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### **Evaluating the Impact of Decentralisation on Educational Outcomes: The Peruvian Case**

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## **Abstract**

This dissertation evaluates the impact of the Municipalisation Pilot Programme in Peru on learning outcomes, and aims to contribute to the identification of pre-conditions for its success. The study uses data of language test results from the Census Assessment of the Ministry of Education and complementary databases. A Fixed-effects Panel Data regression is conducted for 1750 municipalities over the period of 2007-2010. An emphasis will be given to the peculiarities of poor and rural localities in order to assess the risk of incurring enhanced inequalities in learning achievements derived from decentralisation, and to identify sensible factors that affect these areas.

## Evaluating the Impact of Decentralisation on Educational Outcomes: The Peruvian Case

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## **1. Introduction**

### *1.1 Background of the decentralisation of education*

Decentralisation efforts are popular in public sector reforms worldwide, and specifically the decentralisation of the education sector is becoming an increasingly widespread reality in developing countries. Its supporters argue that it allows for enhanced efficiency and accountability, and for a better fit of responses to the 'client's' needs such as educational resources and methods. As Carnoy (1999) from the International Institute of Educational Planning of UNESCO pointed out, policy makers often agree that decentralisation is one of the most effective strategies for ensuring flexibility and quality of education. In addition, there is ample evidence of positive results of decentralisation in the literature, such as King and Ozler (2000) who found that greater autonomy in decision-making about pedagogical and administrative matters in schools produces a positive effect on student performance.

The overall success of decentralisation reforms on education, however, is not clear in the literature because it often produces mixed results –some indicators improve but inequalities may also be widened. In effect, some output indicators such as coverage rates tend to be responsive to these types of reforms, but its impact on learning outcomes is less clear and appears to vary within countries. Furthermore, decentralisation assessments are largely focused on issues of implementation instead of impacts, because its effects may be difficult to isolate (Winkler 1989). Therefore, the lack of academic consistency turns into a limiting factor for interventions addressing educational quality. It is nevertheless an increasingly relevant topic, given that international discussions currently emphasise the importance of investments in quality of education after evidencing the poor results attained in learning outcomes by the Millennium Development Goals, IISD (2012).

### *1.2 Research Gap*

The results concerning decentralisation reforms are therefore enormously varied, as Litvack et al. (1998, p.30) illustrates with the following statement: "It is not much of an exaggeration

to say that one can prove, or disprove, almost any proposition about decentralisation by throwing together some set of cases or data.” The current debate about the appropriateness of decentralisation for improving education quality focuses on identifying the specific conditions that determine its outcomes. The present study contributes to this discussion, and will be the first quantitative evaluation to measure the impact on learning outcomes of the Municipalisation Pilot Programme (PPM) in Peru.

### *1.3 Introduction to the Peruvian Municipalisation Case*

The Peruvian case is interesting because it was a phased process, which helps to isolate the effects of specific factors such as the transfer of responsibilities and financial resources. In addition, it started as a pilot programme in a small but representative sample of the diverse conditions in the country—e.g. geographic diversity, urban-rural population rates, and economic development—and gradually included new municipalities with the aim of incorporating ‘lessons learned’ before expanding to a national scale.

The programme was decommissioned in December 2011 due to a lack of evidence about improvements in quality and a perceived risk of increasing the gaps in learning outcomes in poor and rural districts (MED, 2012). Given that these conclusions were drawn out of qualitative assessments of the implementation process, this study aims to provide more robust evidence on the subject. Despite the fact that the programme has been decommissioned, the study of its impacts can be useful to understand the mechanisms by which decentralisation affects (or not) learning outcomes for future policies and for the decentralisation process at the regional level.

### *1.4 Argument*

This study argues that the decentralisation of education has the potential to increase learning outcomes due to its capacity to increase efficiency, accountability, adaptability, awareness of problems, and the speed of responses. Nevertheless, there are a number of pre-conditions that must be met, such as the clarity of the process, a minimum degree of autonomy achieved at subnational levels, the effective transfer of capabilities, responsibilities and resources, the availability of information and participation mechanisms

for the population, and resource availability. Through the analysis of the literature review and quantitative estimations, I will assess the potential benefits of the municipalisation of education in Peru, the compliance of the aforementioned factors, its effects on learning outcomes, as well as the existence of an increased risk of widening the gaps for the less favoured locations.

### *1.5 Methodology and Limitations*

The assessment of the impact of decentralisation on language test results will be conducted through Panel Data estimations covering the period of 2007-2010 for over 1750 municipalities out of the total of 1837. Several sources of information are used, including education indicators from educational surveys and census assessments conducted by the Ministry of Education; budget information from the Ministry of Economy and Finance; and complementary municipal and socio-economic information from the National Institute of Statistics and Informatics of Peru. Given the fact that the pilot programme was active for four years only, the quantitative analysis draws on the methodology proposed by Faguet and Sanchez (2008) for estimating the effects of decentralisation in an environment of poor data. Nevertheless, the conclusions from this study should be taken with caution given the short period of available information. In addition, studies of this nature are normally subject to bias due to measurement errors and unavailability of information.

The impact evaluation of decentralisation on learning outcomes will be complemented with the analysis of output-level indicators and case study analysis. An important emphasis will be given to the peculiarities of poor and rural areas in order to identify sensible factors and to assess the risk of incurring enhanced inequalities in learning achievements as highlighted by the Ministry of Education, MED (2012). Policy implications will be drawn in the light of these results.

### *1.6 Structure*

Subsequently, the study is organized as follows. Section 2 covers the theoretical framework concerning decentralisation and learning outcomes. Section 3 reviews the

Peruvian decentralisation programme. Section 4 presents the empirical model, Section 5 the results and Section 6 concludes.

## **2. Literature Review**

### *2.1 Definition*

The literature on decentralisation outlines three types of responsibility transfers: deconcentration, delegation and devolution; shaped by the degree, type and permanency of transfers, Hanson (1997). Deconcentration is defined as “the transfer, usually by administrative decree, of decision-making authority from higher to lower levels of the bureaucracy within the same level of government”, Winkler (2005, p.2). Delegation is the transfer of government tasks or functions to autonomous organizations that are ultimately accountable to the government, Winkler (1989). Devolution is characterized by the idea that the body or agency receiving the new powers is legally separate from the central ministry, and does not report to the central authority, Ketleen et. al. (1997). This study considers a more general definition of decentralisation: the devolution of specific functions by the central government, with all the administrative, political, and economic attributes that these entail, to democratic local governments which are independent of the centre within a legally delimited geographic and functional domain (Faguet & Sanchez, 2008). Moreover, decentralisation can be applied at different geo-political levels, implying different degrees of autonomy for regions, localities or schools.

### *2.2 Conceptual arguments in favour of decentralisation*

Increased *efficiency*, *accountability* and *local knowledge* are some of the most popular benefits associated with decentralisation among the literature. McGinn & Welsh (1999) mention that decentralisation is a popular reform of the education system among countries that aims to tackle slow state bureaucracies in issues regarding teachers, school material and infrastructure. Public spending reductions are also associated with decentralisation, since high bureaucratic administrative costs are reduced and expenses are financed at lower local prices. The argument of augmented *accountability* was presented by Treisman (2007), who considers that checks and balances can be better achieved at a local level



because more disaggregated information should be available, and McGinn & Welsh (1999) highlight that the lines of accountability result more clearly defined and are closer to local population. Regarding *local knowledge*, it is expected that, when decision makers and managers of services are closer to the users, the information and knowledge about local preferences would be enlarged. In effect, Oates (1972) argues in his pioneering decentralisation theorem that decentralised decision-making better adjusts heterogeneous demands with local supply. Additionally, it is argued that decentralisation also allows for faster identification of local problems and more efficient governance, McGinn & Welsh (1999).

The argument of increased *participation* of constituents is popular in the literature. Putnam (1993) explains the economic gap between the North and South of Italy by their differences in the importance of the voice and involvement of their citizens in public decisions. Civic traditions in northern regions tend to be more organized and influential in their authorities because they were able to pressure politicians more effectively than the unorganized groups in the south. Moreover, Barkan and Chege (1989) found that the perception of citizens about their potential to influence and participate in municipal decisions produces a direct effect on prospects of development. An assessment of the education framework in Chile highlights the importance of democratic participation in the quality of education. It is recognized that one of the benefits of providing education services at a municipal level is that democratic elections are practiced at that level of government, whereas regional governments are perceived to be more highly dependent on the Central Government, CAPCE (2006).

Policy *innovations and experimentation* may also improve when education services are in the hands of many local instances that provide similar services, Habibi et.al.(2001). Specially, when schools compete for resources or students based on their results, incentives to innovate increase due to the need to differentiate from the rest.

McGinn & Welsh (1999) mention two additional benefits of decentralisation. The first one is that it *reduces the power of teachers' unions* because they are not representative at a local level, which facilitates education reforms. Second, it is used as a measure of the Central Government to devolve the management of schools that it can no longer finance.

