

12. Administrative decentralisation and its impacts on educational expenditure and student outcomes: evidence from Colombia

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Summary

A substantial decentralisation reform occurred in Colombia school education in 2001. The government established an arbitrary rule that granted municipalities with a population greater than 100,000 almost complete autonomy to provide education services (certification). Going beyond some mechanisms identified in previous policy evaluations (such as a higher proportion of higher-quality teachers) we analysed how reform affected the investment of local resources in education and the distribution of the total budget in key areas of the school system. Certified municipalities experienced an increase in education expenditure, after discounting teachers' payroll, because of increased efficiency in the management of total resources, both locally raised and central government transfers. This allowed higher expenditures in school infrastructure, education quality, and other education-related programmes, all key components of education policy. In addition, after 2002 the competitiveness of public schools increased in certified municipalities, compared to non-certified areas. Achieving better student outcomes was primarily explained by changes in the allocation of resources in certified municipalities that resulted in increased efficiency after gaining autonomy. Lastly, certification enhances competitiveness of public schools as against private ones.

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Since the 1980s Colombia has undergone a progressive process of administrative and political decentralisation that allowed the enactment of the election of mayors in 1986 and of governors in the early 1990s (Falleti 2005; Falleti 2010). As a consequence of the 1991 constitution, resources transferred from the central government to departments and municipalities began to grow rapidly in the early 1990s. But, later in the decade, the nation's fiscal situation became critical, which triggered a set of reforms in 2001 aimed at reducing the public deficit. Among them was a decentralisation reform that limited the growth of resources transferred from the central government to subnational governments and altered the distribution of transfers across municipalities. A set of municipalities became officially decentralised, which meant that they received higher transfers from the central government and greater responsibilities in the delivery of public services.

One of the core laws of the reform (Law 715/2001) shifted the management of public education to either municipalities or departments. Starting in 2002, municipalities with 100,000 or more inhabitants became 'certified in education', which conferred on them the responsibility for supervising, planning, and delivering public education in their territories. Their duties included managing central government transfers, teacher hiring and transfers, and other education-related programmes to improve both school student enrolment rates and education quality. Municipalities with fewer than 100,000 inhabitants were not certified, and their public education activities remained a departmental-level responsibility. Becoming certified meant transitioning from receiving and managing a lower amount of transfers, and being subject to departmental supervision, to having greater managerial and financial autonomy. By contrast, non-certified municipalities gave up their already-limited powers to their respective department (Bonet, Pérez, and Ayala 2014; Brutti 2020).

We first describe the educational decentralisation process in Colombia, including some background on the pre-reform scenario and the technical implications of the reform in the public delivery of education across municipalities in the country. We next expand the slim existing literature on the reform's impact (for example, Elacqua et al. (2021) and Pritchett (2014); see also the Annex to this chapter) by exploring some previously untapped channels that account for part of the improved student outcomes. Elacqua et al. (2021) found positive impacts of decentralisation on academic achievement and enrolment, but only explored a few of the underlying mechanisms such as improved teacher hiring and increased tax collection, which only account for a small part of the observed changes (see Annex, Table 12D). Our research builds upon their findings by identifying the ways in which decentralisation contributes to these improvements, specifically in relation to municipal educational spending. We also delve deeper into the effects on school enrolment by comparing the increase in public primary and secondary school enrolment to that of private schools, indicating a heightened competitiveness in the public education system.

We find that, beyond improving student outcomes, allotting autonomy to local governments strengthened the competitiveness of the public school system vs private institutions. This study adds to the existing literature by filling in the gap in understanding how decentralisation leads to improved educational outcomes and contributes to the ongoing debate on the most effective ways to improve education delivery. Our results suggest that the mechanisms associated with these improvements primarily relate to efficiency gains in the management and allocation of resources in newly autonomous certified municipalities. Our results thus contribute to the existing literature by addressing the gap in understanding the relationship between decentralisation and improved educational outcomes, thus adding to the ongoing discourse on the most effective methods to improve education.

12.1 Decentralisation in Colombia

In the mid-1980s, Colombia initiated a process of gradual decentralisation that started with political decentralisation in 1986 with the election of mayors of the 1,121 municipalities and continued in 1991 with the election of the governors of the country's 32 departments (each spanning many municipalities) by popular vote. Prior to these changes, mayors were appointed by governors and the governors by the president (Cortés 2010). In 1993, with the enactment of Law 60, the process of administrative decentralisation deepened and both municipalities and departments assumed greater responsibilities in the delivery of education, health, and potable water and sewage (Faguet and Sanchez 2009; Faguet and Sanchez 2014). This reform was accompanied by a significant increase in central government transfers to departments (known as the *Situado Fiscal*) and municipalities (the *Municipal Share*). Law 60 specified that municipalities were to oversee the management of preschool, primary, and secondary education services. In addition, municipalities should allocate resources to finance school construction and education programmes and projects and oversee and evaluate the delivery of educational services. The responsibilities of departments included the same roles as the municipalities, which entailed a great deal of coordination between the two levels of government. In addition, departments were also put in charge of the hiring, training, and ranking of teachers, as well as their assignment across municipalities. Teacher payrolls were to be paid by departments, financed with central government transfers to them (Bonet, Pérez, and Ayala 2014; Borjas and Acosta 2000).

The absence of a clear delineation of the responsibilities of each level of government generated an overlapping of functions that blurred lines of accountability. For example, prior to the 2001 reform, teachers were in fact paid by both departments and municipalities. Estimates by Borjas and Acosta (2000) indicated that the department payrolls covered 85–90 per cent of all public school teachers. Municipalities hired and paid the remaining 10–15 per cent, and in addition assigned teachers across schools within their jurisdiction. In

many cases the entities put in charge of certain educational services did not have enough resources and legal authority to fulfil their responsibilities. For example, municipalities had a key role in the management of public schools, but they had very limited authority to appoint or dismiss staff (Borjas and Acosta 2000). In practice, during the 1990s and until 2002, departments performed the chief role in the administrative decentralisation of education. They also received a higher percentage of the central government transfers earmarked for education.

The 2001 Decentralisation Reform of Education

However, by the late 1990s, the structure of administrative decentralisation and central government transfers associated with it had become fiscally unsustainable, given its increasing cost. The Colombian economic and fiscal crisis of 1999 sparked a reform of the system of central government transfers to subnational entities. However, the reform required a set of constitutional and legal changes and involved a great deal of political and technical discussions. Law 715 was enacted in 2001, and since then, with some modifications, it has been the main regulatory framework of Colombia's administrative decentralisation. The reform limited the annual growth of central government transfers and tried to fix the shortcomings of Law 60 regulations, mainly by simplifying the overlapping responsibilities between departments and municipalities (Bonet, Perez, and Ayala 2014; Brutti 2020).

Under Law 715, administrative decentralisation and the supervision, planning, and delivery of education began to be managed by certified territorial entities (Entidades Territoriales Certificadas – ETCs), which could be either departments (at regional level) or municipalities (at local level). The departments managed most of the supervision, planning, and delivery roles for the non-certified municipalities within their jurisdiction. The law established that certification would be granted to all municipalities with more than 100,000 inhabitants at the end of 2002, of which there were 46. In addition, after 2003, municipalities not initially certified in 2002 were allowed to become so if an evaluation by their supervising regional department found that they had the technical, administrative, and financial capacity to manage the provision of education despite having fewer than 100,000 inhabitants (Ministerio de Educación Nacional 2005). Seventeen more municipalities became certified through this process.

As for teachers, Law 715 established that certified entities had the legal authority to hire principals and teachers, although owing to resource constraints the Ministry of Education imposed restrictions on the number that could be hired. These limits were implemented to avoid the disorderly increase in teacher payrolls characteristic of the 1990s (Congreso de Colombia 2000; Duarte 2001). Before 2002, the hiring of teachers and principals by the departments occurred after a determination of eligibility based on the credentials of the applicants (degrees, experience) and interviews.

Once teachers were deemed eligible, the educational authority assigned the new teachers to the department's schools based on the number of available vacancies (Brutti and Sanchez 2022; Ome 2013). This credential-based system was replaced in 2002 by an exam-based system under which the candidate applied to become a teacher in a specific certified entity. Candidates were required to pass the subject exam with a minimum score (60/100) and, once that requirement was met, the candidate would take a psychometric test, meet credential requirements, and be interviewed. Eligible new teachers then chose schools among the available vacancies. Certified entities placed applicants into vacancies based on the rankings of eligible teachers.

