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# The more the merrier? The effects of competition on achievement in public schools and low-fee private schools in Lima, Peru

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## ABSTRACT

Competition has been considered as a desirable feature of education markets for over fifty years (Friedman, 1962). The rationale is that more competition generates incentives for schools to increase their productivity and, hence, improve their results (Hoxby, 2003). Therefore, many countries have embarked in privatization efforts to increase competition, either promoted by the government (Woods, Bagley, & Glatter, 1998) or despite their efforts (Harma, 2011). Therefore, private enrolment has increased worldwide by 58% between 1991 and 2004 (Patrinos, Barrera-Osorio, & Guaqueta, 2009). However, the positive effects of competition on achievement seem mild (Borland & Howsen, 1993) and the effect on the overall quality and equity of the education system is contested (Darling-Hammond & Adamson, 2016).

Peru has also seen an exponential increase in the number of private schools since the liberalization of education in 1996 (Peruvian Government, 1996) with the aim to increase innovation and improve the educational results by having more competition (Balarin, Kitmang, Ñopo, & Rodríguez, 2018). Yet, in the province of Lima, capital of Peru, primary private schools are performing worse than public schools as an aggregate (Balarin, Kitmang, Ñopo, & Rodríguez, 2018). This is significant, since the theory suggests that competition would reduce their enrolment and attractiveness, which has not happened. However, no study has been done to analyse the role competition plays in the achievement of the schools in the province of Lima.

Thus, the aim of this research is to understand the effect of competition on achievement in low-income areas of the province of Lima using two types of regressions: OLS and 2SLS. To that end, this research first defines low-fee private schools (LFPS) in the province of Lima. Then, calculates the degree of competition each school faces using the Competition Index (CI) developed by Misra & Chi (2011). Finally, this research uses correlations and regressions to understand the relationship and effect of competition on achievement, measured using the 2015 ECE tests results for reading and math in the second grade of primary education.

The first finding of this research was that the primary education market in the low-income areas of the province of Lima is highly competitive. Each school has about ten other schools competing with them in just 1 km of distance. The second was that competition, measuring using the logarithm of the CI, has a moderate negative correlation with achievement, for both reading and math, significant at the 1% level. The third finding was that competition might have a negative effect on achievement. However, the regressions did not provide enough evidence that the results were not due to endogeneity, making a case for further studies on these topics.

Despite the uncertainty over our main hypothesis, these findings add to the debate of whether competition in education has positive effects in all contexts and over time. To the best of our knowledge, this is one of the few empirical researches that suggests that competition might have negative effects on achievement. This research supports the idea that market forces alone do not improve education and that it is fundamental for governments to regulate the education market and take responsibility to ensure quality education for all.

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## **ABBREVIATIONS**

2SLS – Two-stage Least Squares

CI – Competition Index

ECE –National Standardised Test, Peru

ENAH0 - National Household Survey, Peru

HHI – Herfindahl–Hirschman Index

INDECOP1 - Office for the Protection of Consumer's Rights, Peru

LFPS – Low-fee private schools

LOGCI – Logarithm of the Competition Index

MINEDU – Ministry of Education, Peru

OLS – Ordinary Least Squares

PEN – Peruvian Sol

PSPM - Public schools privately managed

UE - Education Statistics Office, Ministry of Education, Peru

UGEL – Peruvian Local Education Authorities (LEA)

SISFOH - Household Targeting System, Peru

SLC – School Leaving Certificate, Nepal



## I. INTRODUCTION

The aim of this study is to understand the influence of competition in the achievement of primary schools in low-income areas of Lima, Peru. Since most of the competition in the city is a consequence of a privatization by default process, this chapter first presents the trajectories of privatization worldwide and in Peru to have a clear understanding of the context. It also develops the concept of low-fee private schools (LFPS) and its impact in education around the globe. Then, the rationale and research questions of the study are sketched out. The chapter closes with a summary of the structure of this study.

### 1. Context

#### *1.1 Education privatization in the world*

All over the world, there has been a surge in the provision of basic education by private providers, increasing by 58% between 1991 and 2004 (Patrinos, Barrera-Osorio, & Guaqueta, 2009). Three main factors (Belfield & Levin, 2002) have increased private provision of education worldwide. First, demand-side pressures, from parents who have no public school to enrol their children into or are dissatisfied with the public school options. Second, supply-side pressures, from local entrepreneurs that seek to profit from the provision of education (Tooley & Dixon, 2005). Third, general pressures, from globalization and international organizations that advocate for neoliberal policies in education markets (Ball, 2013).

The idea behind the increase of choice and inclusion of neoliberal market elements in the education system is that market forces, through competition, would improve educational standards and equity, by providing families with more options (Godard, Taylor, & Fitz, 2003). Schools that are more successful would attract more students and grow. Less effective schools would have to improve or close because of low demand (Campbell, Hankey, & Seiden, 2017). Because of this, there is a belief that private schools are more effective than public schools because they have to be more responsive to market pressures. Thus, they are compelled to “choose a mix of inputs that accelerates student learning,

economizing on those inputs that have little impact on student learning” (Lockheed & Jimenez, 1994, p. 18). In practice, the evidence is inconclusive to whether competition increases school efficiency and if private provision is preferable to a public option (Urquiola, 2016). Other researches suggests that the benefits from private education disappear controlling for socioeconomic status (Piante & Ansari, 2018) and private education does not seem to have positive effects on the education system (Vandenberghe & Robin, 2004). Moreover, successful schools cannot grow as predicted because their infrastructure capacity limit their growth. What seems to happen, though, is that they become more selective and admit only the most able students (Godard, Taylor, & Fitz, 2003).

Still, many countries around the world have embarked in education reforms that either increased the role of private providers or provided parents with more choice. The trajectories of these reforms have been very different between countries and dependent on the context. In developed countries, the increase of private provision has been limited and a consequence of intentional policies to increase choice for parents via alternative types of publicly funded school, such as the United Kingdom (Woods, Bagley, & Glatter, 1998); vouchers, such as Sweden (Urquiola, 2016); or direct subsidies to private schools, such as the Netherlands (Patrinos, Barrera-Osorio, & Guaqueta, 2009).

However, in many middle and low-income countries, the privatisation of education has been significant and a response to government failure due to the lack of public school provision or the perception of poor quality in those schools (Akyeampong & Rolleston, 2013). Therefore, in those countries, private enrolment can represent more than two thirds of students (Tooley & Dixon, 2005). In some of those countries, the government decided to finance the administration of public schools by private providers, such as Liberia (Hook, 2017). In others, a ‘de facto’ privatization or privatization by default (Tooley & Dixon, 2007) occurred, where there was no intention from the government to increase private provision but it occurred anyway, such as India (Harma, 2011; Singh, 2015). This phenomenon is very common in developing countries and the ‘mushrooming’ of low-fee private schools (LFPS) is a clear sign of this trend.

## *1.2 Low-fee private schools (LFPS)*

Even though there is no standard definition (Srivastava, 2013), LFPS are defined in this research as schools operated by private providers that are affordable for low-income families. The exact threshold of what constitutes a low-fee depends on the context (Srivastava, 2013). For LFPS to emerge, at least four conditions should be met: 1) the regulatory framework or lack of government capacity allows the management of schools and charging of fees by private providers; 2) teachers, which are the most significant cost in education, can be hired at a relative low cost; 3) government provision is limited or perceived as low-quality; and 4) there are no significant barriers for students to change between schools.

There are several reasons as to why low-income families choose LFPS. Among them, two recurrent reasons provided on previous studies are that there are not enough places in public schools or parents perceive that LFPS provide an education of higher quality (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018). Other reasons are smaller class sizes (Oketch, Mutisya, Ngware, & Ezech, 2010), more accountability to the schools (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018) or parent's aspirations (James & Woodhead, 2014). Whatever the reasons, what is evident is that parents have enacted their choice and a great number of them have migrated to LFPS (Kingdon, 2017), even if it meant that they would have to dedicate a very important percentage of their family income to school tuitions (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018). The merely existence of such a prevalent LFPS market "is an indication of inadequacies of state education" (Oketch, Mutisya, Ngware, & Ezech, 2010, p. 23).

Parents might be right to choose a LFPS since a number of studies show moderate evidence that LFPS have better aggregate achievement than public schools (Day, et al., 2014), although not consistently or definitively (Tooley & Dixon, 2007). The better outcomes of LFPS are attributable to two main reasons: either LFPS are more productive than public schools or LFPS serve better-off students that benefit from peer effects (Urquiola, 2016). In the first case, LFPS have better results because of their own actions. Competition pressures incentivize schools to work constantly to satisfy parents' expectations in order to keep their business. This creates a responsiveness flow that improves achievement, where schools are accountable to parents and teachers, in turn,

are accountable to school principals (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018).

In the second case, the better results are not attributable to anything in the practice of the LFPS, but that students benefit from peers from better socioeconomic status and other related characteristics (Chudgar & Quin, 2012). The influence of peer effects in schools has been documented to be significant for learning (Proud, 2010). If that were the case, the magnitude of the advantage of private provision would decrease with socioeconomic status and the “marginal differences found in the studies may not persist if many students moved from public to private schools” (Lockheed & Jimenez, 1994, p. 30).

Currently, among the general discourse, it is a given that LFPS provide a better education than public schools. However, the debate is twofold. First, what are the reasons for their improved performance? Second, what is their impact in the educational system as a whole? Advocates of LFPS and more competition in education markets claim that LFPS provide a better education than public schools: teaching is better and students achieve more (Day, et al., 2014). Not only that, private schools are more efficient by achieving better results at a lower cost (Tooley, Dixon, Shamsan, & Schagen, 2010). The education system is also better: school enrolment increases and public schools improve due to competition from private schools (Lockheed & Jimenez, 1994; Sandström & Bergström, 2005). The main evidence of the advantage of LFPS is the exodus of students from public schools to them (Kingdon, 2017). Parents clearly prefer the private alternative.

The challengers of LFPS claim that their impact in the education system is not necessarily positive. From a quality perspective, on one hand, most of the difference between private and public schools are attributable to sorting, where students from a higher socioeconomic status attend private schools (Day, et al., 2014). On the other, in some cases such as India, the increase in competition from more private providers have not resulted in the predicted system improvement (McPherson, 2014). From an equity perspective, since tuition fees for LFPS are not affordable to the poorest (Harma, 2011), a highly privatized system would reproduce and exacerbate a country's social disadvantages. Parents who can pay a private alternative would opt-out of public schools and leave the most disadvantaged students at public schools, leading to more

stratification in the education system (Godard, Taylor, & Fitz, 2003) and the 'ghettoization' of public schools (James & Woodhead, 2014).

### *1.3 Private schools and LFPS in Peru*

As other countries, Peru has also seen an exponential increase in the number of private schools, especially in urban areas, since the liberalization of education in 1996 (Peruvian Government, 1996). This change in the country's law allowed the creation of for-profit private schools that benefited from tax exemptions and had little regulation from the government. Nationwide, the enrolment of students in basic public education decreased from 90% to 75%. In the province of Lima, Peru's capital where one third of the population lives, the system is even more privatized: more than half of the students attend a private school and there are four private schools for every public school (MINEDU, 2018a).

The theory of change that inspired the normative modification was that, having more actors in the education market, competition would increase and that, in turn, would increase innovation and improve the educational results (Balarin, Kitmang, Ñopo, & Rodríguez, 2018). Certainly, more private schools appeared due to this change. The supply of more schools reduced their size significantly: while the average size of a primary school in 1990 was around 150 students, by 2014, the number reduced to 100. Public schools did little to keep their enrolment, since their budget does not depend to their enrolment rates and they have no incentive to attract more students. Moreover, if the past years' tendencies continue, private enrolment in the province of Lima is expected to grow to 75% in 2021 (Cuenca, 2013).

However, the aim of the policy was not to have more schools *per se*, since enrolment has remained constant in the last two decades due to lower birth rates and near universal access to primary education (Guadalupe, León, Rodríguez, & Vargas, 2017). A privatisation by default occurred, where individuals and companies created new for-profit private schools due to their high demand in a bottom-up process (Verger, Fontdevila, & Zancajo, 2017). Three main factors have contributed to the higher growth in private enrolment since 2004: the economic development of the country during that period, the regulatory framework that allowed the creation of new private schools and the ill reputation

of public education (Guadalupe, León, Rodríguez, & Vargas, 2017). In the province of Lima, most of the LFPS appeared in the periphery of the city, where there is more poverty, less public offer and higher population growth (Balarin, Kitmang, Ñopo, & Rodríguez, 2018). However, the relationship between poverty and LFPS is not automatic and other factors such as extreme poverty and the coverage of public education might explain the differences (Fontdevila, Marius, Balarin, & Rodríguez, 2018).

During the same period, achievement also improved in Peru. Test scores show that reading and math have consistently increased for the last ten years for all types of schools (Guadalupe, León, Rodríguez, & Vargas, 2017). However, these results do not capture the high inequality of the Peruvian education system and the wide gaps in achievement. First, in Latin America, Peru is the country with the highest segregation in education and where socioeconomic status and learning most strongly correlate (Benavides, Leon, & Etesse, 2014). These correlations occur both at the individual level and at the sub-national level, where a region's budget and support capacity influences the achievement of its communities (Guadalupe & Castillo, 2014). Second, there is a gap between private and public schools. Private schools outperform public schools nationwide, but the differences between the two have a decreasing tendency. This is likely to be a consequence of an increase in private provision, many of which offer a low-quality education (Guadalupe, Burga, Miranda, & Castillo, 2015), and to the significant increase in expenditure per pupil in public schools (Rolleston, 2016). Finally, the education system is a reflection of the country's social differences: rural, disabled or indigenous students (Defensoria del Pueblo, 2013) have less access to education and a worse performance overall.

In the province of Lima, primary private schools are performing worse than public schools as an aggregate (Balarin, Kitmang, Ñopo, & Rodríguez, 2018), without controlling for socioeconomic status. Only the private schools with a monthly tuition over 400 PEN outperform public schools (Fontdevila, Marius, Balarin, & Rodríguez, 2018). This is significant, since the theory and the research suggest that private schools would tend to outperform public schools just by peer effects. If private schools have worse results than public schools, the theory proposes that competition would reduce their enrolment and attractiveness, which has not

happened. Still, no study has yet explained the reasons for this occurrence and the case of the province of Lima seems like an anomaly.

## **2. Rationale**

Private education is a paradox in the province of Lima. Even though public schools outperform private schools, their appeal has not decreased. Several studies have been done in the province of Lima to understand how private providers operate in the education market (Balarin, Kitmang, Ñopo, & Rodríguez, 2018) and the aggregate impact of choice and LFPS on education quality (Fontdevila, Marius, Balarin, & Rodríguez, 2018) and equity (Balarin M. , 2015). However, no study has been done to analyse the role competition plays in the achievement of schools in the province of Lima.

This research is relevant today for Peru and the province of Lima in particular because with an ever-increasing supply of private schools, the impact of more competition on achievement and equity requires further study. The research could also help to understand if competition might be one of the reasons for the better performance of public schools compared to private schools. For other countries that are in a similar privatization by default trajectory, such as those in Sub-Saharan Africa and South Asia, this field of research would help to understand better the impact of competition in unregulated low-income areas. Moreover, to our understanding, this research is one of the first of its kind to analyse competition between LFPS and public schools and one of the few to analyse competition in a developing country using a quantitative measure of competition (Thapa, 2013). Particularly, since “school choice is spatially constructed and determined” (Taylor, 2007, p. 82), a competition index that considers the size and distance between the schools (Misra & Chi, 2011) will be used in this study.

## **3. Research questions**

The aim of this study is to determine the level of influence of competition on achievement in low-income areas of the province of Lima, Peru. In order to fulfil this aim, the premise of this dissertation is that, as others researchers suggest,

competition between public and LFPS has a positive effect on achievement. In order to establish the validity of this premise for the case of the province of Lima, Peru, we will answer the following questions:

1. What is the degree of competition of LFPS and public schools in low-income areas?
2. What is the correlation between competition and achievement in low-income areas?
3. What is the level of influence of competition on achievement in low-income areas?

#### **4. Structure of the study**

The aim of this study is to determine the level of influence of competition on achievement in low-income areas of the province of Lima, Peru. As such, this chapter includes the context, the rationale and the research questions that guide the study. The second chapter is the literature review of the main concepts of competition and its relationship with education, with a particular focus on its measurement and impact. The third chapter describes the data sources, the construction of variables and the methodology for the regression models. The fifth chapter provides the results of the analysis and a discussion of them reflecting on the literature. The final chapter provides the study conclusions and recommendations for policy and future research.



## II. LITERATURE REVIEW

This chapter will provide a detailed overview of what the research has to say regarding competition in education. Since competition is a concept borrowed from economics, the first section presents the theoretical foundations of competition and how those imported concepts are applied in education. The second section focuses on the debates of competition measurement in education and its relationship with achievement. Since no study was found that identified causation between achievement and competition using the Competition Index (Misra & Chi, 2011), for this study, we include six similar studies that analysed the effect on achievement of quantitative measures of competition. The last section shows research in the province of Lima regarding demand and supply of education in low-income areas to understand better the motivations and behaviour of the actors in the education market.

### 1. Theoretical concepts of competition

#### *1.1 Basic concepts of competition*

One of the basic orthodox economic assumptions is that, in the market, self-interest is the main driver of the actions of its participants: buyers behave seeking the lowest price and sellers behave seeking the highest profit. The value they can obtain of the market is a consequence of competition, which is regarded in classical economics as the “dominant regulatory force of the capitalist market economy” (Auerbach, 1988, p. 7). Competition works as an ordering force that ensures that the demand and supply of goods reach an optimal distribution, where enough goods are produced to satisfy the demand. This is called allocative efficiency and, when reached, the price of a good is the same as its marginal cost (McNulty, 1968).

