The collateral effects of private school expansion in a deregulated market: Peru, 1996-2019

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Abstract

This document explores the mid-term effects of the *de facto* privatization taken place in the Peruvian educational system. It exploits exogenous policy shocks as well as two sources of variation, namely the geographical location of new private schools and the year of birth of individuals. Both variables determine the degree of exposure to the private school expansion process. It is argued that while this phenomenon has contributed to increasing access to formal education, it has nevertheless been detrimental to the global quality of the educational system. Its consequences on the labor market are studied.

Keywords: Private education, school choice.
JEL classification: I21, O15, O22.

1   Introduction

Privatization of education refers to the provision of educational services by non-government institutions, whether for-profit or non-profit. This type of educational provision has shown a significant expansion in developing countries during the last decades, at all educational levels.[1]

While this phenomenon constitutes a global trend, the Peruvian case is considered one of the most radical (Balarín & Escudero, 2019). Indeed, especially thanks to a law enacted in the mid-1990s (namely the Legislative Decree Nº 882 "Law to Promote Investment in Educational Services", hereafter DL882), the privatization process in this country has taken place with little intervention by the state, without clear public policies for promoting quasi-markets[2]. Moreover, families have absolute freedom for school choice; however, they are backed by neither public funding, transparent information, nor appropriate regulation. These have led some to describe this process as a "de facto" or "by-default privatization" (Balarín, 2016).

At the global level, evidence on the consequences of educational privatization is still inconclusive and it appears to be case-specific (Urquiola, 2016). On one hand, some have argued that the rise of private education fosters universal access and increases quality through higher market competition. On the other hand, others have pointed out that it increases segregation, weakens educational systems, or could even generate socially undesirable actions (Romero, Sandefur, & Sandholtz, 2020). In this sense, it might constitute "a key challenge to the conception of education as a basic human right and a public good" (Verger, Fontdevila, & Zancajo, 2016, p.3).

There exist some important gaps in current knowledge.[3] For instance, the extent and nature of the heterogeneity within the group of private schools is still largely unknown. Furthermore, there does not exist any typology of private schools considering different dimensions, such as infrastructure, fees, and pupil's learning achievement. On the other hand, little is known about the reasons of households for choosing low-fee private schools instead of tuition-free public education.

This paper aims to estimate the causal effects of the increase in the supply of private schools on educational and subsequent labor market outcomes. It exploits a series of exogenous policy reforms that occurred in Peru during the 1990s, as part of the broader movement towards a more liberalized economy. In particular, for the first time in Peruvian history, a law (DL882) was promulgated that allowed private schools to operate on a for-profit basis, and offered, in addition, tax credits

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[1]However, it is worth noting that "policies toward private schools in developing countries vary widely, from outright prohibition (Cuba, Sri Lanka) to heavy subsidization (Chile). Consequently, in some countries (Algeria, Mongolia, Tanzania), less than 1 percent of primary school students are enrolled in private schools. In other countries (Chile, Pakistan, Zimbabwe), nearly one half or more are enrolled in private primary schools" (Glewwe & Kremer, 2006, p.964).

[2]i.e. hybrid forms for public sector provision that use "market philosophies and business sector practices in the delivery of government funded services" (Carey, Malbon, Green, Reeders, & Marjolin, 2020, p.30).

[3]See Day Ashleym et al. (2014) for a compelling review of developing countries' experiences.

to investors.

The empirical strategy builds on the seminal paper by Duflo (2001), who evaluated the effects of a large public school construction program on education and earnings in Indonesia.[4] However, it differs from Duflo's paper in several ways. First, it takes into account separately the effects of public and private sector expansion. Second, it considers secondary education. Third, in addition to a difference-in-differences with multiple time periods, it compares a sub-sample of two different cohorts exactly at the same age, which makes the analysis more pertinent and less subject to non-desired influences. Finally, following the contributions by Akresh et al. (2018) and Mazumder et al. (2019), it also explores long-term effects on outcomes of the second generation, i.e. the children of treated individuals.

The identification strategy exploits two sources of variation that determine the individuals' degree of exposure to the privatization process: the year of birth and the province of birth.[5] Evidence using differences-in-differences and instrumental variables is provided.[6] Placebo tests are also conducted. The method accounts for other competing mechanisms such as the Conditional Cash Transfer Program "Juntos", labor regulation changes, as well as the sustained levels of economic growth and poverty reduction.

Using rich national household surveys, yearly applied since 2004, the degree of exposure to the treatment, and several educational and labor market outcomes, are observed. Survey data are complemented with information from the School Census (1993, 1998-2019) and the Population Census (1993, 2007, 2017).

The results show that provinces with initial intense presence of private schools, are those where the private expansion increased relatively more. Also, results suggest that the treatment has a negative effect on the outcomes under study for the younger cohorts, after an initial period of positive effects. In terms of methodology, the extent of the presence of private schools, instead of the number of new schools, shows clearer trends in the decline of the effect on secondary completion and real wages.

The rest of the paper is organized as follows. First, some stylized facts are presented (section 2), followed by a description of the regulatory context (section 3). Then, the data and the methods for estimating the private supply expansion effects are described (section 4). Next, the main results are presented (section 5). Finally, a discussion with concluding remarks and some implications for public policy are provided (section 6).

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[4]Recent extensions include Akresh, Halim, and Kleemans (2018) and Mazumder, Rosales-Rueda, and Triyana (2019).

[5]According to the 2017 Population Census, 71% of basic education students attend a school located in their district of birth. The percentage regarding the province of birth must be higher because it is a larger geographical division. Unfortunately, I could not calculate this percentage at the province of birth level because of queries restrictions with the open data available at https://censos2017.inei.gob.pe/redatam.

[6]The characteristics of the private school expansion allows also for emulating a step-wedged design analysis, at least for the largest cities.

2 Stylized facts

In Peru, the sizeable expansion of the private sector education –which is particularly noticeable since the beginning of the 21st Century– occurred alongside three simultaneous phenomena: (i) sustained levels of economic growth and poverty reduction (and therefore more purchasing power at the household level for private educational services), (ii) regulatory changes during the decade of 1990 allowing a for-profit private educational supply, and (iii) a strong loss of public school prestige (Guadalupe, León, Rodríguez, & Vargas, 2017, p.48).

The rise of the private sector shares is a relatively recent, and primarily urban, phenomenon. It is particularly concentrated in major cities (cf. Figure 1).[7] The enrollment rate in those schools has doubled since 1998, representing at present a third of total enrollment at the country level (cf. Figure 2), and a half in the capital, Lima.[8]

Figure 1: Peru: Enrollment in private schools, 2004-2016 (% of total enrollment)
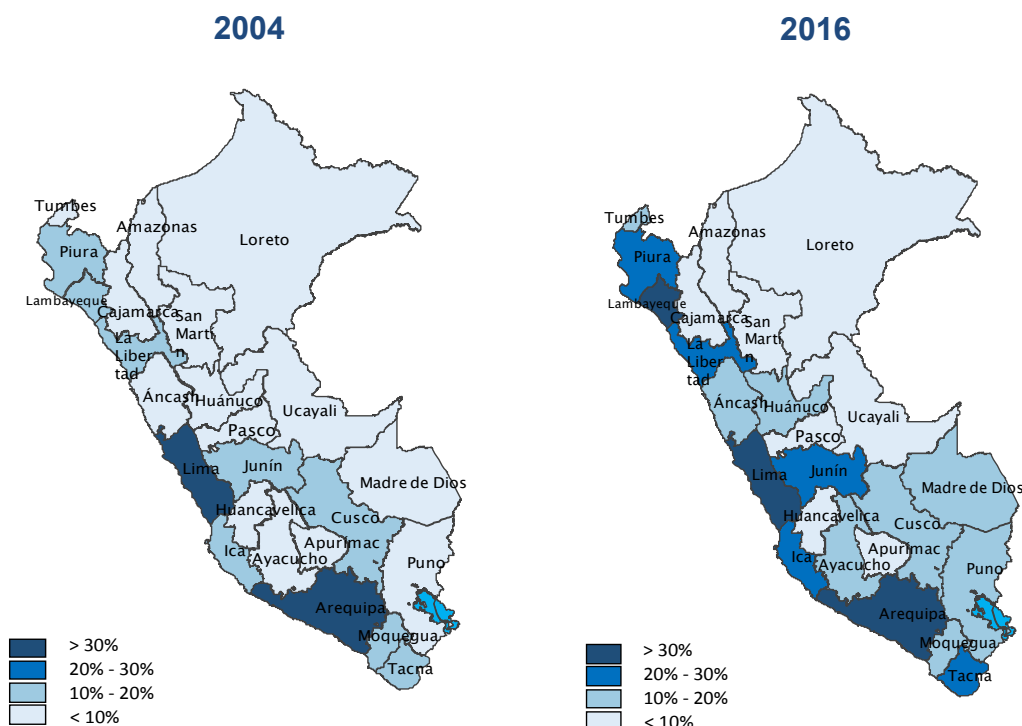
Source: Balarín (2017, p.17).

More particularly, in the case of secondary education, the number of schools has increased consistently since, at least, 1990. Consequently, the ratio of private to public schools followed the same pattern and stabilized around 2005, as depicted

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[7]The literature dealing with this topic is still scarce and almost exclusively qualitative. Some contributions include Balarín, Kitmang, Ñopo, and Rodríguez (2018); Cuenca (2013); Guadalupe et al. (2017); Sanz (2014).

[8]In this metropolis, the number of private schools doubled between 2004 and 2012. The spread seems to be all over the city, including marginal poor areas, as Figure C.1 shows.

Figure 2: Private sector participation in total enrollment, 1970-2018 (selected countries)

Note: The vertical line makes reference to the 1996 privatization law in Peru.
Source: World Bank Open Data. Own elaboration.
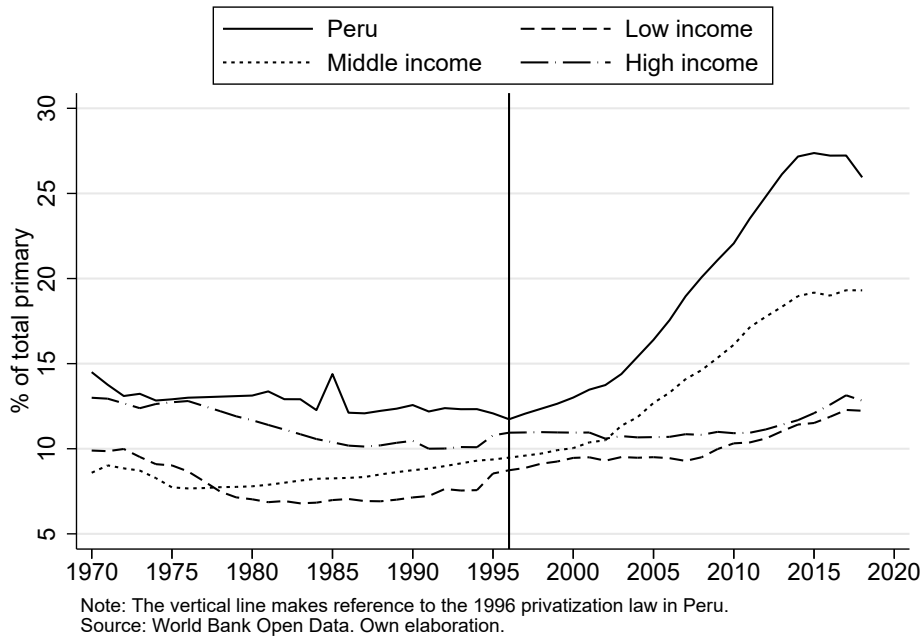
Source: World Bank Open Data. Own elaboration.

in Figure 3. However, a more dramatic change is observed for the enrollment ratio. Indeed, around the same year, 2005, a remarkable increase of this indicator favors the private sector, increasing from 0.20 to a peak of nearly 0.35 ten years later. As explained in the next section, the roots of this explosion can be traced to a law enacted in the mid-nineties.