Nonetheless, decentralisation processes do not always prove to be a success. Several authors point out certain pre-conditions that must be met in order for reforms to produce positive outcomes. A commonly recognized factor is the importance of examining the availability of human and financial resources before the reform takes place. Nonetheless, there is no consensus on this ground either and several authors ascertain different factors. For example, Faguet (2009) points out the importance of political economy conditions such as a competitive local economy, an active and organised civil society with adequate information, and an open and transparent electoral system. In his approach, the aforementioned factors would endogenously produce a political response of authorities to local needs. On the other hand, Di Gropella (2004) highlights the importance of the way in which the accountability relations are set to work, and provides some lessons on how to get these relationships to work effectively.

### *2.3 Conceptual arguments against decentralisation*

Faguet (2004) estimates a Nash centralization model of municipal bargaining for the allocation of public resources to the Central Government. He explains that high degrees of centralization respond to a 'residual power' located in the capital where resources are agglomerated and decisions are made. The model assumes that the Central Government is a selfish organisation with incentives to allocate resources within its mandate. Local governments, on the other hand, need to exert pressure on the Central Government for the allocation of resources. This harms weak local governments that are unable to respond accordingly. As a consequence local governments, especially weak ones, would be worse-off under a centralized scheme than under a decentralized one. Furthermore, the author explains that decentralisation fails very often because of the limited incentives of the central government to commit in serious reforms that involve delegation of powers. Therefore, 'de facto' and not 'de jure' decentralisation reforms are commonly put into practice.

Zajda (2006, p.11) states that "There is no total political and administrative decentralisation, since all policy decisions concerning finance, personnel and staffing retain varying degrees of centralisation and decentralisation. Hence, the real policy issue is one of finding the necessary balance between centralization and decentralisation." The literature on the subject covers many reforms on education with negative outcomes related with a lack of

'completeness' of decentralisation. For example, the success of the Chilean reform on education is debatable given the wide range of contradictory opinions and assessment results about the case. Nevertheless, student mobilisations that started in the year 2006 have made it clear that there is discontent among students. Indeed, an education quality council was named by the executive authorities in Chile in order to draw recommendations and suggestions to improve the quality of education given the restlessness of students. There were many unresolved debates, but the agreement was wide when assessing the need of further participation of parents. Likewise, there was consensus regarding the need to ameliorate inequalities by prioritizing poor students, CAPCE (2006).

In fact, most of the arguments against decentralisation are associated with concerns about its potential to increase inequalities. McGinn & Welsh (1999) mention inequalities in human and financial resources that need to be compensated by the Central Government. Unequal conditions may translate into impoverished quality and access of education because of the higher restrictions faced by poor students, Winkler (2005). Specifically in Chile, the decentralisation process of over two decades strengthened the social divide in society, Van der Wal (2007). "Educational inequality is the result of "unequal treatment" of different categories of the Chilean population. Municipalization operates as a social mechanism that perpetuates class segregation instead of breaking or removing it. This occurs because lower socio-economic groups are dependent on the administrative and policy decisions of different actors between which consensus concerning policy goals, plans and allocation materialize with difficulty. The necessary resources, like knowledge, experience, capacity and money, turn out to be lacking with actors at the primary level as well as actors at the secondary and tertiary level. These resources are necessary in order to improve the special needs and social position of a large group of students in an effective and efficient manner." Van der Wal (2007, p.37)

Another concern regarding decentralisation relates with problems derived from the shared distribution of powers among several levels of authority. Florestal et. al. (1997) conducted a review of legal issues on decentralisation and found that shared distribution of powers may affect local accountability and efficiency. This is linked with losses in clarity of accountability lines for the users of the services and ineffective management because of unclarity in responsibilities and functions.

Habibi (2001) refers to the potential problems of decentralisation related with efficiency losses: "From an efficiency point of view, moreover, decentralisation risks limiting gains obtained from economies of scale in technology and information, while the lack of local expertise could offset some of the potential efficiency gains; excessive trial-and-error experimentation and duplication might, of course, also result. Equally important, while there may be greater transparency at the local level, we cannot be certain that corruption is not likely to also be greater, given the frequent substantial power of local elites." Habibi (2001, p.7).

#### *2.4 Empirical Evidence of the Effects of Decentralisation on Educational Outputs*

"Whilst some evidence suggests that education and health are attractive areas to look upon, this is far from being clear for most other functions." Letelier (2004). Empirical results about the impact of decentralisation in the education sector present mixed results in general, but this appear to be better in relation with other sectors.

Habibi et. al. (2001) studied the Argentinian decentralisation case and found a positive impact on enrolment rates and in the reduction of regional disparities. Faguet and Sanchez (2008) also showed increased enrolment rates and responsiveness in Colombia and Bolivia respectively due to decentralisation, especially in poor and rural areas. Patrinos & Ariasingam (1997) study the cases of Balochistan and Bangladesh and found positive impacts on female enrolment and attendance rates and in dropout rates. Busemeyer (2008) empirically tests the hypothesis that decentralisation produces benefits via consumer-voters competition in the provision of public goods in a decentralized framework. He finds that in the education sector competition translates into higher spending than under a centralized provision scheme.

Nevertheless, some empirical studies point to risks associated with decentralisation reforms. Behrman et. al. (2002) concludes that decentralisation is linked with poorer quality school inputs in Bangladesh and Indonesia. However, it appeared to improve survival rates and learning outcomes of primary school in the Philippines and did not affect the secondary school cohort. Acedo and Gorostiaga (2007), Geo-Jaja (2006) and Prawda (1993) found

worsened or neutral results in their studies of decentralized education because of contracted education budget allocations and school quality. In addition, Cuellar-Marchelli (2003), Kristiansen y Pratikno (2006) and Sayed and Soudien (2005) find aggravated poverty, elite capture and increased inequalities.

### *2.5 Empirical Evidence of the Effects of Decentralisation on Learning Outcomes*

Despite the fact that low quality of education is an endemic problem in most developing countries, (Winkler and Boon-Ling, 2007), Winkler (1989) and many years later Hinsz (2006) found that the attention of many academics is focused on assessments of the implementation period of reforms. Nevertheless, the number of quantitative studies assessing impacts on learning outcomes is augmenting over time, many of which find positive effects of decentralisation on student achievements.

At an international scale, Diaz-Serrano and Meix-Llop (2012) find positive results of economic decentralisation on mathematics, language and science scores using data from the Programme for International Student Assessment (PISA) for 22 countries. In addition, Falch and Fischer (2010) found that government spending on decentralisation produced a positive effect on test scores using PISA and TIMSS tests from some OECD countries.

Regarding country-level experiences, King and Ozler (2000) conduct a quantitative study to estimate the effect of decentralisation in learning outcomes in Nicaragua that suggests that greater autonomy with respect to teacher staffing, salaries, and incentives are effective in raising student performance. A study from Argentina of Eskeland and Filmer (2002) also found improvements in test scores caused by decentralisation. In the case of Chile, results are mixed. For example Parry (1997) finds causation between educational outcomes and decentralisation, whereas Winkler and Rounds (1996) found an improvement in the provision efficiency, but a decline in the score of cognitive tests.

## **3. The Peruvian decentralisation programme**

Peru has been facing a decentralisation process of its public management at a regional and local level in the last decades. The poor education results at the national level triggered the

decentralisation of the sector in the General Education Law of the year 2003. The education provision in Peru would be decentralized, simplified, participative and flexible, and the Regional Government Law of 2005 would detail the transfer process to these instances. This reform did not involve major changes because the same management structure was maintained, with the difference that the Regional Director of Education is now appointed by the Regional President instead of by the Ministry. Nevertheless, a Pilot Municipalisation Programme was put in place at the same time. With 46 municipalities at its initiation in 2007, additional ones were included in the consecutive years and other dropped the programme. Thus, only 35 municipalities reached the final stage of the process by its decommission in 2010. The municipal programme implied significant changes in relation with the regional because authorities of the later possess participation and vigilance functions mainly, while municipal mayors handle expenditure decisions in addition. Newly acquired functions by municipal authorities include deciding the number of schools and teachers, opening new schools and managing school budgets, among others.

### *3.1 Phases of the Pilot Programme of Municipalisation*

The municipal programme contemplated three phases: Initiation (2007-2008), expansion (2009-2010) and generalization (2011-2015). In 2007, 56 initial municipalities were selected to participate with the aim to represent the diversity of the country regarding the size of territories; population dispersion; and levels of budget, income and economic development potential, in order to gain feedback for the gradual inclusion of the 1837 municipalities. Only 46 out of the 56 municipalities remained in the programme in 2008, and 88 additional ones were included, as well as the secondary level of education. This stage had the objective to transfer administrative faculties to municipalities. Financial transfers, though, were tied to an accreditation process that resulted too complex and precluded municipalities from receiving funds during this phase.

