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Undisclosed Effects of Privatization: School Choice and out of School Educational Investments in Urban Peru

Fernando Alarcón
and
Joan Martínez

2015 No. 71



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All remaining errors are our own.

Abstract

This study aims to evaluate the relationship between private school's attendance and student's allocation of time on educational activities outside school. In this sense, our analysis focuses on student's learning investments throughout their educational progress. We model parent's consumption decisions and private schooling choice to predict a positive relationship between children's educational investments at home and parents' welfare. Using this analytical framework we aim to interpret reduced form results. A main challenge to obtain consistent estimates on this relationship hinges on selection problems as is broadly depicted on school choice empirical literature. To overcome this, our identification strategy exploits the supply expansion of private schools in urban areas of Peru prompted by a nationwide market deregulation policy issued in 1997. Using data from the Young Lives Survey for Peru (rounds 1, 2 and 3 from the young and old cohort) we employ Ordinary Least Squares (OLS) and Instrumental Variables (IV) methods while controlling for students, school and family covariates. Our results indicate a positive relationship between private school attendance and educational investments outside school for the younger cohort of children of 8–9 years old at the time of the survey; but not for the older cohort of children with 11–12 years old. We argue that the relationship dissipates as parents have less involvement on children's time allocation. IV results show a stronger linkage once we account for self-selection bias that arises from parents' school choice. As predicted in our model, parents compensate the loss of supervision time of their children's education due to working hours by enrolling them in private schools.

Keywords: school choice, private education, instrumental variables, time use.

This paper is one of a series of policy-oriented research papers on privatisation in education jointly commissioned by the Privatisation in Education Research Initiative (PERI) and Young Lives using school survey data from the Young Lives longitudinal study of childhood poverty in Ethiopia, India, Peru and Vietnam. The findings of these diverse studies reflect on the manner and extent to which the varied supply of schooling types and private tutoring influences the pivotal role education has to play in societal development and building sustainable futures for all.

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About Young Lives

Young Lives is a longitudinal study of childhood poverty following the lives of 12,000 children in Ethiopia, India, Peru and Vietnam over 15 years. It is funded by UK aid from the Department for International Development (DFID) and co-funded by the Netherlands Ministry of Foreign Affairs from 2010 to 2014 and by Irish Aid from 2014 to 2015. The full text of Young Lives publications and more information about its work is available on the Young Lives website: www.younglives.org.uk



Table of Contents

1. Introduction..... 7

2. The Education System’s Privatization in Peru 11

 2.1 Deregulation Policy on the Education Market 11

 2.2 Private School Expansion in Urban Areas..... 11

 2.3 Demand Shifts: Background and Context..... 14

3. Literature Review 16

4. A Brief Educational Choice Model 18

5. Identification of the Effects of School Choice on out of School Investments.... 21

 5.1 Estimation Framework..... 21

 5.2 Identification Strategy and Instrumental Variable Approach 22

6. Data and Sample 24

7. Results 29

 7.1 Baseline Results 29

 7.2 Addressing Endogeneity Issues..... 31

8. ConcludingRemarks 34

Bibliography..... 35

Appendix 1. Statistics on the Privatization of Education in Peru 38

Appendix 2. Discussion Regarding Exogeneity Test of Instrument 40

Appendix 3. Description and Coding of Variables Used in Out of School
Studying Hours’ Estimation 43

Appendix 4. Distribution of Hours of Study Out of School..... 44

Appendix 5. Distribution Variation in the Private School Supply 45

Appendix 6. Instrumental Variables First Stage..... 46



List of Figures and Tables

Figures

Figure 1.	Percentage of school enrollment in private institutions, (%)	12
Figure A1.1.	Number of schools in urban areas, 1993–2009	38
Figure A1.2.	Urban population from 5 to 19 years old	39
Figure A2.1.	Private enrollment rate by geographical areas, (%)	42
Figure A4.1.	Reported hour of study out of school, including tutoring, homework activities, Young Cohort	44
Figure A4.2.	Reported hour of study out of school, including tutoring, homework activities, Young Cohort	44
Figure A5.1.	Instrument variable. Reported hour of study out of school, including tutoring, homework activities, Young Cohort (proposed instrument)	45
Figure A5.2.	Instrument variable. Reported hour of study out of school, including tutoring, homework activities, Young Cohort	45

Tables

Table 1.	Quality measures for primary schools	13
Table 2.	Summary statistics by public/private school, Young Lives sample.....	26
Table 3.	Summary statistics by out of school study hours, Young Lives sample	28
Table 4.	School choice and home based investment, OLS	30
Table 5.	School choice and home based investment, Instrumental Variable.....	32
Table A1.1.	Enrolled urban students by type of schools, 1998-2013	39
Table A2.1.	Test of exogeneity between a set of demographic characteristics and growth of private offer (instrument).....	41
Table A6.1.	Instrumental variables first stage	46

1. Introduction

School choice has set amidst a striking pattern of privatization of educational services in recent years.¹ The degree of the private's sector participation in education provision differs significantly across countries since many of these initiatives have emerged or widespread under heterogeneous schemes as charter schools (Murray 2014), low fee private schooling programs (Harma 2011), public private partnerships (ASPBAE 2013) or private schooling voucher systems (Berhman 2014). Developing countries are not excluded from the recent privatization trend. An large literature is documenting emergent private initiatives as shown in Angrist (2002) for Colombia, Duflo (2001) for Indonesia and Muralidharan & Sundararaman (2013) for Andhra Pradesh (India), Madeira (2012) for Sao Paulo, Javaid et al. (2012) for Pakistan, Andrabi (2008) for Punjab (India),² Srivastava & Walford (2007) for South Asia and Africa.

Several studies have examined the effectiveness of private involvement in educational services to enhance students' learning within a supply growth context. A positive relationship has been found in a set of educational outcomes such as student's test scores, effective instructive time, and teacher's capability in private schools; but at the same time a number of negative effects complete the big picture of school's privatization. Muralidharan & Kremer (2006) and Desai (2009) evaluated the pounding supply expansion of private schools in India. The former authors found that the private schools have students with higher attendance rates and test scores. However, private school teachers are more likely to hold a college degree than a certificate of teaching training in comparison to their colleagues in public schools. Conversely, the latter paper shows that rates of absenteeism of teachers in private schools is lower and encourages the student. Pal and Ghandi (2010) found that the expansion of private schools in seventeen states of India gained a positive impact on reading comprehension of students; however, achieved minimum effects on the gender gap of the same indicator. This evidence suggests that private school expansion process as having mixed results. In another study for Brazil, Madeira (2012) argues that decentralization of public schools in the state of Sao Paulo harmed education quality and increased dropout and repetition rates; however, economic resources of schools improved. Similarly, Ryan (2014) investigated the effect of Australian's private schools on the skills and student achievement to show that the difference in performance between students from private and public schools is attributed essentially unobservable characteristics of individuals.

Empirical evidence on the effect of private schooling in developing countries has resulted from experimental approaches³ as well as non-experimental studies. The later have been mainly challenged by selection bias and omitted variables that have prevented to obtain consistent causal estimates.⁴ Within these concerns, although literature has

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1. See, for example, the literature revision introduced by Imberman (2011), Berends et al. (2011); or the evaluation of Deming (2011) that focuses on the case of EE.UU.
 2. For an extensive revision of private schooling effects on educational outputs in developing countries, see Ashley et al. (2014).
 3. A representative is the well-known evaluation of the PACES school voucher program in Colombia made by Angrist et al. (2002) and Angrist et al. (2006).
 4. According to Muralidharan & Sundararaman (2013) among the empirical methods to identify causal effects of private schools are the following: French and Kingdon (2010) uses fixed effects at the family level, Desai et al. (2009) incorporates selection-bias correction, Muralidharan and Kremer (2008) controls for observable variables. Nevertheless, the authors point out that, thus far, results are questioned for being confounded estimates.

evaluated the straightforward effects of privatization on learning outcomes, most it has overlooked its impacts through shifts in parents or students' behavior outside schools. More specifically, throughout school educational investments such as school material purchasing, private lessons, parental assistance in homework, school attendance encouragement. This paper studies the potential twofold effect of school choice within a schools' privatization policy on out of school educational investments in a developing country. As an overall measure we focus on children's time allocation in educational after school activities. Following the work of Fiorini & Keane (2013) and Del Boca, Monfardini & Cheti (2012), we argue that study time allocation reflects the magnitude of student's investments in formative activities.

The analyzed undisclosed linkage is conceptually portrayed in Gleww et al. (2013), where time allocation and educational settings⁵ are highlighted for having a double effect on learning outcomes. On one hand, they influence directly major educational decisions such as the years of schooling and academic achievements. Similarly, school setting ultimately affects learning through home-based investments made by parents and children in view of the type of instruction they receive. In this study we focus on the latter link. Based on the educational investment's model proposed by Becker and Tomes (1976) which is revisited by Todd & Wolpin (2003) and Del Boca, Monfardini & Cheti (2013), we hypothesize a first scenario, in which educational inputs given at school are considered, by caretakers or parents, to be sufficient for their children to achieve an adequate performance in class so they minimize to give them additional education resources at home. We argue this setup is advocated by caretakers' perception of learning-enhancing school settings, which ultimately have an *offsetting* effect on further investments. A second diametrically different scenario takes place when caretakers perceive non learning-enhancing school settings; therefore, expenses on additional private lessons, extra homework support among other home education investments are needed ; retakerseducation service given at school and eeeeeeeeeeeelto encourage children's learning. Here, a *reinforcing* effect between school service and home educational resources takes place. In this context we propose a method to estimate which scenario most closely aligns with the decisions taken by caretakers that enroll their children in private schools exploiting its recent expansion. Previous studies present little evidence to lean toward either scenario given school choices; to the best of our knowledge neither addresses the school choice effects on children's study time.⁶

Our main objective is to quantify the out of school investment's gap that arises between private and public schools by exploiting a large education expansion as our identification strategy. In the late nineties,⁷ the education system in Peru was to great extent deregulated by the issue of the *Law to Promote Investments in Education* (LPIE) in order to facilitate private school initiatives. We argue that the newborn legal scheme triggered a private education expansion by which over 4.1 thousand schools were launched

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5. Formally, Gleww et al. (2013) characterizes school environment as quality, which considers the educational service.
 6. Literature has documented the effect of various factors on homework or study time in children and adolescents. Cosconati (2010) points that strict parenting style has mixed effects on the amount of study time, depending on the child's valuation of human capital. Gelber & Isen (2012) conclude that parent's involvement in reading; math support and other educational activities benefit their children in the short and long run.
 7. The Law enacted by the legislative decree No. 882 issued in 1997 favors basic and higher education institutions to be promoted, conducted and managed for nonprofit (as it always was) or profit purposes; to administrate its institutional lines, duration of programs or school hours and teaching methodologies and systems, as long as they adhere to state minimum state requirements.

nationwide between 1993–2009,⁸ corresponding to a 115% equivalent supply growth. Moreover, according to Balarin (2013), since the law was issued in 1997 the enrollment rate in private institutions increased from 14 to 24 percent in 2011 while enrollment rates of public schools' students decreased from 86 to 76 percent, figures that extend an historical downfall trend registered during the nineties.⁹ Using the National Census of Schools and administrative data with a full record of the number of schools in Peru, we document a faster growth rate in the number and enrollment on private schools as a result of the deregulation policy of Peruvian education system initiated in 1997.¹⁰

We first examine the linkage between selecting a private or public school and study hours at home in a simple consumption model that accounts for parents' choices regarding their own distribution of time each day between work and other activities, which include the supervision of their children's studies at home. This decision will enable them to afford private schools that require tuition payments or public schools with a null costs. As a result, we formalize a classification of three scenarios in which the amount of student's hours of study at home changes given that parents' choice of public or private education. Within this decision framework we give interpretation to the reduced form estimations.