3 Regulatory context, supply, and demand

3.1 Regulation

During the authoritarian government of Alberto Fujimori (1990-2001), several reforms were implemented in order to develop a neoliberal free-market economy.[9] The country "experienced one of the fastest trade liberalization processes and one of the deepest labor market reforms in Latin America. These reforms were accompanied by a downsizing of the public sector, the start of a privatization process, the abolition of all state-owned monopolies, and a tax reform. In addition, restrictions to capital account transactions were eliminated while the financial sector was deregulated" (Saavedra & Torero, 2004, p.131).[10] In this context, the education sector was not an exception in the process of deregulation and privatization.

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[9]For a summary on the evolution of the Peruvian educational system for the period 1950-2011, see Sanz (2014, pp.47-60), and Haddad (1994, pp.33-71) for the period 1968-1980.
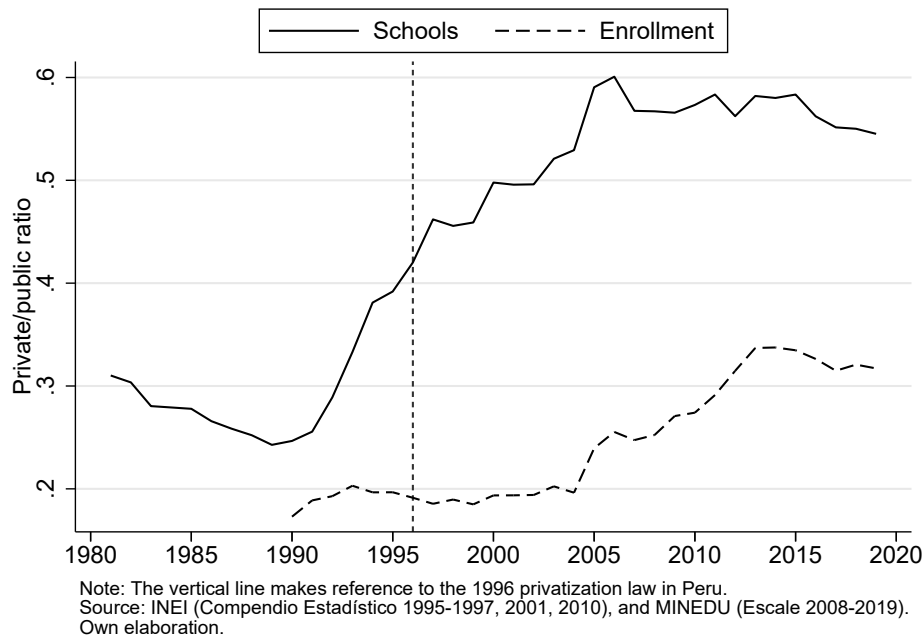
[10]More details regarding labor market regulation during this period are provided in Appendix B.

Table 1: Chronology of legislation associated with educational privatization

Type	Code	Year	Description	Status
Legislative Decree	699	1991	Transfer of schools to promoters ("transfer of use")	Repealed
Legislative Decree	26011	1994	Transfer of schools to COMUNED (municipalities and parents)	Repealed
Legislative Decree	26012	1994	Educational financing	Repealed
Legislative Decree	26013	1994	Coverage expansion	Repealed
Law	26549	1995	Law of private educational institutions	Current
Legislative Decree	882	1996	Law to promote investment in educational services	Current
Supreme Decree	004-98-ED	1998	Regulation of infractions and sanctions for private educational institutions	Current
Supreme Decree	007-98-ED	1998	Regulation of transformations for private educational institutions	Current
Law	27665	2002	Law on the protection of the family economy regarding the payment of fees in private educational centers	Current
Law	28044	2003	General law on education	Current
Supreme Decree	009-2006-ED	2006	Regulation of private educational institutions of basic and vocational education	Current

Source: (Cuenca, 2013, p.79) and Education Legal Information System (SIJE). Own elaboration.

Figure 3: Secondary level: Schools and enrollment private to public ratio, 1990-2019

Note: The vertical line makes reference to the 1996 privatization law in Peru.
Source: INEI (Compendio Estadístico 1995-1997, 2001, 2010), and MINEDU (Escale 2008-2019).
Own elaboration.

From 1991 to 1996, at least three attempts were made to massively privatize basic education, inspired by the Chilean experience.[11] However, they faced strong opposition from teachers and civil society and were not implemented.

However, at the end of 1996, the "Law to Promote Investment in Educational Services" (DL882) was finally enacted. This law was promoted as a solution to the problem of the public sector incapacity to satisfy the increasing demand. Indeed, it was presented as a policy that would modernize the education system and increase its offer and coverage. The DL882 implemented a strong deregulation of private educational activities, "allowing private schools to operate on a for-profit basis, and offering tax credit to investors" (Balarín, 2015, p.11).[12] In this context, "private education, once the preserve of economic elites, has become the choice of the emerging middle-classes, and also of many poor families who can now access low fee private schools" (Balarín & Escudero, 2019, p.2).[13]

After the end of the authoritarian regime and the transition to democracy, the "General law of education" was promulgated in 2003. One of the main features introduced by this law is related to the functions of regulating and supervising the quality of education provision (Leyva, 2017, p.92). Indeed, it devolved this re-

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[11]Table 1 summarizes the main legislation acts on the topic for the period 1990-2006.

[12]Tax relief was promoted but no direct public funding.

[13]Regarding the higher education market, it has been documented that increased access after deregulation came at the cost of a deterioration in quality supply (Yamada, Lavado, & Martínez, 2015).

sponsibility to decentralized agencies.[14] In particular, these decentralized agencies were now in charge of the authorization of new private schools opening. Nevertheless, they were not prepared for their new responsibilities because of insufficient economic, human, and administrative resources. As a consequence, a disordered growth of private schools followed since the "silence procedure" applied for this issue.[15]

In this context, the Peruvian educational market has experienced a "de facto" privatization behind the State. In this market, parents can freely choose the school to which send their child. Indeed, they can choose any tuition-free public school[16] or any private school they can afford. In this regard, "Peru may qualify as a radical example in the global trend to develop markets in education. [Indeed,] families' choices are not backed by public funding, transparent information, or by appropriate regulation and policies that may limit the effects of choice on educational segregation dynamics" (Balarín & Escudero, 2019, p.2).

3.2 The demand

Demand for private education is explained by at least six factors. First, there has been a progressive deterioration of public-school prestige, and thus the idea that "private is better" has almost become common sense. However, this is not necessarily true, as the recent National Student Assessment reports show.[17] Besides, parents perceive some problems with the public provision, e.g. teacher absenteeism, closures due to strikes, and low wages of public sector teachers.

Second, families have strong liberty for school choice. In this way, they are able to overcome the crisis of public-school quality and make strategic choices. However, parents face a lack of information concerning private provision standards. Households (especially poor ones) make choices without knowing the quality provision or their rights guaranteed by law, among other issues.

Third, private education is seen as a means for social mobility. More generally, education is linked to notions of progress and more opportunities, "embodying the hopes and dreams of the most excluded populations for becoming truly integrated into Peruvian society" (Balarín, 2015, p.19). Being part of the public school does not contribute to social differentiation and private education is preferred.

Fourth, in the peripheral districts, households have a preference for nearby schools. Indeed, closer schools (relative to home) "make schooling more compatible with families' (especially mothers') other domestic responsibilities, and allows parents to be more vigilant of their children -taking them and picking them up from school-

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[14]Unidad de Gestión Educativa Local (UGEL), whose jurisdiction spans the province level, and the Dirección Regional de Educación (DRE), with a broader jurisdiction at the regional level.

[15]More precisely, if a demand for a new school opening has no official response after sixty days, it is assumed to be positive and can start to operate.

[16]While public education is meant to be free, in reality, households make some expenses "in form of voluntary and sometimes unlawfully demanded contributions towards educational materials, uniforms, school activities, etc." (Balarín, 2015, p.13).

[17]See, for instance, Minedu (2017).

in precarious urban contexts that are perceived by their dwellers as being very high risk" (Balarín, 2015, p.18). Thus, some families' choices are influenced by the lack of a nearby public school.

Fifth, parents also have a concern about the conditions of educational provision. For example, a small number of students per class tends to be seen as an indicator of school quality. In the public sector, it is not generally the case.

Last but not least, Peru has experienced important GDP growth rates during the last two decades (on average 5% per year) and considerable reduction of monetary poverty rates (20% in 2019 versus 49% in 2004), which have been actively accompanied by public policies such as the conditional cash transfer program Juntos.

3.3   The supply

The current Peruvian legislation guarantees liberty of education provision. Every natural or legal person has the right to establish and operate school centers and programs (General Law of Education 2003, Art. 5). In this context, the private initiative is considered helpful to expand coverage, innovation, quality, and financing of educational services.

For more than two decades, there has been virtually no supervision of private school provision (opening of new schools and operation). The state's supervisory capacity was overwhelmed. The disordered decentralization process, which started in 2003, intensified the problems that already existed because of bureaucracy and insufficient resources. As a consequence, some unintended consequences have risen during the privatization process.

First, the private sector growth has taken place almost exclusively in urban areas, particularly in the most important cities in the country. This fact raises the question of equity in the system, where rural areas do not receive any benefits of privatization.

Second, an informal market of unlicensed schools has emerged. They provide questionable education quality, and in most cases are not on the radar of authorities. These schools do not meet minimum standards and are not recognized by the system. However, it is not infrequent to see ordinary houses that operate as unlicensed schools in many cities.

Third, there exists an increasing heterogeneity of private schools, in terms of fees, infrastructure, and quality. Before the reforms described in section 3.1, private education was concentrated among wealthy households of the middle and high classes. Accordingly, this type of education was more homogeneous than it is now. In the present, there exist differentiated channels that target the emerging middle-class and also poor families (Sanz, 2014). As a consequence, an emerging cluster of low-fee schools appeared, some of which do not meet basic minimum quality standards, as stated above.

Fourth, segregation in the educational system has increased. Indeed, "poor families access poor-quality low-fee private schools with pensions of around US$ 60 per month; while rich families access good quality high-fee private schools with

fees above US\$ 1,000 a month" (Balarín & Escudero, 2019, p.19). Evidence points out that the pupil's socioeconomic status and even community factors are highly correlated with learning achievement outcomes (Arteaga & Glewwe, 2019; Benavides, León, & Etesse, 2014). In addition, schools' social composition has become increasingly different between schools, but more homogeneous within them.

Finally, in the school-household relationship, new problems emerged. For instance, parents cannot afford tuition fees because of job insecurity (which in turn, affects the child's educational trajectory with interrupted periods of attendance); schools (in particular low-budget schools) apply abusive practices, such as mandatory textbooks from specific publishers with whom they have some sort of agreement, demand for unlawful contributions from parents, etc.

4   Data and methodology

Three main databases will be exploited in this study:

(i) National Household Survey (ENAHO) - National Bureau of Statistics
There is an annual series starting in 2004.[18] Currently, the sample consists of around 40,000 households at the national level (urban and rural). This survey has a panel sub-sample (9,000 households), which rotates every 5 years. ENAHO is a very rich survey, with detailed modules on household expenditure, education, employment, health, etc. For this paper, ENAHO provides the two key variables of individual treatment exposure: the province of birth and the year of birth. The sample will be restricted to individuals aged 18 to 40 at the moment of the survey.

(ii) National Population Census (CPV) - National Bureau of Statistics
The most recent censuses were conducted in 1993, 2007, and 2017. The last has information on students' school district. For the present paper, the CPV provides the population per age-group for each district, which is particularly important for constructing a baseline for 1993.

(iii) School census - Ministry of Education
Available for 1993, and for the years 1998 to 2019; however, it is relatively reliable only from 2004. It provides information on the schools' location, number of students and teachers, and other basic information. Here it will be used mainly for the number of public and private schools per district for each educational level.

As the reader may have noticed from section 3.1, the privatization process started during the decade of 1990 and was the result of a few important changes in legislation, especially the DL882. These changes are part of a broader transformation of the Peruvian economy towards a more liberalized market. Therefore, these changes can be seen as plausibly exogenous. In this sense, it is worth mentioning that the present paper examines the educational privatization process as a whole. It does

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[18]From 1997 to 2003 it was applied only in one trimester per year.

not focus on the effect of one particular policy shock. Accordingly, the phenomenon is taken as a continuum.