The expansion period was supposed to start in 2009 including 500 additional municipalities per year, but none was added. The accreditation process was simplified, and a total of 44 municipalities were accredited during this period. Nevertheless, financial transfers were subject to administrative complexities and delays, thus only 24 received financial transfers by 2009. Therefore, the municipalisation produced: (1) delegation of functions to

municipalities that did not comply with the accreditation requisites and (2) devolution to 34 municipalities with budgetary transfers to fund operational costs of schools.

In December 2011, the programme was decommissioned due to the following reasons: (i) a clash of competences between local and regional governments, (ii) that the process did not take into account the heterogeneous local realities of Peruvian municipalities, and (iii) that several studies of the implementation of the programme showed that there was no significant improvements in the quality of education and a perceived risk of increasing the gaps in learning outcomes impairing results in poor and rural areas. Furthermore, it was also argued that the process revealed improvisation and a lack of evaluation criteria; that it was limited to administrative transfers with no pedagogic accompaniment; and that it was not aligned with the National Education Plan nor articulated with the Regional Education Projects.

### *3.2 Major limitations of the programme*

An analysis of the limitations of the municipalisation process will be conducted, based on the literature of case studies, official assessments of the programme and an interview (**Appendix 1**) where the perceived limitations of the process were reviewed with the Head of the Education Office in the Municipality of Miraflores.

Some of the most commonly mentioned limitations of the process of decentralisation are the insufficiency or inexistence of financial transfers, the lack of clarity in the separation of functions between different levels of government, the lack of experience and municipal capabilities regarding the transferred activities, insufficient coordination between the local and regional levels, and the limited scope of transferred responsibilities, many times limited to the management of school payrolls. In this line, Alcazar and Valdivia (2011) state the necessity of transferring complementary programmes that are managed by the Central Government, such as the teacher training programme, the literacy programme and the programme of educational infrastructure.

Valdivia and Arregui (2009) highlight the problems derived from the homogenous conception of municipalities in the design of the process. Through cluster analysis, the authors illustrate that the main differences between municipalities are usually explained by the volume of their

budgets, the quality of human capital, the level of IT in their administration and management capabilities.

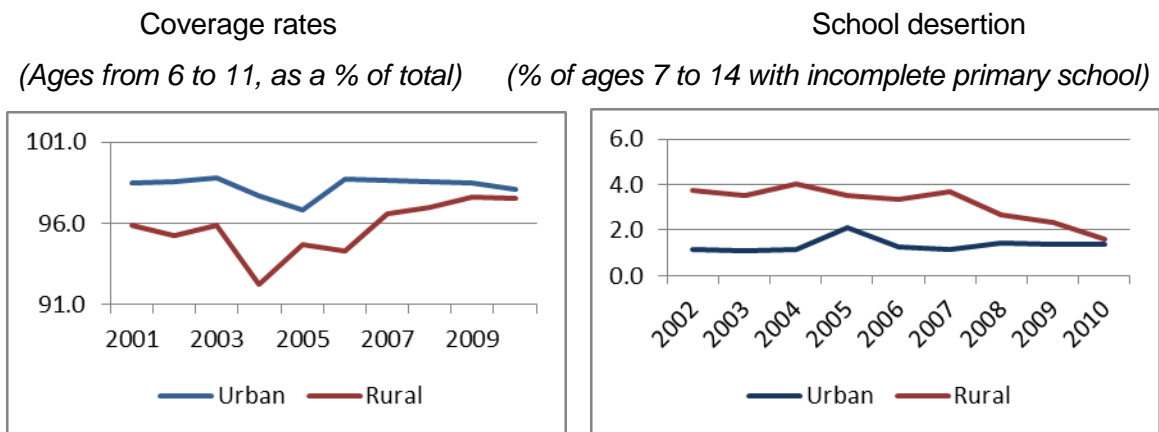
Regarding the implementation process, the Defensoria del Pueblo (2009) concludes that decentralisation plans were not respected, that the transfers were characterized by normative disorder, and that there was a dissociation with financial transfers and capacity building support.

In conclusion, it is widely agreed that the provision, funding and management of education resulted complex activities given the capabilities and institutional restrictions of municipalities in Peru.

### 3.3 Overview of the sector

In the last years, educational output indicators showed an improvement in Peru. School enrolment, coverage, conclusion, repetition, delays, and the rate of primary approval present at least slight improvements in the last ten years for urban and rural populations and for boys as well as for girls. In addition, despite the fact that education results are superior in urban areas, there is a catch-up effect of rural localities in certain indicators. For example, coverage rates in the 6-11 age range increased from 95.9% in 2001 to 97.5% in 2010, reaching urban levels (see **Figure 1**).

**Figure 1: Coverage Rate and School Desertion**



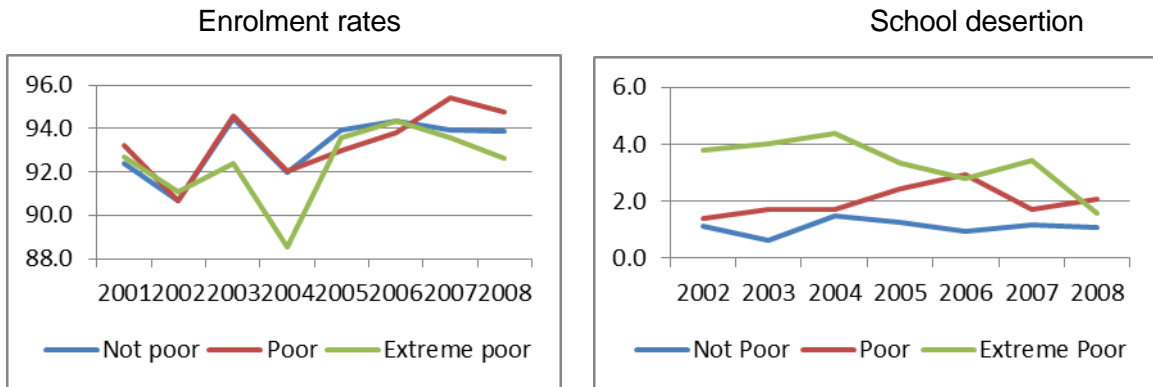
Source: National Institute of Statistics and Informatics of Peru



In addition, poor and extreme poor populations have experienced improvements in certain indicators such as school enrolment and desertion (see **Figure 2**). In fact, school enrolment rates in Peru have surpassed the Latin American average.

**Figure 2: Enrolment and School Desertion**

*(Ages from 6 to 11 in the year of correspondence for enrolment rates and from 7 to 14 years with incomplete primary school for desertion rates, both as a % of total)*

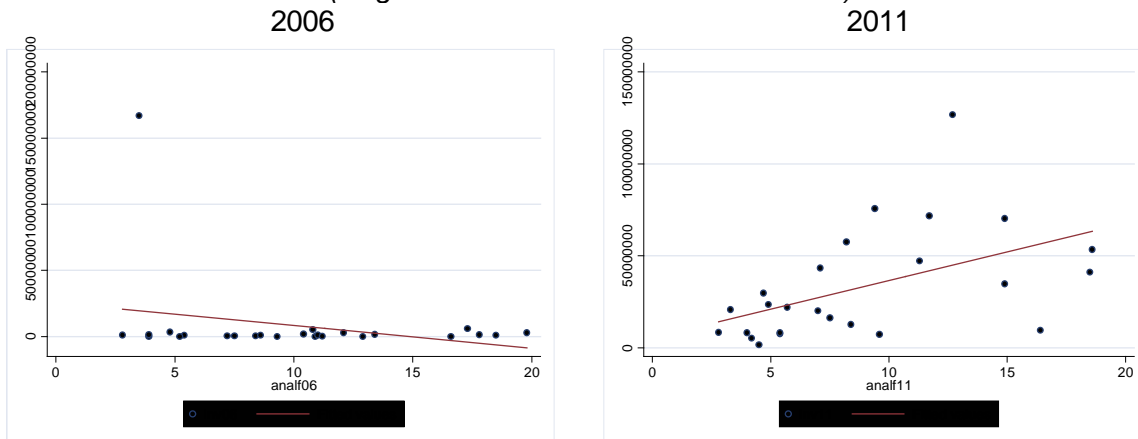


Source: National Institute of Statistics and Informatics of Peru

**Figure 3** plots total investment in education and illiteracy rates in all municipalities of Peru, grouped by regions. The relationship between these two variables is negative and weak in 2006, and positive and significant in 2011. This contrast appears to signal an improvement in the responsiveness of investments in education after the reform, focusing resources in localities where educational needs are greater.