Secondly, following Del Boca et al. (2012) and Fiorini & Keane (2012), we propose that educational investments are summarized in the amount of study time outside of school, that is, in the form of homework or private tutoring. We use a data set with children's school, family and socio economic information, collected throughout three rounds in years 2001, 2006 and 2009 by the Young Lives Study in Peru. Using an IV approach that complements our baseline OLS results, we obtain consistent estimates. The validity of the instrument is discussed in the paper. The identification strategy takes into account the fact that personal and family information is important when modeling the role of hours of study outside of school, which is a form of resource investment. It also takes into account self-selection by parents when choosing the type of educational service (public or private) in which they will enroll their children. Using a two-stage least squares methodology we found that educational provision by the private sector has a positive and statistically significant impact on educational investment by students outside of school for the young cohort. Estimation takes into account self-selection of parents, allowing consistent results.

Our contributions to the literature are described subsequently. First, we took advantage of school census and administrative databases which has not been previously exploited to account for the large education's supply expansion that occurred in Peru. The resulting novel information was a key factor to address identification of the effects of private school choice in a developing country. Second, our methodology acknowledges that direct impacts of private school settings can be offset or reinforce by the influence of additional educational investments or disinvestments made outside school hours. Finally, we account for the effect of parents' involvement in educational activities of their children across two age cohorts of students. Employing a young cohort sample that

8. We consider 1993 as baseline year to evaluate private schooling expansion as this is the most recent year of the period prior to the deregulation for which the National School Census of Peru is available.

9. According to the Ministry of Education of Peru (2002), the expansion on public schools' enrollment was 9% from 1993 to 1999; which reflects a lower growth rate compared to private school's enrollment which was set at 12%.

10. Enrollment figures will be available in upcoming versions of this paper.

comprises children between 5.5 and 6.5 years old and an old cohort sample with children between 14 and 15 years old, we pin down the influence of parental encouragement over school effort. This is presumably heterogeneous at two stages of children's development. The organization of the paper is as follows. The next section characterizes Peruvian education system's privatization process which was embedded in the issue of the Law to Promote Investments in Education. Section 3 presents the literature relevant to the study. Section 4 proposes a brief education choice model in which the empirical parameters obtained by our reduced form strategy are interpreted. Section 5 presents our educational expansion instrument, discusses our identification strategy and describes our empirical strategy. Section 6 presents the employed data and section 7 provides results. Finally, section 8 concludes with our key findings.

2. The Education System's Privatization in Peru

2.1 Deregulation Policy on the Education Market

The Law to Promote Investments in Education Services, or LPIE (in Spanish refers to, *Ley de Promoción de la Inversión Privada en Educación*) enacted by the Legislative Decree No. 882 was Issue on November 8th, 1996 and published on November 9th of the same year.¹¹ It had the purpose to modernize the education sector and amplify its supply coverage. Among its most outstanding reforms, we noted the following. First, LPIE establishes that any natural or legal person is entitled to free private initiative in the education sector. This right includes founding, promoting, leading and managing private educational institutions profit or nonprofit (article 2, chapter I). Additionally, the norm sets the tax benefits to private investments. As article 13, chapter II states, educational institutions that reinvest total or partial its rent within itself or other institutions in the country will have a tax credit of 30% of the reinvested amount. The reinvestment should be in infrastructure, educational equipment, research and scholarships. Actors that donate to these entities can also make use of the benefit of the tax credit. Moreover, private educational institutions will be exempt from the payment of tariff for imported goods carried exclusively for educational purposes as stated in chapter II, article 23.

This new scheme applied to all the private education institutions in the national territory, for example private centers and education programs, in any kind of modality, institutes and private colleges, universities, postgraduate schools, and others in the education sector.

2.2 Private School Expansion in Urban Areas

The LPIE was a stepping stone of education system's privatization in Peru as it started a considerable transformation of this market's structure. This section focuses on the shifts that occurred in the provider's side since it gives us an important insight to understand straightforward effects of the law. Figure A1.1 in Appendix 1 gives a first glance of the rising number of private schools. Schools reported in national census data between 1993 and 2009 increased by 115% across urban areas. According to the latest estimations, 7,640 institutions provide primary, secondary and preschool services to students; an expansion from the 3,552 schools private schools in 1993.

An official statistic of children enrolled in private or public institutions is not available annually for the analyzed period of 1993 to 2013 for the country.¹² Thus, we present the enrollment rates in Table I on Appendix 1 as approximate calculations. We used the total

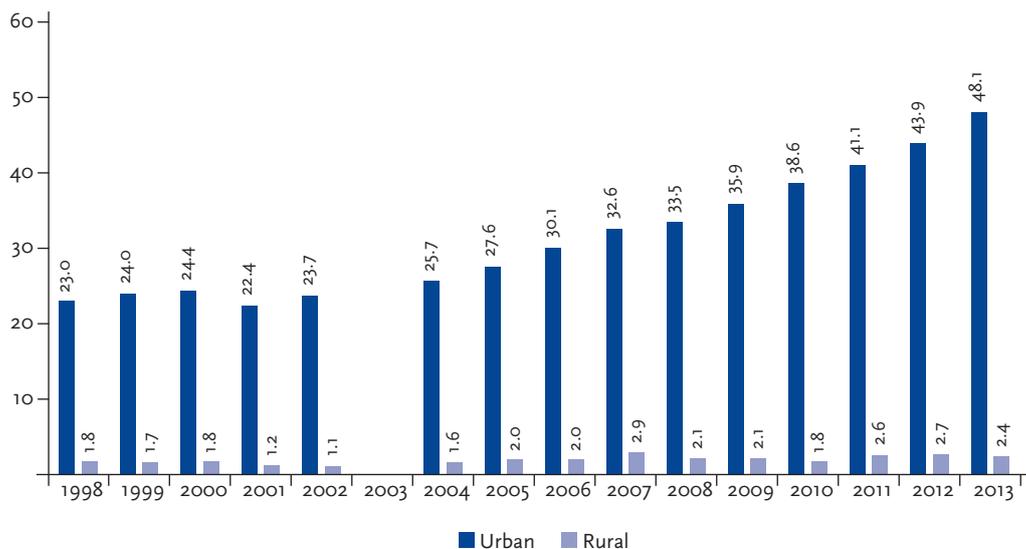
11. The law was in force starting the day after its publication, with exception to the tax dispositions and exonerations or other conceived benefits regarding general sales tax and income tax; these will entry into force since January 1st, 1997.

12. The figure is not reported on the official education statistics system Peru, named *Statistics of Educational Quality*, or ESCALE. Web page consulted: <<http://escale.minedu.gob.pe>>.

urban population from 5 to 19 years old as reference group for the following reasons: (i) five years is the lower age threshold since national enrollment rates on younger age groups is minimum, around 4% in 2005 according to ESCALE; (ii) 19 years is the upper age threshold over which school drop-out rate among secondary-level students is computed by ESCALE.¹³ The documented private supply expansion reflected in school numbers, matches with a period of increase in private enrollment rates. Particularly, the annual average growth of enrollment in private institutions amounted to 6.15%, outpacing the public counterpart which is amounted to 0.8% for the period 1998–2013. Over this span of time the share of students enrolled in private institutions advanced from 15.4% to 30.3%.

A closer look into private enrollment across geographical regions is shown in Figure 1. Evidence suggests that a minor amount of private school students live in rural areas. Surprisingly, this pattern has not been changed significantly by the deregulation policy. Conversely, in urban areas the share of private schools' students has advanced dramatically in around 25 percentage points. This stylized fact focus our study in the urban region.

Figure 1—Percentage of school enrollment in private institutions, (%)



Pre-school, primary and secondary school students enrolled in private institutions over total students enrolled, respectively for urban and rural geographical areas.

Source: National School Census 1998–2002, 2004–2013.

13. In detail, the evolution of the population group from 5 to 19 years is reported on Figure II on Appendix 1.

Effects on Education Quality

Lastly, to document a shift in schools' quality as a result of the education supply expansion we propose a set of quality measures: a schools' basic services index and an infrastructure index. For the calculation of both indexes, only primary schools are considered¹⁴ at a national and urban level. Note that urban districts are defined as those with less than 5,000 habitants according to the Regulation of Law No. 27795 Demarcation and Territorial Organization (LDOT) approved by DS No. 019-2003-PCM in 2003. The basic services index comprises the services of electricity, water and drainage; whereas the infrastructure index evaluates that ceilings, walls and floors of each school have adequate materials (i.e. bricks, stones). As observed in Table 1, significant differences arise between the Basic Services Index between the pre and post deregulation for both the national and urban areas. In particular, between years 1993 and 2009 we document a decline in schools' quality as shown in panel B. However, no significant differences are identified in the infrastructure index. This finding points a moderate decline in quality that could be further confirm looking at tests scores among students, which is a pending task for future researches.

Table 1—Quality measures for primary schools

Quality index	1993	2009	<i>p-value</i>
Panel A. Total			
a) Basic services	1.372	0.983	0.000
	(0.0483538)	(0.0280125)	
	[274]	[274]	
b) Infrastructure	0.678	0.658	0.3505
	(0.0431883)	(0.0422804)	
	[445]	[445]	
Panel B. Urban			
a) Basic services	1.414	0.984	0.000
	(0.0483622)	(0.0288906)	
	[258]	[258]	
b) Infrastructure	0.720	0.709	0.5968
	(0.0434877)	(0.0424515)	
	[411]	[411]	

Notes: The observation level is the local or building of a primary school. Urban districts are defined as those with less than 5,000 habitants. Infrastructure Quality Index is reported for 2006, not for 1993 in column 1 due to report limitations of input variables in the School Census of 1993. Means are reported without additional notations. Standard errors for the difference in means are in parenthesis. Observations are in brackets.

14. Information for secondary schools was not taken into account since the estimation sample in this study comprises mainly primary school students. Additionally, census data regarding schools' infrastructure and services in Peru is reported at the "module" level (i.e. primary, secondary levels separately). This means that, in case both primary and secondary levels are included, the school information is at risk of being included twice, if you have two modules in the same school premises.