The four main variables that will be used throughout the paper are defined as follows. First, define **"treatment intensity"** (TI) as the number of private schools (of educational level l) in year t, per 1,000 age-group population in 1993 (for the same educational level l), at the province level.[19] Second, define **"current treatment intensity"** (CTI) as the number of private schools (of educational level l) in year t, per 1,000 age-group population in the same year t (for the same educational level l), at the province level. Third, define **"treatment intensity change"** (ΔTI) as the change in treatment intensity between years t and $t-1$. Finally, define **"basal treatment intensity change"** (ΔBTI) as the change in treatment intensity between 1993 and year t. These four definitions of treatment and treatment change, schematized in table 2, will be useful for understanding some key descriptive statistics in the following section.

Table 2: Treatment variables definitions

	Numerator	Denominator
	Nb of private schools in year	Age-group population in year
Treatment intensity (TI)	t	1993
Current treatment intensity (CTI)	t	t
Treatment intensity change (ΔTI)	Change in TI between $t-1$ and t	
Basal treatment intensity change (ΔBTI)	Change in TI between 1993 and t	

Note: Only secondary-level schools. The population of reference is aged 12-17. Own elaboration.

In this context, two sources of variation determine the individuals' **degree of exposure** to the privatization process: year of birth, and province of birth. First, let us consider a simple framework that will help to have a general view of the phenomenon of interest. Inspired by the strategy of Kuecken, Thuilliez, and Valfort (2020), let us consider the specifications presented in Eq.(1) and Eq.(2):

$$y_{ipct} = \beta_1 + \beta_2 post_c + \beta_3 \left(post_c \times TI_{1993p} \right) + \mathbf{X}_{ipct}'.\Gamma + \delta_p + \delta_c + \varepsilon_{ipct} \qquad (1)$$

where y_{ipct} is an outcome for individual i, born in province p, belonging to cohort c, and surveyed in year t. The variable $post_c$ is an indicator for being born on a cohort that started secondary education after 1996 (the year of the main privatization law, DL882). The variable TI_{1993p} is the treatment intensity[20] in the province of birth

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[19]The year 1993 is taken as the baseline because the National Population Census and the National School Census were both conducted in 1993, before the privatization law of 1996, which is the main (but not the only) reference of legislation change, as shown in section 3.1 and Table 1.

[20]i.e. the number of secondary private schools in 1993, per 1,000 population aged 12-17 in 1993, at the province level.

at the 1993 baseline (i.e. before the DL882). The vector $\mathbf{X}_{ipct}$ includes three individual covariates: gender, mother tongue, and migration status. Finally, δ_p and δ_c are province of birth and cohort fixed-effects, respectively.

To go further in the analysis, Eq.(2) considers a period-cohort model, which takes into account the combination of cohort and time survey as well as a continuous measure of exposure to treatment:

$$y_{ipct} = \beta_1 + \beta_2 \left(TI_{1993p} \times exposure_{ct} \right) + \mathbf{X}_{ipct}{'}.\Gamma + \delta_p + \delta_{ct} + \varepsilon_{ipct} \qquad (2)$$

This specification exploits the variation of exposure relative to the individual's birth cohort and survey year. Since exposure to treatment is a function of the year t when the respondent is surveyed and her age at that moment (i.e. year of birth cohort c), thus $exposure_{ct}$ represents the proportion of individual's life post-DL882. In Eq.(2), β_2 identifies the treatment effect. To address potential bias from omitted variables, the interactions δ_{ct} is also included.

Eq.(1) and Eq.(2) and are a simple but useful first step. They will provide some intuitions about the question of interest. However, they have the inconvenient of focusing on only one policy shock, namely the DL882. As mentioned above, this paper aims at studying the educational privatization as a continuous and progressive process that is the consequence of different legislation changes (cf. Table 1). This is the reason why we propose two additional identification strategies for this natural experiment. The first one is analogous to that of Mazumder et al. (2019, p.245):

$$y_{ipt} = \beta Exposed_{t*} \times \Delta BTI_{p,t'} + \sum_t \left(\mathbf{P}_p \times \tau_t \right) \delta_t + \mathbf{X}_{ipt}\gamma + \alpha_p + \tau_t + \varepsilon_{ipt} \qquad (3)$$

where y_{ipt} is the outcome of interest for individual i, born in province p, in year t. The variable $Exposed_{t*}$ is a dummy that captures the time of exposure to the privatization process. It takes the value of one beginning the year of individual i's entrance to secondary school, t^*. The variable $\Delta BTI_{p,t'}$ is the basal treatment intensity change (change in the number of private secondary schools, in birth province p, between 1993 and individual i's last year t' of secondary education, per 1,000 secondary-school-aged children in p in 1993). The parameters α_p and τ_t are province of birth and year of birth fixed-effects, respectively. The term $\mathbf{P}_p \times \tau_t$ captures birth-year fixed effects interacted with the following province-level covariates: the number of secondary-school-aged children in the province in 1993, the secondary level enrollment rate of the province in 1993, the number of public secondary education schools in 1993, and the number of private secondary education schools in 1993. These interactions control for the factors underlying the allocation of private schools and for other interventions that could confound the privatization process effects. Finally, $\mathbf{X}_{ipt}$ stands for a set of individual characteristics: gender, mother tongue, and migration status. Standards errors are clustered at the province of birth level.

Finally, the alternative identification strategy focuses on TI instead of ΔBTI. Thus:

$$y_{ipt} = \beta Exposed_{t*} \times TI_{p,t'} + \sum_{t} \left(\mathbf{P}_p \times \tau_t \right) \delta_t + \mathbf{X}_{ipt} \gamma + \alpha_p + \tau_t + \varepsilon_{ipt} \qquad (4)$$

By focusing on the number of private schools instead of the number of new private schools, Eq. (4) provides a complementary understanding of the privatization process.

5 Results

5.1 Descriptive provincial dynamics

The number of new private schools built since 1993 is strongly positively correlated with the population at baseline (within the age-group), and negatively related with the number of public schools already existing in the province (cf. Table 3).

Table 3: Secondary education: New private schools built since 1993 at the province level (OLS estimates)

	(1) Until 2004	(2) Until 2008	(3) Until 2012	(4) Until 2016	(5) Until 2019
Population in 1993	1.352***	1.943***	2.255***	2.732***	2.905***
	(0.072)	(0.108)	(0.134)	(0.178)	(0.198)
Nb. of public schools in 1993	-0.350***	-0.509***	-0.624***	-0.704***	-0.749***
	(0.074)	(0.110)	(0.137)	(0.182)	(0.202)
Constant	-1.485	-1.734	-1.783	-3.183	-3.962
	(1.297)	(1.938)	(2.408)	(3.201)	(3.561)
N	191	191	191	191	191
R2	0.846	0.834	0.810	0.786	0.771
R2-adj.	0.844	0.833	0.808	0.784	0.768

Standard errors in parentheses

Source: MINEDU, Censo Escolar. Own elaboration.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The treatment intensity[21] (TI) is not homogeneous across provinces.[22] There are 21 provinces, out of 191, whose treatment intensity remained constant over the whole period of study. They all display a TI equal to zero, which is due to the fact that no private secondary school has been built in their territory, at least since 1993.

According to Table 4, the larger the population at baseline, the larger the number of private schools. Likewise, over the period 1993-2017, provinces that were in the

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[21]See the definitions in section 4.

[22]Due to its large size, Metropolitan Lima has been split into five "provinces" in the present paper: Lima Norte, Lima Este, Lima Centro, Lima Sur, and Callao. The partition follows the one used by the National Bureau of Statistics (INEI, 2014, p.9).

fourth quartile in 1993 according to their TI, are those that experienced the largest increase, in absolute terms, in the number of private schools.

Table 4: Provinces: Age-group population and number of private schools, by treatment intensity quartile in 1993 (secondary level)

Treatment intensity quartile in 1993	N	Age-group population (thousands)		Number of private schools	
		1993	2017	1993	2017
Total	**191**	**13.9** (23.4)	**13.5** (26.0)	**9.3** (35.3)	**26.7** (86.8)
Q1	72	4.4 (3.6)	3.8 (3.1)	0.0 (0.0)	1.6 (3.1)
Q2	24	12.4 (7.1)	10.4 (6.2)	1.6 (1.2)	7.7 (9.6)
Q3	48	13.7 (11.7)	13.1 (12.0)	4.6 (4.2)	16.6 (27.5)
Q4	47	29.5 (41.1)	30.4 (46.4)	32.4 (66.2)	85.3 (159.7)

Note: Standard deviations in parenthesis.
Source: Population Census (INEI) and School Census (MINEDU), 1993 and 2017.
Own elaboration.

It is noteworthy that the treatment intensity dynamics are irregular in some cases. Indeed, TI may increase or decrease in consecutive periods (cf. Figures C.3 and C.4 in the Appendix). As a consequence, unlike Duflo (2001) whose treatment always increases, it is important here to take into account the TI at the moment of schooling for each individual. That is the reason why in Eq.(3) the basal treatment intensity change ΔBTI displays the subscript t^*, which refers to individual i's last year of secondary education.

Table 5 depicts the distribution of provinces according to their current treatment intensity (CTI) quartile in 1993 and 2019. This table suggests that there have been differential relative treatment intensities across provinces. For instance, 61% of provinces in Q1 in 1993 remained in the same relative position in 2019. However, a fifth of them (19%) passed to Q3 in 2019. The most important relative change is observed Q3 of 1993, where 23% passed to Q4 in 2019.

Table 5: Provinces: Current treatment intensity (CTI) distribution, 1993-2019 (%)

			CTI quartile in 2019				
			Total	Q1	Q2	Q3	Q4
CTI quartile in 1993		Total	100	30	20	25	25
		Q1	100	61	15	19	4
		Q2	100	17	54	17	13
		Q3	100	15	19	44	23
		Q4	100	6	11	19	64

Source: School Census 1993 and 2019
(MINEDU), Population Census 1993 (INEI).
Own elaboration.

Figure 4 shows the relationship between net attendance rate and treatment intensity. Two findings are worth noting. First, provinces that had the largest treatment intensity in the baseline (Q4) are those that experienced the largest increases in TI between 1993 and 2017. More generally, the extent of TI seems to be correlated with the initial TI. Second, no matter the initial TI, at the end of the period all quartiles show similar net attendance rates, close to 90%. This implies that public educational services (and concomitant public policies such as the conditional cash transfer program Juntos) have played an important role in the democratization of education, at least in those regions with relatively few private schools.
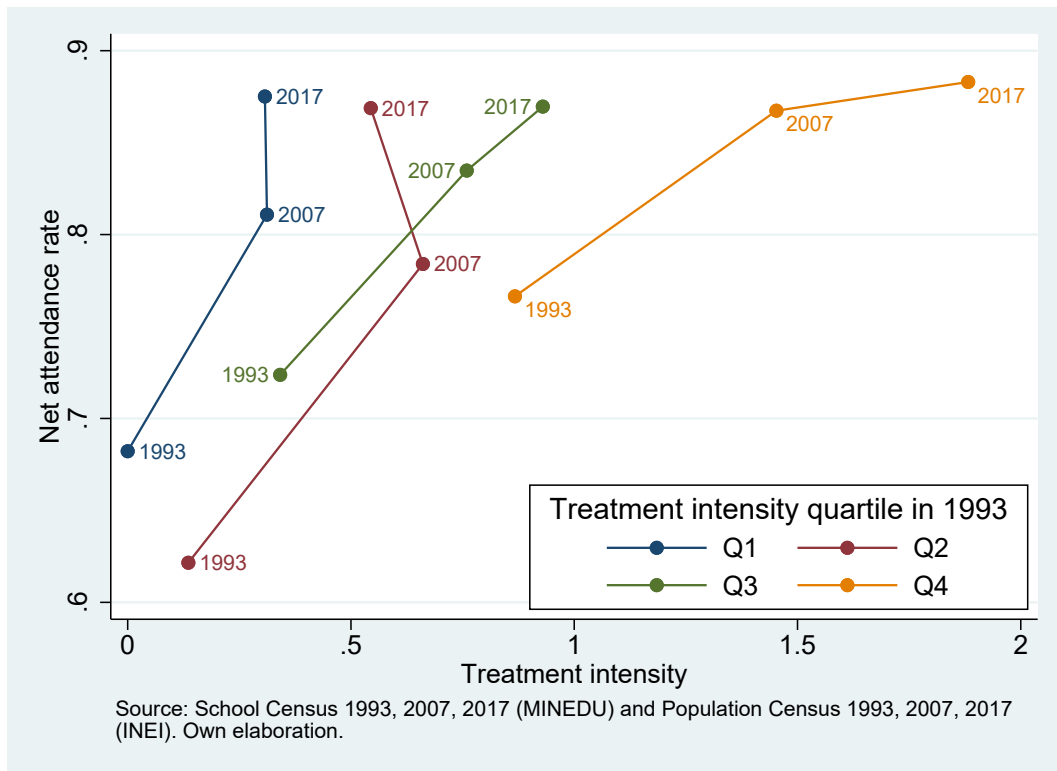
5.2 A simplified overview

Before deploying the empirical strategy presented in section 4, let us consider a simpler descriptive framework. For this purpose, provinces of birth are divided into two groups: high and low intensity treatment. **High intensity** treatment provinces are those of the fourth quartile according to their average ΔBTI for the period 2004-2019. Quartiles 1 to 3 constitute the group of **low intensity** treatment provinces.