**Figure 3: Illiteracy rates vs Educational Investment**

*(Regional information of 2006 and 2011)*

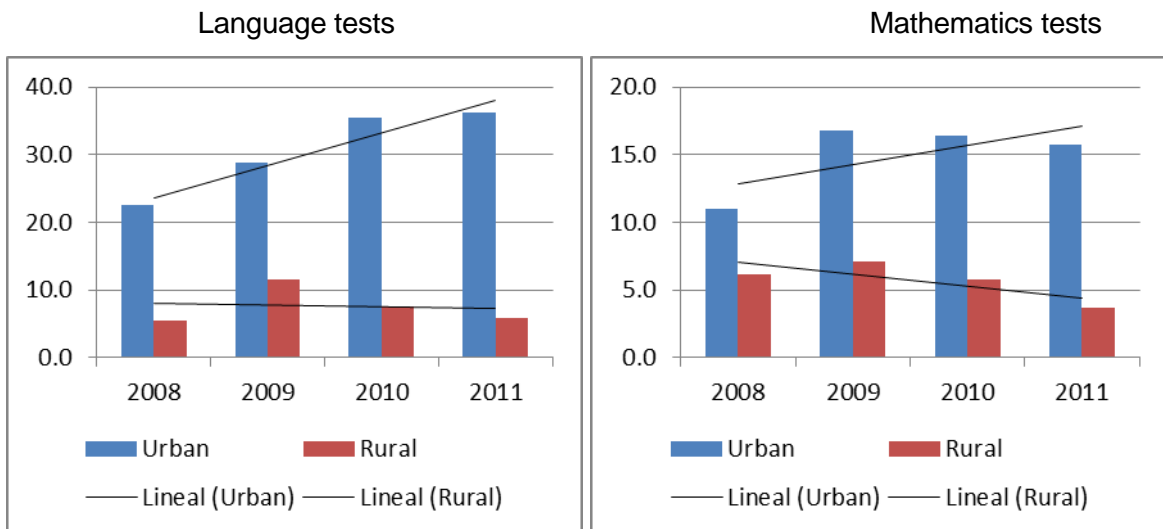


Source: Ministry of Economy and Finance and National Institute of Statistics and Informatics of Peru

Nevertheless, many indicators show significant differences between rural and urban populations e.g. 7% versus 22% in school delays respectively, and a difference of 10% versus 24% between Spanish and Indigenous speaker populations respectively. In addition, learning achievements have opposite trends in urban and rural areas. Both areas show poor results, with approximately 35% and 15% of students that attain the expected results in language and mathematics tests, respectively (see **Figure 4**).

**Figure 4: Students that attained learning objectives**

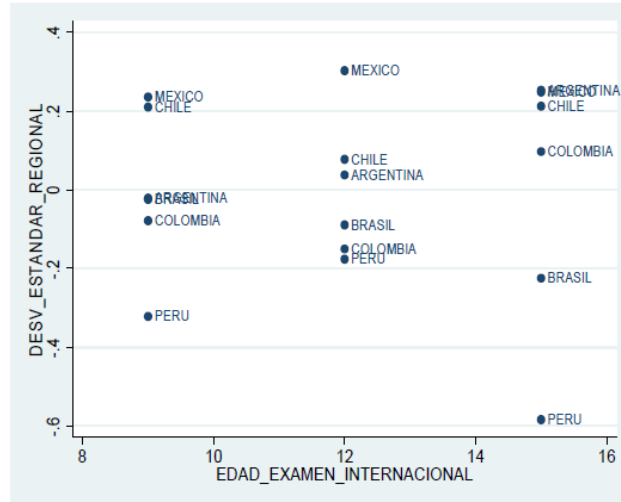
*(% of participants from 2nd grade)*



Source: Ministry of Education

In fact, Peruvian test scores lay behind results in the rest of the region in international assessments. World Bank (2001) calculations show that in both the SERCE and PISA tests Peru is the last country in the region. It stands 0.3 standard deviations below the regional average in primary school and 0.6 standard deviations below the average in secondary school results (see **Figure 5**).

**Figure 5: Latin America results in SERCE and PISA tests**  
(In standard deviations)



Source: World Bank (2010), using data from UNESCO and OECD

### 3.4 Overview of the sector by level of government

Concerning investment patterns, the evidence suggests that local governments invest considerably higher proportions of their educational budgets than their central and regional peers (see **Figure 6**). The investment ratios are 23%, 10% and 68% of total expenditure in education for central, regional and local governments, respectively, with the rest allocated to running costs. This could be due to the fact that in total 36% of municipal budgets is financed with sources restricted to public investments only, such as revenues from natural resources. It is also noticeable that municipalities that participate in the decentralisation programme tend to assign higher proportions of their expenditure to the education sector. For example, while local governments in Lima allocate 3% of their expenditure to education, the municipalities that participate in the municipal programme assign 32% in average to education. The same ratios are 5% to 26% for El Callao, and 8% to 59% for La Libertad, widely surpassing the extra financial amounts perceived by their participation in the programme.

**Figure 6: Expenditures in education***(Running costs as a % of total expenditure)*

	<b>Central</b>	<b>Regional</b>	<b>Local</b>
2001	83		
2005	91		
2006	95		
2007	91	100	
2008	97	100	85
2009	90	91	16
2010	83	89	28
2011	77	90	32

Source: Ministry of Economy and Finance of Peru

In addition, it can be observed in **Figure 7** that total expenditures in education maintain a positive tendency in the last years, and that local expenditures in education became significant with the decentralisation of the sector. In fact, in spite of the fact that only 1.9% of municipalities received financial transfers from the municipal programme, municipal expenses in education represent around 14% of the total. This suggests that municipal incentives to invest in education go beyond their participation in the municipal programme.

**Figure 7: Total expenditure in education***(In millions of soles)*

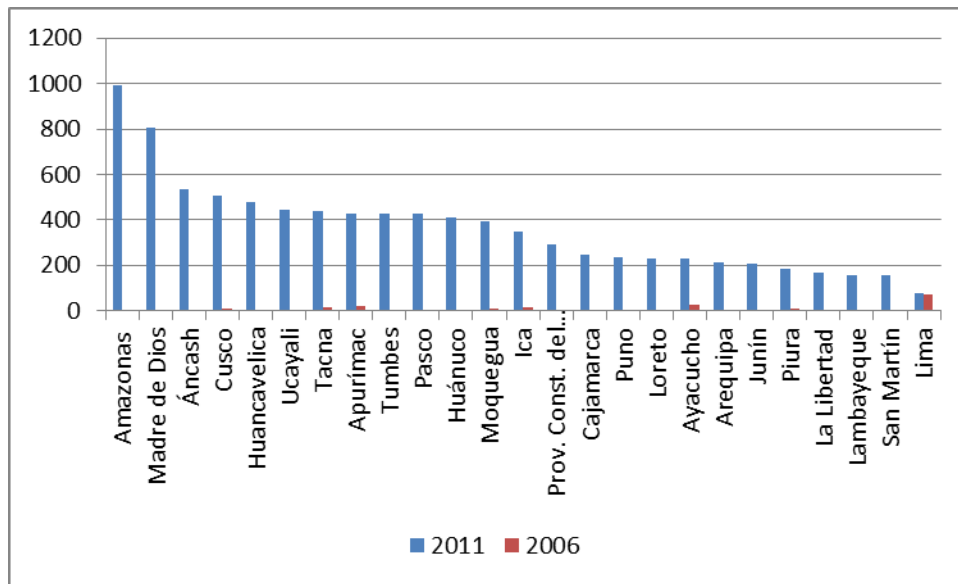
	<b>National</b>	<b>Regional</b>	<b>Local</b>	<b>Total</b>
2001	954			954
2005	1,283	4,189		5,472
2006	1,342	4,529		5,871
2007	1,640	4,812		6,452
2008	1,868	4,971	3	6,842
2009	2,192	5,560	1,195	8,947
2010	2,419	5,744	1,286	9,449

Source: Ministry of Economy and Finance of Peru

3.5 Overview of the sector by geographical area

Regarding the geographical distribution of investments in education, it can be seen that the Central government did not invest equally in all municipalities before decentralisation because investments per capita in education were mainly concentrated in Lima in 2006. After the reform, the geographical distribution looks more equal and the levels of investment per capita increased significantly. In effect, Lima became the district with lower levels of investments per student in 2011 (see **Figure 8**). Therefore, the decentralisation process has helped to scatter educational investments and to deconcentrate from the capital. Moreover, the more equal distribution of resources has benefited many poor regions such as Amazonas, Ancash and Cusco that have significantly higher poverty levels than the national average of 40% of poor and 14% of extreme poor population.