2.3 Demand Shifts: Background and Context

Thus far we have assessed at the school expansion attributable to the deregulatory policies in Peru; although we have mostly overlooked the population's response in this scenario. On this side of analysis, we can identify a number of institutional and political changes experienced by Peruvian population in recent years, which framed the school privatization.

Two factors in particular may be related to the increase in enrollment that has been documented in the previous section. The first has to do with the low prevalence of repetition among students, which are prone to further advance in their educational trajectory. According to statistics of the Ministry of Education in Peru (MINEDU, ESCALE), between 2000 and 2013 the percentage of repeaters has declined by 5.8% in the case of elementary students, and 0.7% for high school students. The change has been even more dramatic among students in rural areas, where it went from 18.2% of repeaters at primary level in 2000, to 9.7% in 2013. A similar pattern can be observed between high school students, where change is most noticeable among those from rural areas—specifically, it goes from 9.6% to 5.7% of repeaters. An additional factor that may be related to increased enrollment is the growth in the number of children's population (cohort of between 3 and 24 years). Between 2000 and 2015 there has been a slow increase but remained in the school-age population (population projections). Specifically, the subgroups that seem to grow are those of 12–16 years and 17 to 24 years. Institutional and political changes have also shaped a shift in preference towards private schools among population. Among them, there has been a growing number of private schools that offer a perceived high quality in relation at low costs in comparison to public education. Especially following the enactment of the Law on Promotion of Private Education (LPIE) in 1997, low-cost private schools thrive both in the department of Lima and in the main cities of the country. This scenario has not always been as prominent. Moreover, a growing dissatisfaction towards the public education system in Peru started in the late nineties and it continued until mid-2000s as it will be explained below.

Two additional points are key to understanding why parents opt for low quality private education. Another source of little prestige of the public education system during the nineties relies on the common knowledge that public schools are an environment in which problematic youths study, and violent groups such as gangs, can attack or victimize the attendants. There has been also a stigma about population groups that are in need of free-tuition-public-schools, most frequently those with families with no monetary resources. Despite this range of problems associated with public education in Peru, its main source of low prestige is associated with its low quality teaching, formative and educational service at a broader range. A survey conducted by *Ipsos Apoyo* in October 2012 among urban locations nationwide, revealed that almost 60% of respondents considered that public education was “bad” and 29% thought it was average. The lack of confidence towards public education dates back to the nineties and was enhanced by low scores obtained in the country's National Assessments in 1998 and 2001 conducted by the Ministry of Education; PISA results of 2000 (published in 2003); and the results of the first study of Latin American Laboratory (1997, published for Peru in 2001). Furthermore, as a result of political scandal due to the resistance from public employed teachers to be evaluated to enter the public career and then got low scores, the image of teachers was significantly impaired. Confidence in the teacher's

skills remains quite low and this is reflected in that tend to consider this as the main culprit of poor quality offered.¹⁵

At the same time, Peru has experienced about ten years of sustained economic growth (see Castillo et al. 2006) which has led to increased purchasing power of citizens; therefore have greater willingness to pay for educational purposes. In this context, in which the average parent has more money to spend and public education criticized for its poor quality, private school options become quite attractive in households that are experiencing an economic improvement (Semana Económica 2014). While *premium* schools' supply is still elusive, the heterogeneity of the private schools' supply allows access to these centers, as there are various price ranges (Proexpansión 2014). In sum, the current expansion in private education's supply in the country contains a high degree of heterogeneity in quality and encompasses wide ranging costs. Therefore, the rise in enrollment in private schools embedded by the political, demographic and institutional facts mentioned above.

15. For an exploration of the assessment of state education by public opinion and its associated factors, see *El Comercio* (2013), at web portal: <<http://elcomercio.pe/peru/lima/casi-90-piensa-que-educacion-escolar-nuestro-pais-entre-mala-regular-noticia-1485623>>. Also, see Peruvians Network of News' report (RPP 2012) at web portal: <http://www.rpp.com.pe/2012-10-21-el-58-piensa-que-la-educacion-en-el-peru-es-mala-segun-encuesta-noticia_532852.html>.

3. Literature Review

The relative effectiveness of private schools in developing countries will be discussed at the intersection of two bodies of literature. First, several studies have explored the allocation of after school time between children and youngsters in order to examine their effects on educational outputs. Moreover, the time decisions made by parents are addressed as important inputs for children educational development.

Carneiro & Rodríguez (2009) evaluated the effect of time distribution of a mother on child development. For this, the technique propensity matching score with the data from the base Child Development Supplement of 1997. The study shows that the more time the child spends with his or her mother they perform better on assessments of cognitive skills. The effect holds even if children already have an advanced age. Paradoxically, there is an opposite effect for black children who spend more than 5 hours a day close to their mothers; whereas this effect does not exist for white children. Similarly, Cosconati (2010) conducted an investigation to determine the effect of different parenting strategies on child development. The model used highlights the parent-child interaction to better understand their effect on human capital. Data from the National Longitudinal Survey of United States for 1997 is employed. The results show that the establishment of strict rules for children who value human capital relatively recently helped increase their study time were used. The opposite is true for children who highly value human capital. Del Boca et al. (2012) differ from the referred studies that seek to assess the impact of parental decisions on the development of children. By contrast, the investigation seeks to determine the impact of the decisions of children themselves on their development. To do this, the authors focused on a sample of adolescents from the base Panel Study of Income Dynamics United States. Among the findings stand out that investments (in terms of decisions) made by children are more important for their development decisions of mothers. By contrast, during childhood, mother decisions are those that become more significant. In the same spirit, Fiorini (2012) performed a study of the distribution of time decided by children and its impact on cognitive and non-cognitive skills. Authors used data from the Australian Longitudinal Survey of Children. Through their analysis, they found that the activity that provides higher yields for obtaining cognitive skills is the educational assignments accompanied by parents. On the contrary, the development of non-cognitive skills appear to be correlated with the distribution of time the child but are mainly related to parenting style of the mother.

Another strand of literature that is crucial to our analysis has examined school choice effects upon a wide ranging set of educational outcomes. Starting with the seminal study by Angrist et al. (2002), a randomized experiment was conducted in Colombia to assign the delivery of vouchers that partially covered the cost of secondary school for students that held satisfactory academic performance. Given that assignment was randomized the estimation of differences among treated and non-treated groups was obtained by least squares regression. Three years after the draw, program beneficiaries had higher ratings at 0.2 standard deviations compared to the control group on average; however, the results show an impact of 0.26 standard deviations for women and 0.19 for men. Moreover, the likelihood that students complete secondary beneficiaries was 10pp higher. Also, found that lottery winners worked less on average and had lower rates of marriage or cohabitation.

Chudgar & Quin (2012) examined the role of school choice on test scores in rural and urban areas of India. In order to do this, they used data from household surveys with specialized variables in educational attainment regarding reading and math comprehension. Students in private schools scored significantly higher than those of public schools based on least squares regressions estimates. However, in both rural and urban areas this effect disappears when assessing when propensity the score matching method is implemented. Also, the authors analyzed the impact of low-cost private schools finding that their contribution is zero on the performance of their students. Deming (2011) conducts an experimental study in which the entry to a secondary public school is defined by a lottery. Data from the Charlotte-Mecklenburg school district and the national database of US college students (National Student Clearinghouse) was employed to explore the effects on postsecondary attainment. Among low-income applicants those selected shown to be more likely to finish high school and get a college degree. Furthermore, it is doubly likely to achieve obtain a degree in an elite university among low-income applicants. Also, program reduced the gap between white students and black: 75% in high school and 23% among college graduates.

More recently, Muralidharan et al. (2013) conducted an impact assessment of a school choice program that enabled a lottery for admission to private schools in the state of Andhra Pradesh in India. This study stands out as one of the few that assess the relative performance between public and private schools in a low-income country. Among the expected dynamics triggered by the program and its two-stage assignment, both individual and village-level aggregate effects as well as the presence of externalities were accounted. Estimates shown no significant differences between attendants of private and public schools, based on mathematics test scores which reflects a component of cognitive attainment. However, on average across all subjects, lottery winners earned scores 0.13 standard deviations higher than non-drawn students that attended public schools. Among other findings, authors point out that private school have less effective instruction hours and still manage to produce similar results to the ones obtained by public schools on math scores and Telugu (Indian language). Furthermore, private schools use extra school time to increase score results on other subjects that not offered by public schools (mainly, Indi languages). As this stylized fact holds, authors inferred that private institutions are more effective in the usage of educational inputs.

Finally, Woodhead et al. (2013) addresses the impact of low-cost private schools on the academic performance of students using data from two cohorts drawn from the Young Lives project gathered from the state of Andhra Pradesh in India. The direct impact of the expansion of private school supply in basic education provision was an increase in enrollment among the poorest households located in rural areas which embodies a improvement from the initial access-gap that favors urban areas in the country. In spite of the general upgrading, the found impact has been differentiated since the enrollment rate rose only 10% in urban areas while in rural areas was 32%.

4. A Brief Educational Choice Model

The relationship between education provision by the private sector and the hours students spend on educational activities at home can be analyzed by parents' decisions regarding the distribution of their time along each day. Within this purpose, we hinge on the fact that decisions affect the expected income thereof which is essential to enroll students at private schools that require tuition fees.

In our basic setting, parents must maximize a utility function which approximates their preferences, given a budget constraint is presented.

$$U = f(c, h, HSE) \quad (1)$$

Where f represents a concave function, which allows rational (transitive and complete), continuous and independent preferences.

As for the variables that define parents' utility, c is the consumption of goods and which are not educational services; h is the time devoted by parents to engage paid work; and HSE is the time that the students intend to conduct educational activities at home, which is our proposed measure of home student effort. This model assumes that parents value the commitment made by children to educational activities at home (i.e. study, homework).

As expected, the partial derivatives of equation (1) have the following signs:

$$f_c, f_{HSE} > 0 ; f_h < 0 \quad (2)$$

On the other hand, the amount of hours spend by students in educational activities at home depend on the life cycle's stage in which the decision is engaged. We argue that during childhood the decision is made by parents¹⁶ as well as educational requirements to conduct private institutions at home.¹⁷ It follows that:

$$HSE = g(PE, HPE) \quad (3)$$

Where g represents a continuous function such as

$$HSE = \{(x, y) \in R^2 \mid x \in \{0,1\} \wedge y \in [0, 24]\}$$

The variable PE indicates whether the parents decided to send their children to private education sector and HPE is the variable that measures the number of hours devoted parents to monitor their child's educational work at home. In a significant manner, the decision to choose the private educational service is the result of the capacity to pay that parents have and the bid with the private education sector.

$$PE = h(I, growth) \quad (4)$$

Here, h represents a continuous function on a two-dimensional space, such as $y: R^2 \rightarrow R$. Also I , is the family income and $growth$ is the private education supply growth.

16. The role of parents is monitoring their children about the work they do at home.

17. This variable summarizes the difference between the educational requirements performed by public and private educational institutions at home.