High treated provinces display an average ΔBTI equal to 1.39 for the period 2004-2019, whereas low treated provinces have a value of 0.174. In other words, over the period under consideration, in high treated provinces the number of **new** private secondary schools per 1,000 secondary-aged population of 1993, was on average 1.39, at the province level.

Table 6 presents, for different cohorts and types of provinces, means of secondary completion, years of schooling, and real hourly wages. On one hand, panel A depicts the experiment of interest, where individuals with little or no exposure to the privatization process (born between 1970-1980, i.e. finished secondary education by 1986-1996) are compared to those who were exposed during their secondary

Figure 4: Provinces: Net attendance rate by treatment intensity, 1993-2017 (secondary education)

Source: School Census 1993, 2007, 2017 (MINEDU) and Population Census 1993, 2007, 2017 (INEI). Own elaboration.

schooling (born between 1990-2000, i.e. finished secondary education by 2006-2016).[23] On the other hand, panel B depicts a control experiment, which consists on comparing two cohorts that had no exposure to the privatization process.

The results in panel A of Table 6 show that (i) secondary completion was higher in high treated provinces for both cohorts, (ii) more private schools were opened in regions were secondary completion was already high, (iii) secondary completion augmented in both types of provinces; however, it increased more in low treated regions, (iv) the double difference (cf. row 5, column 3) suggests –under a number of identification assumptions– a negative causal effect.

As shown in the previous section, the privatization process varied across regions. According to the control experiment conducted in panel B (with two cohorts that have not been exposed to the privatization process), the double difference is close to zero.

The estimates presented in Table 6 may be biased since they do not control for other factors that may affect enrollment.[24] However, it is an useful illustrative exercise that provides some evidence of the phenomenon under study.

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[23]The sample is restricted to individuals aged 18 to 40 at the moment of the surveys.

[24]Among the simplifications, it can be mentioned, for example, that cohorts have been collapsed mixing different years of birth. However, if examined more in detail, it can be found that pre-trends are plausibly parallel, as depicted by Figure 5.
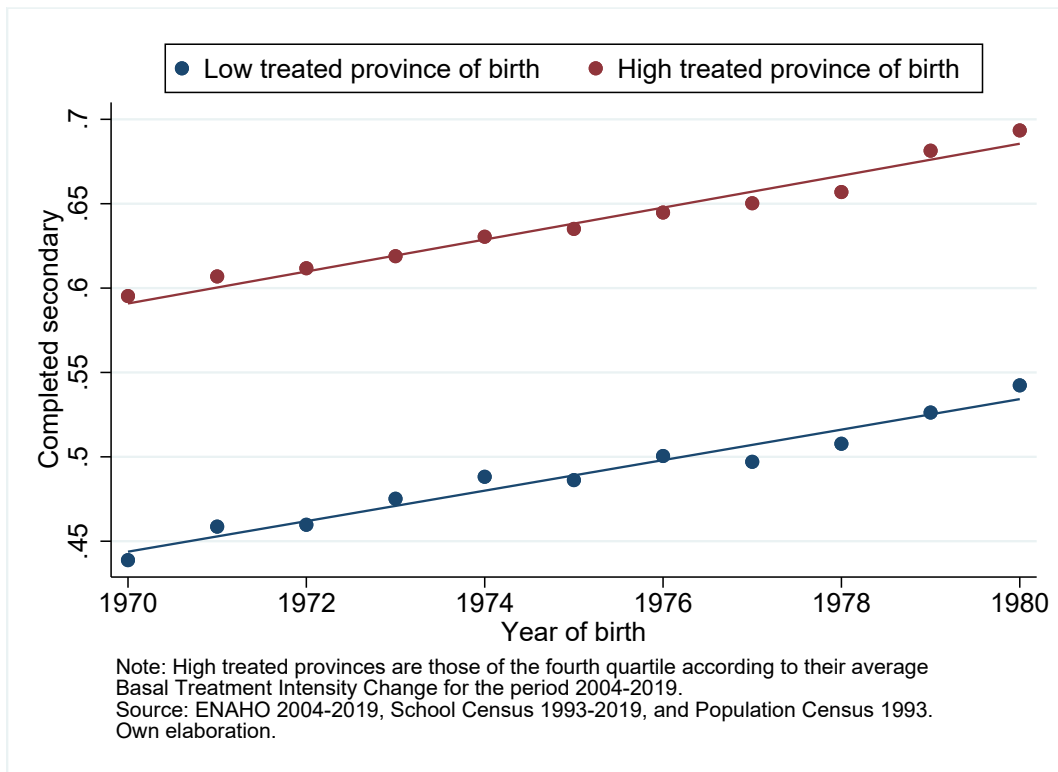
Table 6: Means of secondary completion, years of schooling, and real hourly wages, by cohort and type of exposure to treatment

	Completed secondary			Years of schooling			Real wages		
	Treatment in province of birth			Treatment in province of birth			Treatment in province of birth		
	High (1)	Low (2)	Difference (3)	High (4)	Low (5)	Difference (6)	High (7)	Low (8)	Difference (9)
Panel A: Experiment of interest									
Born 1990-2000	0.834	0.779	0.055***	11.588	11.159	0.429***	4.581	4.035	0.546***
	(0.002)	(0.002)	(0.003)	(0.017)	(0.016)	(0.023)	(0.071)	(0.065)	(0.096)
Born 1970-1980	0.676	0.588	0.088***	10.75	9.909	0.841***	8.371	7.681	0.69***
	(0.003)	(0.003)	(0.004)	(0.026)	(0.024)	(0.035)	(0.115)	(0.11)	(0.158)
Difference	0.157***	0.191***	-0.034***	0.838***	1.25***	-0.412***	-3.79***	-3.646***	-0.144
	(0.004)	(0.003)	(0.005)	(0.029)	(0.027)	(0.039)	(0.135)	(0.127)	(0.185)
Panel B: Control experiment									
Born 1970-1979	0.669	0.582	0.087***	10.689	9.868	0.821***	8.478	7.81	0.668***
	(0.003)	(0.003)	(0.004)	(0.028)	(0.025)	(0.037)	(0.129)	(0.122)	(0.176)
Born 1960-1969	0.606	0.517	0.09***	10.022	9.206	0.817***	8.105	6.886	1.219***
	(0.008)	(0.006)	(0.01)	(0.072)	(0.061)	(0.093)	(0.301)	(0.212)	(0.366)
Difference	0.063***	0.066***	-0.003	0.667***	0.662***	0.004	0.373	0.923***	-0.551
	(0.008)	(0.006)	(0.01)	(0.072)	(0.061)	(0.093)	(0.326)	(0.244)	(0.407)

* $p<0.1$, ** $p<0.05$, *** $p<0.01$. Standard errors in parenthesis.
Sources: National Household Survey 2004-2019, Population Census 1993, and School Census 1993-2019.
Own elaboration.

Figure 5: Pre-trends in secondary school completion

Note: High treated provinces are those of the fourth quartile according to their average
Basal Treatment Intensity Change for the period 2004-2019.
Source: ENAHO 2004-2019, School Census 1993-2019, and Population Census 1993.
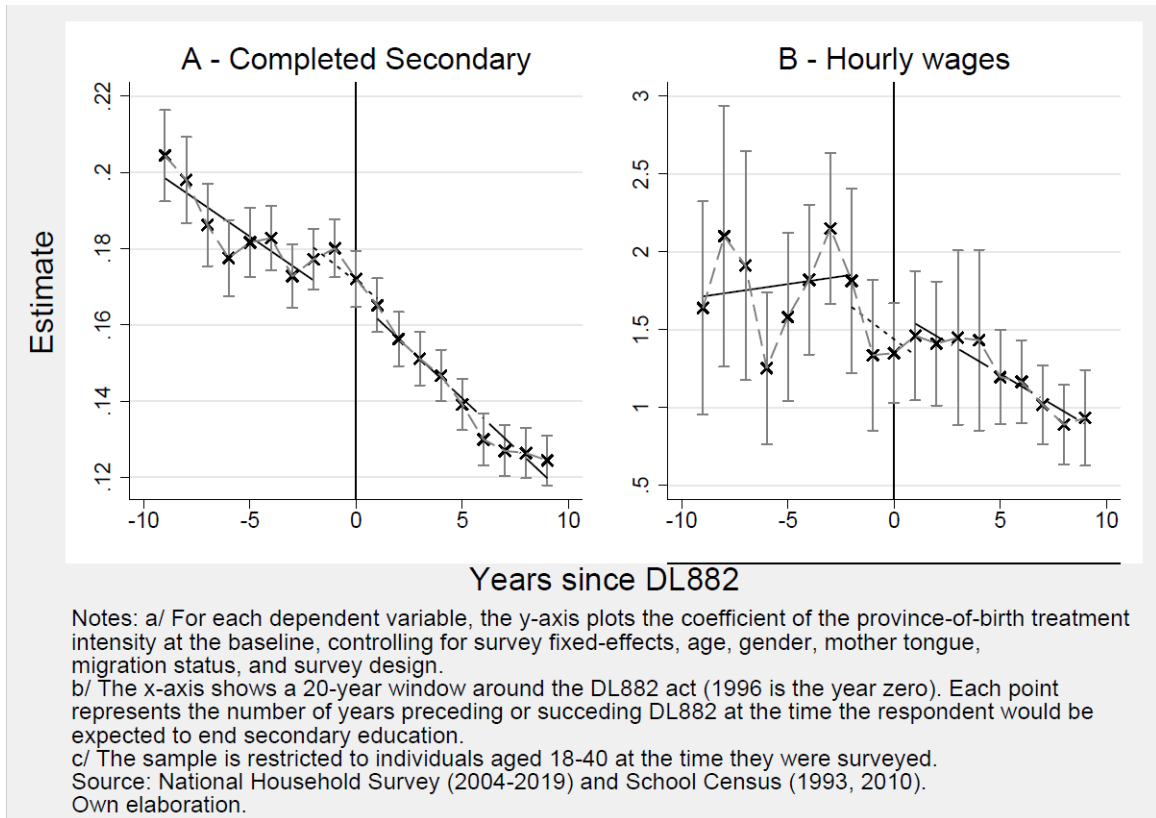Own elaboration.