In neoclassical economics, however, competition is not considered as a force but as a market structure that defines the behaviour of firms (Auerbach, 1988). If there is no competition, such as a monopoly, prices and profit would be high and buyers would be dissatisfied. On the contrary, with a large number of competitors, prices and profit would decrease since they would try to be more appealing to the

buyers. Only the best would remain, since sellers that are not valued by the market would have to exit. Other sellers would substitute them and drive up innovation and competition to remain competitive in the market. If equilibrium is achieved, where the effects of competition have reached their maximum capacity, a market is in perfect competition (McNulty, 1968).

Simplifying, to have perfect competition a market must have four features: (1) there is a large number of sellers and buyers, (2) the goods being sold are homogeneous, (3) free entry and exit to and from the market and (4) complete knowledge from buyers and sellers of the relevant factors of the good (Hayek, 2016). However, “perfect competition is an ideal state, incapable of actual realization” (McNulty, 1968, p. 641). The value of the concept of perfect competition resides in the comparison between it and a real market. The gaps between the real and ideal versions are a ‘market failure’, and the appropriate regulatory bodies can take corrective measures.

According to some critics’ perspectives, the classical and neoclassical traditions have three main issues. First, competition is considered as static, even though in practice it is a dynamic process (Hayek, 2016). Competition is not an external structural determinant (Auerbach, 1988) but a consequence of market behaviour: the actions of each agent in a market changes market concentration and the other agents have to adapt to the new competition setting. Second, the delimitation of the markets is not precise and economists tend to ignore the external interdependency of competition between markets (McNulty, 1968). Third, productive efficiency, which is the optimal method of producing goods, may not be reached by competition. In the models, if all firms are equally inefficient, there is no explanation for how the costs would be minimized. Moreover, in certain markets, the gains from productive efficiency could be much higher than from allocative efficiency (McNulty, 1968).

Another important issue with the orthodox models is that they are conceptualized in terms of exchange relationships (McNulty, 1968) and do not take the behaviour of the market actors in consideration. Sellers, on one hand, might try to differentiate themselves from their competition via advertising, undercutting or improving (Auerbach, 1988). Buyers, on the other hand, are not passive agents but signal the sellers their satisfaction directly by: 1) voice, when they demand a buyer to change; or 2) by exit, when they leave a buyer to opt for the competition

(Hirschman, 1970). In that sense, when sellers are in a performance lapse, they might recuperate if enough buyers provide feedback to start the recuperation and enough continue as buyers to provide time and income for the recovery. Thus, the competition model also fails to describe how sellers recover from performance lapses (Hirschman, 1970).

Hayek (2016), finally, points out the importance of acquisition and use of knowledge in economic decision-making by both buyers and sellers. To him, “competition is essentially a process of the formation of opinion” (p.371) and, as such, there is a constant change in information and perceptions by all the involved agents in a market. Therefore, a market with a high degree of buyer ignorance would also have substantial market power from the sellers, even without significant market concentration (Auerbach, 1988).

### *1.2 Competition and choice in education*

Competition only happens in an education market with school choice. If one school is the only available option in an area, there will be no competition because families have no choice but to send their kids to the only alternative. Thus, competition and choice are two sides of the same coin and constantly interact between each other. That is why when governments promote competition in the education market, they encourage policies that increase school choice (Belfield & Levin, 2002). This is what is called ‘quasi-markets’, where the government is no longer the sole provider of services, but encourages competition between different providers and acts as the regulator or funder of the services (Le Grand, 1991).

In education quasi-markets, choice is promoted for three reasons. The first, is the assumption that choice is good for its own sake: providing families with more options is always preferable than a single alternative. Second, choice is believed to improve equity by giving access to private schools that were only attainable for richer families. Third, that choice would encourage competition, which would improve the educational standards of the system by improving its allocative efficiency (Godard, Taylor, & Fitz, 2003).

By giving parents choice and more options, the belief is that they will select the best option in school markets that are “open, unbiased, and fair” (Bell, 2009, p. 207). However, this idea is contested because choice is not entirely rational and unrestricted, and school markets are not perfect. First, it is shaped by the demand, which are the parents. Parents choices are in turn shaped by their socioeconomical capital, their preferences and their children characteristics. Their socioeconomical capital define how much information and networks they can acces to make their choices (Noronha & Srivastava, 2013), even though parents do not necessarily behave as rational actors if they have the information (Campbell, Hankey, & Seiden, 2017). It also defines what options they can pay for: if they don't have the resources to choose an alternative school, their choice is reduced and competition in the market would be less than if they could (Hoxby, 2013). Their preferences are shaped by the social, economic and education systems they are part of (Butler & Hamnetta, 2007) and are influenced by their level of education and aspirations, which may reproduce social hierarchies (Woods, Bagley, & Glatter, 1998) or drive them to choose options to gain social status or prestige (Srivastava, 2013). The characteristics of their children and the parent's expectations of them also shape their choice. Thus, the child's gender, ability or, behaviour, among others, can be crucial in the parent's choice (Harma, 2011; James & Woodhead, 2014). In particular, the school choice for the first child may determine all subsequent choices for their siblings (Woods, Bagley, & Glatter, 1998).

Second, choice is determined by “the set of schools considered by parents, called the choice set” (Bell, 2009, p. 191). The most basic requirement is that there are alternatives for parents to choose because “school choice is spatially constructed and determined” (Taylor, 2007, p. 82). Some of the main problems for parents to enact school choice are the availability of schools, their admission arrangements and the distance to their house (Woods, Bagley, & Glatter, 1998). Schools behave differently depending on the number of competitors in their market. Thus, a school in a competitive environment behave trying to maximize the utility of their school clients, being parents or students. To remain competitive, they may choose to offer differences in their service that can appeal to the parent's preferences: school effectiveness, schools composition or school resources (Gibbons, Machin, & Silva, 2009). They can also choose to reduce their profits to

increase their pool of possible buyers, “which results in optimal resource allocation from the viewpoint of school clients” (Borland & Howsen, 1992, p. 32). On the contrary, on a non-competitive environment, schools “act as if they collude with one another” (Borland & Howsen, 1993, p. 165). The threshold from which firms start to compete as expected is called the critical level of concentration. In addition, a situation of apparent competition may exist, where parents have several school options to choose from, but they provide virtually the same service (Bell, 2009). Thus, real choice might not exist even in a scenario of apparent competition.

Regarding the school markets, competition is a dynamic process. Supply and demand of schools are interconnected and change over time. They are shaped by the context and the preferences. Maroy & van Zanten (2009) claim that schools are subject to ‘competitive interdependencies’ with the other schools in their neighbourhood, which means that they compete for the same resources. First-order competition is around competing for the most students, since they define the size and quality of the other resources. Second-order competition is about competing for the best students, which has an important impact on the working conditions of the schools and their prestige. These competitions generate their ‘logics of action’, which are “the predominant orientations given to the conduct of a school in different spheres of action, through decisions, routines or practical choices” (Maroy & van Zanten, 2009, p. e72). A school’s intensity of competitive interdependencies and its position in the local education market hierarchy determines how it will react in the market: via logics of conquest, diversification, adaptation or profiting from the status quo.

### *1.3 Benefits of competition in education*

Competition has been seen as a desirable feature of education markets since Milton Friedman suggested it more than fifty years ago (Friedman, 1962). To make it possible, Friedman (1962) recommends the introduction of vouchers, which would cover the tuition costs so families can choose their preferred school, either public or private. By doing so, he believed that in a system where tuition money follows the student (Hoxby, 2003), schools would be forced to be more attractive to parents. Therefore, the voucher system would promote diversity in

the supply of schools in their effort to appeal to the parents' preferences. Other gains would come from the competition for more qualified teachers, making their salary responsive to market forces.

The promoters of more competition in education markets agree with these ideas and suggest that "competition would be the proverbial rising tide that lifts all boats" (Hoxby, 2013, p. 1) and, as a consequence of more competition, both private and public schools would improve their results. In this scenario, high-quality schools would be in demand and their enrolment and finance secured. Low-quality schools would have to improve by increasing their productivity, which can be defined as the learning achieved by dollar spent, or be forced to shut down. Their improvement would come by either increasing achievement keeping costs equal or by reducing costs keeping achievement equal (Hoxby, 2003). This would increase the overall quality of the system by the exit of low-quality schools and the increase in productivity of the school that remain in the education system.

On the contrary, the opponents of more competition via voucher programs, charter schools or privatization, claim that it would increase inequality and that the theoretical effects of competition in an education market are unclear. One possibility is that competition provides schools with the incentives to improve and innovate, improving the results of the system as a whole. The other is that competition drives the best teachers and students out of less appealing schools, which in turn, negatively affect the students that remain on those schools (Sandström & Bergström, 2005), which generates a 'pauperisation' or 'ghettoization' of public schools with the least capable students (McPherson, 2014; James & Woodhead, 2014). The claim is that the closure of failing schools, especially public schools, is unlikely and that even with an overall improvement of achievement across the education system, learning gaps could be widened.

Balarin, Kitmang, Ñopo, & Rodríguez (2018) point out that education markets have several market failures that make it difficult to predict its outcomes. First, there are frictions for parents to change schools: the most attractive schools do not usually have vacancies and moving out of a school comes with costs. Second, information is asymmetrical. Parents do not have access to information to assess a school, while teachers and administrators are aware of their shortcomings. Third, the quality of the service is hard to measure and its quality is only evident many years after the service was provided. Fourth, the output of a school does

not depend solely on its personnel actions, but is shaped by the students and parents socioeconomic status, effort and ability. Fifth, failing schools are unlikely to shut down and, if they do, the social cost could be very important. Thus, the effects of competition should be measured in reality to prove which of the two scenarios is correct.

## **2. Competition in practice**

### *2.1 Measures of competition in education*

Competition “is a non-directly observable characteristic, thus neither is directly quantifiable” (Garcia-Diaz, Del Castillo, & Cabral, 2016, p. 24). Many researchers have considered competition either as an increase in school choice due to changes in legislation that allowed for a natural experiment or simply as the share of private enrolment in an education market (Belfield & Levin, 2002). However, Borland & Howsen (1992) were the first to import a measure of market concentration from the economic literature to measure competition in education: the Herfindahl–Hirschman Index (HHI). The HHI measures the degree of market concentration in any industry. In education, market share is understood as the enrolment share of a school within the total enrolment in its education market. The higher the number, the more concentration on the market and thus, the less competition. If only one school exists in the education market, the HHI is 1 and represents a monopoly.

$$HHI_j = \sum_{i=1}^n (S_i)^2$$

HHI = Herfindahl–Hirschman Index in education market  $j$

$S_i$  = enrolment (market share) of school  $i$

It is important to note that the unit of observation of the HHI is an education market, usually a school district (Borland & Howsen, 1992). Thus, the HHI requires a school market delimitation that, in education, can be very difficult since it depends on geography and type of school, among others (Garcia-Diaz, Del

Castillo, & Cabral, 2016). However, the HHI does not allow determining the degree of competition each school faces and does not take into consideration the distance between schools or the capacity of each school (Misra, Grimes, & Rogers, 2012). Belfield & Levin (2002) add that there are issues with the construct validly both for education market and competition: the HHI does not reflect how or whether schools compete in the education market. In addition, even though the HHI is a continuous variable, some researchers have used the results to group the education markets into high or low competition (Belfield & Levin, 2002). Thus, the HHI becomes a discrete measure.

Because of the limitations of the previous measures, a Competition Index (CI) that overcame them was developed by Misra & Chi (2011). The unit of observation of the CI is at a school level and uses Geographical Information Systems (GIS) to have information about the relationships between schools. The formula include the number of competitors, the size of competitors and the geographical distance among competitors. These inclusions are fundamental, since according to Tobler's first law of geography, "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236). A circle around each school is defined to determine the size of the market in which it competes. The CI is also a continuous measure and is not bounded. Unlike the HHI, the CI measures competition directly: the higher the number, the more competition on the school.

$$CI_i = \frac{1}{E_i} \sum_{j \neq i} E_j d_{ij}^{-2}$$

$CI_i$  = competition index of selected school ( $i$ )

$E_i$  = selected school ( $i$ ) enrolment

$E_j$  = competitor school ( $j$ ) enrolment

$d_{ij}$  = distance between  $i$  school and  $j$  school

Difficulties with the CI arise when defining the size of the market. First, determining the size of the circles around each school may prove difficult, since it is dependent on the distance the families are willing and able to travel to attend



the desired school. Second, considering all type of schools inside the circle competing in the same way might be an over simplification. Does a private school compete with a public or religious school equally? Third, natural barriers as mountains and rivers or industrial barriers such as railways and bridges are not considered, despite changing greatly the accessibility to the schools. Fourth, the CI presumes that all the schools in the market compete with each other and are the only alternatives considered by parents in each area.

As seen before, no measure of competition is perfect. Belfield & Levin (2002) point out that there are two issues in how competition is measured: construct validity and accuracy. The issue with construct validity is that the measures for competition actually measure the number of alternatives or options, but do not consider the strategic behaviour of the actors involved. As a result, the competition measure does not consider the strategies used to attract, retain or reject students by the schools, which can change significantly the competition pressures between schools. In addition, defining the education market in which schools compete with each other may be difficult: competition may occur between different types of schools, for inputs such as teachers or students or only under certain conditions.

The issue with accuracy is that, identifying causation between competition and achievement generate two estimation problems. First, simultaneity or endogeneity, when “one or more explanatory variables are jointly determined with the dependant variable” (Thapa, 2013, p. 360). In particular, the students choosing private schools are not a random sample of the total number of students but are more probable in areas where parents perceive public schools as low quality (Noailly, Vujić, & Aouragh, 2012). Therefore, private enrolment (explanatory variable) would have a negative relationship and be jointly determined by public school achievement (dependant variable). Moreover, the availability of private schools might be a consequence of the hostility or sympathy to private education from Local Education Authorities (Sandström & Bergström, 2005).

Second, omitted-variable bias, when a significant variable is excluded from the model. For instance, student ability (Borland & Howsen, 1992), school resources (Thapa, 2013) and student socioeconomic status (Piante & Ansari, 2018) have a direct effect on achievement that can modify the results of the model if not

considered. Then, Belfield & Levin (2002) indicate that “estimation techniques should identify the supply of alternative schooling and should control for key confounders” (p.282). The instrumental variable (IV) method is considered the most useful strategy to account for endogeneity between public school performance and private school enrolment and the omitted variable bias (Angrist & Krueger, 2001).

## *2.2 Modelling the effect of school competition on achievement*

The impact of competition has been studied for different education outcomes, such as “academic test scores, graduation / attainment, expenditures / efficiency, teacher quality, students’ post-school wages, and local housing prices” (Belfield & Levin, 2002, p. 279). The Education Production Function, or its variants, is the most used model to identify causation between competition and achievement in education markets. The function relates the inputs to education to its outputs, such as student achievement (Hanushek, 2007). The inputs are organized in two categories: 1) pupil inputs, such as their socioeconomic standing, the level of education of their parents and their own natural ability, and 2) school inputs, such as school resources, peer effects and teacher education.

In particular, competition is a variable to account for school inputs (Borland & Howsen, 1, 1992). The underlying idea is that, with increased competition, responsiveness from teachers and administrators increases to the needs of parents and students. Teachers and administrators try to maximize student achievement, which is considered one of the main results valued by parents (Borland & Howsen, 1, 1992).

Many of the studies associate competition with academic achievement, where the most evidence is available and where the most measures of competition are used (Belfield & Levin, 2002). Achievement is usually measured as test scores, which reflect the sum of the current inputs plus all previous inputs. Thus, to have a better understanding of school effects on achievement, using the test results from early grades is preferable, since the differences attributed to previous pupil inputs are less severe (Borland & Howsen, 1992). Test scores in standardized tests for a few subjects may be a limited vision of what student learning is, but is

the most used and available option when analysing representative samples of education markets.

Most of the research regarding the impact of competition on student achievement can be divided into two strands (Noailly, Vujić, & Aouragh, 2012). In the first, an increase in school choice due to a policy shift has changed how schools compete and thus, have affected student achievement. Here, comparisons are done between the treatment group, affected by the policy change, and the control group, not affected by the policy change. The main limitation of these studies is that the results are context-specific and cannot be generalised. On the second, a measure of competition is used to compare education markets or schools and how they relate to their student achievement. Noailly, Vujić, & Aouragh (2012) point out that in this case, it is more difficult to identify causal relationships between school competition and student achievement because of reverse causality or endogeneity, where competition drives schools in more demand to grow larger, increasing their share of the education market and thus reducing competition in it.

### *2.3 Relationship between measured competition and achievement*

According to the theory, school competition should improve achievement in an education system because of gains in productivity by the schools, by the exit of low-quality schools or by providing alternative models that suit the preferences of parents better (Lockheed & Jimenez, 1994). In this section, we will present six studies that analysed the relationship between a measure of school competition and achievement using regression analysis. Only those that used a quantitative measure of school competition are considered, since an analogous regression will be done in this study for the Peruvian case using the CI.

Borland & Howsen (1992) did the first research that used a measure of competition (HHI) to see how it relates to student achievement of third graders in 170 school districts in Kentucky, USA. They applied Two-stage Least Squares (2SLS) techniques and they found that competition had mild effects on test scores, but only significant at the 10% level. To control for endogeneity, they used teacher salary as their IV. By doing that, they controlled for the effects of competition between schools to attract teachers, since more competition would

require higher salaries. They also found that innate ability of the students was highly significant and that it should be included in future models not to bias the results. Finally, they add that if competition is promoted by policy-makers, an improvement in student achievement should be expected.