A second scenario takes place in case the student takes the time allocation decision during adolescence or early adulthood, in which case it will be guided primarily by intrinsic characteristics (i.e. level of human capital, knowledge assimilation capacity, etc.). Thus, the hours that the student spend on educational activities at home is the following:

$$HSE = y(\text{student's intrinsic characteristics}) \quad (5)$$

Where y represents a continuous function on a n -dimensional space, such as $y : R^n \rightarrow R$.

Finally, the budget constraint faced by parents is given by:

$$c + PPE = T + w(D - L - HPE) = T + w(h) \quad (6)$$

which represents income and expenses parents must make. PPE represents the expense that must be made in children's private education;¹⁸ D number of hours in one day; L is the amount of leisure, T is an exogenous transfer that parents can receive and w is the salary of parents per hour of work.

Implications of the model. As expressed above, the decision to work has a negative impact on the hours spent at educational supervision of the student as one hour of parent's supervision lessens their labor supply in one hour. In this sense, there is a trade-off between work and parent's engagement. Also note that the decision to enroll the student in private education has a negative effect on the hours that parents can devote to monitoring of educational work at home they should work more time to fund private education.

Finally, the salary received by the parents also have an effect on the hours that the student intended to conduct educational activities at home as parents can hire private educational services based on their incomes. In this context, our main objective is to analyze the relationship between private education and student's study hours at home. Since private schooling decision and the amount of hours that parents can supervise their children's study at home are negatively linked, it is necessary to observe the range of parents' supervision profiles in order to identify the group among which the core relation of interest can be measured. Thus, in the following paragraph parental supervision scenarios will be described.

Local average treatment effect. The methodology for measuring the effect of a treatment uses the comparison between potential outcomes that are not observable at the same time given that an individual's choice makes it impossible to perform any other at the same time (since the decision has already been made). As for the present study, is not possible to observe the decision about the hours of home study that student realized when attending private and public education in the same period for the same student. Specifically, if parents decided to enroll their children in private education their children can't attend public education at the same time. In this framework, the treatment scenarios can be outlined as the following:

18. Following the case of the Peruvian's public education system, we assume that parent's spending on public education is zero.

- First, $HSE(1)$ is the amount of student's hours of work at home given that parents chose private education or $PE(1)$.
- In addition, $HSE(0)$ indicates the amount student's hours of work at home when parents chose public education or $PE(0)$.
- In these cases, $HSE(1)$ and $HSE(0)$ are called counterfactual, since they can't be seen at once.

Link between empirical and theoretical model. The decision model presented initially is linked to the treatment effects' framework as follows: $U(i,j)$ is the utility of parents chose $HSE=i$ and $PE=j$. Of which it is possible to construct the following utilities: $U(1,1)$, $U(0,1)$, $U(1,0)$, $U(0,0)$. $HSE(1)$ is obtained by comparing $U(1,1)$ and $U(0,1)$ and $HSE(0)$ comparing $U(1,0)$ and $U(0,0)$.

Following the result of Imbens and Angrist (1994), it can be concluded that $PE(1) = 1$ if $(\max [U(1,1) U(0,1)] - \max [U(1, 0), U (0,0)]) > 0$, and $PE(1) = 0$ otherwise. Individuals who are part of the proposed model are the following types: (i) always taker: $PE(1) = PE(0) = 1$; (ii) complier: $PE(1) = 1, PE(0) = 0$; (iii) never taker: $PE(1) = PE(0) = 0$; and (iv) defiers: $PE(1) = 0, PE(0) = 1$.

On the assumption that treatment is monotonous, i.e. in case the individual attends private education as it is not treated, it should also assist in the event that it is. As well as the validity and relevance of the proposed instrument. Imbens and Angrist (1994) propose the Local Average Treatment Effect of the (LATE) specific to the instrument, for individuals who belong to the compliers typology, as:

$$LATE = \frac{E(HSE | growth=1) - E(HSE | growth=0)}{E(PE | growth=1) - E(PE | growth=0)} \quad (7)$$

Particularly, the estimated empirical model uses an instrument that takes values between 0 and 1, where 0 refers to the supply of private education did not grow and 1 in the case in question the district that experienced the greatest growth for the study sample.

5. Identification of the Effects of School Choice on out of School Investments

5.1 Estimation Framework

This empirical section will focus on estimating the school choice effect on student's out of school investments in a reduced form. Specially, we aim to explore the complementary linkages, such as parental supervision and private school decision that emerged from the model among compliers.

Our main method follows an instrumental variable strategy in which we exploit a large variation in the private school supply associated to a deregulatory policy scheme. Before introducing this approach we explore a basic regression form. Baseline results are provided by regressing the private school attendance using an ordinary least squares method. Our basic specification is given by:

$$S_{ij} = \alpha + \gamma \text{private}_{ij} + X'_{ij}\beta + \varphi_j + e_i \quad (8)$$

where S_i is the number of study hours that child i living in geographical region j spends outside school. private_i is a dichotomous indicator that takes the value of 1 whenever the evaluated child i is enrolled in a private school. Thus, γ is our parameter of interest, associated to private_i which is a dichotomous variable that takes the value of one (=1) when student i attends to a private school and zero (=0) otherwise. To address consistency in the results, we include a set of covariates in vector X_i that allow us to control for individual and household's characteristics as well as parents' attitudes towards their children education. Moreover, φ_j controls for area-level fixed effects that account for geographical area-invariant unobserved characteristics, such as cultural differences or attitudes towards children's education, educational policies, among other factors.

In equation (1) we assume that $\text{cov}(\text{private}_i, e) = 0$, which would allow to obtain consistent estimates of the linkage between private school attendance and out of school study hours. However, it is likely that parental choice of the type of educational provision is guided by several unobservable factors or determinants not considered in the previous model. Formally, this would imply that $\text{cov}(\text{private}_i, e) \neq 0$; and using an OLS method will probably result in a biased coefficient.

In our estimation setting, the main challenge for identification is self-selection. Within our decision framework there are two main sources of selectivity bias. First, parents or students' decision on whether to attend or not to school could lead to biased results due to selectivity. For instance, parents who are more concerned with future employment of their children are systematically more likely to enroll them in schools which they perceive as stepping stones towards labor success. Thus, among enrolled students we would

19. According to statistics of the Ministry of Education of Peru, Initial enrollment in 3-5 years, Primary or Secondary School who are in the age group that theoretically corresponds to the level of education rises to 93,5% of the total population in that age group. Official statistics for previous years are not available.

distinguish higher levels of home based investments due to parents' involvement. Nevertheless, this stage of decision is not relevant in the case of Peru since enrollment rates are close to being universal in urban areas.¹⁹ Secondly, conditional on the decision of school enrollment, parents' choice of the type of school (i.e. public, private) in which they enroll their children is endogenous as well. Formally, parents are prone to have non-random factors that determine this latter decision regarding education services.

This latter feature carries empirical difficulties that are well documented in the literature²⁰ (see for instance, Muralidharan & Sundararaman 2013) and represent a recurrent concern in school choice studies. Burgess et al. (2009) found that parents' school choice is determined essentially by household socioeconomic status and educational level of the parents. Additionally, Urquizu (2008) indicates that parent's choice of private or public institutions is driven by household wealth, educational resources of parents and family cultural capital. From a stand view other than family characteristics, Jacob & Lefgren (2007) found that parental school choice is strongly influenced by the educational context to which they are exposed to. In contexts with predominantly low-income schools, the choice is based on the ability of teachers to increase student achievement. On the contrary, in high-income schools the choice made by parents is guided by the ability of teachers to increase student satisfaction. To summarize, the evidence points out that private/public school choice decisions are affected by commonly unobserved family characteristics. Moreover, educational supply attributes can settle a decision background, thereby affecting the decision markers' beliefs, attitudes towards private or public schools and their ultimate choices.

5.2 Identification Strategy and Instrumental Variable Approach

To overcome the outlined selectivity problem we exploit a natural experiment by employing the large private education expansion that followed the introduction of a government's policy in Peru. Issued in 1997 by the name of "Law to Promote Investments in Education" (also filed as Legislative Decree No. 882), the newborn legal scheme aimed to foster private educational initiatives. Under the assumption that private schools would made available high-quality schools compared with public institutions (see Lavado, Martínez & Yamada 2014), the norm triggered a rapid education expansion. From 1993–2009, about 4,000 private schools were created nationwide.²¹ The share of private schools is prominently and results in a countrywide average growth of 115% for the referred period. In view of these facts, we use the expansion of private education institutions as a source of variation in the public/private school decision. A brief discussion about the relevance and exogeneity of the proposed instrument can be found in Appendix 2.

Our main identifying assumption relies on the fact that the policy shock has operated in all 24 regions of the country. More precisely, the government-propelled education expansion does not respond to particular regional need or has specifically targeted

20. The seminal work of Card (1993) introduced the IV approach to overcome self-selection empirical challenges in the modeling of school choices.

21. The year 1993 is considered as baseline to evaluate private schooling expansion as this is the most recent year of the period prior to the deregulation for which the National School Census of Peru is available.

regions, but was enacted as a wide base course of action. Next, to address the exclusion condition is needed for the average private school supply expansion to impact out of school study hours only through its effect on school choice, but not directly. In this spirit, we aim to discard possible linkages between our propose instrument and a set of population variables by running complementary OLS estimations. We confirm that the average variation in schools, afterwards the law enactment, is exogenous to a set of socioeconomic characteristics obtained from the nationwide census data.

Framed in this discussion, we propose to estimate the linkage between private schooling and study hours at home, as shown in Equations 1 to 6, with a two-stage instrumental variables approach. Thus, we use a two-stage least square estimator technique to address the reduced-form version of our model, given by:

$$private_{ij} = \rho + \theta Z_{ij} + X'_{ij}\tau + \varphi_j + \mu_i \quad (9)$$

$$S_{ij} = \alpha + \gamma \widehat{private}_{ij} + X'_{ij}\beta + \varphi_j + \varepsilon_i \quad (10)$$

where Z_i is the instrumental variable that allows to consistently estimate the parameter of interest that β_3 measures the relationship between private school attendance and study hours out of the school.

6. Data and Sample

Our methodology primarily makes use of two datasets in order to explore children's amount of study hours at home and school choice. The first is the Young Lives Project dataset for Peru that contains longitudinal information regarding children, their caregivers and communities of four developing countries (Peru, Ethiopia, India (Andhra Pradesh) and Vietnam) since 2002. This sample was divided in a Young and Old cohort according to children's age and was collected throughout Round 1 in year 2002, a Round 2 in 2006-2007 and Round 3 in 2009–2010. The Young Lives Study aimed to monitor children's development by collecting information regarding anthropometric measures, educational outcomes (including cognitive and non-cognitive skills), caregiver's attitudes and parenting practices as well as a rich set of data on household (socio economic status, household consumption, family members' activities) and community characteristics (social capital).