5.3 Complete estimation

Before showing the results of the equations stated in section 4, let us start with a graphical event study. Figure 6 plot the estimated relationships between our dependent variables and the initial treatment intensity (i.e. TI in 1993, that is, three years before DL882) at the province-of-birth level. The initial TI determines the individual probability of treatment. The x-axis shows 10 years before and after DL882 (i.e. the year of the DL882 act, 1996, is year zero). Each point represents the number of years preceding or succeeding DL882 at the time the respondent would be expected to end secondary education. For each dependent variable, the y-axis plots the coefficient of the province-of-birth treatment intensity at the baseline, controlling for survey fixed-effects, age, gender, mother tongue, migration status, and survey design. Regression fits are provided separately for the pre-and post-DL882 periods with 95% confidence intervals for each coefficient. The figure shows that treated cohorts that finished secondary education after DL882 experienced a decrease in the probability for secondary school completion and hourly wages, compared to the pre-intervention period. The graph suggest a pre-trend in Panel A. However, if we look closer, for example between years -5 and +5, the fitted line would be more flat.

Table 7 presents the results of Eq.(1). For both dependent variables –secondary completion and hourly real wages– the treatment effect is negative. Indeed, after the DL882, individuals born in provinces with initial high private sector participation, show a 7% reduction in their probability for secondary education completion.

17

Figure 6: Graphical event study

Notes: a/ For each dependent variable, the y-axis plots the coefficient of the province-of-birth treatment intensity at the baseline, controlling for survey fixed-effects, age, gender, mother tongue, migration status, and survey design.
b/ The x-axis shows a 20-year window around the DL882 act (1996 is the year zero). Each point represents the number of years preceding or succeding DL882 at the time the respondent would be expected to end secondary education.
c/ The sample is restricted to individuals aged 18-40 at the time they were surveyed.
Source: National Household Survey (2004-2019) and School Census (1993, 2010).
Own elaboration.

Likewise, their real wages are expected to decrease by almost 1 Peruvian sol per worked hour. Correspondingly, the results of the period-cohort specification (cf. Eq.(2)) presented in Table 9 depict similar patterns, however much stronger (at least twice as large as the previous table).

As stated before, these regressions does not allow to provide a complete picture of the complexity of the privatization process. Therefore, let us exploit the variation in treatment[25] across provinces and cohorts.

The implementation of Eq.(3) with *completed secondary education* as the dependent variable is presented in Figure 7, which plots the β of interest, i.e. the coefficient of the interaction between $Exposed_t$ and $\Delta BTI_{p,t'}$ (cf. section 4), for different cohorts.[26] Because, by definition, ΔBTI is zero for cohorts that started secondary school before 1993, the first cohort observed is the one born in 1987, which started secondary school in 1998 (the first year after 1993 for which we have data on the School Census, as detailed in section 4). In this context, a consistent decline of the effect on secondary school completion is observed. However, the upper bound of the confidence interval at the 5% of significance level is very close to zero. In terms of wages, Figure 8 shows that the consistent decline starts for cohorts born during the 1990 decade.

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[25]More precisely, the variation in terms of TI and ΔBTI.
[26]The complete regressions' results are presented for some key cohorts in Appendix D. Both TI and ΔBTI are alternatively used as measures of treatment.

Table 7: Effect of the educational privatization expansion on secondary completion and hourly wages (cf. Eq. 1)

	(1) Comp. Sec.	(2) Hourly wages
post X TI93	-0.067*** (0.011)	-0.912*** (0.218)
Female	-0.056*** (0.007)	-3.990*** (0.087)
Indigenous mother tongue	-0.314*** (0.012)	-2.036*** (0.172)
Migrated from province of birth	0.043*** (0.008)	1.344*** (0.151)
No. of obs.	513,906	514,277
R-squared	0.213	0.016

Note: Regressions include cohort and province of birth fixed-effects.
Robust standard errors in parentheses are clustered at the province of birth level.
Source: National Household Survey 2004-2019. Own elaboration.
* p<0.10, ** p<0.05, *** p<0.01

Table 8: Effect of the educational privatization expansion on secondary completion and hourly wages (cf. Eq. 2)

	(1) Comp. Sec.	(2) Hourly wages
TI93 X exposure	-0.176*** (0.030)	-1.951*** (0.659)
Female	-0.056*** (0.007)	-4.082*** (0.088)
Indigenous mother tongue	-0.313*** (0.012)	-2.300*** (0.175)
Migrated from province of birth	0.043*** (0.008)	1.158*** (0.157)
No. of obs.	513,906	514,277
R-squared	0.218	0.024

Note: Regressions include province of birth fixed-effects and interactions
between cohort and survey year. Robust standard errors in
parentheses are clustered at the province of birth level.
Source: National Household Survey 2004-2019. Own elaboration.
* p<0.10, ** p<0.05, *** p<0.01

Figure 7: Coefficients of the interactions Exposed * Basal Treatment Intensity Change in the province of birth (Dependent variable: Completed secondary education)
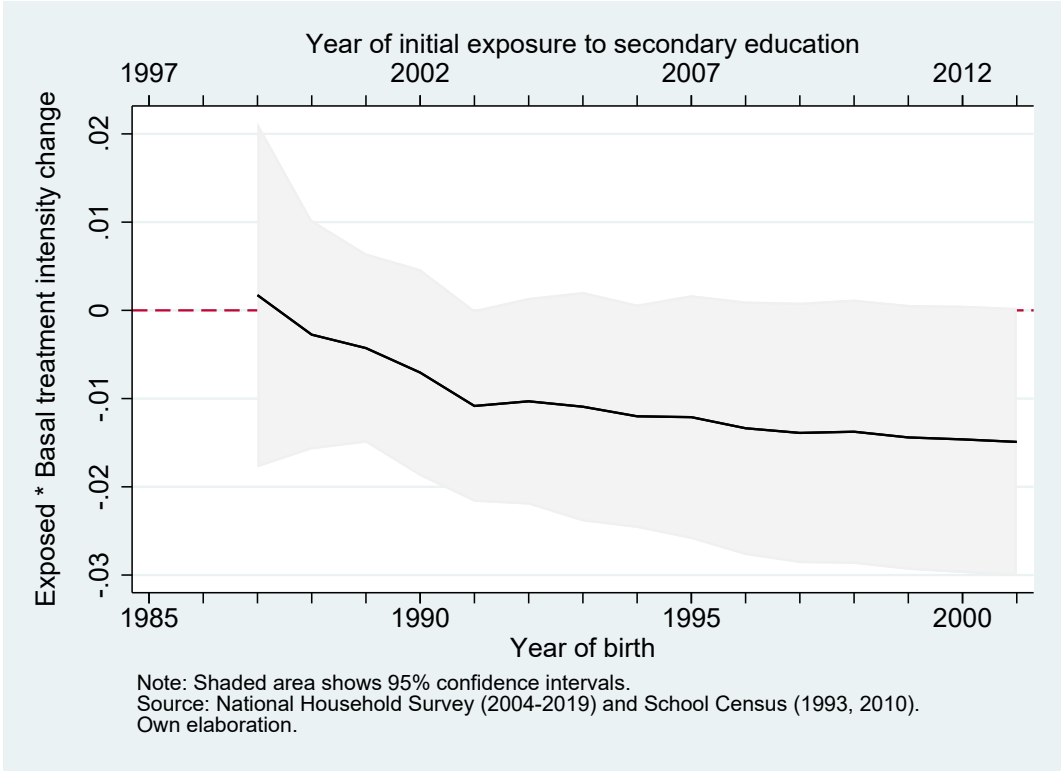

Note: Shaded area shows 95% confidence intervals.
Source: National Household Survey (2004-2019) and School Census (1993, 2010).
Own elaboration.

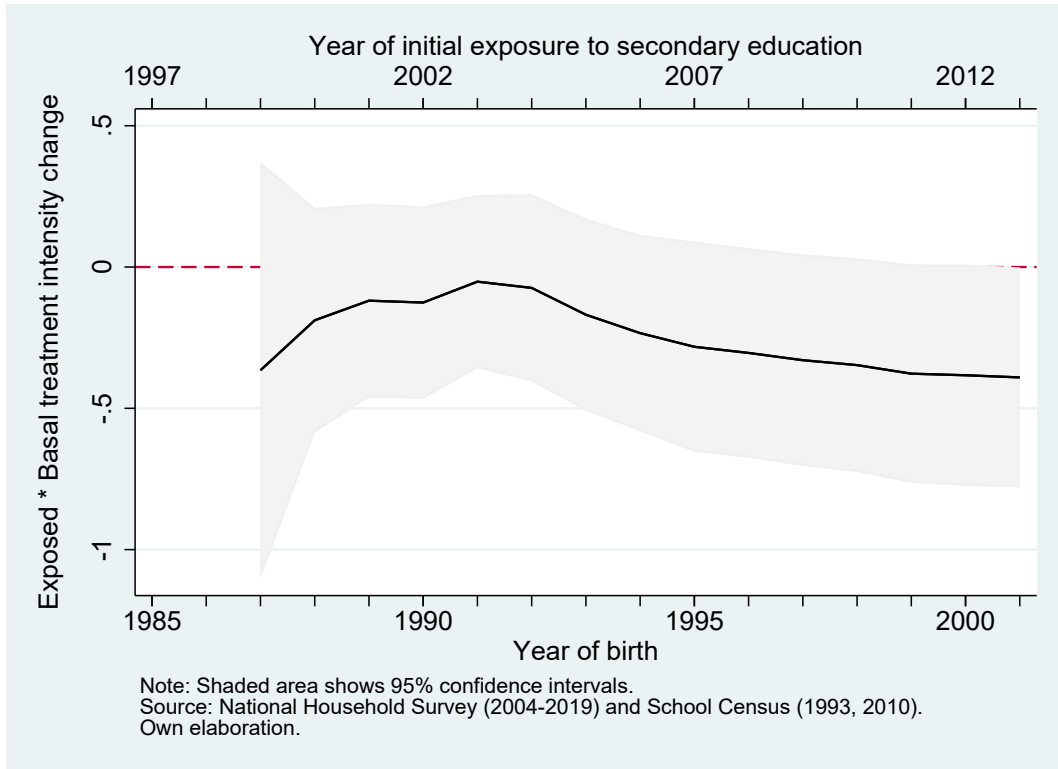**Table 9:** Effect of the educational privatization expansion on secondary completion and hourly wages (cf. Eq. 2)

	(1) Comp. Sec.	(2) Hourly wages
TI93 X exposure	-0.176*** (0.030)	-1.951*** (0.659)
Female	-0.056*** (0.007)	-4.082*** (0.088)
Indigenous mother tongue	-0.313*** (0.012)	-2.300*** (0.175)
Migrated from province of birth	0.043*** (0.008)	1.158*** (0.157)
No. of obs.	513,906	514,277
R-squared	0.218	0.024

Note: Regressions include province of birth fixed-effects and interactions
between cohort and survey year. Robust standard errors in
parentheses are clustered at the province of birth level.
Source: National Household Survey 2004-2019. Own elaboration.
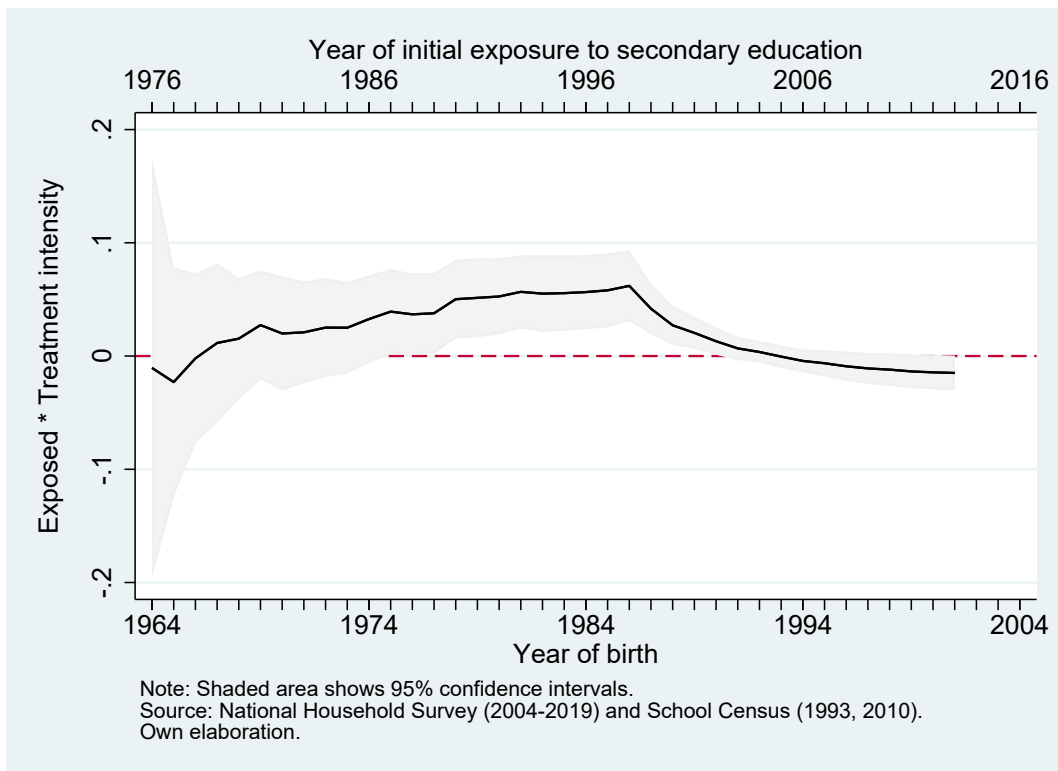* p<0.10, ** p<0.05, *** p<0.01

Figure 8: Coefficients of the interactions Exposed * Basal Treatment Intensity Change in the province of birth (Dependent variable: Real wage)

Note: Shaded area shows 95% confidence intervals.
Source: National Household Survey (2004-2019) and School Census (1993, 2010).
Own elaboration.