**Figure 8: Per capita Investment in Education**  
*(Regional information of 2006 and 2011, considering ages from 0 to 14 )*

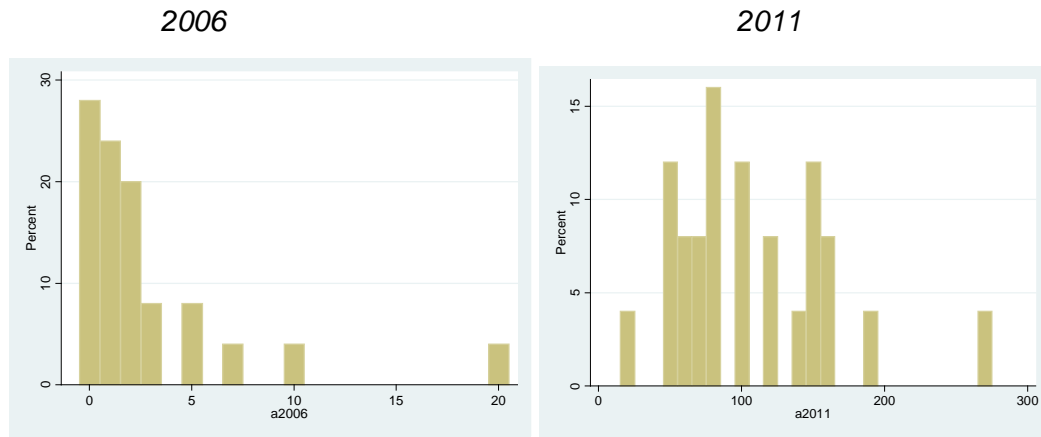


Source: Ministry of Economy and Finance and National Institute of Statistics and Informatics of Peru

The distribution of municipalities by levels of investment in education has significantly deconcentrated as well (see **Figure 9**). The distribution of municipalities is more scattered in 2011, and the levels of per capita investments are higher, in consistency with **Figure 8**.

Municipal investments in education per capita rose from an average of S/.554 in 2007 to S/.874 in 2011.

**Figure 9: Distribution of Municipalities by per capita Investments in Education**  
*(Investments in Education in 2006 and 2011, considering total population)*

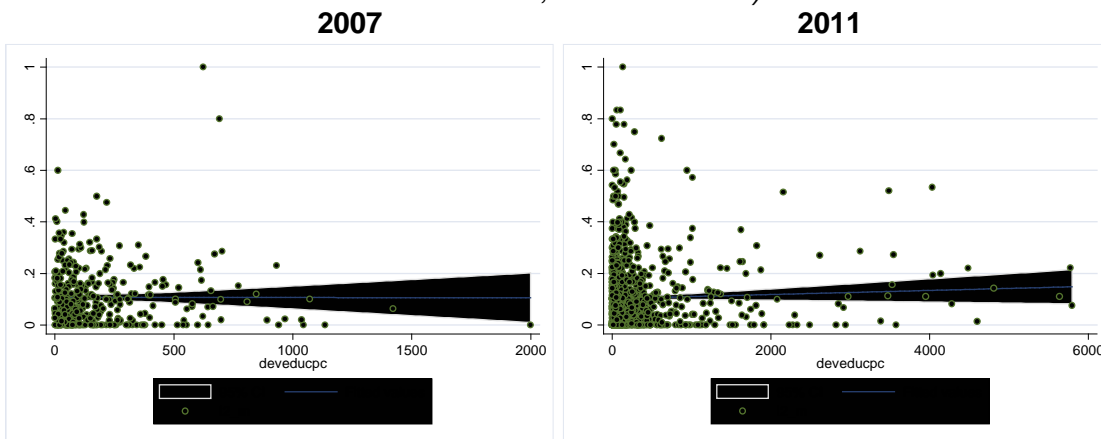


Source: Ministry of Economy and Finance and National Institute of Statistics and Informatics of Peru

### 3.6 Learning outcomes indicators

**Figure 10** plots investment per capita in education and the percentage of students in the expected level of results in Mathematics tests. The most surprising fact in the figures is the high concentration of municipalities with a low percentage of students in the expected level of achievements. In both 2007 and 2011, almost 90% of municipalities have less than a 30% of students that achieve the expected results (see **Appendix 2** for the results of language tests).

**Figure 10: Educational Investment per capita vs Percentage of Students with the Expected Results in Mathematics Tests**  
*(Municipalities according to their percentage of students with the expected results in 2007 and 2011, without outliers)*



Source: Ministry of Education and Ministry of Economy and Finance

The justifications for the cancellation of the Municipal Programme were that there was a risk of widening the gaps between rural and urban areas, and also between rich and poor. This analysis was based on the lack of observed improvements in less favoured areas and on similar international experiences. **Figure 11** presents the evolution of learning outcomes according to the ratio of rural/urban population. It can be observed that the gap between rural and urban areas has widened between 2007 and 2011, as it was predicted.

**Figure 11: Percentage of students with expected results, by degree the ratio of rural/urban students**

*(Considering the percentage of rural to total students in each municipality)*

Year	50% or more	Less than 50%	Gap
2007	16%	16%	1%
2008	7%	13%	7%

2009	13%	18%	5%
2010	11%	23%	12%

Source: Ministry of Education, Educational Assessment Census and Ministry of Economy and Finance

Nevertheless, the analysis by the degree of poverty presents opposite results. When dividing the population in halves considering their poverty ranking, it is shown that the gap in learning outcomes between poor and not poor has decreased over the same period of time (see **Figure 12**).

**Figure 12:** Percentage of students with expected results, by degree of poverty  
(Considering the poverty ranking of municipalities)

Year	50% or more	Less than 50%	Gap
2007	16%	16%	0%
2008	14%	6%	-7%
2009	19%	13%	-6%
2010	25%	11%	-14%

Source: Ministry of Education, Educational Assessment Census and Ministry of Economy and Finance

#### 4. Empirical Model

##### 4.1 Data

The empirical model uses data on the results of the Education Assessment Census in Peru that covers the period 2007 to 2010 for an average of 23,300 schools each year from 1,673 municipalities (there is a total of 1837 municipalities in Peru, therefore the coverage ratio of the census is 91%). The data base contains educational results on language and mathematics tests for students in second grade of primary school. It separates students in three levels depending on their test scores: (i) Level 2: Students that achieve the expected learning outcomes for the specific grade, (ii) Level 1: Students that did not achieve the expected results for each grade and answer the easier questions of the test, and (iii) Under Level 1: Students that did not achieve the expected results and present difficulties to answer the easiest questions of the test. The Annual School Census from 2007 to 2010 is considered in the analysis as well, which provides information about students, school



characteristics and management, teachers and educational infrastructure at a national level. This database is processed at a district level as well.

These databases are complemented with budget information from the Ministry of Economy and Finance for all municipalities and years, with the caveat that information for the year 2007 is not complete for the whole sample. In addition, three databases from the National Institute of Statistics and Informatics are included in the analysis: (i) The National Registry of Municipalities (RENAMU) that contains information about municipal characteristics, personnel and capacity building needs, among other for the year 2010, (ii) The National Household Survey (ENAHU) of 2010 with socio-economic indicators, and (iii) population information from the National Census of Population and Households 2007.

Financial and educational information are panel data, while the socio-economic, demographic and municipal controls are cross-sectional.

#### *4.2 Methodology*

The evidence so far suggests that the decentralisation of education improved the responsiveness of educational investments and the equality in the distribution of resources, but results on educational outcomes are less clear. This section presents an empirical estimation with the aim of providing more robust evidence on the matter.

The analysis will be based in a multivariate regression with the objective of identifying the importance of decentralisation on learning outcomes, considering the effects of both political and economic decentralisation. Political decentralisation refers to the transfer of responsibilities only, and economic decentralisation refers to the economic independence of localities. An indicator of financial resources received by their participation in the municipal programme is considered as well. Estimations will be focused on language results because both language and mathematics tests present similar results and trends, but the former has less variation. Indeed, preliminary estimations were conducted with mathematics tests results as the dependent variable, and this proved to be less responsive to the available explanatory variables.

Controls that account for other factors that might explain differences in the outcomes such as socio-economic and municipal characteristics are also included in the estimation. Thus, the unbalanced panel data model is estimated for the period 2007-2010, with the following specification:

$$ER_{mt} = \alpha + \beta D_{mt} + \gamma R_{mt} + \delta I_{mt} + \rho S_{mt} + \varepsilon_{mt} \quad (1)$$

Where:

$ER_{mt}$  = Percentage of students in second grade with the expected results in language tests.

$\beta D_{mt}$  = Decentralisation indicators.

$R_{mt}$  = Measures of resource availability and expenditure.

$I_{mt}$  = Institutional capacity indicators.

$S_{mt}$  = Socioeconomic controls.

All variables indexed by municipality  $m$  and year  $t$ .

Several variables for each of the categories were assessed, but only the successive proved significant.  $D_{mt}$ , which is the variable of main interest in the regressions, presents two specifications. The first one is a measure of the share of own revenues on the total budget. The second is an interaction term that combines a dummy variable indicating the participation in the municipal programme, with the financial amount perceived by the programme after completing the accreditation process. Both specifications are expected to present a positive coefficient because of the potential benefits of decentralisation. Two measures of resource availability were included accounting for total budget and own revenues per capita. A measure of expenditure growth was considered as well. Regarding socio-economic controls, the ratio of rural-population student population is also included and is expected to present a negative value. Additional socio-economic controls are a measure of unsatisfied basic needs, of under-nutrition, and of the percentage of students that speak Spanish. The percentage of private schools in the district is another proxy of local income and also accounts for complementarities between public and private outcomes that may appear from the interaction with those institutions.