In this study, we employ information of children who are members of the Young Cohort interviewed in Round 3 ($N_1 = 1,158$) who were 8.5–9.5 years old at the time and where enrolled in school. Additionally, we use information of children from the Old Cohort interviewed in Round 2 ($N_2 = 396$) who were 11.5–12.5 years old at the time and assisting to schools, as well. The overall sample comprises 1,554 students. Our goal seeks to identify the type of school children attend to, whether is private or public. Particularly, the endogenous variable was constructed using the question “What type of school are they attending?” from the Young Lives questionnaire. The second main variable hinges on a record of the study hours out of school, which has been picked from a detailed children's activity log collected by the questionnaire. The number of study hours spend outside schools during a day was addressed by the question: “Typically how many hours did each child in the household (aged between 4 and 17 yrs) spend studying outside of school time²² during a typical day (from Monday to Friday) in the last week?” Lastly, covariates that encompass individual characteristics, household attributes and parent's educational expectations and attitudes are described in detail in Appendix 3.

As second source of information School Censuses were used; collected by the Ministry of Education of Peru, for the years: 1998, 2000, 2001, 2002, 2006, 2007, 2008 and 2009.²³ This data set contains records from all educational institutions in terms of infrastructure, teachers and directors' characteristics. We use these records to compute our proposed instrumental variable, as described in the following sub section. Finally, we employed information from the Population and Housing Census collected by the National Statistics Institute in 1993 for robustness checks. Here, demographic, socioeconomic, labor, educational and information related to other topics was comprised. This rich set of variables allowed us to evaluate the exogeneity of the proposed instrument in relation to a set of population attributes as will be presented in Section 5.

Instrument. Our proposed instrument employs information drawn from the School Census' data and school registers gathered by the Ministry of Education of Peru, or

22. Specifically, the activity log report includes study hours at home and/or extra tuition outside school. For illustrative purposes, a graphic distribution of the variable is presented in Appendix 4.

23. The full set of School Censuses are available for the following years: 1993, 1998–2002; 2004–2013.

MINEDU. This instrument aims to capture the supply expansion of private schools that was enhanced by deregulation law in 1997. Therefore, it uses MINEDU's data from 1998 and the year when parents decide what type of school they will enroll their children; namely, public or private. We chose 1998 as it is the subsequent and closer year to the regulation date for which the ministry has information.²⁴ The latter year that closes the expansion period covered by our instrument depends on whether the parent's has children that belong to the Young or the Old cohort.

Thus, the supply expansion's instrument is computed at a district level as:

$$\text{Private supply variation}_{\text{mean}(2000-2002),1998} = \frac{\sum_{i=1}^3 \alpha_{200i}}{3} - \alpha_{1998} \quad (3)$$

$$\text{Private supply variation}_{\text{mean}(2006-2009),1998} = \frac{\sum_{i=1}^4 \alpha_{200i}}{4} - \alpha_{1998} \quad (4)$$

For the Old Cohort sample from round 2, the instrument is constructed as the difference between the average supply in private educational institutions for the years 2000, 2001 and 2002, and private educational supply valid in 1998, as shown in equation (3). Similarly, the instrument was built for the young cohort sample from round 3 with the difference that the years used to compare to the baseline period of 1998 are 2006, 2007, 2008 and 2009 due to the existence of a greater availability of data.²⁵ This is shown in equation (4). Appendix 5 shows a distribution of the IV variable constructed for both samples.

Main variables. Table 2 presents descriptive statistics at the individual level distinguishing the type of school children attend. We report robust standard errors in square parenthesis. The proportion of children attending private schools in the Young Cohort sample (12.8%) is above the same proportion in the Old Cohort sample (7.6%). Overall, the rate of private school attendants is 11.5%, a figure that is below the national private enrollment rate of 35.9% over the enrolled students in 2009. We note that these rates are not entirely comparable. The first considers children in certain grades primary and secondary education while the second considers all grades at all levels, from pre-school to secondary. This implies that factors such as the propensity of parents to transfer their children to private institutions in the last primary or secondary levels (i.e. seeking for a better preparation to secondary or tertiary education) are not considered. This type of behaviors may not be reflected in the first private enrollment rate but in the latter.

The first set of columns (1)–(2) present results for children from the Young Cohort enrolled in public and private schools while columns (3)–(4) present similar statistics for the Old Cohort sample. Our estimation sample is evenly distributed among boys and girls in both cohorts. The average age among Young Cohort members is between 63–67 months (6 years old); and among the Old Cohort members locates between 147–152 months (12 years old). As shown in column (1), children enrolled in public schools are younger than those enrolled in private schools for both cohorts. Children attending private schools have higher overall scores on the Cognitive Development Assessment (CDA) test taken in Round 2 at the age of 5.5–6.5; and similarly, Old Cohort

24. An educational census was not conducted in 1997; and prior to the year of deregulation, the first census was recorded for 1993.

25. There is no information regarding the number of schools for previous or closer years to the deregulation date. For instance, there is no information about 2003.

children report higher scores in the Raven Test taken in Round 1 at the age of 7.5–8.5. This result is summarized in the difference between initial cognitive skills. Consistent with an average lower acquisitive capacity among public school students in Peru, statistics show a higher share of students in these institutions that have paid works or activities (i.e. farming chores, selling goods or services, working for wage in non-agricultural activities, among others).

Table 2—Summary statistics by public/private school, Young Lives sample

	Young cohort sample		Old cohort sample	
	Public (n=1,010)	Private (n=148)	Public (n=366)	Private (n=30)
	(1)	(2)	(3)	(4)
Individual characteristics of child				
Female (%)	49.60 ^a (1.57)	49.32 ^a (4.12)	49.45 ^a (2.62)	53.33 ^a (9.26)
Age	64.46 ^a (0.14)	67.10 ^b (0.28)	148.62 ^a (0.27)	152.11 ^b (0.75)
Initial cognitive skills	301.54 ^a (1.50)	330.01 ^b (3.29)	20.95 ^a (0.40)	25.67 ^b (1.39)
Paid work or activity (%)	71.49 ^a (1.42)	65.54 ^a (3.92)	24.04 ^a (2.24)	16.67 ^a (6.92)
Household characteristics				
Parent(s) with indigenous mother tongue (%)	22.67 ^a (1.39)	10.14 ^b (2.49)	26.50 ^a (2.31)	3.33 ^b (3.33)
Highest parental education level is secondary education (%)	51.98 ^a (1.57)	29.05 ^b (3.74)	54.37 ^a (2.61)	26.67 ^b (8.21)
Highest parental education level is tertiary education (%)	26.83 ^a (1.39)	70.27 ^b (3.77)	24.04 ^a (2.24)	70.00 ^b (8.51)
Socioeconomic Index ²⁶	0.22 ^a (0.03)	1.24 ^b (0.06)	0.25 ^a (0.05)	0.92 ^b (0.16)
Parental support				
Parent's educational aspirations regarding child	15.39 ^a (0.08)	15.93 ^b (0.04)	15.59 ^a (0.19)	16.07 ^a (0.07)
Parent(s) help in school activities (%)	61.11 ^a (1.45)	74.32 ^a (3.60)	69.13 ^a (2.42)	80.00 ^a (7.43)

Note: Means with the same superscript indicates that the differences are not statistically significant at 10% level using ttest for independent samples. Standard errors of the mean are in parenthesis.

26. *Socioeconomic Index*: standardized score that used information about basic services, overcrowding, household assets and material used to construct the house.

Next, we examine household characteristics drawn upon information reported by parents.²⁷ For both cohorts, a higher proportion of students attending public schools, have parents with an indigenous mother language and also have a lower socioeconomic index. It can be inferred that the economic background of private school attendants is superior. Moreover, children who attend private schools in the overall sample reported more frequently to have parents with tertiary education compared to public school students that reported to have parents with secondary education as terminal degree. Finally, is worth highlighting that parental support measures presented in the last rows of Table 2 advocate that private school students have a healthier support net of parents who have higher educational aspirations for them, therefore, a higher level of support towards achievement, enrollment and attainments. Also, it is more common among private schools' students to have parents that spend time helping with school work.

We next examine the set of depicted characteristics distinguishing for two profiles of student according to the amount of study hours outside school. Specifically, students with less than two hours of study at home, who represent 70.1% of the overall sample, can be considered "low effort students." They are distributed among the Young and the Old Cohorts with 73.5% and 63.6% participation, respectively. Those with more than two study hours are "high effort students."²⁸ Table 3 shows statistically significant differences on initial cognitive skills and employment status across both effort profiles in both cohorts. Particularly, as a baseline assessment, we notice high effort students scored better results on their respective cognitive development evaluations and are less likely to engage in paid economic activities.

Socioeconomic variables are highlighted as recurrently different between in both cohorts. Parents with tertiary education, non-indigenous mother languages and higher socioeconomic index's scores are associated with children that have higher amounts of time allocated into studying activities out of school. Additionally, parental support is likely to further advocate the high level of effort shown by students that spend more hours studying among Young Cohort members. Nevertheless, in the Old Cohort parental attitudes towards children's education are not as important. These figures suggest that school choice plausibly prompts deficiencies in students through under investment on educational activities in addition to poorer socioeconomic and psychosocial parental traits' effects since the latest are key factor of private/public school dichotomy.

27. Formally, caregiver's (who can be parents, cousins, aunts, uncles, or other relatives) are interviewed by the Young Lives Study. Nevertheless, as less than 3% of the children's caregivers are non-parents so, for simplicity purposes, we refer to parents directly.

28. The proposed threshold value is equivalent to the median value in the distribution of study hours among the student's comprised in the sample.

Table 3—Summary statistics by out of school study hours, Young Lives sample

	Young cohort simple		Old cohort sample	
	Less than 2 hours (n=851)	More than 2 hours (n=307)	Less than 2 hours (n=252)	More than 2 hours (n=144)
Individual characteristics				
Female (%)	50.06 ^a (1.71)	48.21 ^a (2.86)	46.43 ^a (3.15)	55.56 ^b (4.16)
Age	63.36 ^a (0.16)	66.02 ^b (0.23)	148.73 ^a (0.34)	149.15 ^b (0.41)
Initial cognitive skills	303.11 ^a (1.68)	310.89 ^b (2.46)	20.19 ^a (0.49)	23.27 ^b (0.60)
Paid work or activity (%)	73.56 ^a (1.51)	62.87 ^b (2.76)	25.79 ^a (2.76)	19.44 ^a (3.31)
Household characteristics				
Parent(s) with indigenous mother tongue (%)	23.03 ^a (1.44)	15.64 ^b (2.08)	20.63 ^a (2.55)	31.94 ^a (3.90)
Highest parental education level is secondary education (%)	50.18 ^a (1.71)	45.93 ^a (2.85)	54.37 ^a (3.14)	48.61 ^a (4.18)
Highest parental education level is tertiary education (%)	29.02 ^a (1.56)	41.69 ^b (2.82)	23.02 ^a (2.66)	35.42 ^b (4.00)
Socioeconomic Index	0.26 ^a (0.03)	0.61 ^b (0.06)	0.17 ^a (0.05)	0.53 ^b (0.08)
Parental support				
Parent's educational aspirations regarding child	15.44 ^a (0.10)	15.55 ^a (0.07)	15.63 ^a (0.27)	15.61 ^a (0.08)
Parent(s) help in school activities (%)	67.45 ^a (1.61)	76.22 ^b (2.43)	67.46 ^a (2.96)	74.31 ^b (3.65)

Note: Means with the same superscript indicates that the differences are not statistically significant at 10% level using ttest for independent samples. Standard errors of the mean are in parenthesis.