Once staff were in the system, the educational authority of each certified entity had the legal authority to reassign teachers within the entity. Departments assigned teachers across multiple non-certified municipalities in their area, according to the teachers' ranking and preference across these jurisdictions. More advantaged and high-performing schools were often chosen first by the highest-scoring teachers, so the low-performing teachers were often assigned to underachieving, isolated, and disadvantaged schools. Certified entities could also hire temporary teachers if they deemed it necessary. A high percentage of these teachers either did not undergo the eligibility process or did not pass the mandatory exams.

Certified entities tended to have no restrictions either on the use of their diverse sources of funding (for example, their own local taxes, debt, or dividends from public companies) or on how they distributed resources to programmes or interventions aimed at improving educational outcomes. Likewise, non-certified municipalities could add their own resources for the educational inputs they considered important. Such inputs could cover (i) furniture, texts, libraries, didactic, and audiovisual materials; (ii) improvement of school management; (iii) construction, maintenance, and adaptation of infrastructure; (iv) public services and operation; (v) improvement of working conditions of teachers; and (vi) non-teaching staff. Certified entities could attract teachers to schools in their jurisdiction by improving working conditions and giving incentives to high-performing candidates. These municipalities could also allocate resources for school transportation and school meal programmes (Ministerio de Educación Nacional 2002).

The structure of the central government transfers for education

Between 1993 and 2022 the distribution of transfers to subnational entities in Colombia operated under two legal and regulatory frameworks. Under Law 60 of 1993, 60 per cent of total transfers to departments (*Situado Fiscal*) had to be allocated to education and 20 per cent to health. In addition, 30 per cent of central government transfers to all municipalities (*Participación Municipal*) were earmarked for education and the rest to other social services and local running costs. The distribution of transfers across municipalities depended upon population, poverty rates, and many other variables.

Under Law 715 in 2001, coming after the economic and fiscal crisis of the late 1990s, central government transfers – known as the General System of Revenue Sharing (Sistema General de Participaciones) – were set to finance the provision of social services in general, and public education in particular, according to the responsibilities assigned under decentralisation. The structure of central government transfers to subnational entities expressed in Law 60 was radically changed. Law 715 introduced a new set of rules to distribute monies paid under the General System of Revenue Sharing (SGP). The total amount of transfers would grow at a fixed annual rate of 2 per cent and fund the provision of education, health, and water and sanitation services. Up to 2022, the legislation stated that 58.5 per cent of the SGP total must be allocated to education, and 90 per cent of that 58.5 per cent (or just under 53 per cent of the total) was to be distributed across ‘certified’ entities depending on the total number of students and their regional costs, as well as on national objectives for enrolment growth. These funds covered personnel costs (teachers and administrative staff) and could also be used to contract private schools when places for students in public schools were in short supply. The remaining 10 per cent of central government transfers for education were distributed across municipalities and allocated to quality improvement (for example, school transportation, school meals, utilities, minor school construction, school computers, and teacher training) (Alvarez et al. 2018).

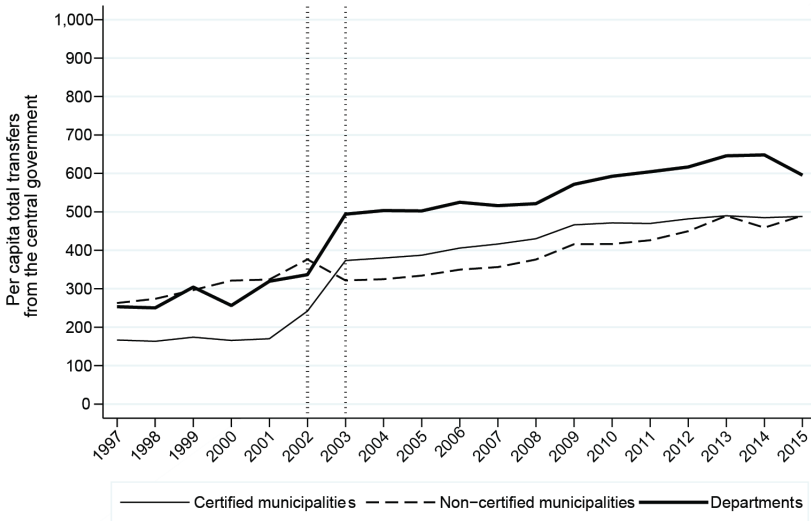
Figure 12.1 presents the evolution of per capita central government transfers to departments and municipalities using the Law 715 classification of ‘certified’ and ‘not-certified’ entities for the period 1994–2015. It is immediately apparent how profoundly the 2001 reform altered the distribution of central government transfers (Figure 12.1a). In the 1996–2002 period, the large municipalities (certified in 2002) received the same per capita transfers for education as those that would become non-certified. However, in 2003 per capita transfers for non-certified municipalities abruptly declined, while transfers for certified municipalities and departments sharply increased (Figure 12.1b).

Still, despite the fall in transfers from the central government to non-certified municipalities, overall transfers and transfers for education spending were much higher for non-certified municipalities, as they depended on their transfers from the central government in addition to the departments’ transfers. This change entailed that certified municipalities did acquire more independence in the administration of their resources, but that the change did not mean an increase in total transfers received beyond the resources available for non-certified municipalities. This detail is crucial when thinking about the impacts of decentralisation because any effects caused by the 2021 reform can be interpreted as an effect of gained autonomy at the local level, and not as a consequence of an increase in the absolute value of the transfers received.

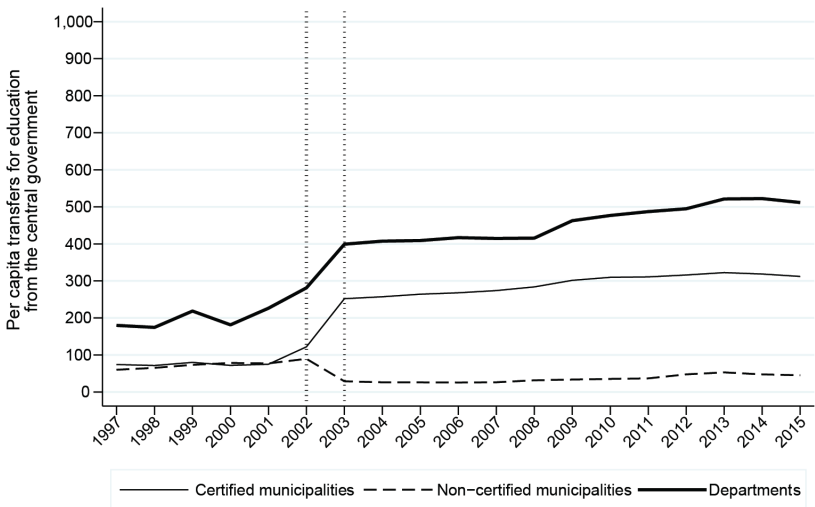
To help readers’ appreciation of these differences between certified and non-certified municipalities, the Annex to this chapter (especially Tables 12A, 12B, and 12C and their accompanying text) give additional background infor-

Figure 12.1: Central government transfers before and after the administrative decentralisation reform

a. Total central government transfers per capita



b. Transfers for education per capita



Source: National Planning Department. Author's calculations.

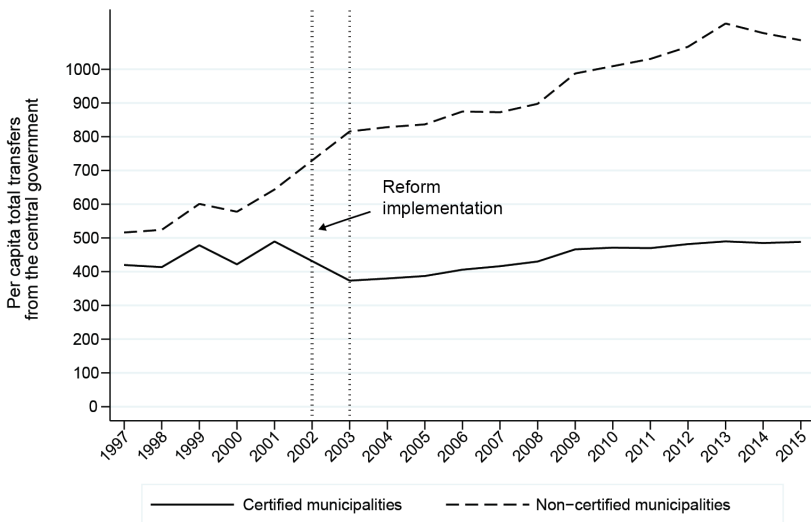
Note: Per capita educational transfers in thousands of Colombian 2018 pesos.

mation on the differences between the two authorities in terms of their social characteristics, their inputs into education and their school students' performance on various test scores.