Clearer trends are observed when considering the variation in terms of TI, instead of ΔBTI, across provinces. Regarding secondary completion, Figure 9 shows that the coefficient of the interaction term becomes positive for individuals who entered secondary school by 1987 and afterward. However, the positive effect vanishes for those entered as of 2004. A sharp change in the trend is observed a couple of years after the privatization law[27]

Furthermore, an interesting parallel is established when using real wages as dependent variable (cf. Figure 10). This time, the interaction term shows a similar behavior as the one previously observed in Figure 9. In particular, the effect appears to be positive approximately for the same cohorts (born between 1975 and 1990) with a strong intensification of the trend decline for exposures right after the privatization law.
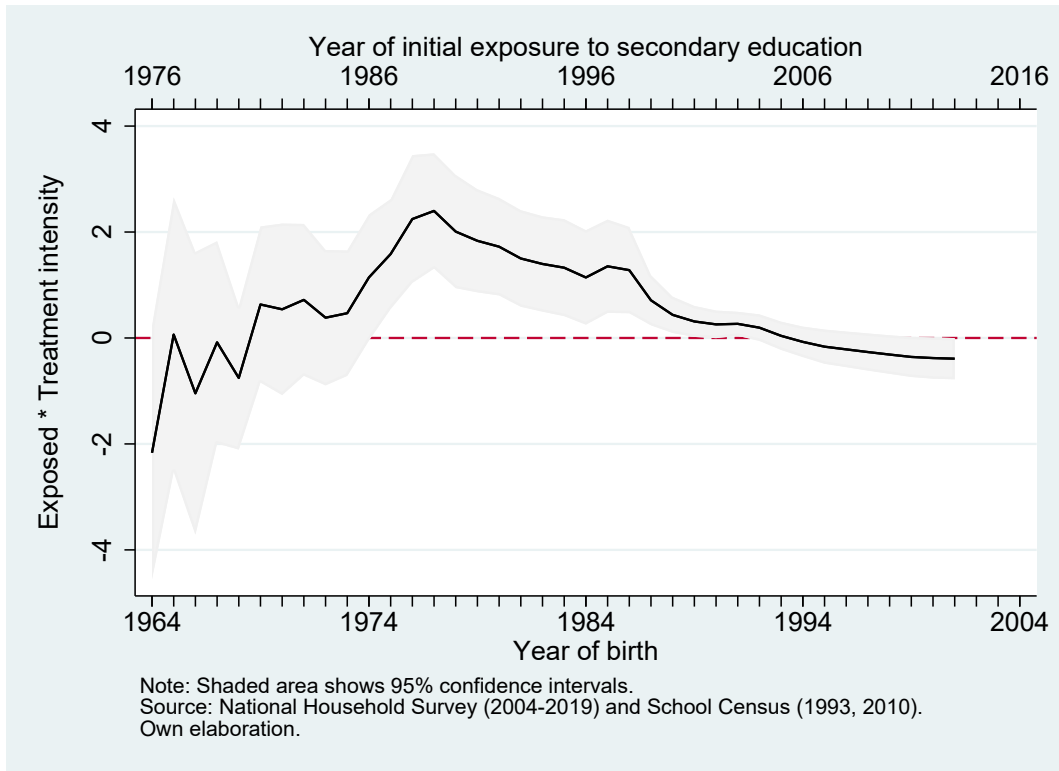
Figure 9: Coefficients of the interactions Exposed * Treatment Intensity in the province of birth (Dependent variable: Completed secondary education)

Note: Shaded area shows 95% confidence intervals.
Source: National Household Survey (2004-2019) and School Census (1993, 2010).
Own elaboration.

In sum, the results shown in this section suggest that the privatization explosion (particularly noticed from 2004 afterward) has been detrimental in terms of both education and wages. More precisely, the control group increased more rapidly the outcomes under study.

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[27]It is worth recalling that this law enacted in 1996 was one of the most important legislation changes during the last thirty years. However, it is not the only one (cf. section 3.1 and Table 1).

Figure 10: Coefficients of the interactions Exposed * Treatment Intensity in the province of birth (Dependent variable: Real wage)

Note: Shaded area shows 95% confidence intervals.
Source: National Household Survey (2004-2019) and School Census (1993, 2010).
Own elaboration.

6   Concluding remarks

The present paper studies the effects of the educational privatization process that took place in Peru since the decade of 1990 on both secondary school completion and real hourly wages. This is a particularly relevant case of study, since this country is an example of almost extreme liberalization, where the state has no much intervention in the configuration of the educational market.

Using household surveys as well as population and school censuses, the empirical strategy exploits the variation on the private school expansion across provinces and the year of birth of individuals. These exogenous variables determine the degree of exposure to the privatization process.

The results show that provinces with initial intense presence of private schools, are those where the private expansion increased more. The Peruvian private school expansion process is much different from what is documented for other latitudes, for example in Pakistan (Andrabi, Das, & Khwaja, 2008). Also, results suggest that the treatment has a negative effect on the outcomes under study for the youngest cohorts, after an initial period of positive effects.

The finding that the expansion of private schools lead to worse educational outcomes may seem counter-intuitive. One possible explanation is that parents mistakenly think that new private schools are better than the existing public ones, but in fact they are worse. Probably parents are not able to discern school quality opportunely,

23

and by the time they figure this out it is too late to get their children back into public schools. In any case, it is worth recalling that the methodology compares *more treated* versus *less treated* provinces, as a consequence, results have to be understood in these relative terms.

Regarding methodology, the extent of the presence of private schools (treatment intensity TI), instead of the number of new schools (basal treatment intensity change (ΔBTI), shows clearer trends in the decline of the effect on secondary completion and real wages.

These findings point that the liberalization of educational markets not necessarily leads to better outcomes for the educational system, and in the mid-term, neither for labor market outcomes.

References

Akresh, R., Halim, D., & Kleemans, M. (2018). *Long-term and Intergenerational Effects of Education: Evidence from School Construction in Indonesia* (Tech. Rep.). National Bureau of Economic Research.

Andrabi, T., Das, J., & Khwaja, A. I. (2008). A dime a day: The possibilities and limits of private schooling in Pakistan. *Comparative Education Review*, *52*(3), 329–355. doi: 10.1086/588796

Arteaga, I., & Glewwe, P. (2019, mar). Do community factors matter? An analysis of the achievement gap between indigenous and non-indigenous children in Peru. *International Journal of Educational Development*, *65*, 80–91. doi: 10.1016/j.ijedudev.2017.08.003

Balarín, M. (2015). *The Default Privatization of Peruvian Education and the Rise of Low-fee Private Schools: Better or Worse Opportunities for the Poor?* (Tech. Rep.). The Education Support Program.

Balarín, M. (2016). La privatización por defecto y el surgimiento de las escuelas privadas de bajo coste. *Revista de la Asociación de Sociología de la Educación*, *9*(2), 181–196.

Balarín, M. (2017). *La trayectoria reciente y situación actual de la educación privada en el Perú* (Tech. Rep.). Lima: FORGE.

Balarín, M., & Escudero, A. (2019). The ungoverned education market and the deepening of socio-economic school segregation in Peru. In X. Bonal & C. Bellei (Eds.), *Understanding school segregation: Patterns and consequences of spatial inequalities in education* (pp. 179–200). London: Bloombsbury.

Balarín, M., Kitmang, J., Ñopo, H., & Rodríguez, M. (2018). *Mercado privado, consecuencias públicas. Los servicios educativos de provisión privada en el Perú* (Tech. Rep.). Lima: Grupo de Análisis para el Desarrollo, GRADE.

Benavides, M., León, J., & Etesse, M. (2014). Desigualdades educativas y segregación en el sistema educativo peruano: una mirada comparativa de las pruebas PISA 2000 y 2009. *Avances de Investigación*.

Carey, G., Malbon, E., Green, C., Reeders, D., & Marjolin, A. (2020, jan). Quasi-market shaping, stewarding and steering in personalization: the need for practice-orientated empirical evidence. *Policy Design and Practice*, *3*(1), 30–44. doi: 10.1080/25741292.2019.1704985

Chong, A., Galdo, J., & Saavedra, J. (2008). Informality and productivity in the labor market in Peru. *Journal of Economic Policy Reform*, *11*(4), 229–245. doi: 10.1080/17487870802543480

Cuenca, R. (2013). La escuela pública en Lima Metropolitana. ¿Una institución en extinción? *Revista Peruana de Investigación Educativa*, *5*, 73–78.

Day Ashleym, L., Mcloughlin, C., Aslam, M., Engel, J., Wales, J., Rawal, S., . . . Rose, P. (2014). *The role and impact of private schools in developing countries: a rigorous review of the evidence* (Tech. Rep.). London: Department for International Development.

Duflo, E. (2001). Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment. *The American Economic Review*, *91*(4), 795–813. doi: 10.2307/2677813

Figueroa, A. (2015). *Growth, employment, inequality, and the environment: Unity of Knowledge in Economics. Volume II.* Palgrave Macmillan.

Glewwe, P., & Kremer, M. (2006). Chapter 16 Schools, Teachers, and Education Outcomes in Developing Countries. In E. Hanushek & F. Welch (Eds.), *Handbook of the economics of education* (pp. 945–1017). Amsterdam: North-Holland. doi: 10.1016/S1574-0692(06)02016-2

Guadalupe, C., León, J., Rodríguez, J., & Vargas, S. (2017). *Estado de la Educación en el Perú. Análisis y perspectivas de la educación básica.* Lima: Grupo de Análisis para el Desarrollo (GRADE).

Haddad, W. (1994). *The dynamics of education policymaking. Case studies of Burkina Faso, Jordan, Peru, and Thailand.* Washington, DC: The World Bank.

ILO. (1994). *Labor overview: Latin America and the Caribbean.* Lima: International Labor Organization.

INEI. (2014). *Una mirada a Lima Metropolitana.* Lima: Instituto Nacional de Estadística e Informática.

Kuecken, M., Thuilliez, J., & Valfort, M.-A. (2020, dec). Disease and Human Capital Accumulation: Evidence from the Roll Back Malaria Partnership in Africa. *The Economic Journal.* doi: 10.1093/ej/ueaa134

Leyva, J. (2017). *Determinantes de la expansión del sistema privado de educación básica en el Perú* (Master thesis). Pontificia Universidad Católica del Perú.