In sum, previewing correlates shown baseline differences regarding educational outputs, socioeconomic background and parental support practices among the in the Old Cohort and Young Cohort samples, respectively. Moreover, the observed heterogeneity among private and public school students as well as across groups of low and high study effort outside school, reflects several concerning gaps. These are likely to be strengthening by a deficient public school systems whereas the initial advantages of private school students could be crowded out by a clumsy privatization process of school services. In the next section our empirical findings will allows us to asses which scenarios is more likely.

7. Results

7.1 Baseline Results

The following section presents the results of the ordinary least squares and instrumental variables estimations for both the younger cohort and older cohort samples. Regarding OLS results, Table 4 examines the linkage between out of school study hours and school choice only in columns (1) and (3). Columns (2) and (4) include relevant covariates that contain information to overcome non observable characteristics among students.

We found a positive and statistically significant relationship between attending a private school and the number of hours of study devoted to educational activities outside of school for the younger cohort that can be observe in columns (1) and (2). Columns (3) and (4) use the old cohort sample and show the relationship is not present. Our finding reveal that educational provision by the private sector have effects on the hours students spend educational activities outside school only among students at the beginning of their school training. Notice that in this stage the parental influence is greatest. For the more “independent” children (members of the Old Cohort, who have less parental intervention), the effect of private schooling is not decisive. Thus, the findings suggest that when students are less influenced by parents, the type of school they attend to has no effect to determine the amount of educational investments they made at home under the form of study hours.

As for the other covariates, different linkages were found and will be reported below. Individual characteristics of students have an important role in educational investments outside the school among the Older Cohort sample. Among the Young Cohort, we stand out the fact that female students with more age are prone to study more; while children undertaking any paid work activity invest less on study hours. In the Old Cohort, gender, initial skills and employment status are the most relevant variables that affect the out of school study decisions.

Household characteristics are also decisive when choosing the number of hours devoted to educational activities outside of school. According to our results, parents with an indigenous mother tongue, lower attainments in parental education and poorer household socioeconomic status have a main discouraging role towards studying hours. Finally, the willingness of parents to support their children in schoolwork activities at home reveals as essential for achieving greater investment in educational activities outside of school for both cohorts. In contrast, educational expectations of parents over their children have only positive effects on educational investments outside the home in the older cohort.

Table 4—School choice and home based investment, OLS

Dependent variable	Out of school studying hours per day							
	Young cohort				Old cohort			
	(1)		(2)		(3)		(4)	
Private school attendance	0.52	***	0.20	***	0.50	***	0.16	
	(0.03)	(0.04)			(0.06)		(0.10)	
Individual characteristics								
Female			0.05	**			0.27	***
			(0.02)				(0.04)	
Age			0.02	***			-0.01	
			(0.00)				(0.01)	
Initial cognitive skills			-0.00				0.03	***
			(0.00)				(0.00)	
The student work			-0.17	***			-0.14	**
			(0.03)				(0.06)	
Household characteristics								
Parent(s) with indigenous mother tongue			-0.12	***			0.39	***
			(0.02)				(0.05)	
Highest parental education level is secondary education			0.07				0.15	**
			(0.05)				(0.05)	
Highest parental education level is tertiary education			0.16	***			0.34	**
			(0.05)				(0.12)	
Socioeconomic Index			0.17	***			0.24	***
			(0.02)				(0.05)	
Parental support								
Parent's educational aspirations regarding child			-0.01	***			0.01	*
			(0.00)				(0.01)	
Parent(s) help in school activities			0.17	***			0.27	***
			(0.03)				(0.05)	
Constant	2.09	***	0.65	***	2.17	***	2.23	**
	(0.02)		(0.19)		(0.02)		(0.88)	
Centered R-squared	0.03		0.10		0.01		0.17	
Observations	1158		1158		396		396	

Notes: Clustered robust standard errors at Young Lives survey's cluster level in parenthesis. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5%, and ***1%.

7.2 Addressing Endogeneity Issues

By examining the relationship between private schooling and study hours at home, endogeneity arises as an issue to pay attention to. As we aim to obtain causal estimates, first stage results of Appendix 6 show that in both cohort samples, private school attendance is positively associated with the variation in private school supply. However, this coefficient is slightly smaller in the Older Cohort sample. Covariates yield signs that are consistent with the forthcoming results in this section.

In Table 5 the core estimation by Instrumental Variables (IV) is presented. Similar to our baseline analysis, results point that the relationship between attending a private school and the amount of hours devoted to educational activities outside of school is positive and statistically significant for the younger cohort.²⁹ For the old cohort, this relationship is not present. This striking and recurrent age pattern was estimated consistently since it accounted parents' self-selection of the type of school. Note that the dissipation of the private school and study hours linkage is present across our two estimation methods of estimation.

The main difference with the previous estimation (OLS) is that the effect of belonging to a private school still positive but underestimated. This may be a counterintuitive effect in the literature if we may think that more able children are self-selected to attend private school, assuming high quality private schools. However, our results indicate an opposite situation due to low quality incoming private schools and a substitution effect within the classroom. In this line, our results advocate that supply private schools' shock was mainly composed by low quality institutions as it was roughly documented in Section 2. In addition, it may be the case that parents realized the low quality of new private schools and supply home education time to their children to offset the negative effect of having less homework or school problems badly explained. This evidence suggest providing information to parents about quality of private schools. Otherwise, the investment made in private education is harmful in comparison to the same education in a public school.

Results in columns (1)–(4) show a gap between educational provision by private and public sector, which are persistent across both age cohorts. Thus, students attending private education institutions have a higher initial human and financial capital. Also have greater support from their parents in educational activities and more encouraging expectations about their development (i.e. they are expected to achieve more years of education).

One explanation is the higher knowledge of monetary and non-monetary returns to education held by parents who enroll their children in private schools. This can be fairly expected among parents who attain tertiary education degrees, as it was observed in Section 4. Significantly, the affordability of parents who send their children to be educated private schools is higher as from more favorable economic conditions. Among our conclusions, such result backs an intergenerational transmission of poverty through the privatization pattern of the school supply at the primary and secondary levels in a developing country such as Peru. Furthermore, long-term effects on the capabilities of public school students are likely to be developed and enforce mainly due to the fact that their peers who are educated by the private sector have comparative advantages for the labor sector.

29. As show in Table 5, relative bias of the IV estimation is less than the 10% of the OLS model. The Kleibergen-Paap rk, Wald F statistic for each model is greater than the Stock and Yogo critical values at 10% level, which is 16.38.

Table 5—School choice and home based investment, Instrumental Variable

Dependent variable	Out of school studying hours per day							
	Young cohort				Old cohort			
	(1)		(2)		(3)		(4)	
Private school attendance	1.34	***	0.96	***	1.84	***	0.54	
	(0.09)	(0.12)			(0.58)		(0.57)	
Individual characteristics								
Female			0.05	*			0.26	***
			(0.03)				(0.04)	
Age			0.02	***			-0.01	*
			(0.00)				(0.01)	
Initial cognitive skills			-0.00				0.03	***
			(0.00)				(0.00)	
The student work			-0.17	***			-0.13	**
			(0.03)				(0.06)	
Household characteristics								
Parent(s) with indigenous mother tongue			-0.09	***			0.41	***
			(0.02)				(0.06)	
Highest parental education level is secondary education			0.06				0.16	***
			(0.05)				(0.05)	
Highest parental education level is tertiary education			0.05				0.30	**
			(0.05)				(0.14)	
Socioeconomic Index			0.10	***			0.23	***
			(0.02)				(0.05)	
Parental support								
Parent's educational aspirations regarding child			-0.01	***			0.01	**
			(0.00)				(0.01)	
Parent(s) help in school activities			0.20	***			0.27	***
			(0.03)				(0.05)	
Constant	1.99	***	1.10	***	2.06	***	2.71	
	(0.03)		(0.20)		(0.05)		(0.99)	
Kleibergen-Paap rk, Wald F statistic	445.66		302.41		185.91		154.35	
Centered R-squared	-0.04		0.05		-0.07		0.16	
Instruments Significance (1st stage, P-value)	0.000		0.000		0.000		0.000	
Observations	1158		1158		396		396	

Notes: Clustered robust standard errors at Young Lives survey's cluster level in parenthesis. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5%, and ***1%. We used Kleibergen-Paap rk, Wald F statistic, because the standard errors uses cluster information of Young Lives study.

WORKING PAPER

Lastly, notice that relations between the others covariates and the endogenous variable are the same that was found in the previous analysis (OLS).

8. Concluding Remarks

This paper aims to analyze the relationship between the provision of private educational services and educational investments made by students at home. For this purpose, the method of instrumental variables allows us to estimate the parameter of interest without bias. We present a simple model of consumption decisions by parents, which predicts a positive relationship between educational investments at home, measured by study hours, and well-being of parents due to non-monetary benefits. An amount of parent's welfare follows the effort in educational activities at the home made by children.

Our empirical methodology takes into account self-selection when choosing public or private provision of educational services, allowing us to identify the parameter of interest. As for the instruments used, this is justified by the internal logic of the model as well as tests of validity and exogeneity applied to it. Moreover, the proposed model allows us to identify individuals who are relevant for our analysis. These are parents who have preference towards private educational provision and have a socioeconomic level that does not always allow their children to assist to private education services. The effect calculated in this paper is applicable to this type of individuals; that is, we calculated the Local Average Treatment Effect (LATE) in this group.

The following results can be highlighted from our analysis. (1) Assistance to the private sector has a positive effect on educational investments made by students at home. (2) We have evidence on measurement error when using the OLS methodology, where this methodology underestimates the parameter of interest. (3) A positive relationship between the instrument and the effect of private provision in educational investments made by students at home was found, which reveals a counterintuitive result, because arguably private educational provision has a higher quality level than the public. In this prospect, students should make greater investments in education at home. However, this situation is not in force as the quality between these services is not very different according to census evaluations conducted by the Peruvian Ministry of Education. (4) We noted that educational provision by the private sector has a positive effect on study hours invested by the students when they are children; albeit when they are young this relationship vanishes.

Finally, the variable of interest in this paper discloses an educational process, not an outcome. Therefore, it is pending to further examine the relationship between educational investments at home and their educational returns. Forthcoming research lines are left to explore this linkage which, within our identification strategy, suggests that greater educational investments at home are associated with better test scores performance.