The second part of the Annex also looks at previous work in this field, describing the findings of Elacqua et al. (2021), who evaluated the impact of administrative decentralisation on educational outcomes, including student enrolment and student achievement, and on the contractual and educational characteristics of teachers. Their results suggest that the decentralisation process in Colombia substantially altered the way in which local governments assigned and executed their resources. While certified municipalities had the mandate to plan, manage, and deliver the provision of education and seem to have successfully improved enrolment, quality, and equity in their school systems, departments had a similar mandate (and received higher per capita transfers from the central government to deliver education in the non-certified municipalities), but showed lower educational outcomes. The reform had positive and significant effects on enrolment and student performance and Elacqua et al. (2021) attributed these effects to a greater percentage of teachers with higher education and improved fiscal efforts in certified territories.

Figure 12.2: Total transfers (from both central government and departments) to municipalities before and after the administrative decentralisation reform

a. Total transfers from both central government and departments per capita



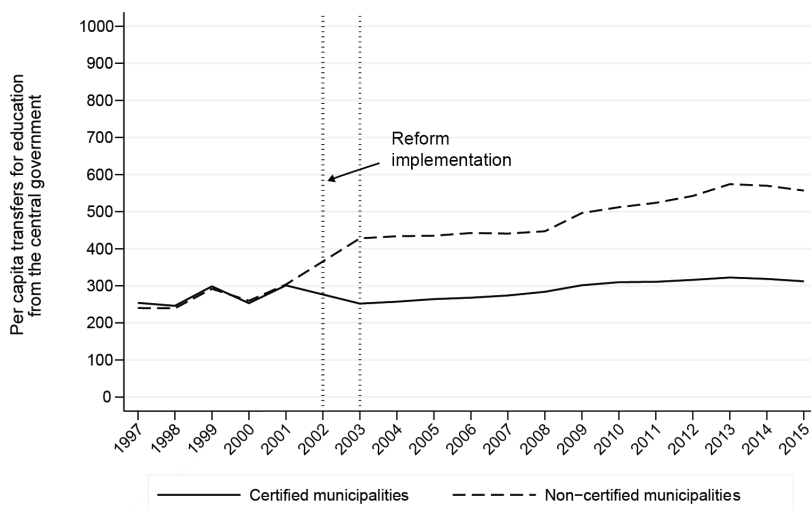
Source: Elacqua, Munevar, Sanchez, and Santos (2021).

Note: Per capita transfers in thousands of Colombian pesos as at 2018. (For this figure, 500,000 COP = US\$105 US approximately per capita; and COP 1,000,000 = US\$208 approx, per capita.) Until 2002 all municipalities received central governments' transfers both directly and indirectly through departmental spending. Since 2003, certified municipalities have received only direct transfers from the central government, while non-certified municipalities receive central government transfers both directly and indirectly through departmental spending.

(Continued)

Figure 12.2: Continued

b. Transfers for education from both central government and departments (in thousands of Colombian pesos)



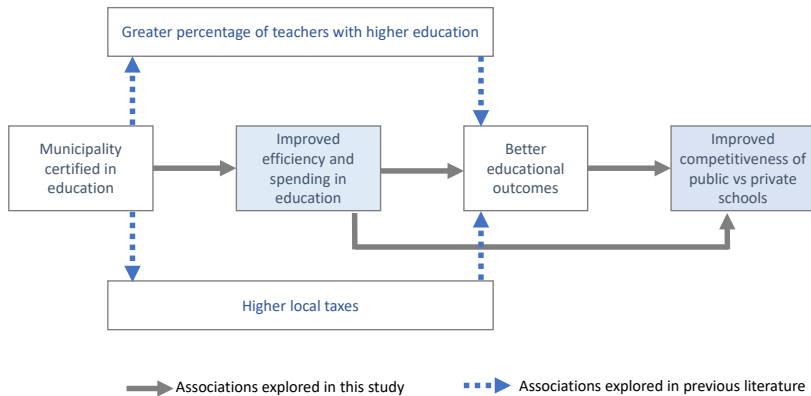
Note: Per capita educational transfers in thousands of Colombian 2018 pesos. Until 2002 all municipalities received central governments' transfers for education both directly and indirectly through departmental spending in education. Since 2003 certified municipalities have received only direct transfers for education from the central government, while non-certified municipalities receive central government transfers for education both directly and indirectly through departmental spending in education.

It seems plausible to assume that by creating greater municipal autonomy certification prompted significant efficiency gains, by lowering transaction costs due to more and better information, more transparent negotiation processes, and rapid adjustment to correct errors (Pritchett 2014; Pritchett and Pande 2006). Local governments in certified municipalities might have gained the power to use their resources in a way that served the needs of their particular populations, while the freedom to better tailor their budgets might have enhanced the efficiency of the resources spent. Improved teacher hiring seems likely to be only part of the story, and other pieces of the puzzle (both mechanisms and longer-term outcomes) may explain the superior path observed in certified municipalities years after the reform's implementation of the reform.

12.2 Analysing the efficiency effects of decentralisation on outcomes

We next focus on breaking down the 'efficiency' hypothesis – namely, the proposition that part of the effects of the reform came from a 'better' or more efficient use of both central government transfers and own local resources in

Figure 12.3: How the ramifications of certification operated after the 2001 decentralisation reform – outcomes and mechanisms



Source: Authors' creation.

certified municipalities. More specifically, we explored the effect of the reform on (i) the amount of local resources that certified municipalities spent on education, and (ii) the way local governments assigned and spent their resources. We found that while these municipalities were able to spend more in important educational programmes, they did not require additional fiscal efforts to do so. We then analysed the mediating effect of increased efficiency and improved allocation of resources on student outcomes, and we discuss below how all these existing channels translated into a stronger public school system.

We propose that being certified (understood as the ability to assign and manage education resources autonomously) produced efficiency gains because decision makers gained more access to information about local educational needs and a stronger capacity to allocate resources effectively (see Figure 12.3). Additionally, this gained autonomy might have allowed certified entities to redistribute and invest their available resources (both locally raised and central government transfers) across key areas of the education system in a way that increased the productivity of the resources spent and more accurately served the needs of their municipalities. We also hypothesise that both an improved education system and the more efficient use of resources triggered more permanent, or structural, transformations in the way that local communities related to their public school system, promoting parental demand and higher student enrolment in local public schools.

To evaluate the effects and mechanisms of the decentralisation reform, we used four different sources of data: (i) the population census of 1993 which forecasted 2001 municipal population sizes, used to determine which municipalities became certified; (ii) a panel database, constructed by the Center of Economic Studies of Los Andes University, that contains data from different public sources and contains diverse geographic, demographic, and

socio-economic characteristics for the 1,121 Colombian municipalities; (iii) the Territorial Administrative Report – Formato Unico Territorial (FUT) – which contains detailed reported annual expenditures in each municipality, including itemised expenditures in education; and (iv) a database from the National Bureau of Statistics (Departamento Administrativo Nacional de Estadística, DANE), with information on the numbers of students by level of education (preschool, primary, and secondary) in all Colombian public and private schools since 1996.

To evaluate the effects of the decentralisation reform, we exploited the quasi-experimental treatment of the ‘certified’ municipalities using a variant of differences-in-differences (DD) models that controlled for municipality and year fixed effects, and for department-year interactions, to account for any educational policies and interventions in non-certified municipalities that could be carried out by the departmental authorities. Because certification in 2002 was arbitrarily assigned based on a population size cut-off, municipalities could not ‘choose’ to be certified. Given the impossibility of self-selection, as well as the existence of parallel trends in the pre-reform period (which can be observed in Figures 12.8 and our Annex Figures 12.A and 12.B), we justify the use of a DD model to estimate the effects of the reform on our outcomes.

The difference-in-differences model we estimated was the following:

$$Y_{m,t} = \beta_m M_m + \beta_t T_t + \beta_3 \text{Certified}_m * \text{post2002}_t + \beta_{dt} \text{Department} \times \text{Year} + u_{mt} \quad [1]$$

where $Y_{m,t}$ represents the outcomes of study – local and itemised expenditures in education and share of public vs private student enrolment. Our key explanatory variable is the interaction between the two $\text{Certified}_m * \text{post2002}_t$. Certified is a dummy that takes a value 1 when a municipality was certified after 2003; Post2002 is a dummy that takes a value 1 in the years after 2002; it is zero for pre-2002 years. We also include M_m to account for the time-invariant municipal fixed effects, year fixed effects T_t and department-level time-varying unobserved factors $\text{Department} \times \text{Year}$; the latter control for any annual shocks and educational departmental policies that may affect educational spending at a local level. *Ceteris paribus*, our coefficient of interest is β_3 , which captures the effect of a municipality being certified after 2002 on $Y_{m,t}$ compared to those not being certified. Note, however, that the control group of non-certified municipalities did not remain unchanged after 2002; these became centralised after 2002. As such, it is difficult for us to capture the pure effect of decentralisation. We can thus estimate only the differential effects of becoming decentralised in education compared to being centralised after 2002. The estimated treatment effects as captured by $\text{Certified}_m * \text{post2002}_t$ can still be biased because of the unobserved municipality-level time-varying characteristics, for example whether it is allied with the departmental government or not, that determines that a municipality may receive additional direct investments from it; as such we need to be cautious about interpreting these estimates.

