)	(0.035)
Log per capita number of public colleges	0.000	0.072
	(0.046)	(0.057)
Log number of students per public college	0.018	0.053
	(0.042)	(0.051)
Sargan chi2 for IV	24.28	
Prob > chi2	0.06	
Wald test private=public	1.23	
Prob > Wald Stat	0.27	
Number of observations	2661	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of college and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 15: Wage Equation: IV Estimates of the Returns to College and Private/Public High School. Sample of Those Born in the Same State Where They Lived at Age 15.

	Probability of high school completion and college attendance and completion.		
	High school completion	College attendance	College completion
Private high school	-0.0312	0.0678	0.216
	(0.127)	(0.166)	(0.166)
=1 if female	0.0396**	-0.00275	0.0157
	(0.0149)	(0.0195)	(0.0195)
=1 if married or in partnership	-0.0436***	-0.157***	-0.139***
	(0.0109)	(0.0142)	(0.0142)
=1 if head of household	-0.00389	-0.0249	-0.0331*
	(0.0110)	(0.0143)	(0.0143)
=1 if living in semi-urban location	0.000199	-0.109***	-0.0838***
	(0.0170)	(0.0222)	(0.0222)
=1 if living in rural location	0.0116	-0.180***	-0.106***
	(0.0233)	(0.0304)	(0.0305)
=1 if salaried worker	0.0396*	0.0499*	0.0593**
	(0.0156)	(0.0203)	(0.0203)
First Stage			
Log per capita number of private high schools		0.149**	
		(0.054)	
Log number of students per private high school		0.156	
		(0.101)	
Predicted probability		1.036***	
		(0.148)	
F-statistic for IV		49.04	
Prob > F		0.000	
Number of observations		7095	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 16: IV Estimates of the Probability of High School Completion and College Attendance and Completion. Sample of Those Born in the Same State Where They Lived at Age 15.

	Dependent variable: log hourly real wage June 2008 prices.		
	Overall	High school graduates	
Private high school	0.692**	1.455+	
	(0.255)	(0.854)	
Public high school		0.629	
		(0.410)	
=1 if female	-0.100***	-0.253***	
	(0.0204)	(0.0569)	
=1 if married or in partnership	0.0405+	0.0246	
	(0.0244)	(0.0390)	
=1 if head of household	0.0478*	0.0295	
	(0.0212)	(0.0351)	
=1 if living in semi-urban location	0.121***	0.0783	
	(0.0342)	(0.0586)	
=1 if living in rural location	0.0793	-0.0353	
	(0.0483)	(0.0774)	
=1 if salaried worker	-0.0290	-0.301***	
	(0.0322)	(0.0448)	
First Stage		Private High School	Public High School
Log per capita number of private high schools	0.059***	0.023	-0.037
	(0.014)	(0.016)	(0.025)
Log number of students per private high school	0.095***	-0.023	0.056
	(0.026)	(0.031)	(0.049)
Sargan chi2 for IV	34.23	19.79	
Prob > chi2	0.001	0.14	
Wald test private=public		1.01	
Prob > Wald Stat		0.31	
Number of observations	6700	3075	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 17: Wage Equation: IV Estimates of the Returns to Completing a Private and a Public High School. Sample of Those with Bachillerato General and Tecnologico.

	Dependent variable: log hourly real wage June 2008 prices.	
	College graduates	
College and private high school	0.784*	
	(0.348)	
College and public high school	0.308	
	(0.321)	
=1 if female	-0.0805*	
	(0.0338)	
=1 if married or in partnership	0.0458	
	(0.0391)	
=1 if head of household	0.0975**	
	(0.0328)	
=1 if living in semi-urban location	0.117*	
	(0.0496)	
=1 if living in rural location	0.102	
	(0.0831)	
=1 if salaried worker	0.137**	
	(0.0465)	
First Stage	Private high school	Public high school
Log per capita number of private high schools	0.098***	-0.092**
	(0.027)	(0.032)
Log number of students per private high school	0.159***	-0.227***
	(0.054)	(0.063)
Log per capita number of private colleges	0.007	-0.012
	(0.019)	(0.022)
Log number of students per private college	-0.004	0.027
	(0.027)	(0.032)
Log per capita number of public colleges	-0.019	0.114*
	(0.042)	(0.049)
Log number of students per public college	0.004	0.076+
	(0.038)	(0.045)
Sargan chi2 for IV	21.81	
Prob > chi2	0.11	
Wald test private=public	2.76	
Prob > Wald Stat	0.09	
Number of observations	2755	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of college and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 18: Wage Equation: IV Estimates of the Returns to College and Private/Public High School. Sample of Those with Bachillerato General and Tecnologico.

	Probability of high school completion and college attendance and completion.		
	High school completion	College attendance	College completion
Private high school	0.148	0.422**	0.432**
	(0.101)	(0.138)	(0.140)
=1 if female	0.0544***	0.0520***	0.0769***
	(0.0102)	(0.0139)	(0.0142)
=1 if married or in partnership	-0.0406***	-0.140***	-0.137***
	(0.0114)	(0.0156)	(0.0159)
=1 if head of household	-0.00493	-0.0241	-0.0226
	(0.0109)	(0.0149)	(0.0152)
=1 if living in semi-urban location	0.00331	-0.0905***	-0.0783***
	(0.0167)	(0.0228)	(0.0232)
=1 if living in rural location	0.0188	-0.146***	-0.0895**
	(0.0227)	(0.0310)	(0.0316)
=1 if salaried worker	0.0426**	0.0819***	0.0823***
	(0.0152)	(0.0207)	(0.0211)
First Stage			
Log per capita number of private high schools		0.229***	
		(0.051)	
Log number of students per private high school		0.361***	
		(0.092)	
Predicted probability		1.14***	
		(0.132)	
F-statistic for IV		74.31	
Prob > F		0.000	
Number of observations		6699	

Notes: standard errors in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001.
Sample of workers aged 23 to 35. Dummies for year at start of high school and State of residence included.
Sample trimmed at the bottom and top 0.5 per cent of the hourly real wage distribution.

Table 19: IV Estimates of the Probabilities of High School Completion and College Attendance and Completion. Sample of Those with Bachillerato General and Tecnologico.