Later on, Belfield & Levin (2002) analysed the evidence of the effect of different measures of competition on achievement in 25 studies in the USA, indicating that the results suggest “modest gains in achievement as a result of competition” (p.286). First, when HHI was used as the measure of competition, most of the studies found “only weak or null effects on academic outcomes” (p.286). However, when HHI was used as a discrete measure, the results were more statistically significant. Second, using private enrolment as the measure of competition yielded mixed results of its impact on public school achievement and many of the studies showed no significant effect. Third, they considered other studies that used other measures of competition associated with different levels of choice. The results were also mixed. They conclude that even though the effects of competition on achievement seem to be sensitive to the measure used, its positive effect on achievement seem reliable.

The third study we include was done by Sandström & Bergström (2005) and analysed the impact in public schools achievement of the early 1990s Swedish reform that allowed private competition. The case is relevant for our research since it has similar features to the Peruvian case: 1) the privatization reforms had been radical, 2) private schools had exponentially increased due to these reforms and 3) most private schools competed with public school for students. Competition was measured as the proportion of students that attend private schools for each of their 33 municipalities in their sample. Student performance is measured by the math results in the national achievement tests for ninth graders.

The results suggest that competition has a positive effect on achievement and is significant at 1%, when controlling for self-selection bias using Heckman’s approach. Among the other explanatory variables, Sandström & Bergström (2005) included the voting preference for non-socialist parties, under the assumption that it would influence the chance that a student is enrolled in a private school. Its effect was positive and significant at 5%. To have a proxy for the affinity of the municipalities to private provision, they also included five

variables that accounted for contracting out municipal services. All of the variables were positively correlated with market-share of private schools. However, only contracting out childcare was found to be significant for this relationship.

Their last comments regard the additional tests they run. First, they included the HHI in their model but found no significant effect when including an urban dummy and a variable for population distance. They conclude that the HHI is not a good measure of competition for public schools, which depend on the demographics and policies of their municipality. Second, they raise their concerns with the robustness of their results because large numbers of data is missing; the data is not representative of the country and the lack of other explanatory variables. However, they did several checks to account for them and, consequently, they are confident in their results.

The fourth study included was done by Ponzo (2011) and related competition to the added test scores in mathematics, reading and science for 2006 PISA in 806 Italian public schools. Competition was measured as the number of schools available for students attending a school. The Italian public schools had incentives to compete between each other because their funding depended on their enrolment. Ponzo (2011) used an education production function to associate different variables and using an ordinary least squares (OLS) technique, she found that the presence of two or more schools in competition with a school increases student achievement in 4.3 points and is significant at the 5% level. However, there is no significant difference between a school with no competition and another with just one competitor.

Other important findings of the research are the following. First, population density has very important effects: metropolitan areas have 29.73 points more in their tests than small cities. However, since Ponzo (2011) controlled for this, the measure of competition does not include the effect of city size on student achievement. Second, school size also had small but significant effects. Ponzo (2011) believes that this might be due to a reverse causality relationship between school size and student achievement because better schools should attract more students and, therefore, its enrolment increases. Third, students at private schools got much worse results than public schools, which is inconsistent with what the theory predicts. However, Ponzo (2011) suggests that it is a

consequence of how the Italian education system works: private schools are remedial schools for low-achieving students from wealthy socioeconomic status. Finally, she found that when parents put pressure on schools that are already in competition with two or more other schools, tests results increase in 8.99 points, almost doubling the effects of competition alone.

In the fifth study, Noailly, Vujić, & Aouragh (2012) wanted to know if schools facing more competition perform better than schools that do not in 6,000 school markets from the Netherlands. To define the market, they draw circles with a radius of 1.5. km around each postcode area in which a school is located and counted the number of competitors inside the circle. Then, using an inverted HHI, they measured competition, where 0 is a monopoly.

They believed that competition would have an impact in school performance due to two reasons. First, the government finances both public and private schools. The amount of money each school receives is based on their enrolment and the distribution of students, where schools receive extra funding for each disadvantaged student. Thus, schools have incentives to attract as many students as possible to have more funding and even bigger salaries, in the case of school principals. Second, public and private schools are free of charge on the point of use, which means that parents have absolute freedom to choose the school they prefer.

Using an ordinary least squares (OLS) technique, where endogenous competition effects had not been corrected, they found no significant effect. On the contrary, the results using an Instrumental variable (IV) estimation showed a positive effect of competition on achievement significant at 10%, but a small one: an increase of one standard deviation in competition increases 5% to 10% of the mean standard deviation for school performance, which is negligible. Moreover, to achieve this tiny gain, five more school would have enter the market on average. Noailly, Vujić, & Aouragh (2012) hypothesize that the gains of competition are small due to three factors. First, parents lack of information to select better schools. Second, parents' values, since they may prefer other characteristics of the school rather than test scores. Last, the Dutch education market is an already competitive one, with 6.5 alternative schools on average in a school market. Thus, an increase in competition would have limited effects.

In the sixth study, Thapa (2013) studied if public schools facing more private school competition in Nepal would perform better than public schools with no competition, controlling for other variables. The measure of achievement was the school leaving certificate (SLC) exam and to measure competition, he uses the number of private school competitors in the neighbourhood of public school. To control for endogeneity, he also includes the presence within an hour's walking distance from the private school to a motorable road as the IV. The last variable tries to capture the probability of having private schools in that locality, since access to the road and, as a consequence, a bigger market would make the zone attractive to private providers.

The results showed a statistically significant at 5% positive impact of private school competition to public schools using an IV method for a continuous and binary measure of competition. The continuous measure had a coefficient of 0.81 and the binary measure of 2.18. However, the models had an  $R^2$  of only 0.2580 and 0.2885, respectively; and found no significant effect of competition between private schools. Other variables that were significant to predict a student's achievement includes peer effects, gender, ethnicity and caste for the student, size, expenses and SLC graduates for the family and if a school has a library or a computer and science lab and the school size.

Finally, Thapa (2013) believes that the explanation for the results is due to two reasons. First, drawing from Friedman (1962), that more competition increases the educational productivity. Thus, the competition in the market has pushed Nepali public schools to perform increasingly better. Second, drawing from Hirschman (1970), inefficient schools would be forced to exit the market. This claim, however, does not seem to be supported by his evidence, where he found no effect of competition between private schools. In any case, Thapa (2013) warns that his estimates should be interpreted with caution, since the instruments could be correlated with other unobserved determinants.

In conclusion, as seen from the previous studies, competition seems to have positive significant effects on achievement, though mild (Borland & Howsen, 1993). Results that are more positive arise if competition is treated as a discrete variable and not a continuous variable (Sandström & Bergström, 2005; Ponzio, 2011). When competition is analysed considering private schools, it is necessary

to control for endogeneity to avoid biased results. Competition has been measured using HHI or similar methods.

A range of cofounding variables was also selected in the studies trying to identify causation between competition and achievement, depending on the data available and the level of analysis. Different variables were found to be significant and important. Among the school characteristics are its size (Ponzo, 2011) and the presence of a computer or science lab (Thapa, 2013). Regarding context, city size (Ponzo, 2011), urban density (Gibbons & Silva, 2008) and hostility to private provision by municipalities (Sandström & Bergström, 2005). Finally, the role of parents had a significant role, either through parent pressure on the school (Ponzo, 2011) or by their voting behaviour (Sandström & Bergström, 2005), which again stresses that the behaviour of parents in an education market is not neutral and might have significant effects on competition.

### **3. Competition in education in the province of Lima, Peru**

To the best of our knowledge, no study has been done before to measure competition in education in the province of Lima. Therefore, this section will show the studies that have been done that provide a better understanding of the demand and supply of private schools and LFPS in the low-income areas of the province of Lima. By doing so, we expect to better understand how competition has shaped the behaviour of the actors in the education market and how they, in turn, have shaped competition.

#### *3.1 Supply of LFPS in the province of Lima*

The main source of information to understand the supply of LFPS is a study from Balarin, Kitmang, Ñopo, & Rodríguez (2018) that sampled private schools in San Juan de Lurigancho, the most populated district in the province of Lima. The district was selected because it is representative of what occurs in education in urban Peru and in the province of Lima. Their findings reveal important issues of how private schools and LFPS behave and perceive themselves. Nevertheless, there is still an important gap in the literature to quantify their actual behaviour and its effect on achievement and enrolment.



The first issue to understand about the private provision of schools in the province of Lima is that it is effectively unregulated. Private schools are subject to little regulation and the MINEDU has no capacity even to enforce those regulations (Balarin M. , 2015). It is the INDECOPI, the office that protects consumer's rights, that is responsible to intermediate between parents and private schools. Therefore, only a few of the regulations are observed and even less are supervised (Guadalupe, Burga, Miranda, & Castillo, 2015). However, according to previous studies, principals and teachers from LFPS do want to have more regulation and support from the UGEL and the MINEDU, particularly on teacher training (Balarin, Kitmang, Ñopo, & Rodríguez, 2018).

The second is that LFPS are mostly small family-owned and managed businesses. Most of the schools run in refurbished housing buildings (Fontdevila, Marius, Balarin, & Rodríguez, 2018). Even though LFPS are exempted of taxes (Peruvian Government, 1996), they are not a very profitable business: over two thirds of the owners perceive that they earn only enough to keep up with their staff salaries. This might be a consequence of how they embarked into the education business: half of them still do not have a business plan and only 37% had a credit before opening their school. In any case, almost all of the LFPS founders indicate that the schools were not opened with an expectation of high returns, but with the aim to start a business close to their teaching vocation or experience. Still, the decision of the location of the school was well thought and half of them deliberately chose an area with little supply.

The third issue is that competition is severe and is getting rougher. LFPS owners perceive this and 80% of them think that too much competition is one of the main reasons for their low profits. Almost half of them also believed that the improvement of the work conditions in public schools put pressure on them over teacher salaries, which are lower in LFPS and their highest expense. As a consequence, more than 80% of LFPS teachers would prefer to work in a public school. The competition for teachers is notably, since 41% of principals in LFPS declared that the low supply of teachers was one of their main concerns.

The fourth is that LFPS are limited to grow and plan ahead because of their low profits and high uncertainty in the education market. In particular, LFPS have problems to collect the tuitions fees from parents. In some cases, parents might be delayed to make the tuition payment by several months. This, in turn, delays

the payment of teachers and increases teacher turnover and dissatisfaction. LFPS owners claim that this happens because families in the area are poor and they do not have tools to charge tuition debts effectively. Nevertheless, because there is so much competition for students, they are tolerant with the delay in the payments and offer flexible payment arrangements. They also employ additional exams or the retention of the student's scores as mechanisms to pressure parents to pay their tuition debts.

The fifth issue is that LFPS employ different strategies to remain relevant in the market. Price and quality are two of the main attraction strategies and almost all of them claim to advertise. Others attraction strategies include being less selective in their admissions process or having no admissions process at all. The retention strategies are usually academic oriented, such as extracurricular activities or tutoring. In particular, they are responsive to the main parent expectation: ensure that their children gain entrance to a university. Because of this, many of them train their students to be able to take the admissions tests to universities and some of them even call themselves 'pre-university' schools. Nevertheless, in many cases, the academic rigorousness is not based on education reasons but because of parents' demands. Thus, almost one third of LFPS would allow students to skip a grade to have their patronage. In the same sense, some schools use most of their little investment for computers and technology, not for pedagogical reasons, but as a marketing stunt in an effort to signal quality and innovation to parents (Fontdevila, Marius, Balarin, & Rodríguez, 2018).

### *3.2 Demand of LFPS in the province of Lima*

In Peru, demand for LFPS is very high (Cuenca, 2013) and seem consistent with other countries (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018; Kingdon, 2017). Parents' preference are due to, on one hand, problems with public schools such as teacher absenteeism and strikes, and, on the other, advantages of private schools, such as longer school hours, more committed teachers, safer environments and higher accountability. For instance, parents are reluctant to send their children to large public primary schools because they would not have

a personalized attention from teachers and because public schools are perceived as more insecure (Balarin M. , 2015).

However, the main driver of private choice seems to be aspirational. Studies have confirmed that there seems to be a prevalent belief that private education, in itself, is better than public education (Cuenca, 2013). Parents tend to prefer private schooling as an inertial and automatic optimal option without questioning if that belief always holds truth (Sanz, 2014). This belief is also rooted in the 'myth of education'; by which many Peruvian believe that through education they can improve their social standing (Ames, 2014) by attending "schools with other children who are able and highly motivated, even if their own children fall short on these metrics" (O'Shaughnessy, 2007, p. 502). Thus, similar to other countries, private schools are seen as a vehicle of progress and public schools as a last-resort option (Zuilkowski, Piper, Ong'ele, & Kiminza, 2018).

Rejection to public schools comes from parent's aspiration that their children become successful professionals. In that sense, attending a private school is a first step to build their children's optimistic and imaginary future (Sanz, 2014). Parents are not driven by a measure of quality education, but their decision is rooted in more complex social relationships with the aim to enrol their children in a school with their 'peers', making the social composition of the school a very important criteria. To make their decision, parents may search for 'physical' markers as the ethnic and social profile of the students (Maroy & van Zanten, 2009). This differentiation process excludes those who are not seem as one, 'the others', relegated to lower-cost or public schools (Sanz, 2015). That is why parents are willing to spend, on average, 13 to 19 times more for a private school than enrol their children in a public school (Guadalupe, León, Rodríguez, & Vargas, 2017). The goal to differentiate themselves from 'others' from a lower socioeconomic status is not something that happens only in the richest areas, but throughout all social levels. Education in Peru is a positional good, where parent choice is shaped by the social group they aspire to be and the social group they wish to leave (Adnett & Davies, 2002).

However, aspirations are not only dependant of internal motivations, but of their social standing (Chivers, 2017) and of those around them (Janzen, Magnan, Sharma, & Thompson, 2017). If parents feel that they are in an economic vulnerable position, they would be less willing to take risks and might underinvest

in their children's education. This is especially important in markets with low access to credit, such as the Peruvian market. On the other hand, higher aspirations are correlated with higher levels of economic power (Chivers, 2017).

Another reason to exit public school might be economic, since they are not entirely free. There is evidence that families that attend public schools have to pay voluntary or unlawfully up to 30% of the per pupil government expenditure for uniforms, classroom materials and others (Saavedra & Suárez, 2002). The indirect costs of education incurred by parents are very similar between LFPS and public schools: more than half of parents in both public schools and LFPS declare to spend between 50 PEN and 140 PEN on the education of their children over tuition fees (Balarin, Kitmang, Ñopo, & Rodríguez, 2018). This might explain why parents would choose to pay for a similar service in a LFPS, especially if they believe that by their economic effort, their children would have a head start in life (Balarin M. , 2015). Still, further research is necessary to understand the motivations, restrictions and thought processes that drive parents to choose a school over the other.

### III. DATA AND METHODOLOGY

To understand the effect of competition on achievement in low-income areas of the province of Lima, this research uses quantitative methods. This chapter first presents the four sources of second-hand data used in the research. Then, it shows the identification process of LFPS and the construction of the variable for competition. Finally, the regression model is outlined and some methodological limitations are identified.

#### 1. Data

This study uses and processes four sources of second-hand data from Peruvian governmental institutions to analyse the effect of competition on achievement in low-income areas of the province of Lima. The first one is the Poverty Map, to control for the socioeconomic status of the area of influence of each school. The second is the School Census, which has information about the schools characteristics that will become independent variables in the regression. The third source is the Standardized National Test, which will be the dependant variable in the regression. Finally, *Identicole* will provide the information about tuition costs that will enable us to define the LFPS.

##### *1.1 Mapa de pobreza Provincial y Distrital 2013 (Poverty Map)*

The Poverty Map (INEI, 2015) is a tool developed by the National Institute of Statistics and Informatics of Peru (INEI) to identify the provinces and districts with the highest occurrence of poverty to better aim public policies. The result is the poverty level at a 95% confidence and the Gini coefficient of each district in the country, both with a high and low confidence interval. When a district had 1) high inequality and 2) over 20,000 households, the district was divided in two or three segments with equal poverty limits, providing a more precise result that was shown on maps.