We also test the robustness of Equation [1] using the standard difference-in-difference equation specification as follows:

$$Y_{m,t} = \beta_1 \text{Certified}_m + \beta_2 \text{post2002}_t + \beta_3 \text{Certified}_m * \text{post2002}_t + \beta_m M_m + \beta_{dt} \text{Department}x\text{Year} + u_{m,t} \quad [2]$$

How more autonomy in public education affected subnational education expenditures

We theorise that certified municipalities gained the autonomy to prioritise and assign education resources in a way that better responded to the needs of the communities they serve, while non-certified municipalities remained subject to the decisions and mandates of their government at the department level. Previous literature has identified an increase in local taxes post-reform, yet we argue that an increase in per capita local taxes does not necessarily translate into higher local resources spent on education. More autonomous management of education-related resources could promote education goals within local governments policy agenda without necessarily requiring additional fiscal efforts for education, if resources are efficiently used. With equal or even reduced resources, certified municipalities might be able to attain equal or better results, generating increased productivity per peso spent. So, testing for efficiency gains consists of exploring whether local governments assigned their locally raised resources to education-related expenses before and after the reform.

To explore whether the reform affected the total amount of local resources spent in education, and the way municipalities assigned resources across the different components of education policy, we first analysed the percentage of local resources assigned to education, and then we looked at trends in expenditure by item across certified and non-certified municipalities. The information on total and itemised expenditures was obtained from the FUTs, annual administrative reports giving disaggregated information on which services municipalities spend their resources on. For this exercise, we homogenised all education-related expenses by municipality, since 1994. By creating this standardised panel, we were able to do year-to-year and expenditures comparisons across municipalities. To our knowledge, we are the first study to clean and standardise this administrative data in a way that allows across time and territorial analysis. To study changes in particular expenses before and after the reform, between certified and non-certified municipalities we looked at: (i) per capita spending in school infrastructure; (ii) per capita spending in teacher salaries; (iii) per capita spending in education quality; and (iv) per capita spending in other education programmes. School infrastructure, teacher quality, investments aimed at improving education quality, and other education-related programmes are all key components of education policy and have been linked to improved school performance and educational

Table 12.1: School expenditures by category

Category	Expenses
Infrastructure	<ul style="list-style-type: none"> • School infrastructure related studies, designs, and consulting services • School space improvements and interventions • Constructions • Extensions, adaptations, and improvements of educational infrastructure • Maintenance of educational infrastructure • Payment of public services • Improvements and provision of teaching materials and resources for learning • Improvement of accessibility conditions • Institutional endowment • Leasing of properties intended for the provision of education-related services
Other education-related programmes	<ul style="list-style-type: none"> • School feeding programmes • School transportation • Other education-related school programmes
Education quality	<ul style="list-style-type: none"> • Training for teachers and teaching managers • Design and implementation of quality improvement plans • Institutional modernisation • Implementation of information systems • Connectivity

outcomes (Belmonte et al. 2020; Cuesta, Glewwe, and Krause 2016; Goldhaber and Brewer 1996; Wang and Fawzi 2020).

To explore differences in the management of total resources spent across municipalities, we looked at the total expenditure in key education items and the distribution across these categories. Specifically, we grouped reported school expenditures into three main categories: infrastructure investments, investments in other education-related programmes, and investments to improve education quality. These are summarised in Table 12.1.

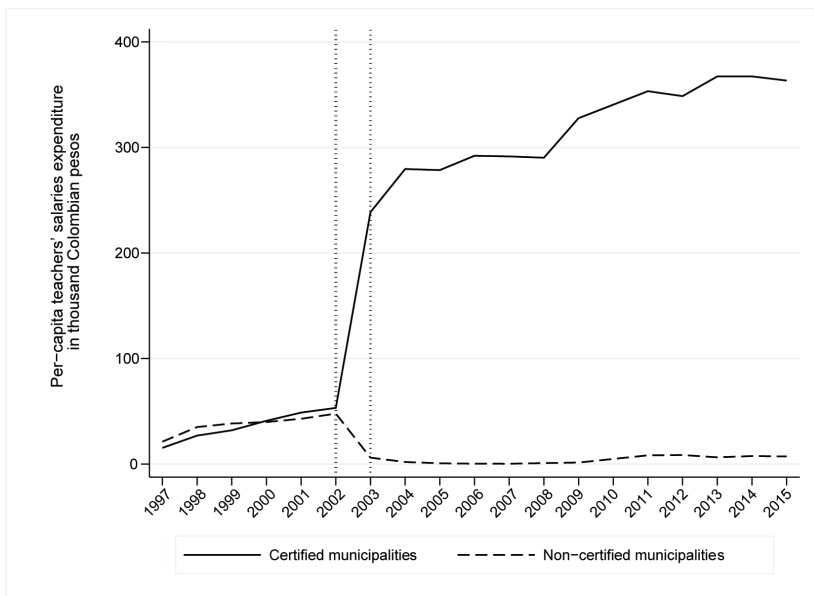
One of the corollaries of Law 715 was that certified municipalities would receive greater transfers, mainly designated to hiring teachers and managing their school assignments. Complemented by the municipalities' own resources, these transfers raised the total resources for education in certified municipalities. And after 2002, local governments could manage these resources freely, as long as they complied with the teacher requirements of their respective school systems. Figure 12.4a shows how the expenditure on teacher salaries increased in certified municipalities but decreased in non-certified areas as this responsibility was transferred to departmental governments. Clearly, certified municipalities managed significantly more resources after the reform

than non-certified municipalities did. But, since resources were primarily destined for teacher salaries, it did not necessarily imply higher per capita education expenditure in these municipalities. Elacqua et al. (2021) inferred that higher transfers could boost fiscal efforts in decentralised territories to increase the share of local resources allocated to education. Contrary to their beliefs, we test for increases in locally raised resources allocated to education and argue that, instead of a boost in available additional resources, autonomy gained by certified municipalities allowed them to assign their resources in a more efficient manner. The latter would translate bigger gains by per capita peso spent, without the need to assign more local resources to education policy. This is explained below.

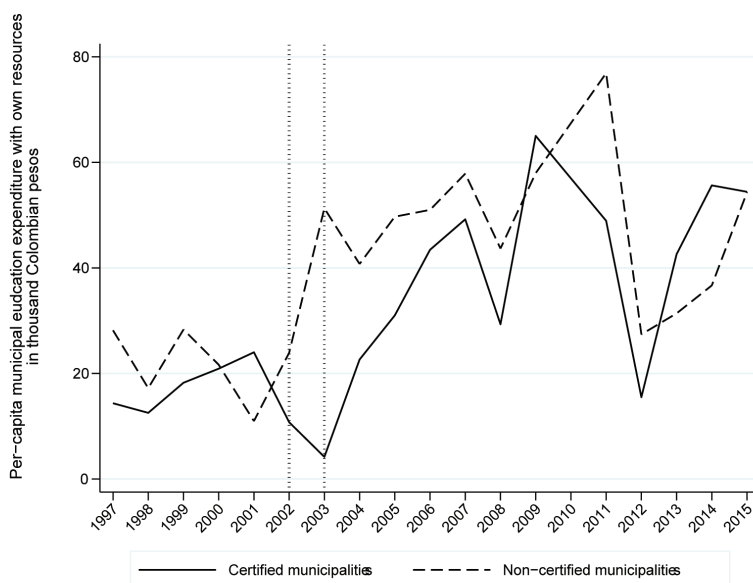
Figure 12.4b shows the assignment of locally collected resources to education in both certified and non-certified municipalities. After 2002, the total amount of per capita local resources spent on education at first fell sharply in certified municipalities, but almost immediately increased again. It then fluctuated but remained somewhat below the resources spent in non-certified municipalities in the years that followed. This could not be attributed to increased fiscal efforts for education in certified municipalities. Instead, the performance of the education system was highly dependent on the way the certified municipalities managed the central government transfers and the assignment of all resources to the different items of their education agendas.

Figure 12.4: Distribution of per capita expenditures in certified and non-certified municipalities, in thousands of Colombian pesos

a. Per capita expenditures on teachers' salaries



(Continued)

Figure 12.4: Continued**b. Per capita education expenditure from local resources**

Source: Authors' calculation. FUT database from the Colombian National Planning Department (1997–2015).

Note: Panel a shows per capita transfers for teacher salaries in thousands of Colombian 2018 pesos.