Two variables are included to account for institutional capabilities. In the case of municipal capabilities, the variables considered are the availability of municipal equipment and the performance of the municipality in the service of garbage collection, which is a main municipal service. In the case of school institutional capabilities, the included variable is a measure of the average type of educational administration in the locality. The type of school delivery takes three different values: 1- when there is one teacher for several grades, 2- when one teacher is responsible for more than one grade, and 3- when there is one teacher for each grade. This variable is constructed as the weighted average of the different types of service delivery that coexist in each municipality, considering the number of students on each school. Therefore, it is expected to have a negative relationship with learning outcomes because teaching standards are higher in the schools that have at least one teacher per grade. Thus, this measure can also be considered a proxy of the teachers-students ratio.

Additional variables were considered in the estimations but did not result significant for the model. Many of them were measures of municipal capabilities and citizen participation in local governments. Some of them were municipal declarations of the need of training or capacity building in managerial issues. Regarding citizen participation, the available variables were the existence of citizen organizations in the municipality and the degree of participation via institutionalized processes and tools. It is possible that these did not result significant due to the low quality of the reporting process. In addition, the effect of decentralisation of education at a regional level is not specified in the model because it is expected to have a homogenous effect in all municipalities.

In spite of the fact that controls were added in the estimation, the municipal nature of the sample entails the risk of the existence of unobservable effects or effects that have not been accounted for in the regression that differ between localities and may also be correlated with the outcome. An example is the capabilities of municipal personnel on educational issues. Therefore, in order to obtain unbiased and consistent estimators, the preferred specification is a fixed effects panel data model. Under this specification unobserved effects by municipality disappear, but it has the drawback of dropping out unchanging explanatory variables as well as the constant term (see **Appendix 3** with the Hausman test of Random and Fixed Effects). Furthermore, the unobserved variables are not expected to change over

time because of the short period covered by the sample and the lack of specific factors that may also affect learning results during this period.

Faguet and Sanchez (2008) used instrumental variables in order to account for the risk of reverse causality in their estimations on student enrolment rates. However, this risk is less ominous in the present regression because better results in educational attainments are not expected to increase local expenditure in education. Therefore, the relation is expected to run in one way only. Notwithstanding, their proposed instrument for decentralisation -*the log of local tax revenues per capita*- is included as a robustness check for the present estimations. The instrument resulted valid and significant as in the previous study, but its use did not improve the estimation outcomes (see **Appendix 4** with instrumental variables Durbin-Wu-Hausman test).

## 5. Results

Results of estimating Eqn (1) appear in **Figure 13**. Model 1 is a simple OLS model. Model 2 is a fixed effects model (FE). Model 3 is an OLS model restricting the sample to observations of poor municipalities only. The last specification allows us to identify especially sensitive factors in vulnerable localities. The results for models 1 and 2 will be presented in a first sub-section, followed by the results of the estimations considering poor municipalities. For the effects of this analysis, poor areas are defined as municipalities in which the incidence of poverty surpasses 70%, and rural areas are defined as districts where the percentage of students in rural localities exceeds 75%.

### 5.1 Results for the complete sample

As can be observed in **Figure 13**, results from the simple OLS model and the fixed effect model present a different number of explanatory variables because the fixed effects model swipes out the time-invariant factors from the regression. Besides that methodological difference, all time-variant explanatory variables result significant in both specifications and the coefficients are similar.

### 5.1.1 *Decentralisation variables*

The first measure of decentralisation, own revenues as a percentage of total resources, has a positive coefficient as expected. This is an indicator of the percentage of resources that are freely disposable by the municipality i.e. funds that can be allocated to any use. Municipalities generally receive substantial financial transfers from the Central Government, which are conditioned to specific uses. Therefore, a positive relation of this measure of decentralisation with learning outcomes suggests that municipalities with ample room to design and implement policies of their own tend to target learning achievements more effectively than when localities follow policies designed by the Central Government.

The second measure of decentralisation is an interaction term of a dummy variable of participation in the municipal programme, with the financial transfer perceived by the programme after passing an accreditation process. This variable would measure the importance of the effective transfer of resources that accompany the transfer of new educational functions.

Both measures of decentralisation, the indicator of municipalities that perceive high proportions of their budgets from their tax collection efforts and the indicator related with municipalities that successfully completed the accreditation process, may share the characteristic of having higher capabilities than the average municipality. Thus, additional variables controlling for municipal capabilities are included in the regression in order to avoid biased results because of these factors.

In addition, both variables are related with economic resources, and thus are measures of the importance of *economic decentralisation* to improve schooling quality. An additional variable measuring *political decentralisation* was included in the estimations but did not result significant. This was expressed as a dummy variable indicating the participation in the municipalisation programme irrespectively of receiving financial transfers. This suggests that political decentralisation, i.e. the delegation of educational functions by itself, does not produce significant effects in learning outcomes.

### *5.1.2 Measures of resource availability and expenditure*

The indicator of total budget measures the degree of municipal buoyance and has a positive relation with learning outcomes. This reflects the fact that municipalities with high income levels present better learning outcomes due to the availability of resources that can be allocated to educational objectives. In addition, this variable may also work as a proxy for the level of income in the locality.

The negative relationship of expenditure growth and learning outcomes may reflect the fact that in the last years many municipalities in Peru have perceived significant increases of their budgets because of the high levels of natural resources revenues. These financial transfers are allocated to municipalities throughout the year by the central government. The allocation rules for these revenues are complex, and thus municipalities do not know in advance how much they will perceive by this concept at the end of the year. In addition, this source of revenues tends to be highly volatile because it depends on international prices of commodities, which also difficult the municipal income projection for the year. Furthermore, income projections result a challenging task for many municipalities that lack of basic municipal capabilities. As a consequence, many localities started exhibiting considerably low execution rates. Therefore, there is an increasingly political pressure for subnational governments to accrue high proportions of budgets, what as a result bias investments toward large scale projects that enable authorities to spend large amounts of resources in fast periods of time. In the case of the education sector, these conditions would push municipalities to spend their resources in school materials or in investment and maintenance of educational infrastructure. Thus policies concerning the revision and improvements of educational methodologies and the design of incentive mechanisms or others policies that directly address education quality, may require longer periods of time to be implemented, as well as a high levels of municipal capabilities regarding education.

### *5.1.3 Measures of capabilities*

The variable of own revenues per capita is considered a measure of municipal capabilities, given the fact that the municipal level of income is already accounted for by the total budget variable. The logic of the variable is that municipalities with high capabilities in

collecting taxes may be expected to have high capabilities in other municipal functions as well, including educational matters. In addition, this may also be a proxy for the level of economic development of the locality since tax collection also depends on the levels of income of citizens.

Moreover, the simple OLS model includes additional variables measuring municipal resources and capabilities in the year 2010. The first one is the availability of municipal equipment and the second the coverage ratio of garbage collection. Both variables indirectly measure the availability of assets and capabilities which may be employed for educational objectives.

Nevertheless, despite the copious agreement regarding the importance of municipal capabilities for the improvement of learning outcomes, the lack of reliable information in the Register of Municipalities (RENAMU) database is a constraint for drawing more robust conclusions about the importance of municipal capabilities in quantitative studies.

Regarding schools' capabilities, the indicator of the average type of educational administration in the locality presents the expected negative relationship with learning outcomes because of the low teaching standards in the schools that share teachers between grades. That is, when teachers deliver the same class for students of various ages the schooling quality and the degree of difficulty in regular evaluations is expected to be low.

#### *5.1.4 Socio-economic factors*

The rural-urban ratio of students by locality works as a socio-economic control variable that indicates that higher degrees of development tend to produce high educational outcomes.

In the simple OLS regression additional socio-economic variables were included. These are under-nutrition ratios, the percentage of students that speak Spanish in the municipality, and the percentage of private schools in the locality. The three of them present the expected relationships with learning outcomes and control for some difficulties associated with low levels of development. The proportion of private schools in the

municipality would act as a proxy of poverty levels or the quality of education, since private schools tend to have higher educational standards than public ones in Peru and result more expensive than public schools (see **Appendix 8** with scatter plots of test results and the degree of private schools in each municipality).

### *5.2 Results for poor municipalities*

The results of the estimations for poor areas suggest that learning outcomes in deprived environments are especially sensitive to income levels and the rural-urban population ratio. The latter may account for the particularly poor results in highly isolated rural areas, which suffer of low teacher-student ratios, low teacher and student assistance rates and other difficulties associated with areas that are hard to access.

In the case of OLS estimations for the restricted sample, two additional factors resulted significant, the ratio of under-nutrition and the percentage of students that speak Spanish. The preponderance of the effect of the language spoken by the majority of students reveals the low levels of adjustment of the curricula to special needs and circumstances of students. It must also be taken into account, that there are public schools that offer educational services in alternative languages with conditioned learning materials, but these are not considered in the census evaluations and therefore there is no available information about their performance.