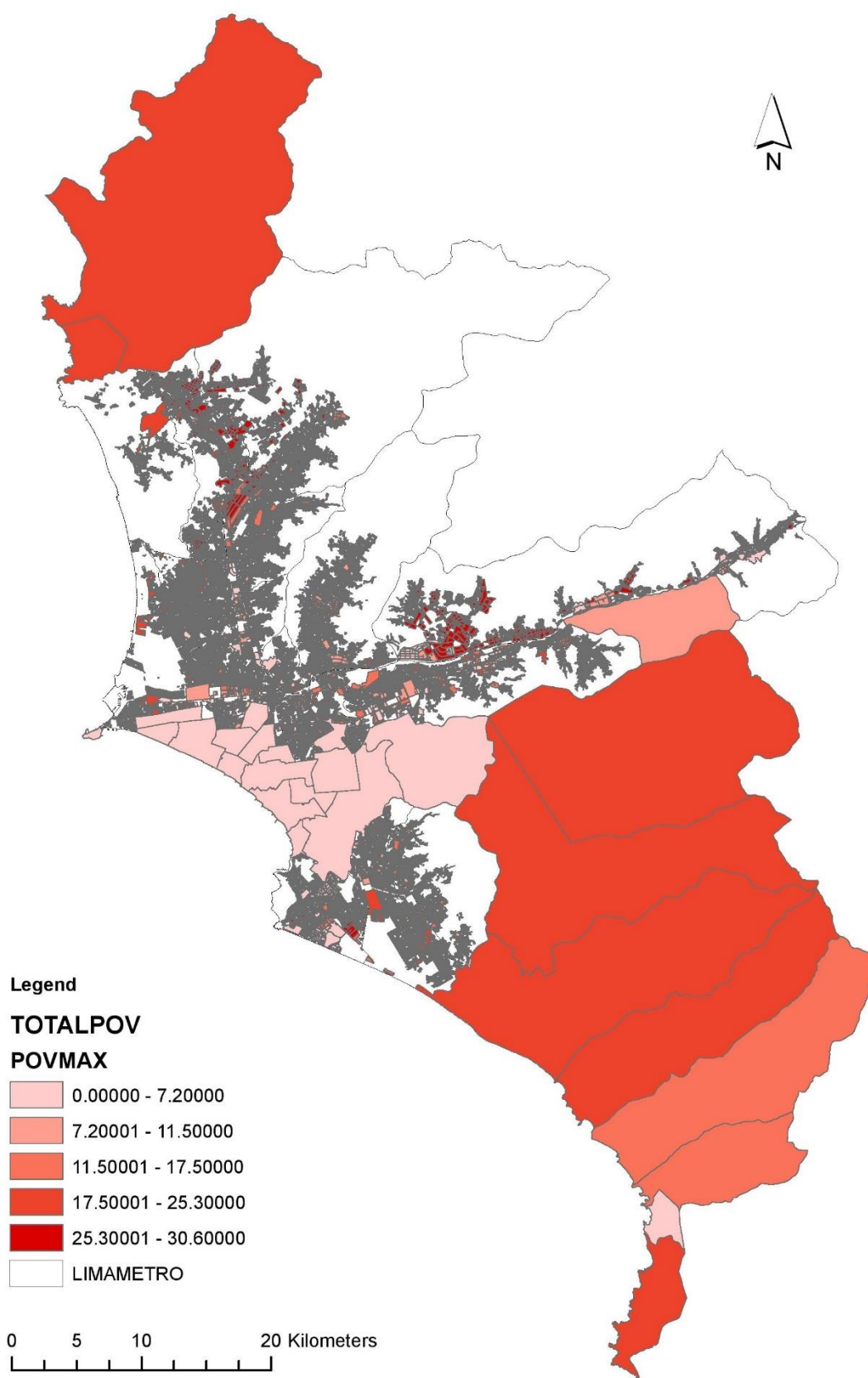
To come up with this information, the report takes into account two main sources: the National Household Survey 2012-2013 (ENAHU) and the Household Targeting System 2012-2013 (SISFOH). The first is an annual survey that

assesses the expenditure and poverty of a sample of households that are representative at the province level. The data was collected between 2012 and 2013, reaching a sample of over 47,000 households each year. The second was done in the same time period and reached over 24 million people, 3 million less than in the previous census. SISFOH is used to determine which households are eligible for social programs, such as conditional cash transfers. Applying the small area estimation method developed by Elbers, Lanjouw and Lanjouw (ELL) from the World Bank, these sources are combined with other external sources to create an expenditure model for each region. Several robustness and precision analysis were done to ensure the internal and external validity of the results.

According to the Poverty Map, the province of Lima has 8.89 million people living in 43 districts. The average poverty levels are between 14.0% and 15.6% at the 95% confidence interval. The expenditure model has an  $R^2$  of 0.613 and considers 30 variables, which include the level and years of instruction of the household inhabitants, the house characteristics and the appliances and electronics they own. The model does not consider the characteristics of the schools close to the household, which was considered for the models in others regions. As a result, we do not expect to have endogeneity in our model when correlating the poverty level in the area of influence of a school and its achievement.

As seen in **Figure 1**, the Poverty Map has identified 79 segments that have different poverty levels in the province of Lima. This is possible because 18 districts met the conditions previously stated to be subdivided in three segments. For this study, the poverty level of each school will have two variables: the upper (POVMAX) and lower (POVMIN) limit at a 95% confidence. The value will be equal to the average poverty in its education market. As shown in a later section, each education market is delimited by a 1 km radius around each school.

**Figure 1 – Poverty Map for Lima and Callao**



Own elaboration. Source: *Mapa de pobreza Provincial y Distrital 2013*

## *1.2 Censo Escolar 2015 (School Census)*

The School Census (MINEDU, 2017) is mandatory for all schools and has been done annually by the Education Statistics Office (UE) of the Ministry of Education since 1998. The school principal is responsible to fill out a form with information about enrolment, teachers, school materials, school infrastructure and school results. Since the information is auto reported, there can be issues when writing down the information by the principals. One of the most commons mistakes are significant changes in the number of students or teachers between consecutive years. Because of this, the UE trains the actors involved at all levels and does several consistency measures to ensure that the information is reliable (MINEDU, 2017).

In 2015, more than 151,000 education institutions were in the census nationwide, from Pre-school to higher education institutes. The province of Lima had 26,197 education institutions of which 6,710 schools were for the primary level. However, only 4,697 primary schools were active with a total of 833,490 students enrolled. Inactive schools are registered as such when there is no record of the school for three consecutive years. Some of the schools that show as active may be inactive but in the process of being noted as such. However, when enrolment is equal to zero, it can be assumed that the school is inactive. Also, informal schools are not part of the School Census but they represent a very small percentage of all schools (Balarin, Kitmang, Ñopo, & Rodríguez, 2018).

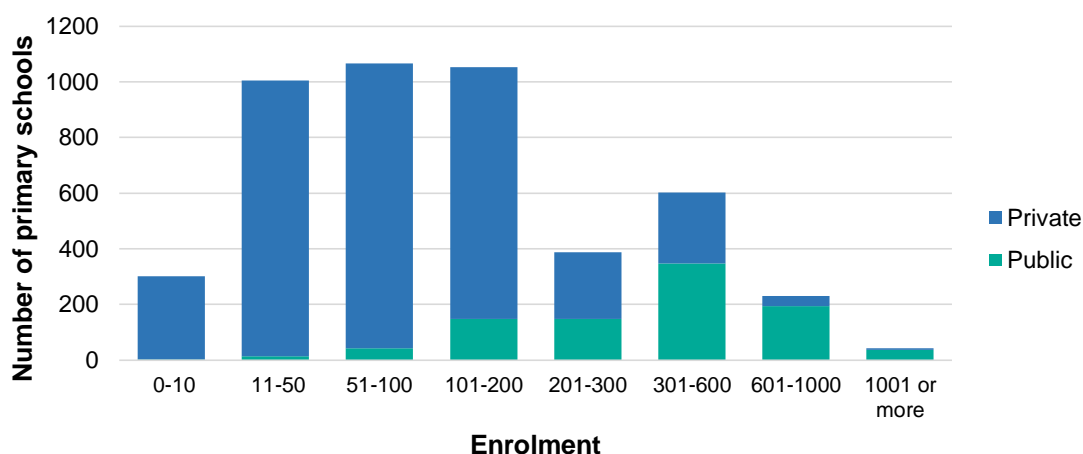
In the province of Lima, private schools represent 80% (3,764) of the primary schools but only have 52% of the enrolment. As seen in **Figure 2**, most of the private schools are small schools of less than 200 pupils. In contrast, public schools are significantly larger and most of them have over 300 pupils.

For this study, we will use the data from the 2015 School Census for all school variables but its location in latitude and longitude coordinates. For the location, we will use the latest available information from the UE (MINEDU, 2018), since from our analysis almost half of private and public schools have slightly different locations in 2018 compared to 2015 and a few of them have very different locations. This is because georeferencing of the schools has been done more accurately in the last few years. The finding is consistent with Balarin, Kitmang, Ñopo, & Rodríguez (2018), which found that around 10% of the schools in their



sample study in the district of San Juan de Lurigancho, Lima did not exist on their registered location.

**Figure 2** – Number of primary schools in the province of Lima by type and size



Own elaboration. Source: *Censo Escolar 2015*

### 1.3 Evaluación Censal de Estudiantes - ECE (Standardised National Test)

Since 2006, the Standardised National Test (MINEDU, 2014) has assessed the reading and math achievement of students in the second grade of primary education. There is also a similar test at eight grade. The purpose of the test is to have evidence of the achievement evolution of each school over time and use that data to improve the education policies. The test is multiple choice and mandatory for all schools, both public and private, that have five or more students enrolled in second grade, which excludes about 5% of the students and 37% of the schools nationwide. The School Census information is used to determine the schools and students that are going to be assessed and a control sample of all the schools is selected to report the results at the national and regional levels.

No ranking or school league tables are made available to the public. The individual results are given to each student and the school administrators have the information for all the students and classes in their school that were assessed. However, achievement at the school level is not made public and only the UGEL and the MINEDU have the information of all the schools in their jurisdiction to make policy decisions.

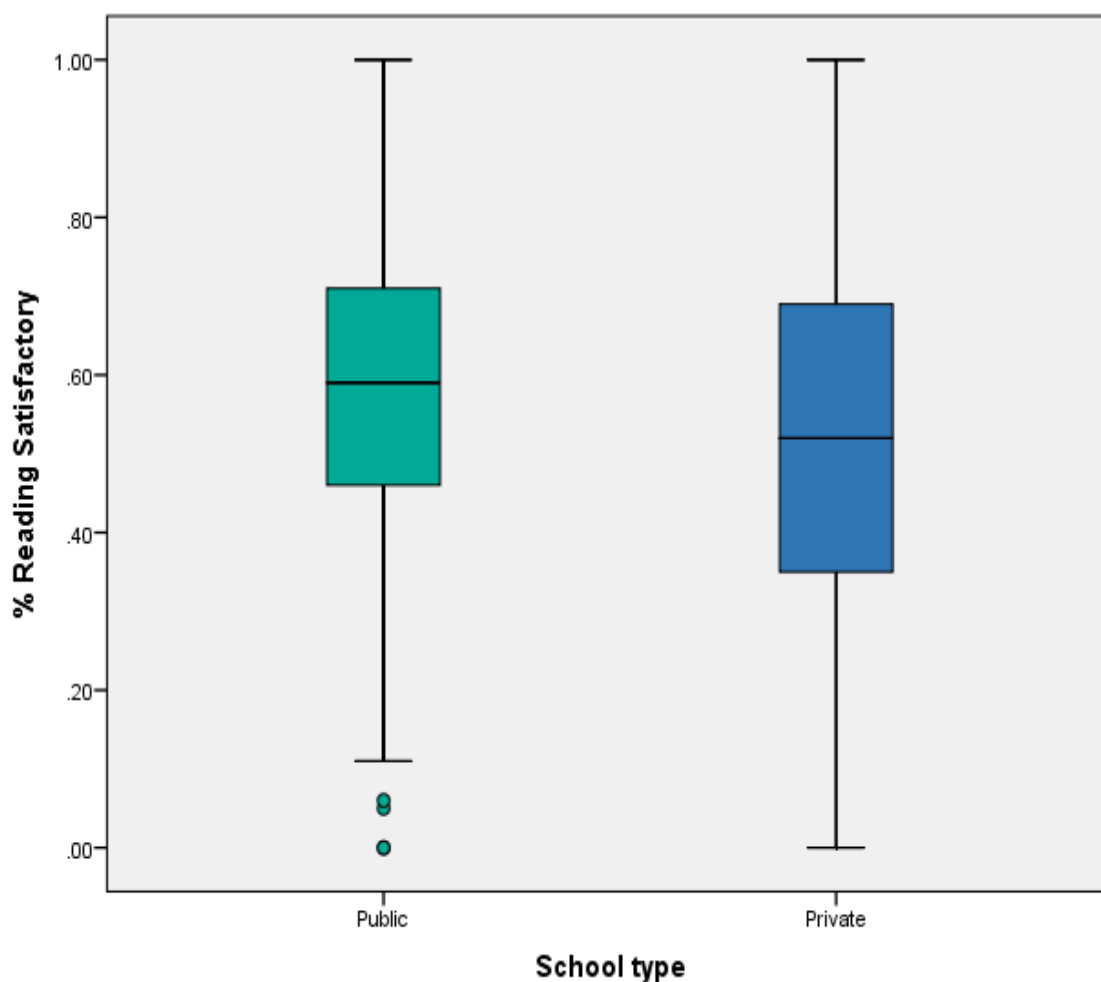
The students are classified in four groups depending on their results. From highest to lowest, the ranks are: Satisfactory, In progress, Beginner and Before Beginner. Each item in the test was clustered by difficulty and the clusters were also ordered by difficulty. Thus, there were items in the test that were the turning point between a rank and the next. The test is also calibrated to the test in 2007 via a lineal transformation, so the arithmetic mean in 2007 is 500 with a standard deviation of a 100. For this research, the ECE 2015 results will be used in the regression as the dependant variable while in one of the models the ECE 2011 and ECE 2014 results will be used as independent variables.

In 2015, 542,061 students were assessed in 21,470 schools nationwide. In the province of Lima, 131,395 students were assessed in 3,997 schools: 918 public schools and 3,079 private schools. The control sample had 13,473 students and 278 schools. On average, public schools outperformed private schools both in Reading and Math, as can be seen in **Figure 3-4** and **Table 1-2**. The differences in Reading are small (.07), but on Math, public schools (.34) double the results of private schools (.17). This is consistent with Vandenberghe & Robin (2004, p. 504), that mentioned that “within a country, private–public differences tend to appear with similar sign”. However, the results do not match with what the theory suggests and what happens in other countries.

One of the reasons for this phenomenon might be due to a market failure in the Peruvian education system. Since the results from the ECE tests are not made public, parents have no information to acknowledge that they have chosen a lesser alternative (Balarin M. , 2015). Another explanation could be that public schools have monetary incentives and are accountable to the UGEL for their performance in the ECE tests (MINEDU, 2018b), while private schools only share their scores with the parents if they obtained a good standing. A third reason could be that parents value other characteristics of the school and use other elements as signal of quality in the absence of information. In particular, since private schools outperform public schools in secondary education (Fontdevila, Marius, Balarin, & Rodríguez, 2018), parents might be using that as signal of quality despite the worse results in primary education. By doing so, they might value more long-term results such as secondary education graduation or acceptance to a university. A fourth reason might be that the investment per pupil is higher in public schools compared to many private schools. Since “spending

and quality are closely related” (Hanushek E. , 2003, p. 64), private schools that invest less than public schools are expected to perform worse. Lastly, competition from other schools might have an important effect on achievement and this study tries to find evidence if this is true.

**Figure 3** - 2015 ECE Reading results by type of school in the province of Lima



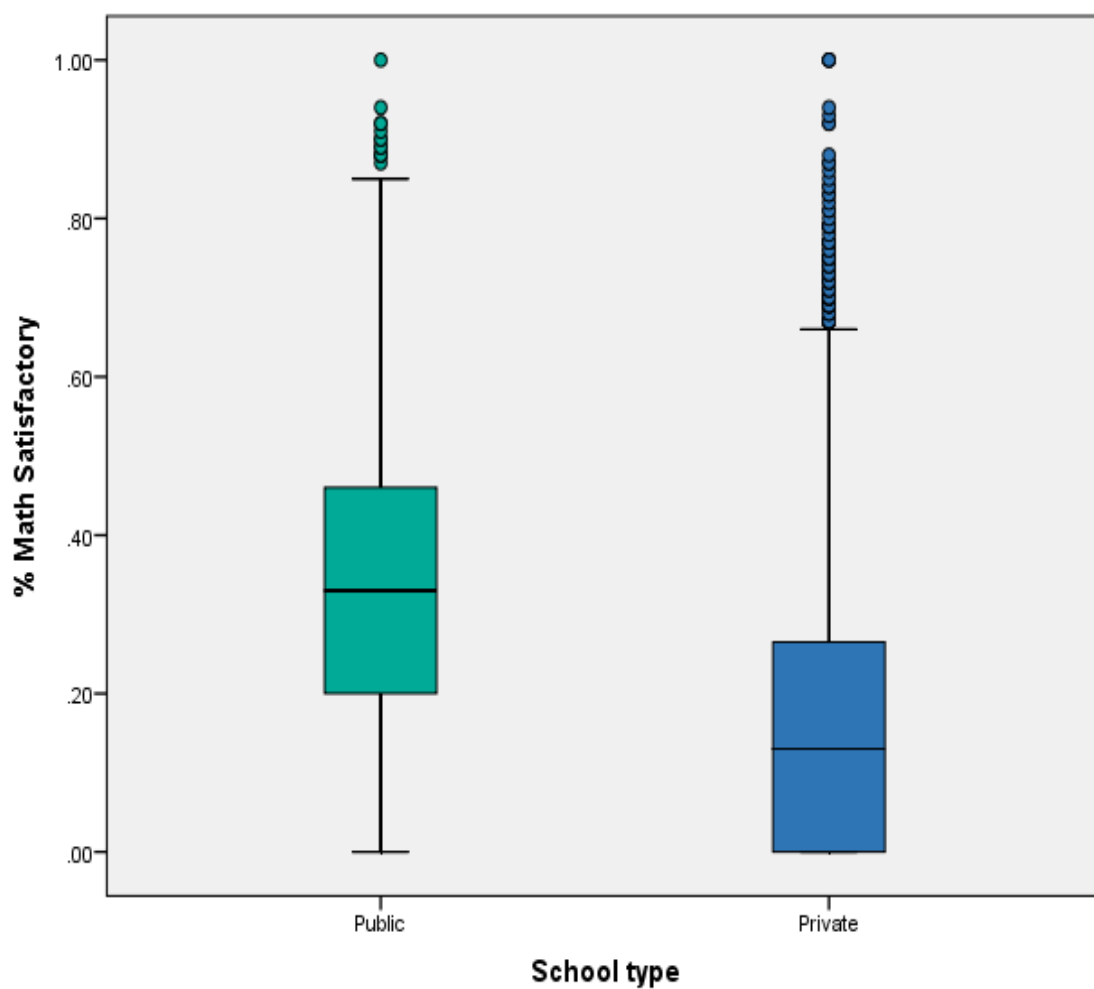
Own elaboration. Source: ECE 2015

**Table 1** - 2015 ECE Reading results by type of school in the province of Lima

School type	N	Mean	Std. Deviation	Std. Error Mean
Public	918	.5858	.17602	.00581
Private	3079	.5181	.23495	.00423