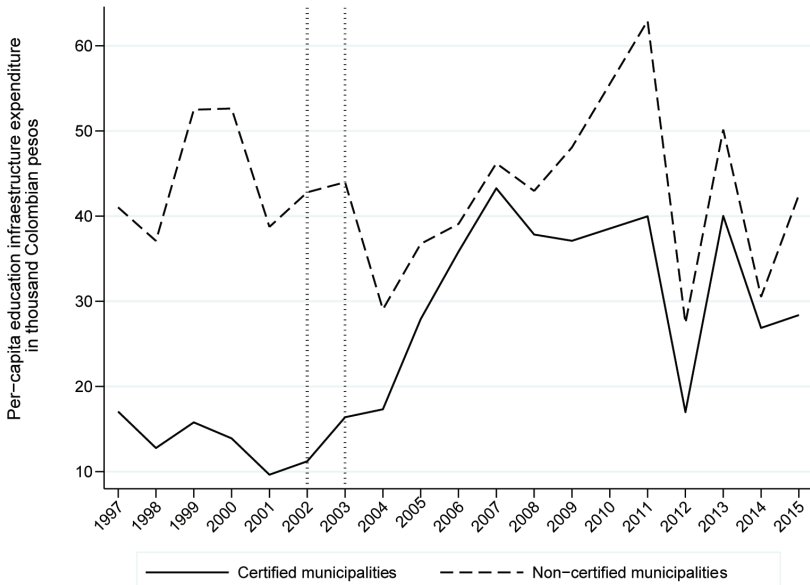
Panel b depicts average municipal per capita expenditure with local resources (that is, total expenditure minus transfers from the central government). Municipal education expenditure was reported in thousands by the municipalities and was then divided by the municipal population and transformed to 2018 Colombian pesos. Data from 2010 was not included due to missing information.

Figure 12.5 shows that before 2003 non-certified municipalities (serving smaller populations than certified authorities) spent substantially more per capita resources in school infrastructure, education-related programmes, and education quality investments. After 2003, the gaps in all three of these expenditures were significantly reduced given the growth in certified municipalities' spending, especially in infrastructure and other programmes.

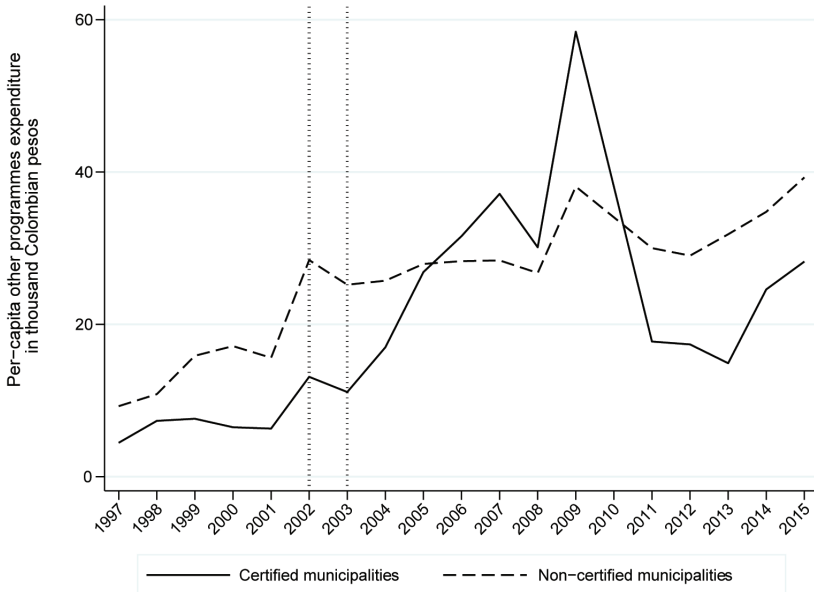
The expansion of total resources in certified municipalities cannot be attributed to the expansion of *locally raised* resources for education, since Figure 12.4b shows that certified municipalities spent less than non-certified municipalities. The central government transfers that the certified entities received after 2002 responded to projected teacher costs in those territories. If these municipalities became more efficient in hiring and assigning teachers, then they freed up resources for other types of educational spending. By contrast, efficiencies in the use of teacher salaries were not possible for non-certified municipalities because they lacked financial autonomy.

Figure 12.5: Trends in per capita education-related expenses in certified and non-certified municipalities, in thousands of Colombian pesos

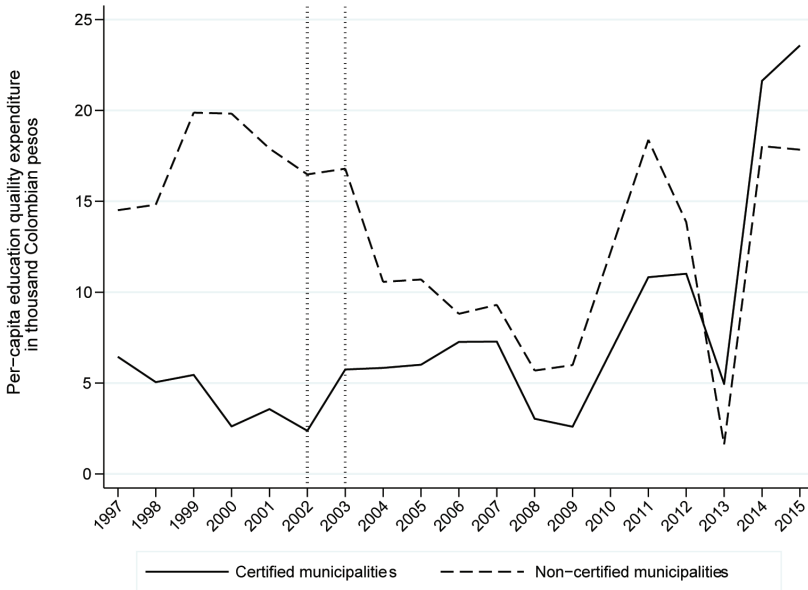
a. School infrastructure



b. Other education-related programmes



(Continued)

Figure 12.5: Continued**c. Education quality**

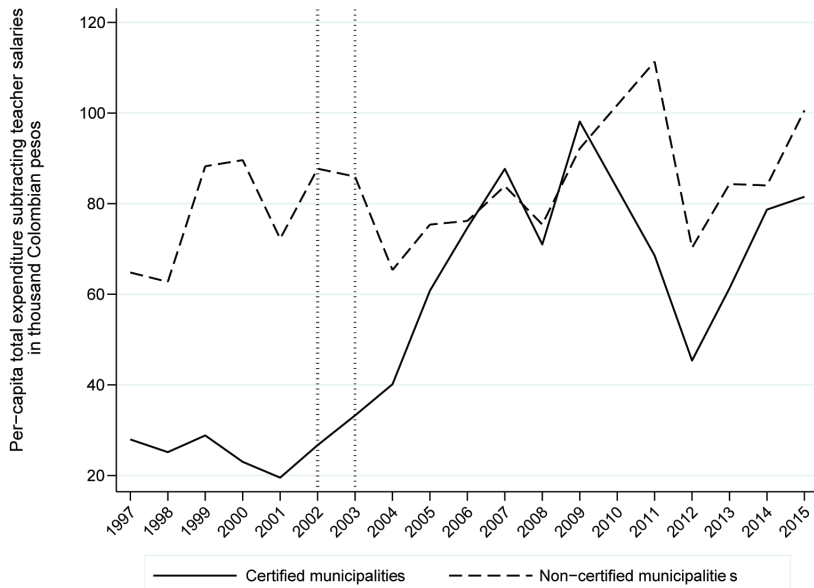
Source: FUT database from the Colombian National Planning Department (1997–2015). Note: Expenditure in the different education components was reported in thousands by the municipalities and then divided by the municipal population and transformed to 2018 Colombian pesos. Data from 2010 was not included due to missing information.

Hence, if non-certified municipalities wished to expand spending in educational programmes, they needed to make a greater fiscal effort than certified municipalities.

For both types of municipality, Figure 12.6 shows the total per capita expenditure in education after subtracting teacher salaries. Consistent with our hypothesis, we observed an increase in total resources available in certified municipalities that cannot be explained by an expansion in local resources. In non-certified municipalities, the resources maintained the trend observed before the reform, while the growth in certified municipalities suggests that the lower teachers' payroll per capita allowed for some resources to be allocated to other education expenditures. Put together, the trends in itemised expenditures and total expenditures after teacher salaries suggest that the reform did promote changes in the way certified municipalities assigned their education resources.