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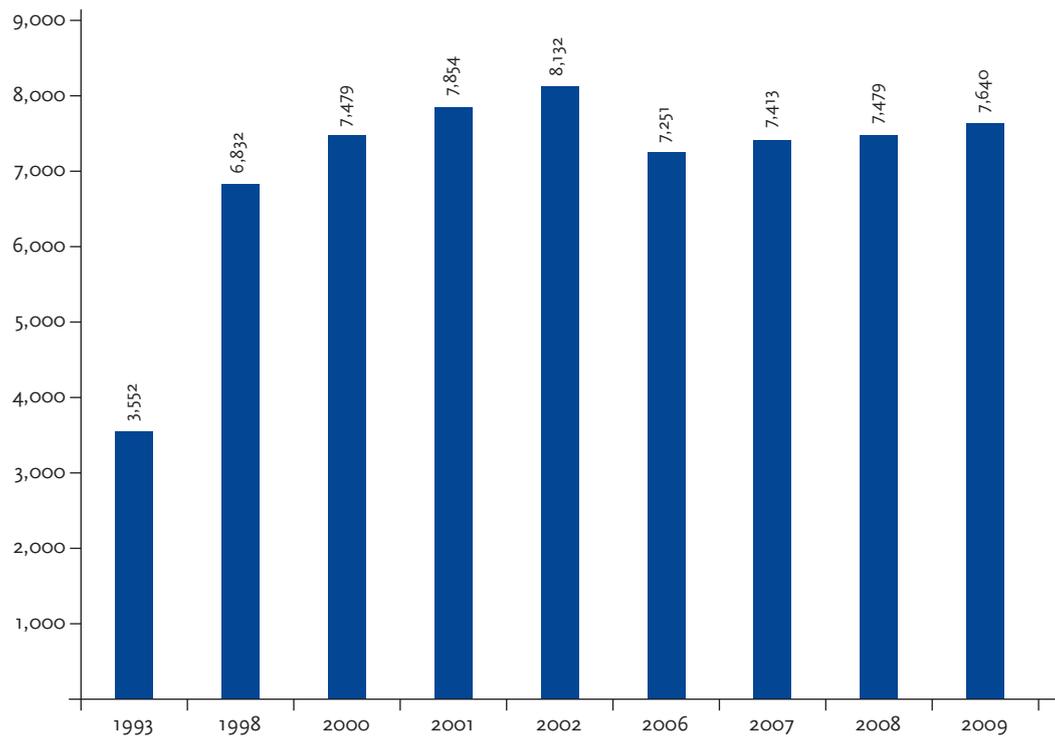
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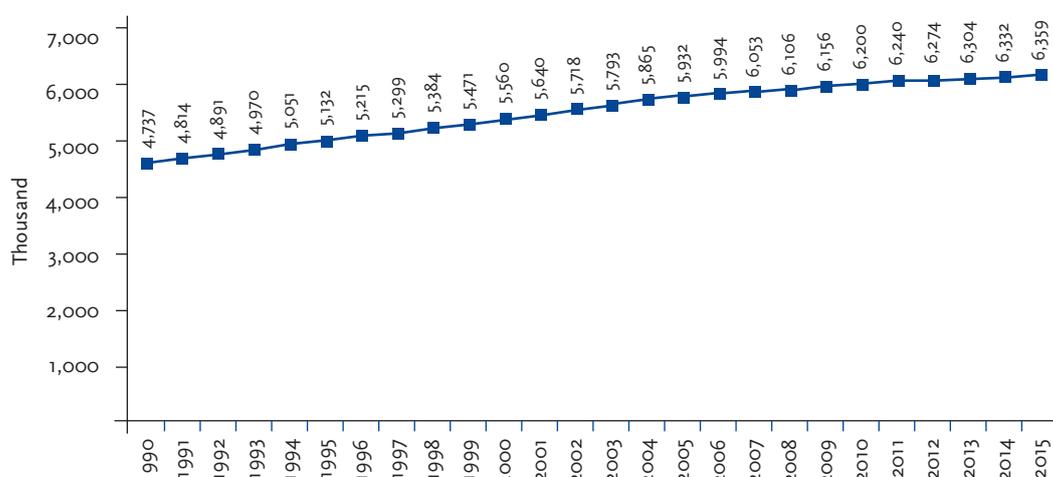
Appendix 1. Statistics on the Privatization of Education in Peru

Figure A1.1—*Number of schools in urban areas, 1993–2009.*



Source: National School Census 1998–2002, 2004–2013, INEI.

Figure A1.2—Urban population from 5 to 19 years old.



Source: INEI; Peru, estimations and projections of population 1950-2050. Demographical Analysis Bulletin N° 36.

Table A1.1—Enrolled urban students by type of schools, 1998–2013 (total students from pre school, primary and secondary school)

Year	N			%		
	Public	Private	Total	Public	Private	Total
1998*	3,608,524	830,846	4,439,370	67.0	15.4	82.4
1999*	3,732,727	897,710	4,630,437	68.2	16.4	84.6
2000	3,645,713	888,605	4,534,318	65.6	16.0	81.6
2001	4,353,305	974,667	5,327,972	77.2	17.3	94.5
2002	4,491,619	1,065,996	5,557,615	78.5	18.6	97.2
2004	4,585,218	1,177,753	5,762,971	79.1	20.3	99.5
2005	4,467,059	1,232,321	5,699,380	76.2	21.0	97.2
2006	4,382,501	1,318,464	5,700,965	73.9	22.2	96.1
2007	4,414,411	1,437,183	5,851,594	73.6	24.0	97.6
2008	4,453,441	1,493,022	5,946,463	73.6	24.7	98.2
2009	4,423,139	1,586,660	6,009,799	72.4	26.0	98.4
2010	4,235,010	1,632,716	5,867,726	68.8	26.5	95.3
2011	4,112,307	1,691,271	5,803,578	66.3	27.3	93.6
2012	3,884,596	1,706,270	5,590,866	62.3	27.3	89.6
2013	3,950,010	1,899,413	5,849,423	63.0	30.3	93.2

Note: The enrollment rate was computed over the total of the urban population from 5 to 19 years old. (*) For 1998 and 1999 the population value was imputed using the *rate of natural increase (per thousand) 1950–1955 to 2045–2050*, compiled by INEI. Source: INEI: «Peru: Estimates and Projections 1950-2050 Demographic Analysis Bulletin No. 36»; MINEDU: School Census 1998–2002, 2004–2013.

Appendix 2. Discussion Regarding Exogeneity Test of Instrument

Among the most important empirical attempts to overcome confounded results on estimates due to non-observable variables and selection bias, as main challenges for our model, stand out the seminal work of Card (1993). The author raised the innovative proposal to use the distances to school as an instrumental variable for Mincer regressions with data drawn from the National Longitudinal Survey of the United States applied to youngsters. To use the proximity variable allowed consistently identifying the impact found by OLS and showed that men who grew up near the school they attended obtained a higher level of education and wages. This finding is especially strong for the group whose parents were poor. Thus, the returns to education by the method of instrumental variables are between 25% and 60% higher.

The referred paper uses an exogenous geographical variable for identification; nevertheless, our proposed instrument uses a geographical and time expansion, instead. In this sense, a study that most closely aligns to our strategy is Duflo (2001). The author studied a rapid increase in human capital as a consequence of a major program of primary schools construction in Indonesia. By a two-stage least squares method that employed the National Household Survey of the country the identification hinged upon a large expansion in the private school supply.

Additional to the reported weak instrument statistics for the IV regression, Table A presents a results that aim to the test the exogeneity between the proposed instrument and a set of drawn from the National Population Census of Peru of 1993. Among the selected variables for this robustness exercise we include the following indicators: the person is male, a dummy indicator of Spanish as mother tongue, another to account if the individual knows is literate, one that indicates if the highest education level is secondary and the last one points if the individual has done any economic activity. Column (1) shows we have no evidence to argue that there is statistical significant linkage between the instrumental variable constructed for the young cohort sample. Column (2) presents similar results regarding the instrument constructed for the old cohort sample.

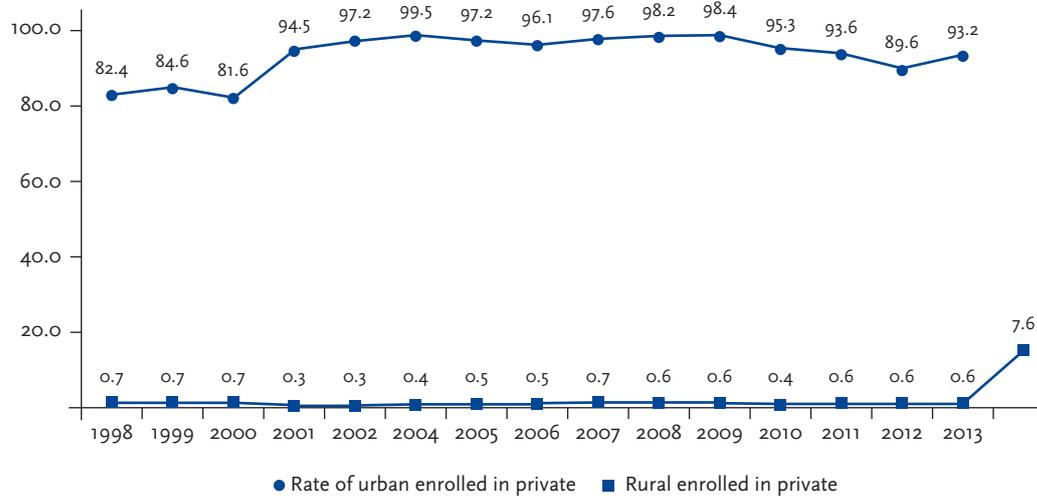
Table A2.1—*Test of exogeneity between a set of demographic characteristics and growth of private offer (instrument)*

Dependent variable	(1)	(2)
	Young cohort sample	Old cohort sample
Male	2.59	0.97
	5.60	4.05
Mother tongue is Spanish	-0.19	-0.63
	0.80	0.58
Knows to write and read	3.35	-0.64
	2.02	1.47
Highest education level is secondary	-0.40	2.16
	0.40	2.29
Works in economic activity	-2.39	-0.86
	1.89	1.37
Constant	-2.60	-4.13*
	2.83	2.05
Regional FE	Yes	Yes
R-squared	0.02	0.08
Observations	1772	1772

Note: Standard errors of the mean are below point estimates. $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Thus far, our study focus has been the choice between public and private schools in the urban areas. As noted in Figure A, students in rural areas have little choice among private schools, as private enrollment rates are consistently low from 1998 to 2013. Thus, even after the supply expansion of private schools, rural students have no effective choice among these. For this reason, the rural areas were also excluded from our estimation sample.

Figure A2.1—Private enrollment rate by geographical areas, (%)



Number of enrolled children in preschool, primary and secondary school over population from 5 to 19 years old, respectively for urban and rural geographical areas.