Mazumder, B., Rosales-Rueda, M., & Triyana, M. (2019). Intergenerational Human Capital Spillovers: Indonesia's School Construction and Its Effects on the Next Generation. *American Economic Association Papers and Proceedings*, *109*, 243–249. doi: 10.1257/pandp.20191059

Minedu. (2017). *¿Cuánto aprenden nuestros estudiantes? Resultados de la ECE 2016.* Lima: Ministerio de Educación.

Romero, M., Sandefur, J., & Sandholtz, W. A. (2020). Outsourcing education: Experimental evidence from Liberia. *American Economic Review*, *110*(2), 364–400. doi: 10.1257/aer.20181478

Saavedra, J., & Torero, M. (2004). Labor market reforms and their impact over formal labor demand and job market turnover. The case of Peru. In J. J. Heckman & C. Pagés (Eds.), *Law and employment: Lessons from latin america and the caribbean* (pp. 131–182). University of Chicago Press.

Sanz, P. (2014). *"We don't need the state": A study of the habitus formation process, through school choice, in Peru's rising middle class. A qualitative study of school choice* (PhD Thesis). University of Bath.

Urquiola, M. (2016). Competition among schools: Traditional public and private schools. In *Handbook of the economics of education* (Vol. 5, pp. 209–237). Elsevier. doi: 10.1016/B978-0-444-63459-7.00004-X

Verger, A., Fontdevila, C., & Zancajo, A. (2016). *The privatization of education : A political economy of global education reform.* New York: Teachers College Press.

Yamada, G., Lavado, P., & Martínez, J. (2015). *An Unfulfilled Promise? Higher Education Quality and Professional Underemployment in Peru* (Tech. Rep.). Bonn: IZA.

Appendices

A   Theoretical background

Consider a model with three social groups, hierarchically defined by their ethnic origins and their position in the production process: white capitalists (A), mixed workers (X), and native workers (Z).[28] In this society, the conversion of years of schooling into human capital is heterogeneous, depending on the social group.[29] Indeed, children of richer households attend higher-quality schools and therefore obtain higher levels of human capital for a given educational level, as depicted in Figure A.1. Social groups accumulate human capital along different paths.

Let assume that firms buy human capital (and not years of education) in the labor market. In this context, "profit-maximizing firms will generate hierarchical labor markets based on the human capital level of workers, in which wage rates will be higher in labor markets for higher human capital levels (...) Therefore, in the labor market, those X-workers and Z-workers that have the same years of education will not get the same wage rate" (Figueroa, 2015, p.19). Figure A.2 shows that, for a given number of years of formal education E, the market wages are different for each social group, which is explained by their differences in human capital (Figure A.1).

Therefore, the theory predicts that white capitalists, mixed workers, and native workers, will accumulate human capital hierarchically in that order, and also that this fact will be reflected in the wages they will obtain in the labor market. As a consequence, a supply shock of private schools would not affect this hierarchy. Mixed and native workers may increase their years of schooling, but the final result in terms of human capital and real wages will remain unchanged.

The structural equations are as follows:

$$h = F(E, S), \quad F_i > 0, \quad where \ S = (A, X, Z) \tag{5}$$

$$y = G(h, S), \quad G_i > 0 \tag{6}$$

---

[28]This scheme is pertinent for societies with a strong colonial legacy and large native populations, such as the Peruvian case. The scheme is also correlated with language inequality because there exists a hierarchy of languages. Spanish is the dominant language, whereas Quechua, Aymara, and others, –despite being the mother tongue of a fifth of the total population– act as strong social markers.

[29]This theory assumes that "students participating in the education process will be endowed with unequal cognitive skills or capacities, depending on the social group to which they belong. Nutrition, health, and early intellectual stimulation are the main channels through which the wealthy can develop higher levels of learning capacity in their children when compared to the poor. (. . .) [In addition], language proficiency, which is also associated with the socioeconomic level of households, is another factor that brings inequality in developing cognitive skills" (Figueroa, 2015, p.13). It is worth mentioning that in Peru there exist several native languages, but Spanish is dominant. Different accents in Spanish also acts as social markers.

Figure A.1: Relations between education and human capital, by social groups A, X, and Z
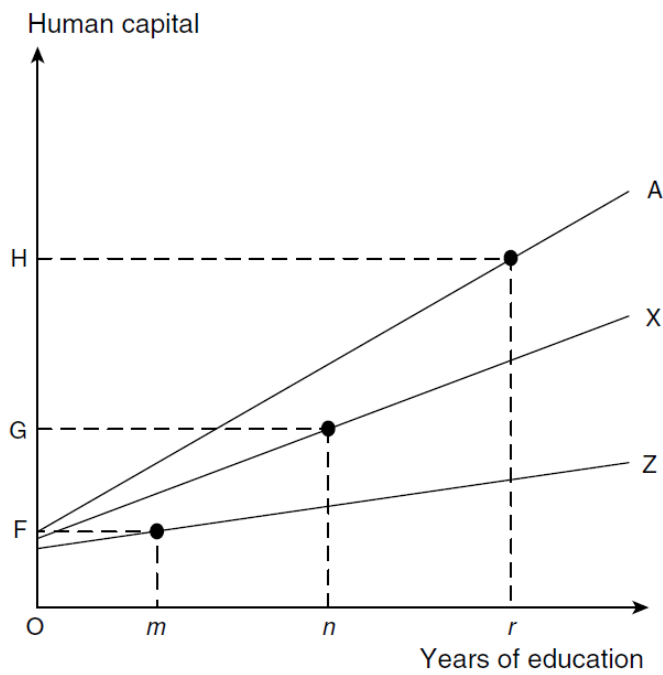
Source: Figueroa (2015, p.17).

Figure A.2: Wages (y) and years of education (E) relationships, by social groups A, X, and Z
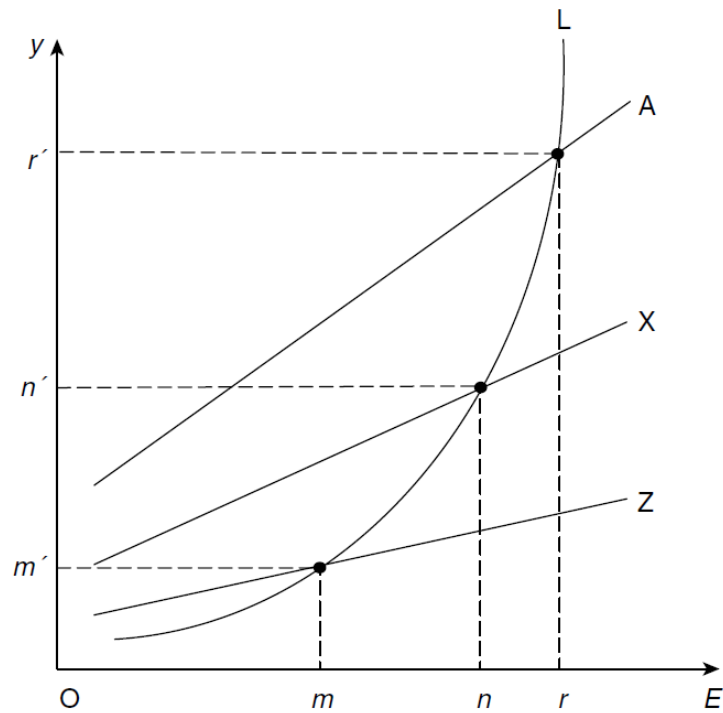
Source: Figueroa (2015, p.22).

28

$$y = \Phi(E, S), \quad \Phi_i > 0 \tag{7}$$

Where h is the human capital, E the number of years of education, S a qualitative variable that represents the social background, i.e. the three social groups defined above, and y the labor market income. "Income increases with years of schooling, and given the number of years of schooling, it increases with the order of the social background" (Figueroa, 2015, p.21)

B Labor market regulation

Labor market regulation deserves some discussion for it is potentially a confounding factor in the analysis.

Until 1991, the Peruvian Labor Code had the reputation of being restrictive, protectionist, and cumbersome (ILO, 1994). However, in that year, "labor market regulations were relaxed through a succession of reforms. Firing costs diminished sharply through the progressive elimination of job stability regulations, the reduction in red tape for the use of temporary contracts, and changes in the severance payment structure" (Saavedra & Torero, 2004, p.132).

A second wave of reforms was carried out in 1995. Indeed, the prior job security rules and the two-tier regime were eliminated. "These changes, plus the reduction in severance payments, implied a sharp reduction in firing costs, which may be interpreted as a lower level of the tax on dismissals perceived by firms" (Saavedra & Torero, 2004, p.137).

The results of the structural reforms on labor market outcomes were unexpected. Especially, "the rate of informality increased steadily during the 1990s despite the increased benefits of formality through the deregulation of the labor markets, a healthy macroeconomic recovery, and tighter tax codes and regulation" (Chong, Galdo, & Saavedra, 2008, p.244).

Since the global quality of jobs did not increase during this period, it can be argued that there is no incentive effect from the labor market that confounds with the reforms in the educational market.
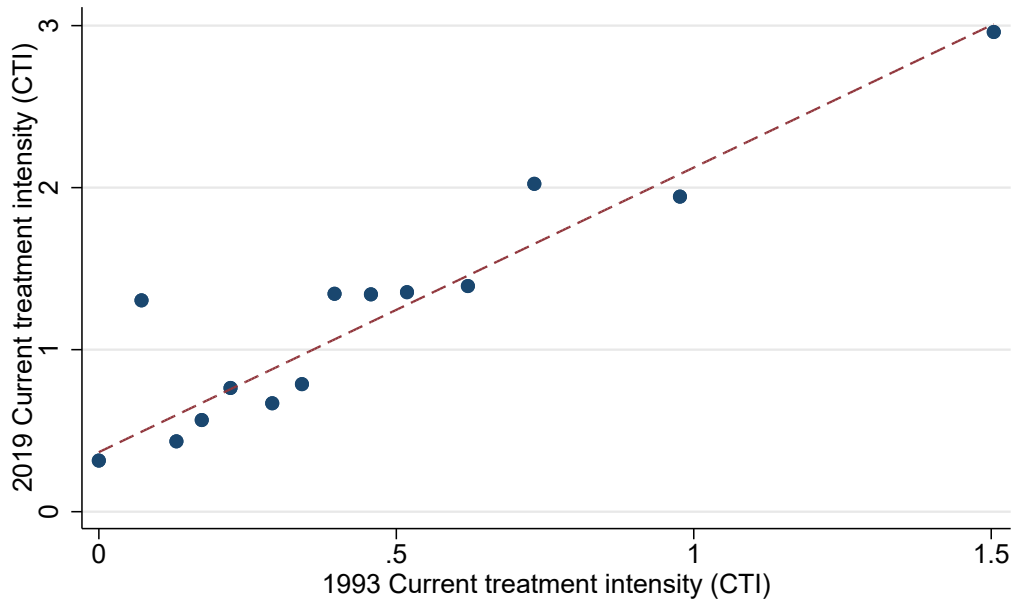
C Figures

Figure C.1: Metropolitan Lima: Public and private schools, 2004-2012
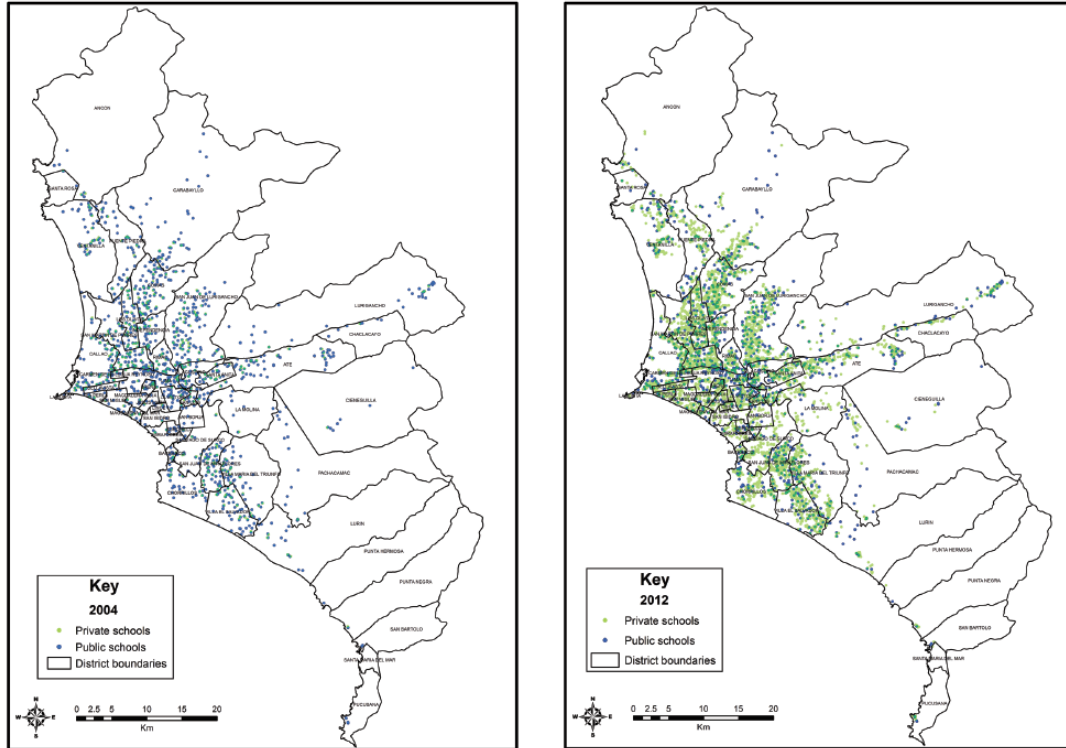

Source: Balarín (2015, p.10).