Own elaboration. Source: ECE 2015

**Figure 4** – 2015 ECE Math results by type of school in the province of Lima



Own elaboration. Source: ECE 2015

**Table 2** - 2015 ECE Math results by type of school in the province of Lima

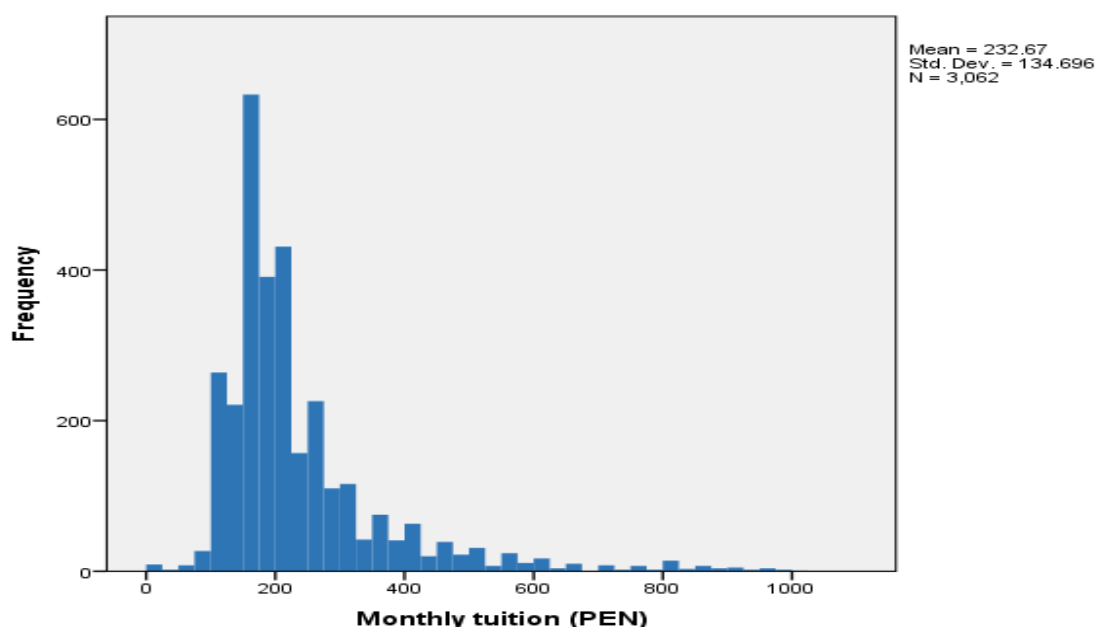
School type	N	Mean	Std. Deviation	Std. Error Mean
Public	918	.3496	.19378	.00640
Private	3079	.1759	.18826	.00339

Own elaboration. Source: ECE 2015

## 1.4 *Identicole*

*Identicole* is a web tool developed in 2016 by the MINEDU so parents can have more and better quality information about private and public schools. The aim is that, by comparing the different schools alternatives, parents will be able to choose a school better aligned with their preferences. *Identicole* allowed the MINEDU to have the dataset for tuition costs of private schools for the first time.

**Figure 5** – Monthly tuition fee in PEN for private schools in the province of Lima



Own elaboration. Source: *Identicole* 2018

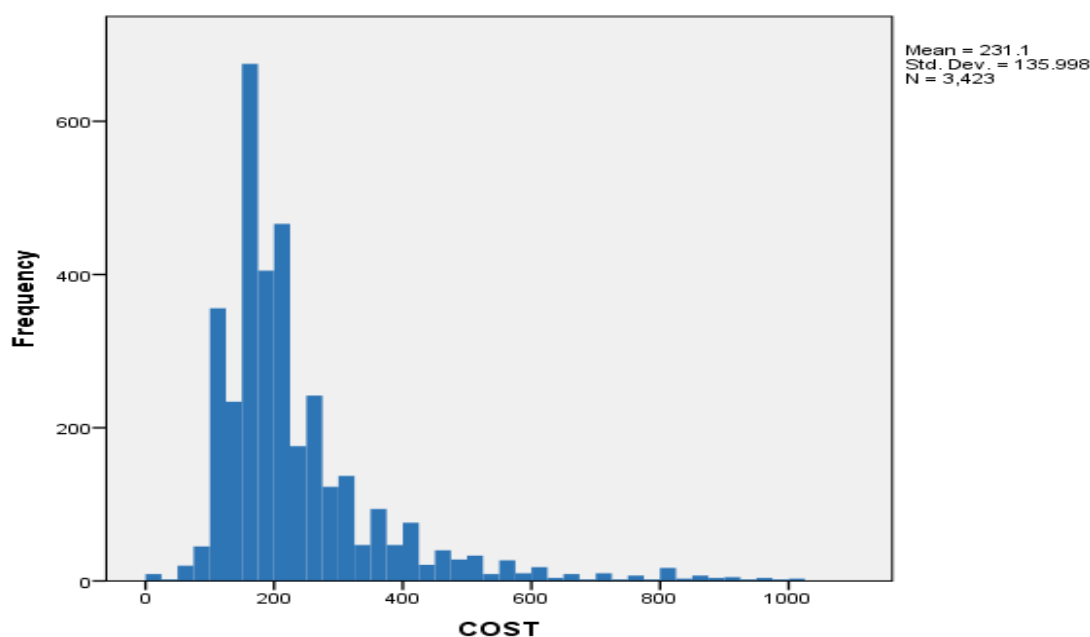
In the January 2018 data, 3,773 primary private schools are registered in the province of Lima. Of those, 480 schools registered zero as their monthly tuition fee and 152 schools did not registered any data. For **Figure 5**, we have not included those schools and neither the 79 schools with a tuition fee of over 1,000 PEN, which represent the most expensive schools in the city. **Figure 5** shows that the average tuition cost is 232.67 PEN, with a standard deviation of 134.70 PEN. The tuition fees have a pronounced rightward skew and is similar to other private schools markets where most schools are in the low-fee spectrum, such as India (Kingdon, 2017).

Since the cost of private schools is one of the variables considered to define LFPS, we will impute the missing values as follows. First, if a private school tuition

cost has a value of zero and has a value for registration, that cost will be considered as the tuition cost. If it has a range as the value for registration, the maximum cost will be considered as the tuition cost. When looking at the data, of the 2,925 schools that have data for both tuition and registration, 54% of them have less than 10% difference between the two. This is reasonable because the registration cost are paid annually as a condition to enrol a student in a private school and cannot be more than the cost of one month of tuition (MINEDU, 2018a). Of the 480 schools that had a tuition of zero, 450 schools comply with this condition.

Second, the remaining 30 schools and the 152 schools that did not registered any data will be out of the study. Third, only the *Identicole* private schools that are part of the School Census will be included in the study. Therefore, out of the 3,764 active private schools from the School Census, 250 schools are excluded. Then, only 6.6% of the tuition cost data would be missing for private schools. By doing these changes, the data varies slightly, as it can be seen in **Figure 6**: the average tuition cost is 231.1 PEN with a standard deviation of 136.0 PEN. This data also removed the 91 schools with a tuition fee higher than 1,000 PEN.

**Figure 6**– Monthly tuition fee in PEN for private schools in the province of Lima with imputed missing values



Own elaboration. Source: *Identicole* 2018

## 2. Quantitative modelling strategy

This study uses two types of regressions to analyse the effects of competition on achievement: an Ordinary Least Squares (OLS) regression, which does not correct for endogeneity, and a Two-stage Least Squares (2SLS) with instrumental variable (IV), to control for endogeneity. In order to do the regressions, we will first have to define the schools that will take part of the study. In this section, we first identify the LFPS and competing public schools in the province of Lima. Then, for each of those schools, the Competition Index (Misra & Chi, 2011) is calculated. Finally, an overview of the regression models and the methodological limitations of the study is provided.

### 2.1 Defining low-fee private schools

The study focuses on the dynamics between LFPS and public schools in Lima. Since there is not a unique definition of what is considered a LFPS (Srivastava, 2013), Kingdom (2017) proposes three ways to define LFPS by benchmarking the tuitions to: 1) state per capita income, 2) minimum wage of daily wage labourers and 3) per pupil expenditure in government schools. In a previous study, Balarin, Kitmang, Ñopo, & Rodríguez (2018) defined LFPS in the province of Lima as the ones that the monthly tuition cost under 200 PEN, which was the average tuition.

However, in this paper, we will define LFPS as the private schools where the tuition costs are in the bottom 20% of the tuition costs for all private schools in the province of Lima. The modified *Identicole* data with 3,514 private schools will be used to make this cut. The bottom 20%, or 703 cheapest schools, have a maximum tuition cost of 150 PEN. Coincidentally, this also matches the average investment per pupil in public schools by the government in the province of Lima: 150 PEN per month, equivalent to 1,500 PEN per year (Guadalupe, León, Rodríguez, & Vargas, 2017). So, only the 666 private schools with a tuition cost under this threshold will be considered as LFPS.

For the final sample, we will only consider the LFPS that have taken the ECE test and have over 10 students in the primary level, since competition pressures from smaller schools seem negligible. The public schools considered are the ones that

also comply with these two conditions and compete with one of these LFPS in the education market radius defined in the next section. Therefore, the final sample consists of 1,262 schools: 560 LFPS and 702 public schools in the province of Lima (**Figure 7**).

There are no important differences in neither 2015 ECE Reading nor 2015 ECE Math between the totality of public schools and the sample that competes with LFPS, which represents over 75% of the total public schools in the province of Lima. Out of the 702 competing public schools, only 39 are public schools privately managed (PSPM). While the latter have on average significant better results (**Table 3-4**), their presence does not change the results of the whole due to their small number of schools.

For LFPS, however, results plummeted: Reading went down from 0.51 to 0.35 (**Table 5**) and Math went down from 0.17 to 0.09 (**Table 6**). At the same time, the standard deviation for LFPS did not changed significantly. Nevertheless, because the mean was reduced so dramatically, its coefficient of variation increased for both Reading and Math, which suggests an important increase in the variability of the quality of LFPS compared to all private schools.

**Table 3** - 2015 ECE Reading results of public schools and public schools privately managed in the sample

School type	N	Mean	Std. Deviation	Std. Error Mean
Public schools	663	.57338	.16974	.00659
PSPM	39	.70120	.24260	.03884

Own elaboration. Source: ECE 2015

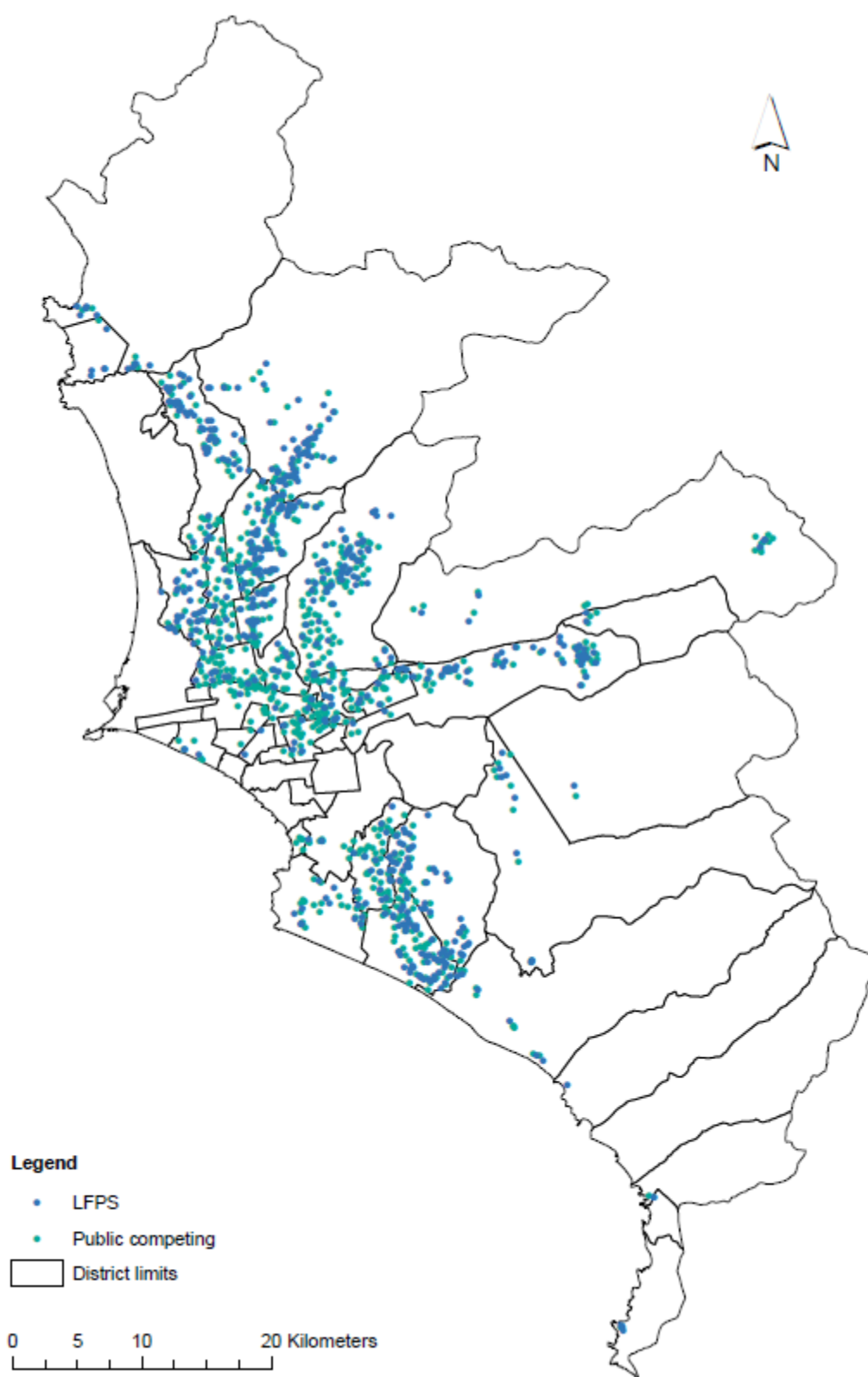
**Table 4** - 2015 ECE Math results of public schools and public schools privately managed in the sample

School type	N	Mean	Std. Deviation	Std. Error Mean
Public schools	663	.34108	.18952	.00736
PSPM	39	.48736	.22449	.03595