Source: National School Census 1998-2002, 2004-2013, INEI.

Appendix 3. Description and Coding of Variables Used in out of School Studying Hours' Estimation

Individual Variables

Sex (female): binary variable that takes the value of one if the child reported to be a woman and zero otherwise.

Age: respondent's age in months (round 2)

Initial cognitive skills: to construct this variable, we used the raven test was conduct in the first round and the Cognitive Development Assessment—Quantitative that was conduct in the second round.

The student work: binary variable that takes the value of one in the case that student realized a work for money and zero otherwise.

Household Variables

Parent(s) with indigenous mother tongue: binary variable that takes the value of one when at least one parent report have an indigenous mother tongue and zero otherwise.

Highest parental education level is secondary education: binary variable that takes the value of one when the maximum educational level among the parents is secondary education (complete or incomplete) and zero otherwise

Highest parental education level is tertiary education: binary variable that takes the value of one when the maximum educational level among the parents is higher education (complete or incomplete) and zero otherwise.

Socioeconomic Index: standardized score that used information about basic services, overcrowding, household assets and material used to construct the house.

Parental Support

Parent's educational aspirations regarding child: variable constructed whit the expected years of education for students that the parents report.

Parent(s) help in school activities: binary variable that takes the value of one when the parents or caregiver reports that he/she help to make homework.

School variables

Private school attendance: binary variable that takes the value of one when the school is private and zero otherwise.

Appendix 4. Hours of Study out of School

Figure A4.1—*Reported hour of study out of school, including tutoring, homework activities, Young Cohort*

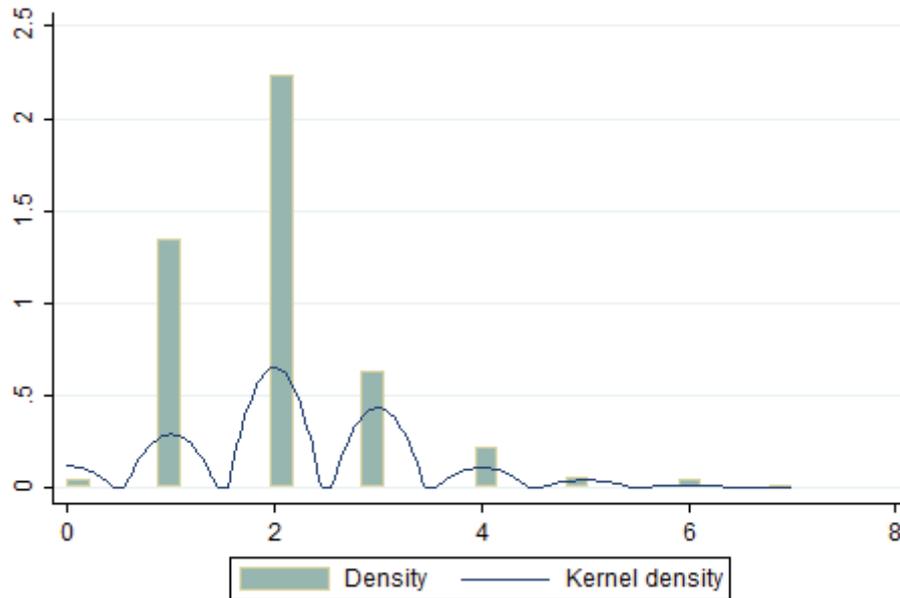
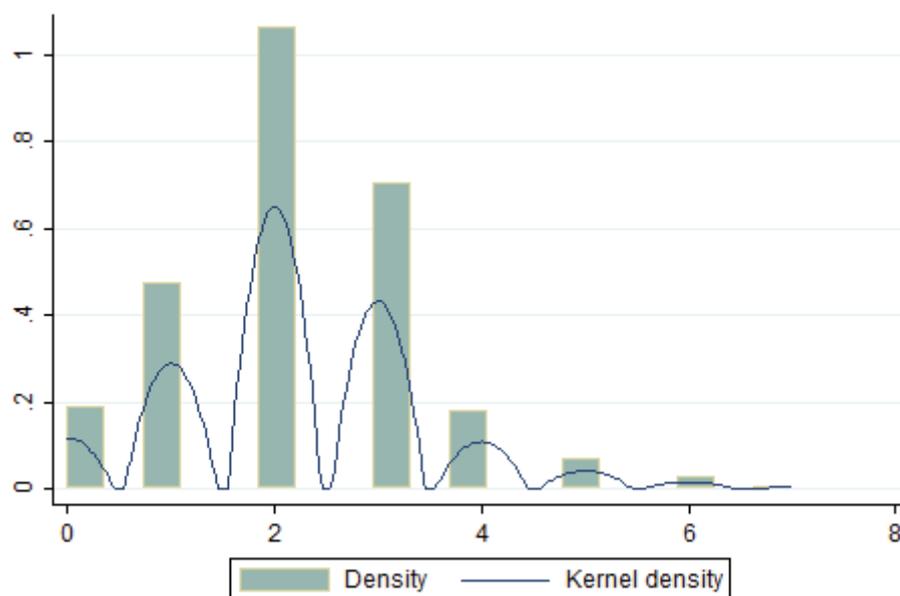


Figure A4.2—*Reported hour of study out of school, including tutoring, homework activities, Young Cohort.*



Appendix 5. Distribution Variation in the Private School Supply

Figure A5.1—Instrument variable. Reported hour of study out of school, including tutoring, homework activities, Young Cohort (proposed instrument)

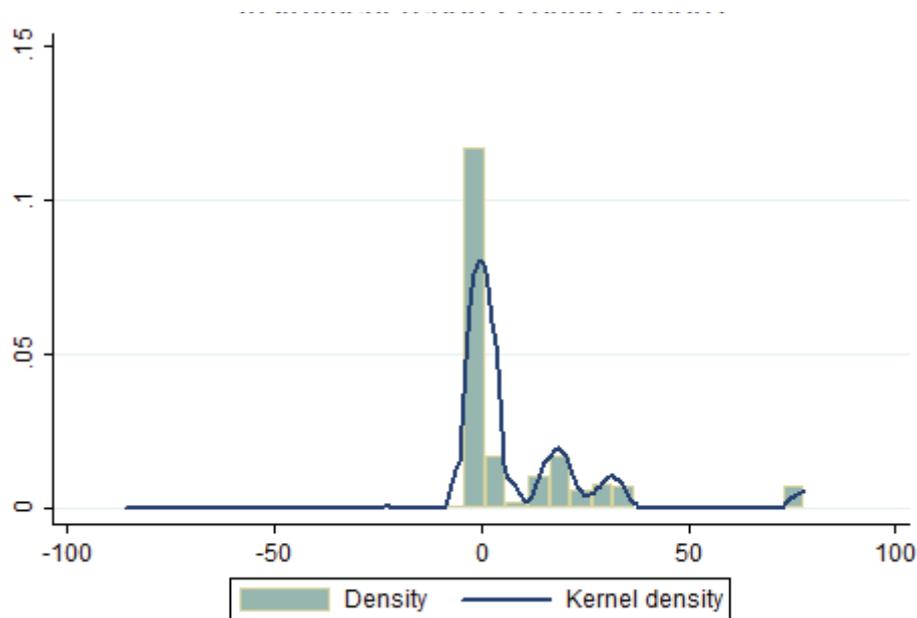
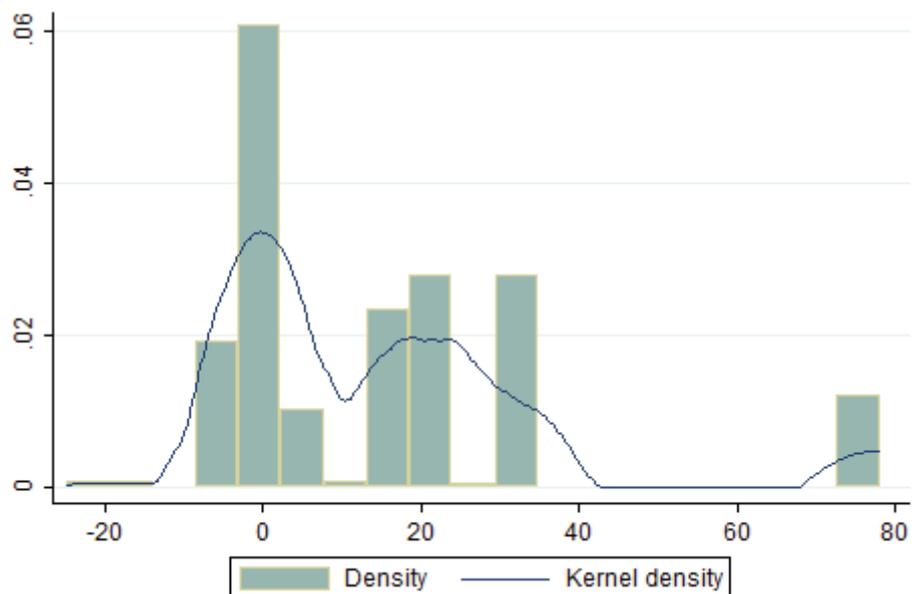


Figure A5.2—Instrument variable. Reported hour of study out of school, including tutoring, homework activities, Young Cohort



Appendix 6. Instrumental Variables First Stage

Table A6.1—*Instrumental variables first stage*

Dependent variable is 1 when School is Private

Dependent variable	Private school attendance							
	Young cohort				Old cohort			
	(1)		(2)		(3)		(4)	
Variation in the private school supply	0.004	***	0.003	***	0.003	***	0.002	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Individual characteristics								
Female			0.01				0.03	***
			(0.02)				(0.01)	
Age			0.004	***			0.01	***
			(0.00)				(0.00)	
Initial cognitive skills			0.00				0.003	***
			(0.00)				(0.00)	
The student work			-0.02	**			-0.02	
			(0.01)				(0.01)	
Household characteristics								
Parent(s) with indigenous mother tongue			-0.05	***			-0.09	***
			(0.01)				(0.01)	
Highest parental education level is secondary education			0.00				-0.03	***
			(0.01)				(0.01)	
Highest parental education level is tertiary education			0.15	***			0.10	***
			(0.01)				(0.02)	
Socio-economic Index			0.08	***			0.02	***
			(0.01)				(0.00)	
Parental support								
Parent's educational aspirations regarding child			0.001	**			0.00	
			(0.00)				(0.00)	
Parent(s) help in school activities			-0.04	***			-0.01	
			(0.01)				(0.01)	
Constant	0.08	***	-0.32	***	0.03	***	-0.78	***
	(0.01)		(0.07)		(0.01)		(0.11)	

WORKING PAPER

F-statistic	445.7		642.5		185.9		1918	
Centered R-squared	0.07		0.22		0.06		0.17	
Observations	1158		1158		396		396	

Notes: Clustered robust standard errors at Young Lives survey's cluster level in parenthesis.

Coefficients that are significantly different from zero are denoted by the following system: * 10%, ** 5%, and *** 1%.



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