Since our preliminary analysis pointed towards efficiency gains arising from increased autonomy after certification, we further tested our hypothesis using a difference-in-difference model as per Equation [1]. All per capita outcome variables had a logarithmic transformation for ease of interpretation. Table 12.2 shows the coefficient estimate of $\text{Certified} \times \text{Post2002}$ as per Equation [1].

Figure 12.6: Per capita total expenditure in education net of teacher salaries, in thousands of Colombian pesos



Source: Authors' creation. FUT database from the Colombian National Planning Department, 1997–2015.

Note: This figure depicts the total average municipal per capita expenditure after subtracting teachers' salaries. Municipal education expenditure was reported in thousands by the municipalities and was then divided by the municipal population and deflated to 2018 Colombian pesos. Data from 2010 was not included due to missing information.

The estimated coefficients of the key interaction term $\text{Certified} \times \text{Post2002}$ in Table 12.2 show that the proportion of own resources spent in education as well as per capita expenditure with own resources fell in newly autonomous certified municipalities after 2002 relative to newly centralised non-certified municipalities. In contrast, per capita expenditure net of teacher salaries, increased for school infrastructure, education quality, and other programmes in certified (relative to non-certified) municipalities after 2002, indicating a reallocation of total expenditure into productive education items that help boosting student performance. We get similar results using the alternative specification Equation [2] as summarised in the Annex, Tables 12E and 12F. Taken together, certified municipalities were able to reallocate resources from teacher payroll to other educational expenses according to student needs, in this case for school infrastructure, and other quality expenses, after gaining autonomy after 2002. That budget flexibility is not possible for centralised non-certified municipalities that do not have the autonomy to assign their educational resources. Quality and infrastructure investments are likely to respond, and be tailored to, the specific needs of the schools and their members, and have been found to boost educational outcomes and enrolment

Table 12.2: Average effects of certification in education on measures of municipal education expenditure

	<i>Dependent variable (in natural log)</i>		
	Proportion of own resources in total expenditure	Per capita expenditure with own resources	Per capita total expenditure minus teacher salaries
Certified×Post2002	-0.385*** (0.014)	-0.457*** (0.112)	0.637*** (0.061)
N	18,289	18,555	18,555

	<i>Dependent variable</i>		
	Per capita infrastructure expenditure	Per capita quality expenditure	Per capita expenditure in other programmes
Certified×Post2002	0.713*** (0.068)	0.715*** (0.072)	0.301*** (0.067)
N	18,555	18,555	18,555

Source: Colombian National Planning Department. Authors' calculations.

Note: The table shows the estimated coefficient of certified×Post2002 using difference-in-difference Equation [1]. In all models the number of years = 18; the number of municipalities = 1070; and fixed effects are included for Year; Municipality; and Department × Year. Robust standard errors in italics and parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

by improving learning conditions (Belmonte et al. 2020; Cuesta, Glewwe, and Krause 2016).

In the Annex to this chapter, Figures 12.A and 12.B show the estimated coefficients of year–certification interactions to our estimations: per capita education expenditure from locally raised resources, per capita total education expenditure net of teacher salary, and per capita education expenditure on key accounts, respectively. Since the resource allocation scheme was the same for all municipalities before the reform, we should not observe significant differences in these expenditure items between certified and non-certified municipalities prior to 2003. The pre-reform coefficients in both sets of figures confirm no significant pre-existing differences in various per capita education expenditure items between non-certified and certified municipalities, which in turn validate the existence of parallel trends before the enactments of the reform. This is essential for the consistency of the difference-in-difference estimates shown in Table 12.2.

Furthermore, these figures show the long-term effects of the 2002 reform. Although the effect of per capita expenditure remained close to zero in the years following the reform, per capita education expenditure after deducting teacher salaries remained positive and significant for at least a decade after the certified municipalities gained financial autonomy over the management

of their resources. In addition to the higher expenditures in key items of municipal education policy shown in Table 12.1, Figure 12.B shows that these indicators remained above the pre-reform levels in certified municipalities way past 2003.

Decentralisation and enrolment in public and private schools

Investments in school infrastructure, and resources destined to education-related programmes and education quality, have all been associated with improved student outcomes (Hong and Zimmer 2016; Wall et al. 2022). So, increases in these investments boost factors that the previous literature has associated with positive effects on student performance and enrolment. Accordingly, we hypothesised that more structural, or long-term gains would be likely to occur as an improved public school system eventually attracted parents who before would have opted to enrol their children in private school. If so, then the enrolment composition of the public and private school systems should change in certified municipalities.

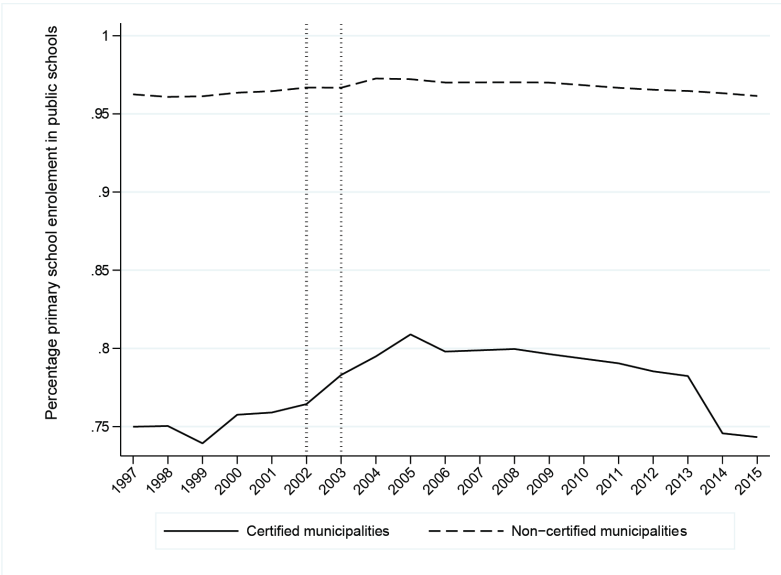
To assess the effects of the decentralisation process on the composition of public vs private student enrolment, we used data from the C-600 database of the National Bureau of Statistics, which contains information on the number of students by level of education (preschool, primary, and secondary) in all Colombian schools, by year, both private and public. We calculated a two-way fixed effect model leveraging on the variation in the proportion of enrolment in public schools as a percentage of total enrolment, before and after the 2001 reform and between certified and non-certified municipalities.

Figure 12.7 shows percentage shares of public enrolment in total enrolment, in certified and non-certified municipalities, before and after the decentralisation reform. The proportion of public enrolment in certified municipalities was increasing before 2001, although rates were significantly below the rates of non-certified municipalities for both primary and secondary schools. After 2002, the growth of public enrolment in certified municipalities started accelerating, reducing the gap with non-certified municipalities. Public enrolment at the primary stage increased sharply in certified municipalities after 2002, but then fell away again compared to non-certified areas, reopening a large gap in Figure 12.7a. However, at the secondary stage Figure 12.7b shows that the immediate post-reform improvement in the share of public schools in certified municipalities was sustained in subsequent years.

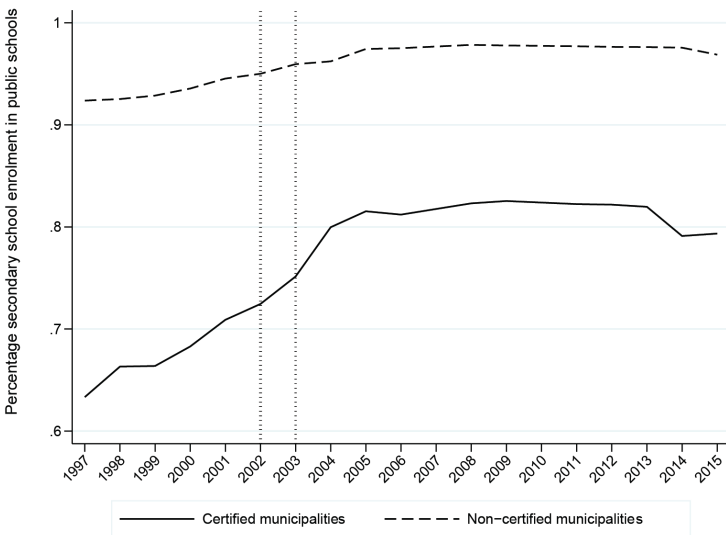
Table 12.3 shows the coefficients of a difference-in-difference model that regresses municipal certification on primary and secondary public enrolment rates using Equation [1]. Each estimated coefficient is positive and statistically significant, indicating that certified (relative to non-certified) municipalities experienced significantly higher share of public enrolment after 2002. We obtain similar estimates when using Equation [2] as summarised in Annex Table 12G. Figure 12.8 further shows that certification had a positive effect on annual public enrolment in primary schools (panel a) and also a positive

Figure 12.7: Trends in the proportion public enrolment, as a proportion of total enrolment, in certified and non-certified municipalities

a. Primary enrolment



b. Secondary enrolment



Source: The National Administrative Department of Statistics. Authors' calculations.
 Note: This depicts the average percentage enrolment in primary and secondary school, of the total municipality enrolment from 1997 to 2015. Information from 2007 was omitted due to misreporting.

effect on public secondary enrolment (panel b), compared to non-certified municipalities, lending support to our view of the increased competitiveness of public schools.