Own elaboration. Source: ECE 2015

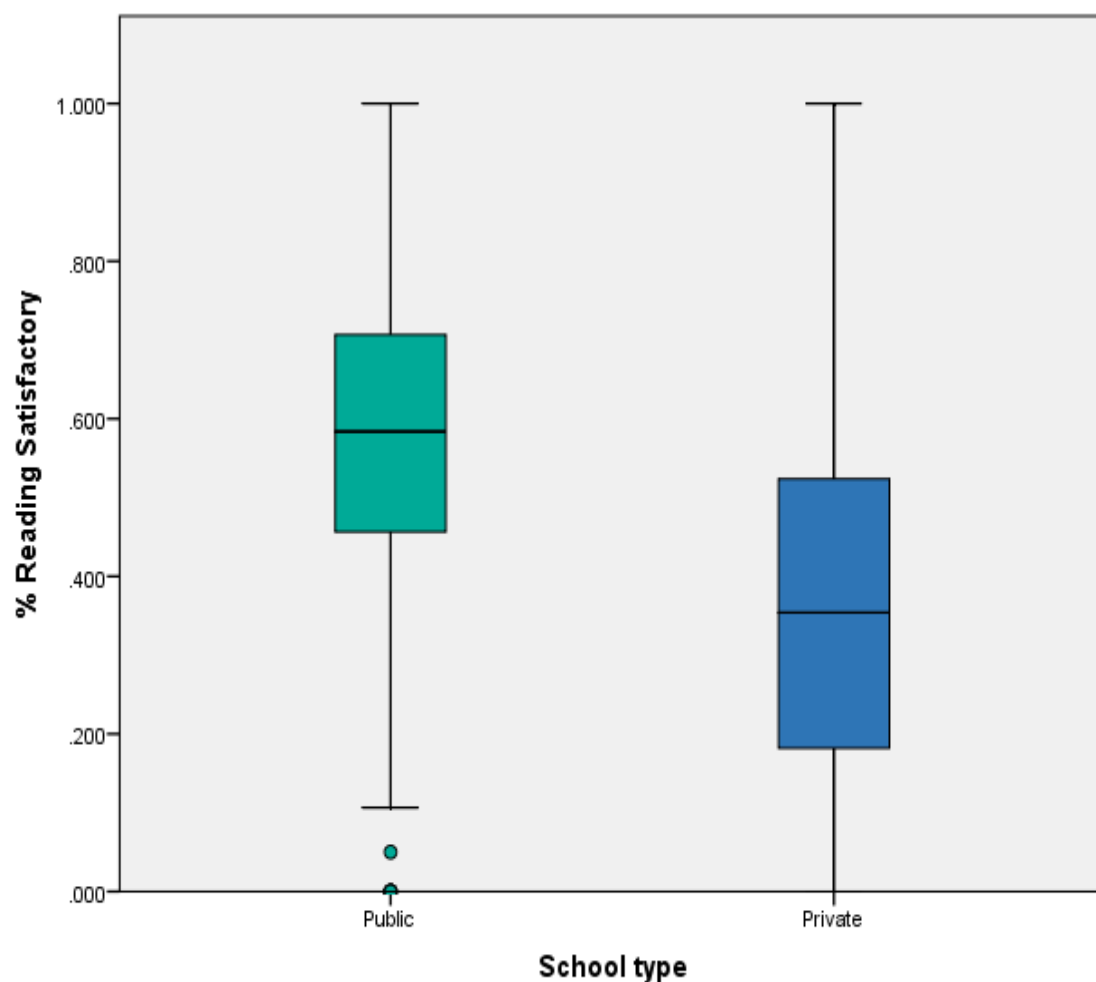


**Figure 7** – Location of LFPS and competing public schools in the province of Lima, 2015



Own elaboration. Source: *Censo Escolar 2015, Identicole 2018*

**Figure 8** – 2015 ECE Reading results of LFPS and competing public schools in the province of Lima



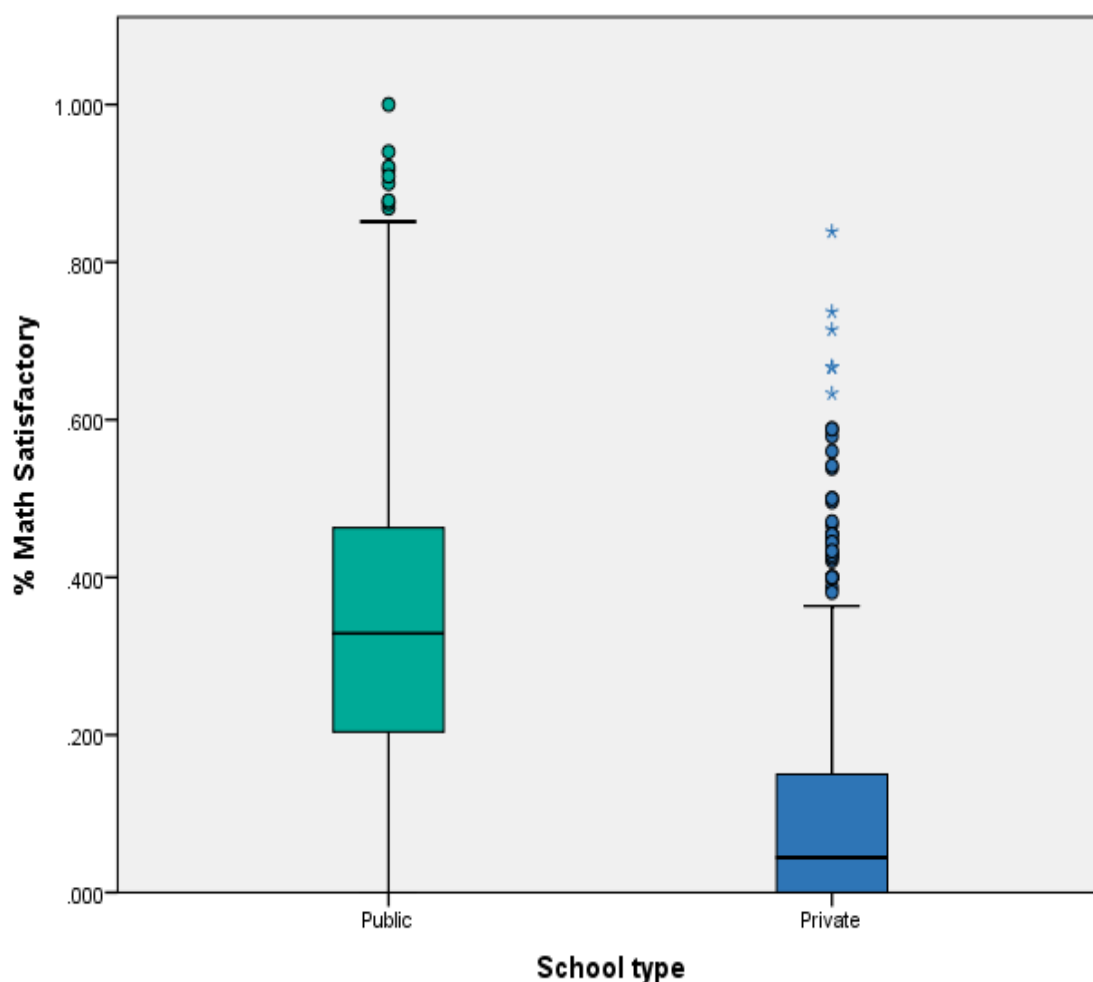
Own elaboration. Source: *Censo Escolar* 2015, ECE 2015, *Identicole* 2018

**Table 5** - 2015 ECE Reading results of LFPS and competing public schools in the province of Lima

School type	N	Mean	Std. Deviation	Std. Error Mean
Competing Public	702	.58048	.17680	.006673
LFPS	560	.35758	.23824	.010068

Own elaboration. Source: *Censo Escolar* 2015, ECE 2015, *Identicole* 2018

**Figure 9** – 2015 ECE Math results of LFPS and competing public schools in the province of Lima



Own elaboration. Source: *Censo Escolar* 2015, ECE 2015, *Identicole* 2018

**Table 6** - 2015 ECE Math results of LFPS and competing public schools in the province of Lima

School type	N	Mean	Std. Deviation	Std. Error Mean
Competing Public	702	.34921	.194361	.007336
LFPS	560	.09892	.141561	.005982

Own elaboration. Source: *Censo Escolar* 2015, ECE 2015, *Identicole* 2018

## *2.2 Defining competition*

For this study, competition is measured using the Competition Index (CI) developed by Misra & Chi (2011). Since the focus of the research is in low-income areas, we have to understand the restriction poor parents have when selecting LFPS. First, its distance, since the closeness of the school to home was a significant reason to choose a LFPS (Balarin M. , 2015). Second, its price, under the assumption that the poorest quintile can only afford public schools or LFPS (Balarin M. , 2015). Inversely, after a certain cost threshold or if the school were too far away, LFPS would not be an option for the poorest families. Thus, the assumption in this research is that public schools and LFPS only compete amongst each other. For that purpose, we have to define the market size for each school considering the time it would take most students from a low-income area to reach the school.

According to the most comprehensive study on mobility in Lima and Callao (JICA, 2005), the average trip to school is 26.8 minutes, which can be rounded to 30 minutes. Half of the trips to schools are done walking and 35% are done by public transportation. Since no information about the times per socioeconomic level is provided, we can assume that the poorest quintile is much more likely to go to school walking to avoid the costs of public transportation or to take it for short distances. We also assume that the length of the school market would be the distance a 7-8 years old child, which is the age of the population of the study, would take to walk their average trip to school (30 minutes). Cavagna, Franzetti, & Fuchimoto (1983) state that a child of those characteristics would walk about 4 km/h, which means that in half an hour the distance travelled would be 1 km. As a consequence, the circles drawn around each school to define its market size will be of 1 km in radius.

To calculate the CI, both the LFPS and public schools that are inside each circle would be the ones that are in competition with the school analysed. As seen in **Figure 10**, a 1 km circle has been drawn around each LFPS (in blue). The public schools (in green) that compete with the LFPS are inside those circles. However, there are public schools that do not compete with the LFPS (in black) and, because of this, are not considered in any of the analysis or the model. The same happens with the private schools with tuition costs over 150 PEN, which target a

different market segment and are not in competition with neither LFPS nor public schools.

**Figure 10** – Referential map of competition markets



Own elaboration. Source: *Censo Escolar* 2015

Since some of the 1 km circles reach the province of Callao, the 23 public schools in that province competing with the LFPS in the province of Lima are included to measure their CI. However, these competing public schools are not considered in the model, which focuses on the province of Lima. On the other limits of the province of Lima, no LFPS competes outside its borders. By doing this, we avoid issues in the boundaries of our sample (Gibbons, Machin, & Silva, 2009).

### *2.3 The basic empirical model*

This research tries to test the premise that schools facing more competition perform better than schools with little competition, controlling for other variables, in low-income areas of the province of Lima. The regression model considers

different school-level variables, including competition, to estimate the causal effect of competition on achievement. The model is as follows:

$$Y_j = \beta_0 + \beta_1 C_j + \beta_2 S_j + \beta_3 A_j + \varepsilon_j$$

$Y_j$  = 2015 ECE test scores (reading or math) from school  $j$

$C_j$  = vector of variables capturing competition at school  $j$

$S_j$  = vector of variables capturing the characteristics of school  $j$

$A_j$  = vector of variables capturing area socioeconomic characteristics in the education market of school  $j$

$\varepsilon_j$  = error term

Ordinary Least Squares (OLS) was chosen to run a linear regression model in SPSS Statistics 24. OLS is a technique that allows to provide evidence in support of causal arguments between a variable of interest and a dependant variable, controlling for the effect of other variables. In our model, the dependant variable was the percentage of students that achieved the satisfactory level in the 2015 ECE test for reading or math. The variable of interest is the CI of each school. There are a set of independent or control variables for socioeconomic characteristics in the education market of each school and the characteristics of the school itself.

OLS rests under two assumptions: no selection bias and linearity of the effect on the dependant variable (Vandenberghe & Robin, 2004). In our study, there is no selection bias since we do not work with a random sample but with the totality of a very specific group: primary LFPS and their competing public schools in the province of Lima. Regarding linearity, as we will show in the next chapter, there is a moderate to strong linear correlation between the dependant variable and the independent variables included in the model, which suggests the linearity of the effect between them.

However, "OLS regression may in general produce biased coefficient estimates when right-side variables are omitted or measured with error" (Marais & Wecker,

1998, p. 495). In particular, relationships may be due to spurious correlations between the independent variables and omitted variables (Altonji, Elder, & Taber, 2005). To avoid that, we will also run the model using an Instrumental Variable (IV). IV is considered the most useful strategy to account for endogeneity since it “allow us to estimate the coefficient of interest consistently and free from asymptotic bias from omitted variables, without actually having data on the omitted variables or even knowing what they are” (Angrist & Krueger, 2001, p. 73). The IV method is a two-stage least square regression model used when one of the variables may be endogenous to the error term. This means that the error term contains an omitted variable that is uncorrelated with all the other variables except the endogenous one (Wooldridge, 2001). One important variable that is missing from our model is urban density, which is associated with class size and achievement. In particular, it influences the location of schools and school size (Gibbons & Silva, 2008) and thus, our measure of competition.

The main limitation of the IV method is to find a suitable instrumental variable that meets the two necessary conditions: 1) the instrumental variable has to be correlated with the endogenous variable, all things being equal; and 2) the instrumental variable cannot be correlated with the residuals of the dependent variable. Since the last condition cannot be tested, the selection of the instrumental variable largely depends in the arguments of the researcher (Vandenberghe & Robin, 2004).

Since the province of Lima is a city with different areas that are highly dense, the distance of the school to the city centre (Noailly, Vujić, & Aouragh, 2012) might be an instrument that does not capture urban density properly. In this research, we have selected the distance between a school and its closest UGEL as our instrument. The province of Lima has seven UGEL and each one of them is located in an important node of the city. The instrument was selected based on the research from others that have used IV to measure the effects of competition on achievement and have selected variables of relative location as their instrument (Noailly, Vujić, & Aouragh, 2012; Thapa, 2013).

## 2.4 Methodological limitations

The study has limitations due to issues with the data and the models. Regarding the data, the accuracy of the data collected by the different government authorities could be questioned. The Poverty Map was the only data source that was sampled. Still, the data collected was representative, had several robustness checks and was done using validated tools from experienced institutions.

Missing values, on the other hand, were only important for the *Identicole* dataset, since 16.8% of the private schools had no tuition cost information. As mentioned before, the missing value imputation using the registration costs was a sound alternative that reduced this to only 6.6%. Thus, we do not expect significant errors from the accuracy of the data since the authorities have ensured its reliability.

Regarding the model, there are important omitted variables that can bias the model's results and reduce its explanatory power. In particular, student ability (Borland & Howsen, 1992) and parent preferences (Ponzo, 2011; Sandström & Bergström, 2005) are relevant variables that were not included in the model due to lack of information. In addition, Gibbons & Silva (2008) pointed out that the density of the area around each school should be controlled for when using the CI. As mentioned in this section, the 2SLS will control for endogeneity with a proxy for urban density, which should reduce the effects of simultaneity in our model. However, the model will be limited by the other omitted variables, but we expect that the model will have the explanatory power to confirm or reject our hypothesis.



## IV. FINDINGS

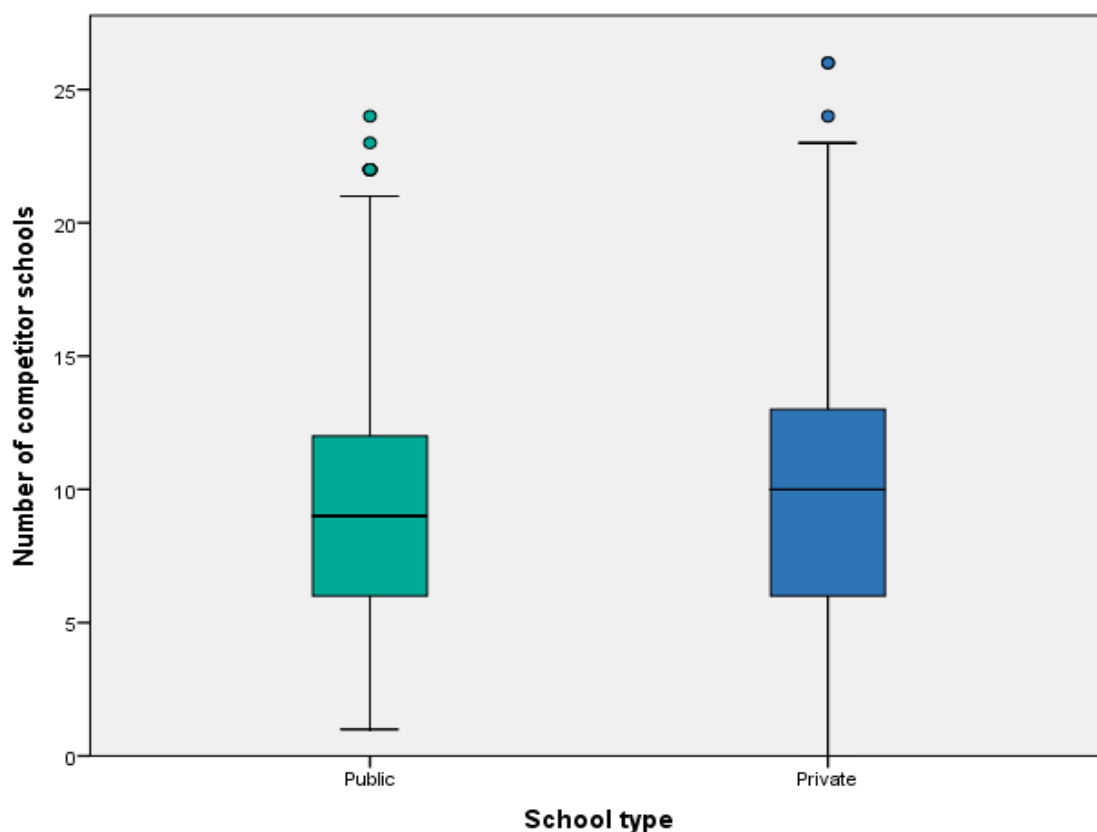
This chapter presents the findings around the three research questions of this study: the level of competition, the correlation between competition and achievement and the effect of competition on achievement in the low-income areas of the province of Lima. The chapter also provides interpretations of the results taking into account the literature. Finally, two robustness checks are done to understand the sensitivity of the regression models to changes in their specifications.

### 1. Descriptive

#### *1.1 Competition in low-income areas*

The first research question tried to identify the degree of competition in low-income areas of the province of Lima. As can be seen in **Figure 11**, both LFPS and public schools face a great deal of competition just in the surrounding 1 km radius. On average, public schools have 9.43 competitor schools and LFPS have 9.62 competitor schools. However, there is an important spread in the competition levels, where 68% of the schools have between 4 and 15 competitor schools (**Table 7**). Comparing to the number of competitors in a consolidated education market as the Netherlands (Noailly, Vujić, & Aouragh, 2012), the high number of competitors is even more surprising: the schools in the Netherlands had an average of only 6.5 competitors in an area twice as big.

**Figure 11** – Number of competitors of private and public schools in the province of Lima



**Table 7** - Number of competitors of private and public schools in the province of Lima

School type	N	Mean	Std. Deviation	Std. Error Mean
Competing Public	702	9.43	4.709	.178
LFPS	560	9.62	5.065	.214

Regarding the CI, since the results have vast scale differences that are a consequence of how the index is calculated (**Table 8**), a logarithmic scale is going to be used from now on. Thus, the competition variable is going to be LOGCI, as seen in **Figure 12**. The lower the number, the less competition the school faces. Even though LFPS and public schools had a similar number of competitor schools, when the distance and enrolment of each school is accounted for, LFPS face about 30% more competition than public schools: -3.5649 versus -4.6323

(**Table 9**). In addition, LFPS have more variability in both the number of competitors and their competition index.