The results of the last estimations should be taken with major care due to the restricted sample size and the lower grades of variation in the restricted sample. Nevertheless, fixed effects estimations were run for this restricted sample as a robustness check and the results were similar.

The variables that measure decentralisation lost significance in the present model suggesting that neither economic nor political decentralisation produce an effect on learning outcomes in poor areas. Since this is the variable of interest of the study, additional evidence is analysed. Surprisingly, municipalities that participated in the municipal programme in this sub-sample presented worse test results throughout the whole sample period than the average of poor municipalities. In addition, their results did



not improve over time. Therefore, it can be concluded that the participation in the municipalisation programme did not produce an enhancement of learning outcomes and that it may have even widened the gap of educational achievements on these areas.

Likewise, the case of rural areas is analysed separately as well. Rural localities that participated in the municipal programme presented better learning outcomes than the rest of rural areas in 2007 and maintain better results than the average in 2010, but with a narrowed gap over time. Additionally, its results did not improve significantly in the sample period. Therefore, these outcomes confirm that the participation in the municipal programme did not produce an improvement of learning outcomes in rural areas in relative terms.

**Figure 13:** Decentralisation's Effect on public school learning achievements

Dependent Variable: Percentage of students with expected results in language tests

Independent Variable	Model		
	1 LSDV	2 FE	3 LSDV Sample: Poor municipalities
Own revenues / Total resources	0.1326632*** [0.0274717]	0.173733*** [0.0721361]	0.074301 [0.0583089]
Financial transfers	0.0537251** [0.0262549]	0.0667047*** [0.030243]	0.0533504 [0.0627502]
Own revenues (Per capita)	0.000045** [0.0000181]	0.0001247*** [0.0000566]	0.0004649*** [0.0001346]
Total budget (Ln)	0.0103066*** [0.002185]	0.0626127*** [0.0108273]	-0.0012585 [0.0037831]
Expenditure Growth	-.00063204* [0.003624]	-.0284032*** [0.0046558]	0.0059046 [0.0067204]
Rural (Ratio)	-.039334*** [0.007652]	-.0725483*** [0.022121]	-.0211896* [0.0112997]
Under nutrition	-.0007554*** [0.0001547]		.00000101* [0.0002571]
Language	0.1137882*** [0.0097148]		0.0866122*** [0.0118154]
Private schools	0.0918498*** [0.0221163]		0.00626 [0.0510742]
Municipal equipment	0.0081554**		0.0201048

Garbage collection coverage	[0.0034103] 0.0349534*** [0.0074883]		[0.0175091] 0.0108877 [0.0198443]
Type of school delivery (ratio)	0.0938039*** [0.0353864]		
Constant	-0.0246453 [0.038031]	-.07893789*** [0.1696336]	0.0984705 [0.0610625]
Observations	4051	4057	1448

Panel regression with robust standard errors; t-statistics in brackets

\*, \*\*, \*\*\* = coefficients significant at the 10%, 5% and 1% levels

## 6. Conclusions

The purpose of this paper has been to contribute to the identification of specific conditions that determine the appropriateness of decentralisation for improving education quality. To this end, this study set out to offer the first quantitative evaluation to measure the impact on learning outcomes of the Municipalisation Pilot Programme in Peru.

In particular, this paper evaluated the impact of decentralisation on language test results through Panel Data estimations covering the period of 2007-2010 for over 1750 municipalities out of the total of 1837. The dependent variable of the model is the percentage of students that obtained the expected results for their year of study. The explicatory variable of interest measures decentralisation, but socio-economic and institutional characteristics were also included in the estimation to account for additional factors that may affect learning outcomes. Municipal samples entail the risk of the existence of unobservable effects or effects that have not been accounted for in the regression. Therefore, in order to obtain unbiased and consistent estimators, the preferred specification was a fixed effects panel data model.

The rest of the conclusions will be structured as follows. First, I will expose empirical evidence about the effects of decentralisation with mixed results, what seems to suggest that the municipalisation does not work. Second, I will also show that this is not necessarily the case because there are several pre-conditions that have to be met in order to achieve positive results; which were not complied in the Peruvian case. Third, I will present the

results of the quantitative assessment of the municipalisation programme. The estimations entail more robust evidence suggesting that decentralisation has the potential to enhance learning outcomes, but that the pre-conditions were not always met in the Peruvian case. Finally, some policy implications will be drawn.

The study has shown the decentralisation of education in Peru improved the responsiveness of educational investments and equality in the distribution of resources. It also increased the awareness of problems and produced a catch-up effect of poor and rural areas, closing the gaps in certain output indicators such as coverage rates and school desertion. Nevertheless, an initial overlook of results seems to suggest that decentralisation did not produce a significant impact in learning outcomes.

The case study analysis has shown that the provision, funding and management of education resulted complex activities given the capabilities and institutional restrictions of municipalities in Peru. The process was not clear and there were juxtapositions of roles between the various participating policy actors (MED, 2012). In addition, there was no transfer of capabilities and the devolution of responsibilities and resources was poor, Defensoria del Pueblo (2009). And there was a homogenous conception of municipalities in the design of the process, overlooking the significant differences between municipalities regarding the volume of their budgets, the quality of human capital, the level of IT in their administration and management capabilities, Valdivia and Arregui (2009).

The analysis of the limitations and achievements of the municipalisation programme helped to have a clearer understanding of the process. This provided the basis for the construction of an empirical model with the aim of providing more robust evidence about the impacts of municipalisation in learning outcomes. The estimations suggest that the decentralisation of education did produce a positive and significant effect on test results in the Peruvian case. Two measures of decentralisation resulted significant: the economic independence of municipalities and the financial transfers perceived by the participation in the programme. In addition, the estimations identified that the main pre-conditions for the attainment of positive outcomes are the support to municipal and school capabilities and an effective economic decentralisation.

Furthermore, a more profound analysis was conducted for the case of poor and rural localities in order to assess the perceived risk of incurring enhanced inequalities in learning achievements in these areas. The evidence shows that municipalisation did not produce an impact in learning outcomes in these localities. In effect, poor and rural municipalities that participated in the programme presented equal or worse test results than their peers, and results did not improve in the sample period. Therefore, it seems that the gap between poor and rich areas might have been widened because of decentralisation. Nevertheless, these results do not mean that the decentralisation of education is necessarily detrimental to learning achievements in poor settings; on the contrary, they shed lights on the pre-conditions that are necessary for its success.

These results imply that the Peruvian government should have sought to improve the identified pre-conditions rather than decommission the programme outright because of its potential for success. Nevertheless, further research is needed to substantiate the costs associated with the implementation of the necessary pre-conditions. This would allow conducting a more precise cost benefit analysis of the programme in order to draw more conclusive results.

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## 8. Appendix

### Appendix 1: Interview

Sandra Carrillo. 2012. Experience as the Head of the Education Office in the Municipality of Miraflores. Location: Lima, Peru.

Transcript (15/07/2012):

#### Perceived positive impacts of the PPM:

- The teacher's union was weakened.
- Enhancement of transparency when hiring new teachers.
- Problems were detected faster. In fact, some problems are not detectable when managing education at a Central level.

#### Successful cases:

- Municipalities where authorities are teachers or have been involved in the sector perceived good results.

- The best results were seen in localities that benefited from complementary projects such as the capacity building programme of USAID and cooperation from ACDI to the regions of San Martin, Piura and La Libertad.
- There is a perceived potential in small communities and communitarian settings. For example, the initiative “Municipios Escolares” at Villa el Salvador, effectively involved students in decision making processes.

Effective responsibilities transferred:

- Management of school payrolls.

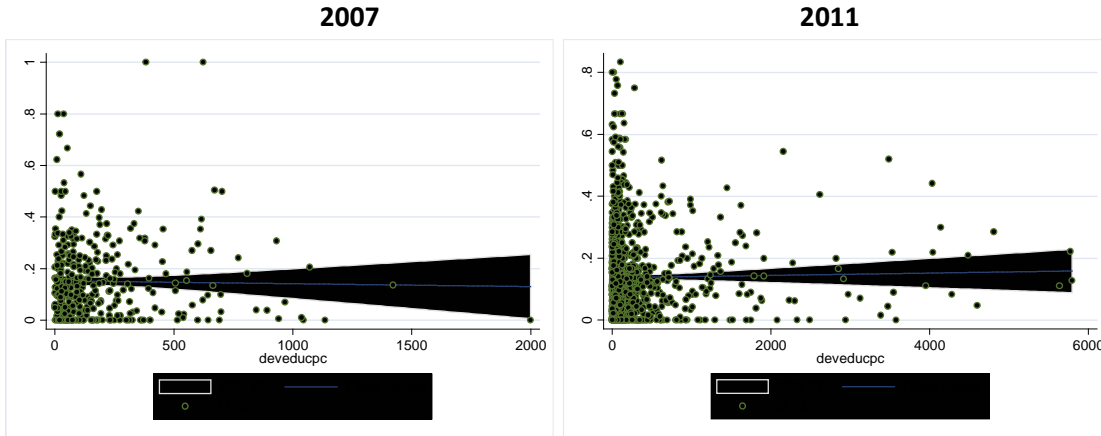
Perceived Limitations:

- The financial transfer for goods and services were sufficient to finance basic school materials only.
- Teacher capacitation functions were transferred, but not the respective financial resources.
- There was a lack of clarity in the separation of functions between different levels of government.
- The risk of corruption increased because there was a transfer of administrative roles, which are prone to corruption.
- According to the law of teachers, these cannot be made redundant, only transferred to other schools.
- Coordination between the local and regional levels was insufficient.
- It significantly increased the municipal red tape, especially in the beginning when the functions and processes resulted completely unfamiliar.
- There was a lack of trust from school directors, which many times preferred working with the more familiar regional level of authorities.
- Some processes took longer than when handled by the regional authorities.