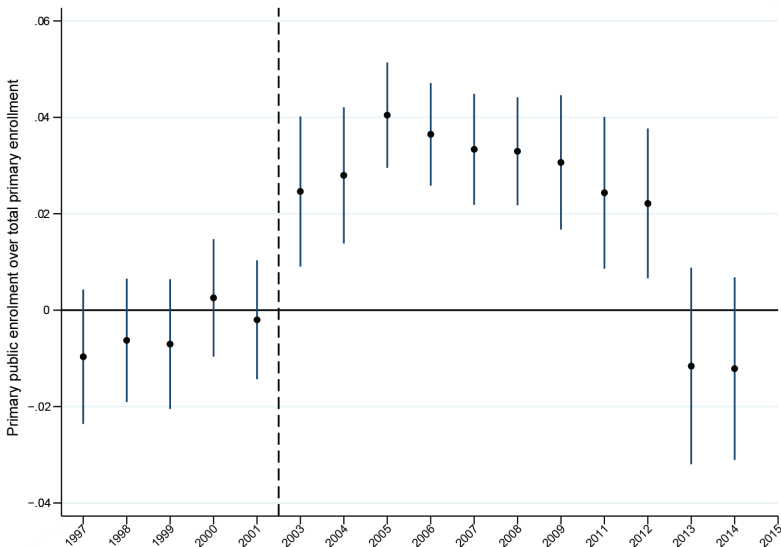
Did increased expenditure (from increased efficiency in the use and allocation of resources) mediate the effect of certification on student performance and share of public enrolment? Table 12.4 shows the results of a regression of six different per capita municipal expenditure measures on high-school exit exam test scores and municipal enrolment rates, controlling for year, municipal, and departmental fixed effects. The exercise aimed to investigate whether the differential way in which certified municipalities spent their resources did

Table 12.3: Average effects of certification in education on proportion of public enrolment

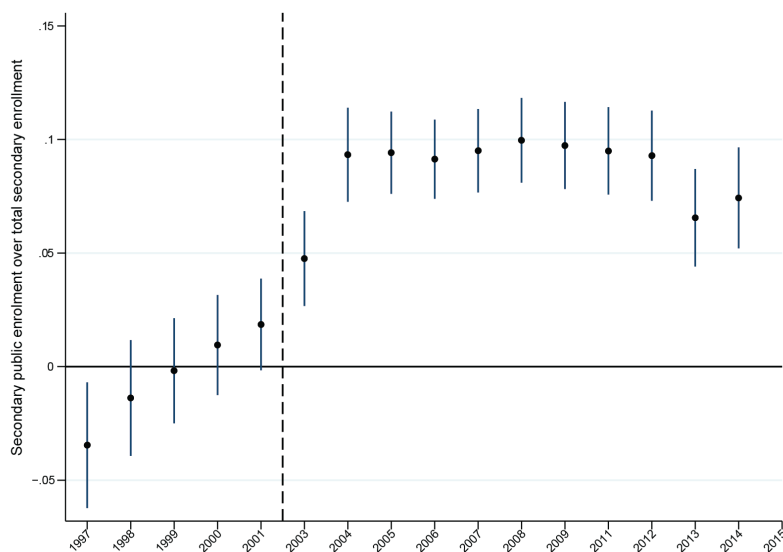
	<i>Dependent variable</i>		
	Change in share of public enrolment	Change in share of primary public enrolment	Change in share of secondary public enrolment
Certified×Post2002	0.055*** (0.003)	0.027*** (0.003)	0.090*** (0.004)
N	20,214	20,214	20,119

Figure 12.8: The effect of certification on the proportion of public primary and secondary enrolment

a. Primary enrolment



(Continued)

Figure 12.8: Continued**b. Secondary enrolment**

Source: The National Administrative Department of Statistics. Authors' calculations.

Note: These graphs show the estimated coefficients of a difference-in-difference estimation that regresses the public education participation of total enrolment on municipal certification for each year from 1997 to 2015. Dots represent estimated coefficients and the lines their corresponding confidence intervals. Municipal investment had a logarithmic transformation for the ease of interpretation.

explain part of the improvements in student academic performance and public enrolment rates in certified municipalities.

We found that per capita measures of total expenditure net of teachers' salaries, plus infrastructure and quality expenditure were strongly correlated with both student performance and enrolment rates. An increase in total per capita expenditure in other education programmes did not show any significant impact on academic performance but it did affect enrolment rates in both primary and secondary schools. The results in Table 12.4 serve as evidence to validate the view that flexibilities in expenditure decisions and efficiencies in the use of resources in certified municipalities have been strong drivers of the improvements in local education systems in certified municipalities compared to non-certified municipalities after 2002.

Conclusions

Our study capitalised on the major educational decentralisation reform that occurred in Colombia in 2001, where the government established an arbitrary rule that granted municipalities with a population greater than 100,000

Table 12.4: Associations between local expenditures, student outcomes, and public enrolment rates

<i>Explanatory variables</i>	Dependent variable	
	SABER 11 scores	Share of public enrolment
Per capita total expenditure subtracting teacher salaries	0.049*** (0.018)	0.014*** (0.002)
Per capita expenditure in school infrastructure	0.028** (0.012)	0.007*** (0.001)
Per capita expenditure in school quality	0.034*** (0.010)	0.004*** (0.001)
Per capita expenditure in other education programmes	-0.008 (0.014)	0.012*** (0.002)
N	18,321	18,554
# Municipalities	1,068	1,070

<i>Explanatory variables</i>	Share of public primary enrolment	Share of public secondary enrolment
	Per capita total expenditure subtracting teacher salaries	0.014*** (0.003)
Per capita expenditure in school infrastructure	0.008*** (0.002)	0.004*** (0.001)
Per capita expenditure in school quality	0.005*** (0.001)	0.001 (0.001)
Per capita expenditure in other education programmes	0.009*** (0.002)	0.011*** (0.001)
N	18,554	18,554
# Municipalities	1,070	

Source: Authors' calculations. Colombian National Planning Department, the National Administrative Department of Statistics.

Note: This table regresses high-school exit exam test scores and municipal enrolment rates on six different per capita municipal expenditure measures controlling for year, municipal and departmental fixed effects. Robust standard errors are shown in italics and parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In all models: the number of years = 18; and fixed effects were applied for Year, Municipality, and Department \times Year.

almost complete autonomy to provide education services (certification). Our four main findings are:

- Certified municipalities experienced efficiency gains that increased the productivity of educational expenditures. Why? We observe that after the reform:

- Per-student transfers are lower in certified municipalities than in non-certified.
- Per capita spending with locally raised resources is also lower in certified municipalities than in non-certified.
- Certified municipalities have both higher student enrolment (Elacqua et al. 2021) and a higher share of public enrolment.
- Newly autonomous certified municipalities were able to increase their per capita expenditure (net of teachers' salaries) in key areas of education, such as infrastructure and other education-related programmes.
- Improvements made in efficiency and student outcomes increased the attractiveness of public versus private schools, thus increasing the share of total students enrolled in public institutions.

Our results suggest that the higher education expenditures did not come from increased fiscal efforts allotted to education but from efficiency gains enjoyed by certified municipalities in their use of available resources after gaining autonomy. As such, our work goes beyond Elacqua et al. (2021) and provides evidence on the mechanisms through which decentralisation improves educational outcomes, specifically through increased efficiency and better allocation of resources.

Annex: Background information on the characteristics and behaviours of certified and non-certified municipalities

We first outline some key differences between certified and non-certified areas and their schools systems, and then briefly consider previous work on the educational decentralisation reforms.

Social characteristics and school education inputs and performance

Given the fixed size rule of 100,000 people applied in 2002 for municipalities to become certified, they were on average larger than non-certified areas. Consistent with this size difference, Table 12A shows that certified municipalities were also on average more developed, as measured by the Municipality Development Index. They had lower levels of poverty, as measured by the Unsatisfied Basic Need Index. And on average certified municipalities were less unequal, as measured by the municipal Land GINI.

Table 12B shows some pre-reform differences on local education expenditures, broken down by development/poverty indicators between the two types of municipalities. Overall, non-certified municipalities sustained higher per capita investments in infrastructure, education quality, and other education programmes, compared to those municipalities that would become certified. Additionally, the share of enrolled students in public versus private schools was higher in non-certified municipalities.