**Table 8** – Competition index in the province of Lima

<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
1,262	.00000	.56375	.00108	.01629

**Table 9** – Logarithm of the Competition Index of private and public schools in the province of Lima

<b>School type</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Competing Public	702	-4.6323	.55903	.02110
LFPS	556	-3.5649	.75139	.03187

### *1.2 Correlation between competition and achievement*

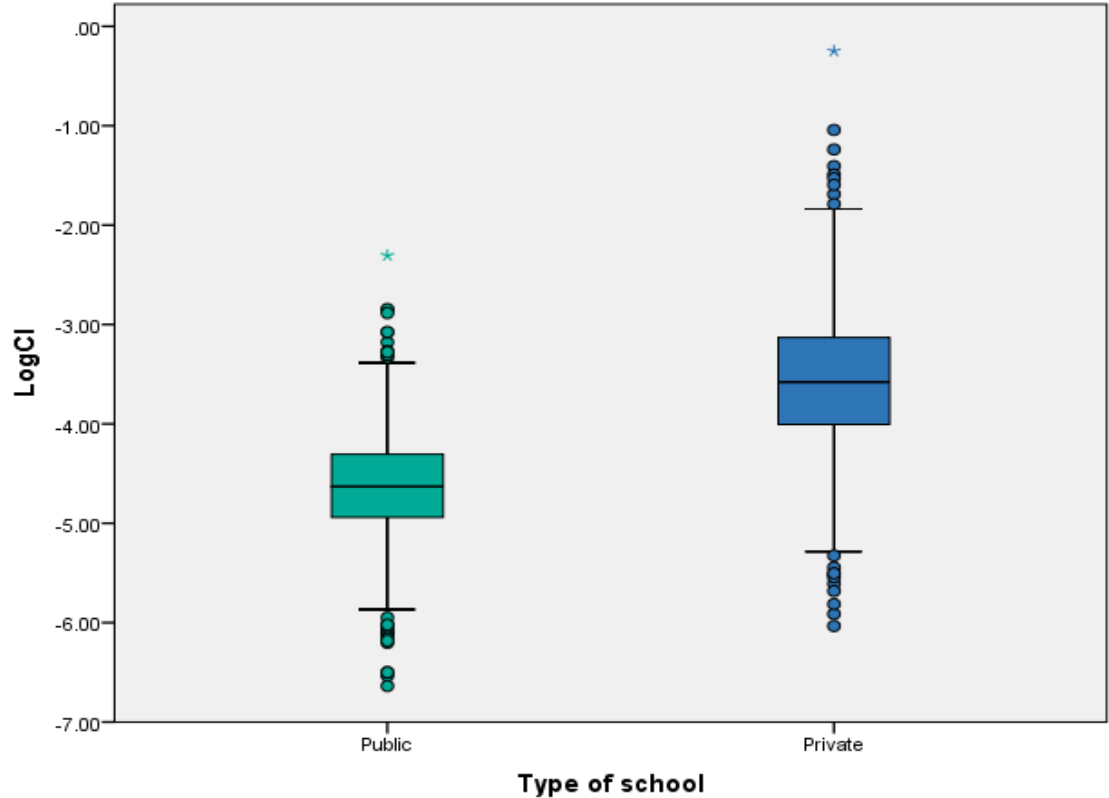
Our second research question had the purpose to analyse if there was any correlation between competition and achievement. The results suggest that a moderate negative correlation significant at the 1% level exists between the LOGCI and achievement for both reading and math (**Table 10**).

**Table 10** - Correlation between competition and achievement

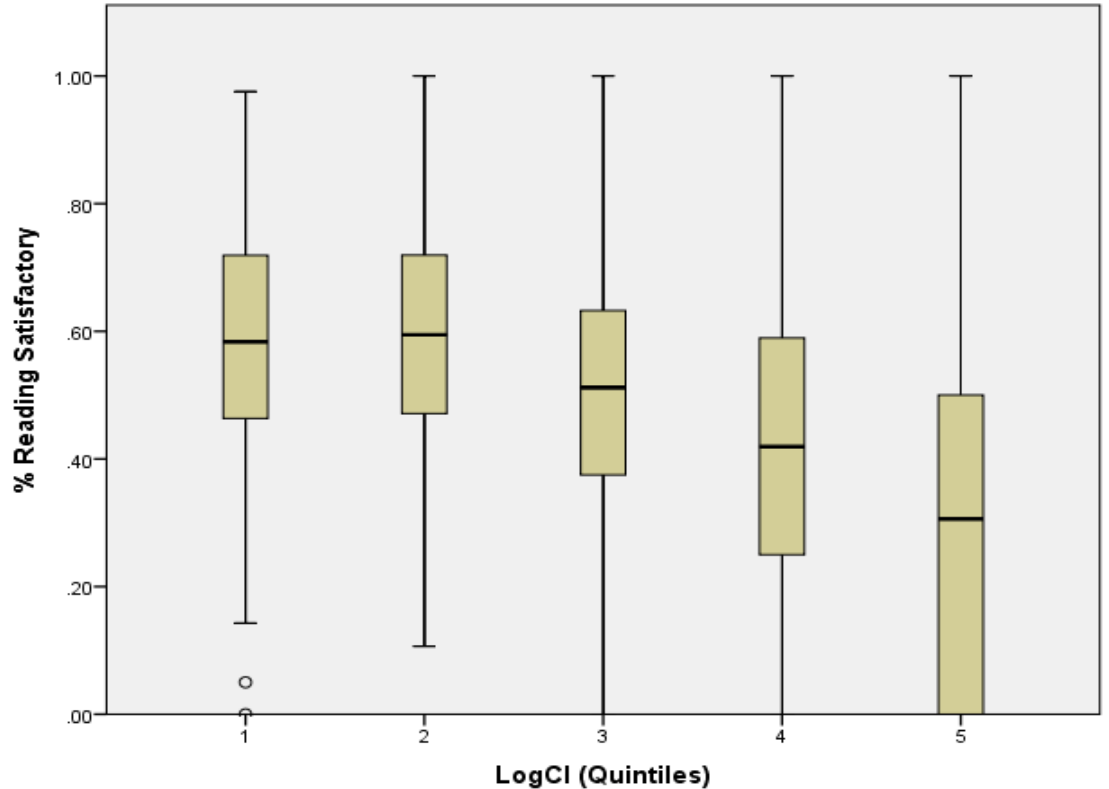
	<b>ECE_Reading</b>	<b>ECE_Math</b>
Pearson Correlation	-.432**	-.451**
Sig. (2-tailed)	.000	.000
N	1,258	1,258

\*\* . Correlation is significant at the 0.01 level (2-tailed).

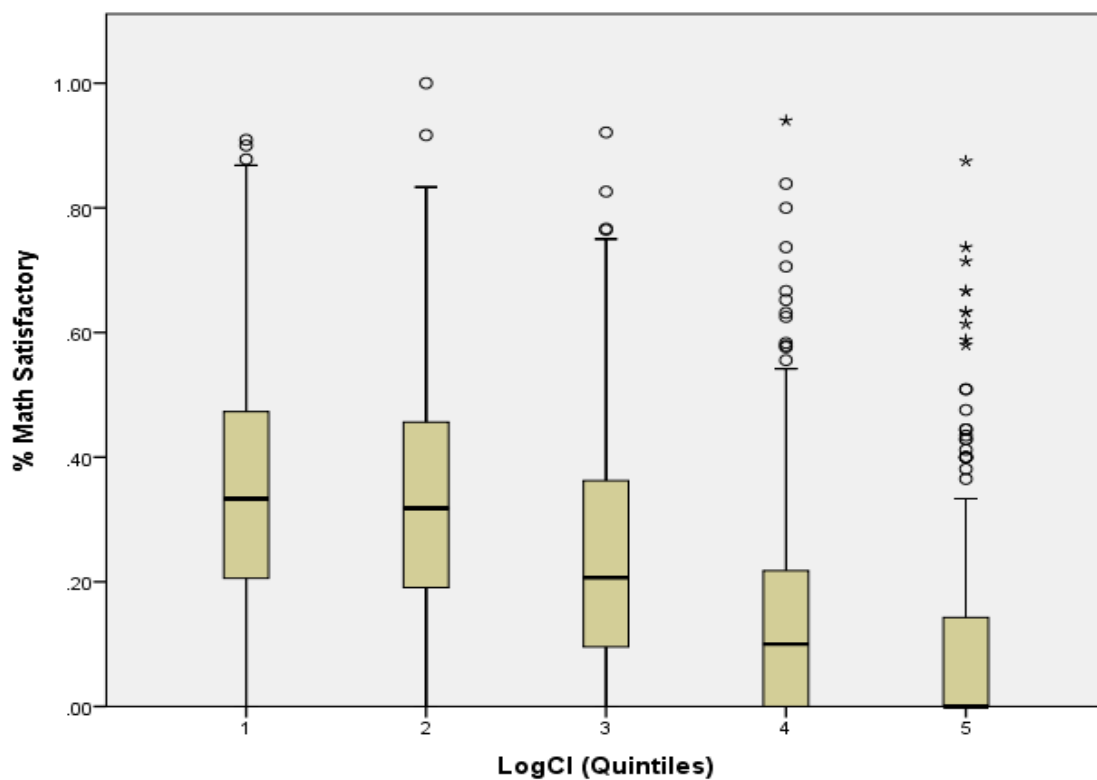
**Figure 12** – Logarithm of the Competition Index of private and public schools in the province of Lima



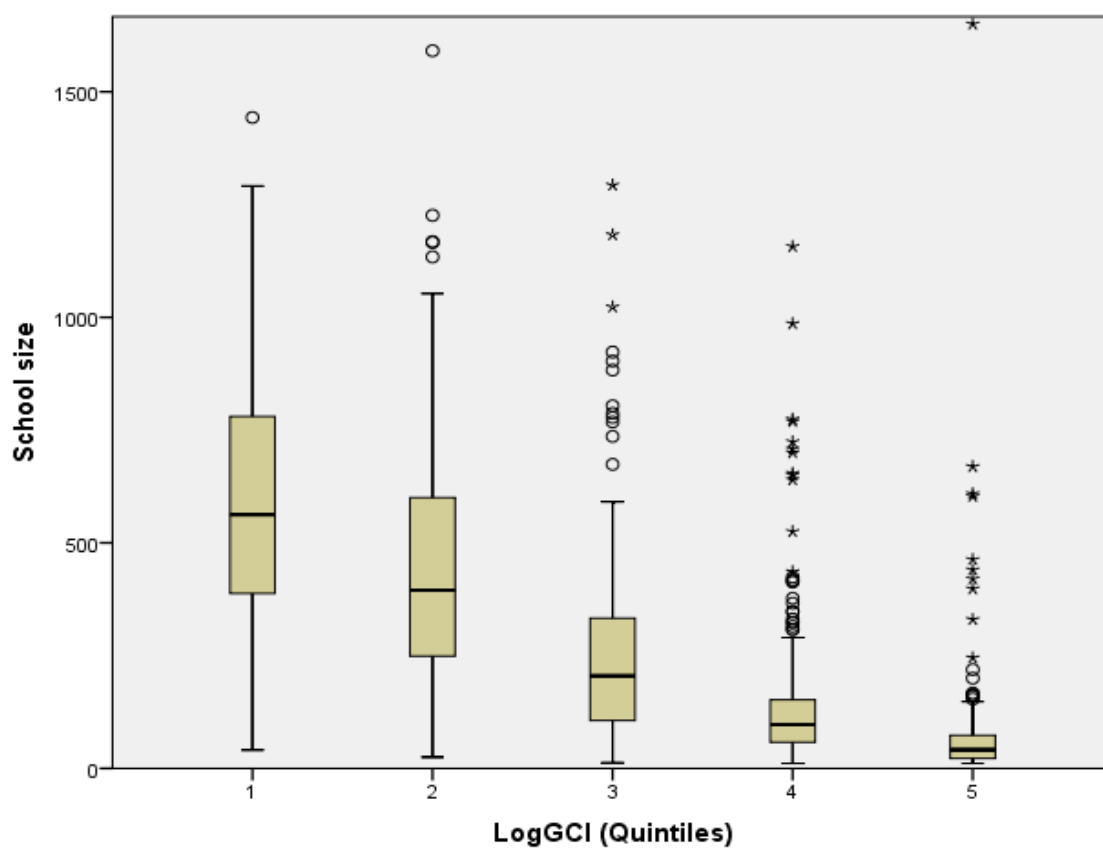
**Figure 13** – Quintiles of competition and reading proficiency



**Figure 14 – Quintiles of competition and math proficiency**



**Figure 15 – Quintiles of competition and school size**



Even though the results are all over the spectrum, a similar trend appears for both reading and math when the analysis is done to the quintiles of LogCI, as seen in **Figures 13-14**. In the first two quintiles, where the schools have the least competition, there does not seem to be any differences. From the third quintile to the fifth quintile, an increase in competition seems to be correlated with a decrease on achievement. One possible explanation as to why this happens is due to the school size. On average, smaller schools have more competition pressures (**Figure 15**), since the CI is a function of its size and an inverse function of its competitor's size. Schools in the first quintile of competition had a mean of 583 primary students, while schools in the fifth quintile had a mean of only 75 primary students. If the school is smaller, it is more likely to be a private school, which have worse results than public schools. Thus, LogCI might be capturing the effects of other variables that are strongly correlated to LogCI, such as school classification and class size. Another explanation is that small schools cannot compete effectively with big schools because of resource constraints (Misra & Chi, 2011) and, consequently, have worse performance. In summary, there is evidence that competition, measured as LogCI, is negatively correlated with achievement. However, a causal effect is yet to be demonstrated.

## **2. Causal**

### *2.1 Impact of competition on achievement*

Our main research question tries to understand the level of influence of competition on achievement in low-income areas of the province of Lima. To do so, OLS and 2SLS regressions are used in two models. The first one, Model I, considers all variables but those from past ECE tests. In Model II, the results from the 2011 ECE tests and 2014 ECE tests are included to control for the effects of past performance of each schools. All but two of the 1,262 schools in the sample took the tests in those years. The instrument for the 2SLS is the distance between a school and its closest UGEL.

**Table 11** - Variable description

Variable	Description of variable
<b>Dependent variables</b>	
ECE15_Reading	2015 ECE reading % satisfactory for school
ECE15_Math	2015 ECE math % satisfactory for school
<b>School characteristics</b>	
S_TYPE	School type: 1 if private, 0 if public
S_MANAGE	School management: 1 if private, 0 if public
S_SECOND	1 if school has secondary education in their venue
S_KINDER	1 if school has pre-primary education in their venue
S_SIZE	Schools size: total number of students in primary
PCT_GIRLS	Percentage of girls in primary
C_SIZE	Average class size in primary
ST_TCH	Student teacher ratio in primary
LAB	1 if school has at least one laboratory. 0 otherwise
LIBRARY	1 if school has at least one library. 0 otherwise
PC	1 if school has computers. 0 otherwise
NUM_PC	Number of computers for primary students
COST	Cost of monthly tuition in PEN
LOCATION	School location: 1 if avenue, 0 if other road
ECE11_Reading	2011 ECE reading % satisfactory for school
ECE11_Math	2011 ECE math % satisfactory for school
ECE14_Reading	2014 ECE reading % satisfactory for school
ECE14_Math	2014 ECE math % satisfactory for school
<b>Area context</b>	
POVMIN	Lower boundary of the level of poverty of the area
POVMAX	Upper boundary of the level of poverty of the area
POVDIF	Difference between POVMIN and POVMAX
<b>Competition variables</b>	
LOGCI	Logarithm of the competition index of the school

**Table 12** - Summary statistics

<b>Variable</b>	<b>Obs.</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>Std. dev.</b>
ECE15_Reading	1,262	0.00	1.00	0.48	0.23
ECE15_Math	1,262	0.00	1.00	0.24	0.21
S_TYPE	1,262	0.00	1.00	0.44	0.50
S_MANAGE	1,262	0.00	1.00	0.47	0.50
S_SECOND	1,262	0.00	1.00	0.50	0.50
S_KINDER	1,262	0.00	1.00	0.56	0.50
S_SIZE	1,262	11	1706	297	289
PCT_GIRLS	1,262	0.00	1.00	0.44	0.50
C_SIZE	1,262	1.83	40.00	20.20	9.14
ST_TCH	1,262	1.86	58.00	19.25	8.22
LAB	1,183	0.00	1.00	0.34	0.47
LIBRARY	1,186	0.00	1.00	0.57	0.50
PC	1,179	0.00	1.00	0.90	0.31
NUM_PC	1,224	0.00	628.0	45.90	59.43
COST	1,262	0.00	145.0	50.67	59.01
LOCATION	1,225	0.00	1.00	0.39	0.49
POVMIN	1,262	0.73	34.40	16.07	6.78
POVMAX	1,262	1.43	44.49	21.10	8.12
POVDIF	1,262	0.70	17.53	5.03	1.71
ECE11_Reading	1,260	0.00	1.00	0.28	0.19
ECE11_Math	1,260	0.00	0.80	0.11	0.12
ECE14_Reading	1,260	0.00	1.00	0.40	0.22
ECE14_Math	1,260	0.00	1.00	0.22	0.20
LOGCI	1,258	-6.64	-0.25	-4.16	0.84
Valid N	1,086				

Own elaboration



**Table 11** describes each variable in the regressions and **Table 12** is the summary statistics for the variables that are going to be used in the models. Most of the variables have data for the 1,262 schools in the sample. However, some schools have data missing for school infrastructure variables from the *Censo Escolar 2015*: location, laboratories, libraries and computers. Four LFPS are missing information for the LogCI, since they had no competitors in their area and their CI was zero. Therefore, the logarithm of its CI is not a valid number and they are not included in the regressions.

The results of the OLS regression are shown in **Table 13**. The variables of COST and POVMAX are not included because they did not have effects on any of the models. The main finding of the regression is that competition has a negative effect on achievement for reading in Model I and II at the 5% significance level. For math, however, the results are not significant or only at the 10% significance level. This suggests that in the low-income areas of the province of Lima, having more competition pressures does not improve achievement. This is not consistent with the theory, which suggests that more competition generates incentives for schools to increase their productivity and, hence, improve their results (Hoxby, 2003). However, four reasons could explain why this might not be the true in our case.

The first is that schools might improve their productivity due to competition, but not their productivity for achievement. Parents could value more other things over test results and select schools based on those (Noailly, Vujić, & Aouragh, 2012). Then, schools would invest more in the signals that drive parents' preferences, such as computers and technology (Fontdevila, Marius, Balarin, & Rodríguez, 2018), and underinvest in areas that could improve student achievement. Competition would force schools to shift their resources to areas with little impact on learning but effective to attract or retain students. This is particularly relevant in the Peruvian case, where parents do not have school-level information on test results and, as a consequence, cannot use it to guide their choice.