**Appendix 2: Educational Investment vs Learning Outcomes**

**Educational Investment per capita vs Percentage of Students with the Expected Results in Language Tests**

*(Municipalities according to their percentage of students with the expected results in 2007 and 2011, without outliers)*



Source: Ministry of Education and Ministry of Economy and Finance

**Appendix 3: Hausman Test for Fixed Effects**

Hausman test of Random and Fixed Effects

---- Coefficients ----

	(b) regfe	(B) regre	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
D2	0.173733	0.269403	-0.09567	0.0654755
transppm~f_	0.0667047	0.0825611	0.0158564	0.0148515
piarevpc	0.0001247	0.0000727	0.000052	0.0000522
lnpim	0.0626127	0.0195746	0.0430381	0.0106023
devgrowth	0.0284032	0.0077115	0.0206916	0.0029646
avarea	0.0725483	0.1020027	0.0294544	0.0207435

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\chi^2(6) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

53.73

Prob>chi2 = 0.0000

**Appendix 4: Hausman Test for Instrumental Variables**

Durbin-Wu-Hausman test for Instrumental Variables

---- Coefficients ----

	(b) ivregfe	(B) regfe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
D2	0.1730918	0.173733	0.0006412	0.0848025
transfppm~f_	0.0666943	0.0667047	0.0000104	0.0013777
Piarevpc	0.0001248	0.0001247	3.78E-08	5.00E-06
Lnrim	0.0625845	0.0626127	0.0000282	0.0037336
Devgrowth	-0.028405	0.0284032	-1.84E-06	0.000244
Avarea	0.0725543	0.0725483	-5.98E-06	0.0007913

b = consistent under Ho and Ha; obtained from xtivreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\chi^2(1) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

0  
 Prob>chi2 = 0.9940

## Appendix 5: OLS Regression

Source	SS	df	MS	Number of obs	=	4051
				F( 14, 4036)	=	98.04
Model	24.640377	1	1.7600269	4	Prob > F	= 0
Residual	72.457996	4036	0.0179529	2	R-squared	= 0.2538
					Adj R-squared	= 0.2512
Total	97.098373	1	0.0239749	1	Root MSE	= 0.13399

l2_cl	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Decentralisation 1	0.1326632	0.0274717	4.83	0	0.0788035	0.1865228
Decentralisation 2	0.0537251	0.0262549	2.05	0.041	0.0022511	0.1051992
Budget (per capita)	0.000045	0.0000181	2.49	0.013	9.51E-06	0.0000805
Budget (Ln)	0.0103066	0.002185	4.72	0	0.0060228	0.0145903
Expenditure growth	-0.0063204	0.003624	-1.74	0.081	0.0134256	0.0007847
Rural	-0.039334	0.007652	-5.14	0	0.0543361	0.0243319
Under nutrition	-0.000704	0.0001006	-7	0	0.0009012	0.0005068
Unsatisfied BNs	-0.0007554	0.0001547	-4.88	0	0.0010587	-0.000452
Language	0.1137882	0.0097148	11.71	0	0.0947419	0.1328345
Private schools	0.0918498	0.0221163	4.15	0	0.0484896	0.13521
Municipal equipment	0.0081554	0.0034103	2.39	0.017	0.0014693	0.0148415
Garbage collection coverage	0.0349534	0.0074883	4.67	0	0.0202721	0.0496347
Type of school	-0.0000178	4.46E-06	-4	0	-	-9.09E-06

delivery					0.0000266	
Constant	-0.0246453	0.038031	-0.65	0.517	0.0992071	0.0499165

**Appendix 6: Fixed Effects Regression**

Fixed-effects (within) regression	Number of obs	=	4057
Group variable: codgeo	Number of groups	=	1741
R-sq: within = 0.0333	Obs per group:		
between = 0.1432	min	=	1
overall = 0.1268	avg	=	2.3
	max	=	3
corr(u_i, Xb) = -0.3577	F(6,2310)	=	13.25
	Prob > F	=	0

l2_cl	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Decentralisation 1	0.173733	0.0721361	2.41	0.016	0.03227	0.3151912
Decentralisation 2	0.0667047	0.030243	2.21	0.028	0.0074	0.126011
Budget (per capita)	0.0001247	0.0000566	2.21	0.028	1.4E-05	0.0002357
Budget (Ln)	0.0626127	0.0108273	5.78	0	0.04138	0.0838449
Expenditure growth	-0.0284032	0.0046558	-6.1	0	0.03753	0.0192731
Rural	-0.0725483	0.022121	-3.28	0.001	0.11593	0.0291693
Constant	-0.7893789	0.1696336	-4.65	0	1.12203	0.4567289
sigma_u	0.12226702					
sigma_e	0.12391812					
Rho	0.49329356	(fraction	of variance	due	to	u_i)

F test that all u\_i=0: F(1740, 2310) = 1.68 Prob > F = 0.0000

**Appendix 7: OLS Regression for restricted poor municipalities**

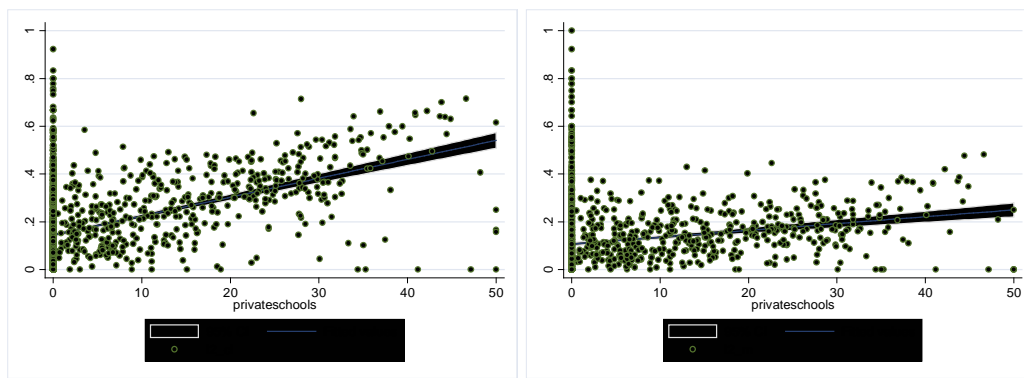
Source	SS	df	MS	Number of obs	=	1448
				F( 14, 1433)	=	7.16
Model	1.54570721	14	0.11040766	Prob > F	=	0
Residual	22.1107264	1433	0.01542968	R-squared	=	0.0653
				Adj R-squared	=	0.0562
Total	23.6564336	1447	0.01634861	Root MSE	=	0.12422

l2_cl	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Decentralisation 1	0.074301	0.0583089	1.27	0.203	0.040079	0.1886809
Decentralisation 2	0.0533504	0.0627502	0.85	0.395	0.069742	0.1764425
Budget (per capita)	0.0004649	0.0001346	3.45	0.001	0.000201	0.0007288
Budget (Ln)	-0.0012585	0.0037831	-0.33	0.739	-0.00868	0.0061626
Expenditure growth	0.0059046	0.0067204	0.88	0.38	0.007278	0.0190874
Rural	-0.0211896	0.0112997	-1.88	0.061	0.043355	0.0009761
Under nutrition	-0.0002744	0.0001621	-1.69	0.091	0.000592	0.0000435
Unsatisfied BNs	1.01E-06	2.57E-04	0	0.997	0.000503	0.0005054
Language	0.0866122	0.0118154	7.33	0	0.063435	0.1097896
Private schools	0.00626	0.0510742	0.12	0.902	0.093928	0.1064483
Municipal equipment	0.0201048	0.0175091	1.15	0.251	0.014242	0.0544511
Garbage collection coverage	0.0108877	0.0198443	0.55	0.583	0.028039	0.0498147

Type of school delivery	-0.1533469	0.0645295	-2.38	0.018	-	-
Constant	0.0984705	0.0610625	1.61	0.107	0.279929	0.0267645

### Appendix 8: Test results vs Private Schools

Scatter plot of language test results vs the percentage of private schools in 2010



Source: Ministry of Economy and Finance