**Figure C.2:** Provinces: Current treatment intensity, 1993-2017

1/ Nonparametric representation of the conditional expectation function with 14 equal-sized bins (quantiles of the 1993 CTI).
2/ Lima is splitted in four regions.
Source: School Census 1993 and 2017 (MINEDU), and Population Census 1993 and 2017 (INEI).
Own elaboration.

Figure C.3: Provinces with high average treatment intensity, 1993-2019
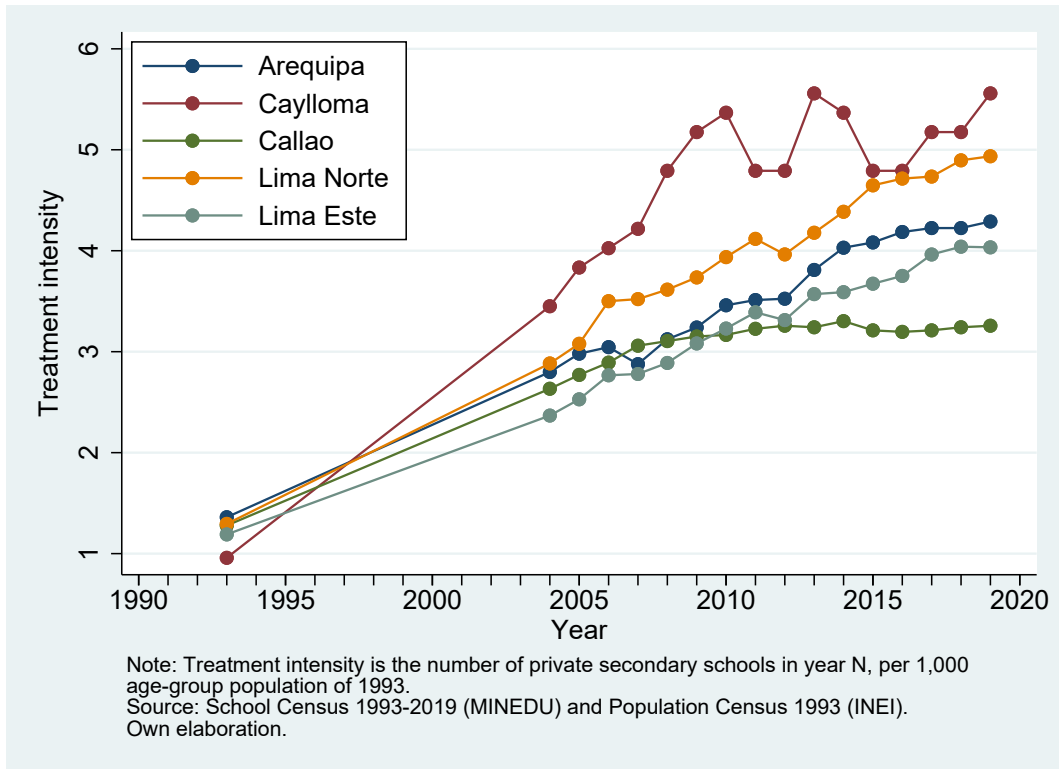
Note: Treatment intensity is the number of private secondary schools in year N, per 1,000 age-group population of 1993.
Source: School Census 1993-2019 (MINEDU) and Population Census 1993 (INEI).
Own elaboration.

Figure C.4: Provinces with at least six periods of decreasing treatment intensity, 1993-2019

Note: Treatment intensity is the number of private secondary schools in year N, per 1,000 age-group population of 1993.
Source: School Census 1993-2019 (MINEDU) and Population Census 1993 (INEI). Own elaboration
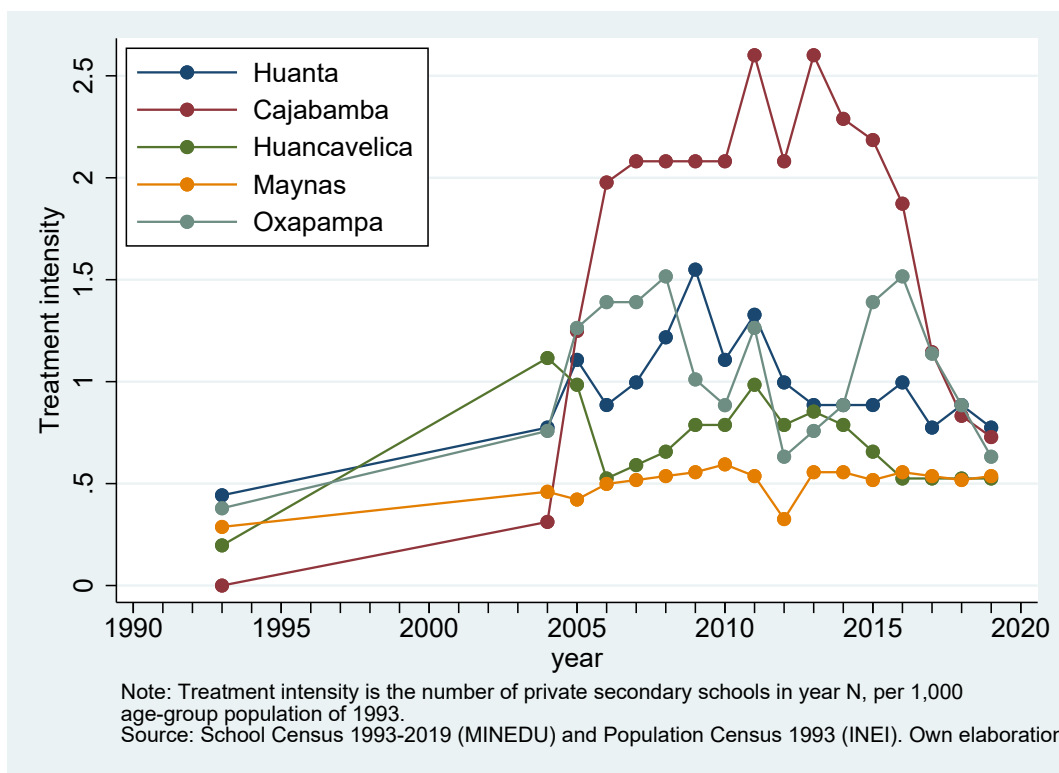
D Tables

Table D.1: Basal treatment intensity change: Effect of the educational privatization expansion on secondary completion (cf. Eq. 3)

	Exposed=1 if born before		
	(1) 1990	(2) 1995	(3) 2000
Exposed X Intesity	-0.007 (0.006)	-0.012* (0.007)	-0.015* (0.008)
Female	-0.056*** (0.007)	-0.056*** (0.007)	-0.056*** (0.007)
Indigenous mother tongue	-0.314*** (0.012)	-0.314*** (0.012)	-0.314*** (0.012)
Migrated from province of birth	0.044*** (0.008)	0.044*** (0.008)	0.044*** (0.008)
No. of obs.	512,314	512,314	512,314
R-squared	0.215	0.215	0.215

Note: All regressions include the following fixed effects: province of birth, year of birth, and year of birth interacted with province-level covariates.

Robust standard errors in parentheses are clustered at the province of birth level.

Source: National Household Survey 2004-2019. Own elaboration.

* p<0.10, ** p<0.05, *** p<0.01

Table D.2: Basal treatment intensity change: Effect of the educational privatization expansion on real wages (cf. Eq. 3)

	Exposed=1 if born before		
	(1) 1990	(2) 1995	(3) 2000
Exposed X Intesity	-0.126 (0.173)	-0.282 (0.188)	-0.383* (0.198)
Female	-3.993*** (0.087)	-3.993*** (0.087)	-3.992*** (0.087)
Indigenous mother tongue	-2.070*** (0.174)	-2.071*** (0.174)	-2.070*** (0.174)
Migrated from province of birth	1.346*** (0.151)	1.346*** (0.151)	1.347*** (0.152)
No. of obs. R-squared	512,684 0.017	512,684 0.017	512,684 0.017

Note: All regressions include the following fixed effects: province of birth, year of birth, and year of birth interacted with province-level covariates.

Robust standard errors in parentheses are clustered at the province of birth level.

Source: National Household Survey 2004-2019. Own elaboration.

* p<0.10, ** p<0.05, *** p<0.01

Table D.3: Treatment intensity: Effect of the educational privatization expansion on secondary completion (cf. Eq. 4)

	Exposed=1 if born before			
	(1) 1970	(2) 1980	(3) 1990	(4) 2000
Exposed X Intesity	0.020 (0.025)	0.053*** (0.017)	0.013** (0.006)	-0.014* (0.008)
Female	-0.056*** (0.007)	-0.056*** (0.007)	-0.056*** (0.007)	-0.056*** (0.007)
Indigenous mother tongue	-0.314*** (0.012)	-0.313*** (0.012)	-0.314*** (0.012)	-0.314*** (0.012)
Migrated from province of birth	0.044*** (0.008)	0.044*** (0.008)	0.044*** (0.008)	0.044*** (0.008)
No. of obs. R-squared	512,314 0.215	512,314 0.216	512,314 0.215	512,314 0.215

Note: All regressions include the following fixed effects: province of birth, year of birth, and year of birth interacted with province-level covariates.

Robust standard errors in parentheses are clustered at the province of birth level.

Source: National Household Survey 2004-2019. Own elaboration.

* p<0.10, ** p<0.05, *** p<0.01

Table D.4: Treatment intensity: Effect of the educational privatization expansion on real wages (cf. Eq. 4)

	Exposed=1 if born before			
	(1) 1970	(2) 1980	(3) 1990	(4) 2000
Exposed X	0.541	1.724***	0.257*	-0.379*
Intesity	(0.820)	(0.466)	(0.132)	(0.197)
Female	-3.993***	-3.994***	-3.993***	-3.992***
	(0.087)	(0.087)	(0.087)	(0.087)
Indigenous	-2.069***	-2.049***	-2.067***	-2.071***
mother tongue	(0.174)	(0.173)	(0.173)	(0.174)
Migrated	1.346***	1.346***	1.347***	1.347***
from province of birth	(0.151)	(0.151)	(0.151)	(0.152)
No. of obs.	512,684	512,684	512,684	512,684
R-squared	0.017	0.017	0.017	0.017

Note: All regressions include the following fixed effects: province of birth, year of birth, and year of birth interacted with province-level covariates.

Robust standard errors in parentheses are clustered at the province of birth level.

Source: National Household Survey 2004-2019. Own elaboration.

* p<0.10, ** p<0.05, *** p<0.01