**Table 13 – OLS regression results**

	(I)		(II)	
	ECE15_Reading	ECE15_Math	ECE15_Reading	ECE15_Math
CONSTANT	0.117** (0.055)	0.125** (0.049)	0.067 (0.053)	0.077* (0.046)
LOGCI	-0.024** (0.01)	-0.016* (0.008)	-0.018** (0.009)	-0.007 (0.008)
<b>School characteristics</b>				
S_CLASSIF	-0.124*** (0.037)	-0.279*** (0.033)	-0.095** (0.037)	-0.175*** (0.033)
S_MANAGE	0.084** (0.033)	0.131*** (0.029)	0.052 (0.033)	0.078*** (0.029)
S_SECOND	-0.049*** (0.015)	-0.024* (0.013)	-0.043*** (0.014)	-0.019 (0.012)
S_KINDER	0.015 (0.012)	0 (0.011)	0.014 (0.012)	0.001 (0.01)
PCT_GIRLS	0.22*** (0.074)	0.057 (0.066)	0.15** (0.071)	0.007 (0.061)
C_SIZE	0.012*** (0.001)	0.006*** (0.001)	0.009*** (0.001)	0.004*** (0.001)
ST_TCH	-0.003** (0.001)	-0.001 (0.001)	-0.002* (0.001)	-0.001 (0.001)
LAB	0.033** (0.017)	0.019 (0.015)	0.025 (0.016)	0.013 (0.014)
LIBRARY	0.01 (0.012)	-0.005 (0.011)	0.012 (0.012)	-0.006 (0.01)
PC	0.037* (0.02)	0.021 (0.017)	0.028 (0.019)	0.021 (0.016)
LOCATION	-0.026** (0.012)	-0.006 (0.01)	-0.025** (0.011)	-0.004 (0.009)
ECE_2011			0.175*** (0.034)	0.187*** (0.044)
ECE_2014			0.216*** (0.028)	0.326*** (0.029)
<b>Area context</b>				
POVMIN	0.002 (0.001)	0.002 (0.001)	0.002** (0.001)	0.002 (0.001)
POVDIF	-0.015*** (0.005)	-0.011** (0.004)	-0.009* (0.005)	-0.005 (0.004)
<b>R2</b>	.350	.391	.412	.477
<b>N</b>	1,169	1,169	1,167	1,167

Standard error in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

The second reason is that certain schools might have incentives to decrease their productivity. In this scenario, “rent-seeking suppliers may choose to go ‘downmarket’ in response to an increase in competition, reducing productivity and service quality. Though they lose market share, suppliers can more than offset the losses by being able to cut costly effort” (McMillan, 2004, p. 1872). Furthermore, going ‘downmarket’ might be the only alternative for some schools to survive. The competition for scarce resources, both students and teachers (Maroy & van Zanten, 2009), might force schools to hire less capable teachers who are willing to work in those conditions or enrol students that, in other conditions, they would not accept. Controlling for student and teacher intake might make clear if the relationship is real, or a spurious relationship or

intervening relationship (Healy, 2012). Thus, in a competitive education market, even though schools are expected more efficient due to competition (Misra, Grimes, & Rogers, 2012), they might have incentives to be less productive in order to remain profitable.

The third is that a very competitive education market may incentivize parents to change schools more often. Since there are many alternative for parents that are dissatisfied with their children's education, they would prefer to exit the school and would not stay and voice their concerns (Hirschman, 1970). Thus, schools would not have the feedback and time to improve their service. Moreover, the children's learning process could be harmed due to their turbulent education trajectories (Balarin M. , 2015) and the remaining children could suffer from the negative externalities of student turnover (Hanushek, Kain, & Rivkin, 2004), reducing the overall achievement of the school.

The last reason is that, similar to all service markets in Peru, the regulation framework and structure of incentives does not allow the education market to function as expected. In particular, tiny and small schools might be significantly less productive than large schools due to lack of experience and knowledge from owners, restricted access to loans and informal work conditions (Ruiz-Arranaz & Deza, 2018). However, the market failures allow a misallocation of resources, where "low-productivity firms attract more capital and labour than they should, while more productive ones fail to receive sufficient resources" (Levy, 2018). Thus, unproductive schools may remain in the market and high-performing schools might not grow.

To ensure that the effects found in the OLS are not due to endogeneity, a 2SLS was also run. However, the use of the distance to the nearest UGEL was not a robust instrument, since its use did not changed the results in any of the models. The same happened for two other instruments: distance to the city centre and urban density at the district level, which did not captured local differences in density. Thus, we cannot abandon the hypothesis that the results are due to endogeneity, especially since class size has a positive and significant effect on achievement for all the models. Moreover, the beta standardized coefficient for class size is one of the highest for all the models and the most important predictor for reading, having greater effects than the results from previous ECE tests.

Then, one of two effects is true. Either competition has a negative effect on achievement or competition is capturing the effects of other omitted variables. Thapa (2013) also obtained some negative coefficients for his measure of competition when he run an OLS regression to understand the effect of private school competition on student's performance. However, for the 2SLS regression, all the coefficients were positive. Thus, there are grounds to believe that part of the effects are due to endogeneity. Two variables not included in the models may explain this: 1) urban density (Gibbons & Silva, 2008), where more dense areas have bigger class and school sizes, which reduces their CI; or 2) pupil sorting across schools, where better schools are attracting more students and increasing their enrolment, which also reduces their CI (Noailly, Vujić, & Aouragh, 2012). In conclusion, the negative coefficients of the competition measure might be due to endogeneity. However, the scope of this research does not allow us to determine if that is true and the question could be subject of another research.

## *2.2 Impact of other variables on achievement*

The results provide other interesting insights regarding the effect of other variables on achievement. First, controlling for socioeconomic status and schools characteristics, private schools have negative and significant effects on achievement. Thus, the important differences in achievement between public schools and LFPS might be due the incentives and actions of each type of school. Complementary, PSPM have positive and significant effects. This is consistent with the assumption that PSPM have better performance in Peru.

Second, the level of poverty of the area of the school has no effect on achievement, but inequality, considering the differences between the upper and lower poverty threshold of the area surrounding a school, has a significant and negative effect. The former may be because since the sample considers only low-income areas, the absolute differences between them are not as important as the differences within each area. The later could be an effect of perverse incentives, where schools lower their productivity in the presence of socioeconomic heterogeneity to accommodate to the demand spill overs (McMillan, 2004).

Third, in the Model II that considers the results of previous ECE tests, the signs of the variables remain unchanged comparing to the Model I. As expected, the

ECE results from 2011 and 2014 have a positive and significant effect on the results in 2015. However, they are not as important as one might expect. When considering the beta standardized coefficients, the two of them combined only explain between 0.345 and 0.423 of the model for reading and math, respectively. Class size is more important for reading (0.355) and school type is almost as important for math (-0.409). The low effect of past performance in the current performance of the schools could be attributed to two factors.

The first could be that the schools do not deliver consistent results over time due to significant teacher or student turnover. If teacher rotation is common in a school, the good or bad performance in a year could change significantly in the next with a different teacher. The negative effects of student turnover on achievement have already been discussed in the previous section (Hanushek, Kain, & Rivkin, 2004). The second factor might be due to endogeneity in the model (Wooldridge, 2001). Thus, the beta standardized coefficients do not capture the magnitude of the effect of each variable accurately. In particular, the high effect of class size and school type seems to be evidence that this might be true.

Finally, some other variables have significant effect in both models. If the school also offers secondary education, it appears to have negative effects on reading in primary education but no effect for math. Other variables such as percentage of girls in the school, lower teacher-student ratios and having a library or computers have significant positive effects on reading. However, those variables have no effect on math and the effects on reading of having a library or computers disappear in the Model II.

### *2.3 Robustness checks*

Two robustness checks are done to understand how the models behave when some of the specifications are changed. The first robustness check considers using a different measure for competition to understand how sensitive the models are to it. In other studies, a discrete measure of competition was used (Sandström & Bergström, 2005; Ponzio, 2011). Likewise, for this research, the competition level divided by quintiles (QuintilLogCI) is the variable selected.

The results from **Table 14** show that, unlike other researches (Borland & Howsen, 1993), the use of a discrete measure for competition lowers the significance of the competition variable in the regressions. Only reading in Model I is significant at the 5% level. Despite this, the signs remain negative and the coefficients lower to half for Model I and to a third for Model II. The results suggest that the models might be sensitive to the variable chosen to represent competition, consistent with the findings from Belfield & Levin (2002).

**Table 14** – Regression coefficients for LogCI and QuintilLogCI

	(I)		(II)	
	ECE15_Reading	ECE15_Math	ECE15_Reading	ECE15_Math
LOGCI	-0.024** (0.01)	-0.016* (0.008)	-0.018** (0.009)	-0.007 (0.008)
QUINTILLOGCI	-0.012** (0.006)	-0.008 (0.005)	-0.006 (0.006)	-0.002 (0.005)

In the second robustness check, Cook's distance ( $D_i$ ) is used to demonstrate if the results hold after eliminating the outliers in the models.  $D_i$  is how much influence a data point has on the predicted outcome of the dependent variable in a regression. Thus, the data point with a larger  $D_i$  have larger residuals and has more effect on the regression than those with a lower value (Wooldridge, 2001). The following OLS regressions do not consider the data points with a Cook's distance over  $4/n$ , where  $n$  is the number of data points. As a consequence, all data points that have a  $D_i > 4/n = 4/1,262 = 0.00317$  will be deemed outliers and not considered in the regression. Also, 93 data points have at least one missing value and, because of this, do not have a  $D_i$  value.

The results in **Table 15** use over 86% of the data points and show that the sign of the coefficient of all variables remained in both models. Moreover, the models seem well specified since the regression coefficients remain reasonably stable and the  $R^2$  increased when comparing to the regression with the complete dataset. Even though it was not the case before, competition is no longer significant in Model II for reading and math is significant at the 10% level. This suggests that the level of significance of LogCI might be sensitive to the specifications of the model.

**Table 15 – OLS regression results without outliers**

	(I)		(II)	
	ECE15_Reading	ECE15_Math	ECE15_Reading	ECE15_Math
CONSTANT	0.111** (0.051)	0.121*** (0.041)	0.035 (0.048)	0.041 (0.039)
LOGCI	-0.019** (0.009)	-0.017** (0.007)	-0.012 (0.008)	-0.011* (0.007)
<b>School characteristics</b>				
S_CLASSIF	-0.186*** (0.036)	-0.337*** (0.03)	-0.118*** (0.034)	-0.201*** (0.031)
S_MANAGE	0.135*** (0.032)	0.189*** (0.027)	0.065** (0.03)	0.104*** (0.027)
S_SECOND	-0.036*** (0.013)	-0.02* (0.01)	-0.033*** (0.012)	-0.012 (0.01)
S_KINDER	0.006 (0.011)	-0.011 (0.009)	0.007 (0.01)	-0.008 (0.008)
PCT_GIRLS	0.208*** (0.07)	0.028 (0.058)	0.204*** (0.066)	0.022 (0.057)
C_SIZE	0.014*** (0.001)	0.006*** (0.001)	0.009*** (0.001)	0.005*** (0.001)
ST_TCH	-0.004*** (0.001)	-0.002* (0.001)	-0.003** (0.001)	-0.001 (0.001)
LAB	0.017 (0.015)	0.02* (0.012)	0.012 (0.014)	0.013 (0.012)
LIBRARY	0.005 (0.011)	-0.017* (0.009)	0.008 (0.01)	-0.015* (0.008)
PC	0.06*** (0.018)	0.029** (0.014)	0.054*** (0.017)	0.026* (0.013)
LOCATION	-0.026** (0.01)	-0.006 (0.008)	-0.024** (0.01)	-0.003 (0.008)
ECE_2011			0.177*** (0.031)	0.157*** (0.037)
ECE_2014			0.264*** (0.027)	0.288*** (0.025)
<b>Area context</b>				
POVMIN	0.003** (0.001)	0.001 (0.001)	0.002** (0.001)	0.002** (0.001)
POVDIF	-0.019*** (0.005)	-0.01*** (0.004)	-0.008 (0.005)	-0.006* (0.003)
<b>R2</b>	.464	.521	.519	.586
<b>N</b>	1,102	1,103	1,086	1,095

Standard error in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

## **V. CONCLUSIONS AND POLICY RECOMMENDATIONS**

The aim of this research was to understand the effect of competition on achievement in low-income areas of the province of Lima, Peru. To that end, this research first defines low-fee private schools (LFPS) in the province of Lima. Then, calculates the degree of competition each school faces using the Competition Index (CI) developed by Misra & Chi (2011). Finally, this research uses correlations and regressions to understand the relationship and effect of competition on achievement, measured using the 2015 ECE tests results for reading and math in the second grade of primary education.

The first finding of this research was that the primary education market in the low-income areas of the province of Lima is highly competitive. Each school has around ten other schools competing with them in just 1 km of distance. Comparing to the number of competitors in a consolidated education market as the Netherlands (Noailly, Vujić, & Aouragh, 2012), the high number of competitors is even more surprising: the schools in the Netherlands had an average of only 6.5 competitors in an area twice as big.

The second finding was that competition, measured using LogCI, has a moderate negative correlation with achievement, for both reading and math, significant at the 1% level. One possible explanation as to why this happens is due to the school size, a variable used to measure LogCI. On average, smaller schools have more competition pressures. If the school is smaller, it is more likely to be a private school, which have worse results than public schools. Thus, LogCI might be capturing the effects of other variables that are strongly correlated to LogCI, such as school classification and class size. Another explanation is that small schools cannot compete effectively with big schools because of resource constraints (Misra & Chi, 2011) and, consequently, have worse performance.

The third finding was that competition might have a negative effect on achievement. Four explanations might help to elucidate this apparent contradiction: 1) schools might focus their effort in other areas rather than test results to attract and retain students; 2) schools might have incentives to be less productive, which negatively affects achievement; 3) parents might have incentives to change their children's school more often, which negatively affects



achievement for the students that leave and remain in the schools; and 4) the market failures from the education system allow a misallocation of resources that negatively affects achievement.

However, neither the OLS nor the 2SLS regression provided enough evidence that the results were not due to endogeneity. In particular, the high effects of class size in the model suggest that it could be capturing the effect of omitted variables such as urban density or pupil sorting. Moreover, the level of significance of competition might be sensitive to the measure used and to the specifications of the model. Thus, we cannot confirm or reject the premise that competition has positive effects on achievement, making a case for further studies on these topics.

Despite the uncertainty over our main hypothesis, these findings add to the debate of whether competition in education has positive effects in all contexts and over time. To the best of our knowledge, this is the first empirical research that suggests that competition might have negative effects on achievement. This is particularly relevant in contexts of competition saturation (Noailly, Vujić, & Aouragh, 2012) and low regulation such as the province of Lima and many other cities in developing countries. In these contexts, market failures might impede the positive externalities of competition. In the province of Lima, market forces alone do not seem to drive the education market to improve and, on the contrary, might be inducing “behaviours that are privately profitable but socially inefficient” (Levy, 2018, p. 8).

Further studies are needed to understand better the competitive interdependencies of schools (Maroy & van Zanten, 2009) and the conditions that allow competition to be a positive force in the education market. The first would be to do a similar research in Peru that includes an IV that might control for endogeneity and have more certainty over the findings. The second, a research that analyses how the context shapes the practices, incentives and beliefs of parents and school administrators in both types of schools to help to answer why private schools underperform compared to public schools. The third research could be an analysis of the effect of teacher and student turnover and school's attraction and retention practices on achievement, to validate if they might be a source of the negative effects of competition. In other countries, especially in developing countries, it is imperative that more research is done on the effects of

competition on achievement and how parents, schools and the government shape the competitive pressures.

Concerning policy recommendations that arise from the findings, the most obvious one might be to provide information of school test results to parents via league tables or similar tools. In this scenario, private schools would have incentives to improve their test scores. However, by doing so, the MINEDU would promote a narrowing of the curriculum and teaching to the test in private schools (Adamson & Astrand, 2016). Moreover, the tests would reduce their reliability, as schools would have important incentives to cheat on the tests or even bribe the test administrators to have an advantage. In an environment with high levels of corruption and low government capability (Proetica, 2017), this seems very plausible. Still, even with accurate information, parents would not necessarily enrol their children in the school with better performance, as it already happens in other countries (Allen & Burgess, 2014), or continue to enrol their children based on other criteria such as aspirations (Sanz, 2015).

This does not mean that information of the test scores is irrelevant. That information, along with other information of the schools, should drive the MINEDU and the UGEL to regulate and support failing schools, both private and public. The increased support, incentives and accountability measures from MINEDU seem to have improved the results in public schools (Cueto, Dammert, & Miranda, 2017). Thus, the same should be provided to private schools. However, private schools could also have their operations license or tax exemptions conditioned to meeting minimum requirements in infrastructure, teacher's education or organization. A recent reform in higher education (Peruvian National Congress., 2014) has paved the way to make this option feasible but not without opposition. Changes that are more aggressive could include a minimum salary for teachers in private schools or a minimum tuition fee, which would force cheaper and lower quality schools out of the market. However, reforms that drastic seem non-viable and could have negative effects on student enrolment and increase school informality.

High-performing public schools, on the other hand, could be provided with incentives to increase their enrolment while keeping their tests results. Some incentives for the outstanding public schools might be more autonomy in the school decisions, tailored training for teachers, faster promotion for tenured

teachers or increased budget. Once public schools have incentives to compete with other public schools and private schools, the education system should improve its results as expected.

In summary, competition might not always be “the rising tide that lifts all boats” (Hoxby, 2013, p. 1). On the contrary, the regulatory framework in the education market and the incentives for schools, parents and the government are critical for the outcomes of more competition since “it is by no means automatic that stronger market forces alone must improve incentives” (McMillan, 2004, p. 1889). Privatization and increase in competition and choice have lasting effects on education markets that change the behaviours of all the agents involved. Thus, a rigorous analysis is necessary when policies to increase competition are to be implemented and, once executed, they should be reviewed to understand their effects and correct accordingly. In any case, what is fundamental is that governments do not abandon their responsibility to ensure quality education for all and expect that the ‘invisible hand of the market’ will deliver the promised results. Governments must ensure that education market failures do not fail children in schools.

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