Table 12A: Pre-reform development, poverty, and inequality in certified and non-certified municipalities, 2001

<i>Index (2001 mean scores)</i>	Certified (N = 45)	Non-certified (N = 986)	Estimated difference and (standard error)
Municipal development Index	51.42	34.89	12.641*** (1.813)
Unsatisfied Basic Needs (UBN)	30.82	53.26	-18.790*** (3.532)
Land GINI	0.436	0.459	-0.009 (0.007)

Source: National Planning Department, CEDE municipal PANEL, and the National Administrative Department of Statistics (DANE). Authors' calculations.

Notes: The first two columns report 2001 mean of each variable for certified and non-certified municipalities.

The last column reports the estimated difference for each variable between certified and non-certified municipalities that results from an OLS regression that controls for the 2001 municipal population. Robust standard errors in italics and parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 12B: Pre-reform local expenditures in education and public versus private school enrolment in certified and non-certified municipalities, 2001

<i>Indicator</i>	Certified (N = 45)	Non-certified (N = 986)	Difference and (standard error)
Per capita infrastructure investment (log mean)	1.412	2.456	-0.479** (0.194)
Per capita education quality investment (log mean)	0.772	1.699	-0.490** (0.196)
Per capita investment in other education programmes (log mean)	0.947	1.496	-0.403** (0.205)
Public school participation in local enrolment (mean)	0.709	0.955	-0.215*** (0.014)

Source: as per Table 12A.

Note: The first two columns report 2001 mean of each variable for certified and non-certified municipalities. The last column reports the estimated difference for each variable between certified and non-certified municipalities that results from an OLS regression that controls for the 2001 municipal population. Robust standard errors in italics and parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Regarding student outcomes, Table 12C shows that in 2001 students in municipalities that would become certified performed better than did students in non-certified municipalities, as measured by the SABER 11 standardised test (the Saber test is further described below). While in non-certified municipalities the enrolment rates in public primary schools were above that of certified municipalities, the rate of enrolment in public secondary schools was

Table 12C: Pre-reform student performance, enrolment, rural–urban ratios, and student–teacher ratios in certified and non-certified municipalities, 2001

<i>Indicator</i>	Certified (N = 45)	Non-certified (N = 986)	Difference and (<i>standard errors</i>)
SABER 11 Math Score	49.80	48.79	0.817** (0.377)
SABER 11 Total Score	49.50	47.25	1.768*** (0.587)
Public primary school enrolment rates	0.854	1.186	−0.254*** (0.052)
Public secondary school enrolment rates	0.417	0.388	0.047 (0.030)
Rural–urban student ratio	0.137	0.516	−0.304*** (0.041)
Student–teacher ratio	27.77	22.10	3.920*** (0.886)

Sources: as per Table A.1.

Note: The first two columns report the 2001 mean of each variable for certified and non-certified municipalities. The last column reports the estimated difference for each variable between certified and non-certified municipalities that results from an OLS regression that controls for the 2001 municipal population. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

higher in the certified areas. Lastly, the ratio of rural to urban students was higher in non-certified municipalities, while the student–teacher ratio was higher in certified municipalities.

Previous work on how Colombia’s reform changed education outcomes

What were the effects of the 2001 decentralisation reform on student and education system outcomes? And what mechanisms lie behind these effects? Colombia’s 2001 decentralisation reform provides a unique research opportunity because it arbitrarily granted almost total administrative autonomy to one set of municipalities while almost totally reducing the autonomy of other municipalities, with no changes in political or fiscal decentralisation. This ‘natural experiment’ allowed the study of whether administrative decentralisation at the municipal level on local outcomes could translate into higher efficiency and performance in a quasi-experimental setting.

Elacqua et al. (2021) evaluated the impact of administrative decentralisation on educational outcomes, including student enrolment and student achievement, and on the contractual and educational characteristics of teachers. The 2001 reform affected the management of public education, including the appointment and allocation of teachers across schools, handling of programmes to reduce dropout rates and increase enrolment, distribution of financial resources to local schools, and evaluation of principals, among other tasks. It also affected the distribution of the central government transfers

between municipalities and departments related to the delivery of public education but did not alter decentralisation in fiscal or political matters. Central government transfers for education were equal per capita in Colombian pesos for the municipalities that would be certified in 2001 and those that would not (see Figures 12.1 and 12.2 above). After 2002, certified municipalities gained more autonomy and received larger per capita transfers; non-certified municipalities lost autonomy and received smaller per capita transfers; and departments acquired stronger administrative powers over non-certified municipalities. This also meant that non-certified municipalities got larger per capita transfers than certified municipalities after adding direct transfers and indirect transfers received through departmental expenditure on the non-certified municipalities. This particular set-up provides an opportunity to evaluate the casual effects of administrative decentralisation in the territories that gained autonomy.

Elacqua et al. (2021) evaluated the effect of the 2001 decentralisation reform on the educational outcomes over which ‘certified’ municipalities had the autonomy to focus their efforts: student enrolment, teacher quality, and student achievement. Their difference-in-differences and regression discontinuity results showed that municipalities that became autonomous

Table 12D: Summary of the effects of municipal administrative decentralisation on education indicators and local taxes

Outcome	Measure	Coefficient	Interpretation
<i>Academic performance</i>	Exit-high-school Exam (standardised)	0.060***	Students in certified municipalities increased the Saber 11 test scores by 0.6 standard deviations
<i>Enrolment</i>	Enrolment in public schools (log)	0.087***	The growth in the number of enrolled students in certified municipalities in public schools was 10% higher
<i>Teacher quality</i>	Proportion of teachers with higher education	0.021***	The quality of teachers in certified municipalities (measured as the proportion with a college degree) was 2% higher
	Proportion of teachers with permanent contracts	0.041***	The proportion of teachers with permanent contracts was 4% higher in certified municipalities
<i>Fiscal effort</i>	Local taxes	0.044***	In certified municipalities, the growth of per capita local taxes was 4% higher

Source: Elacqua et al. (2021).

Note: Coefficients in column 3 were all estimated using a DD method.

in the delivery of public education after 2001 increased student enrolment, recruited a higher proportion of teachers with higher levels of education, and had students with higher achievement scores on standardised tests. Table 12D gives a summary of their main results.

Using a mediation analysis, Elacqua et al. (2021) found that a significant part of their findings (about 30 per cent of student performance) was explained by higher-quality teachers being hired in the newly decentralised municipalities. They also concluded that local taxes explained about 7 per cent of the difference in student performance and about 15 per cent of the boost they observed in student enrolment there. Still, the results also showed that these researchers' proposed mechanisms only explained a part of the improvements in education outcomes in certified municipalities, and that unknown channels accounted for 65 to 90 per cent of these effects.

Robustness check: Results from estimating Equation [2]

Table 12E

	<i>Dependent variable</i>		
	Proportion of own resources in total expenditure	Per capita expenditure with own resources	Per capita total expenditure minus teacher salaries
Certified×Post2002	-0.404*** (0.012)	-0.523*** (0.107)	0.683*** (0.061)
N	18,592	18,592	18,592

Table 12F

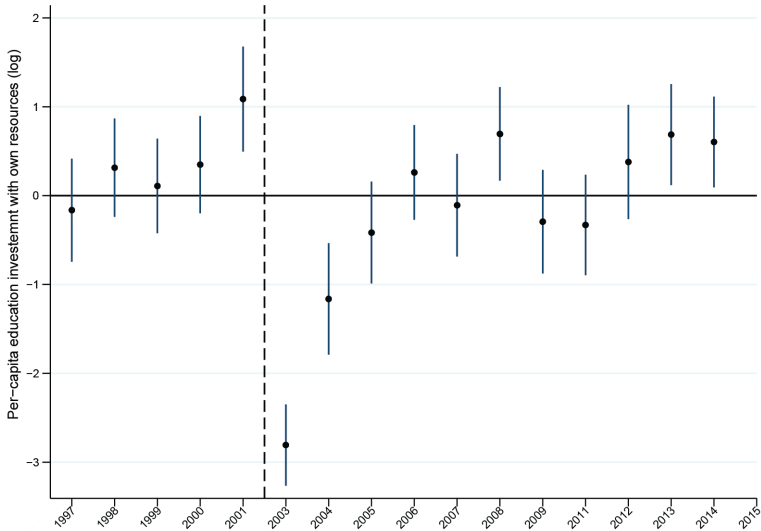
	<i>Dependent variable</i>		
	Per capita infrastructure expenditure	Per capita quality expenditure	Per capita expenditure in other programmes
Certified×Post2002	0.77*** (0.065)	0.864*** (0.072)	0.27*** (0.072)
N	18,592	18,592	18,592

Table 12G

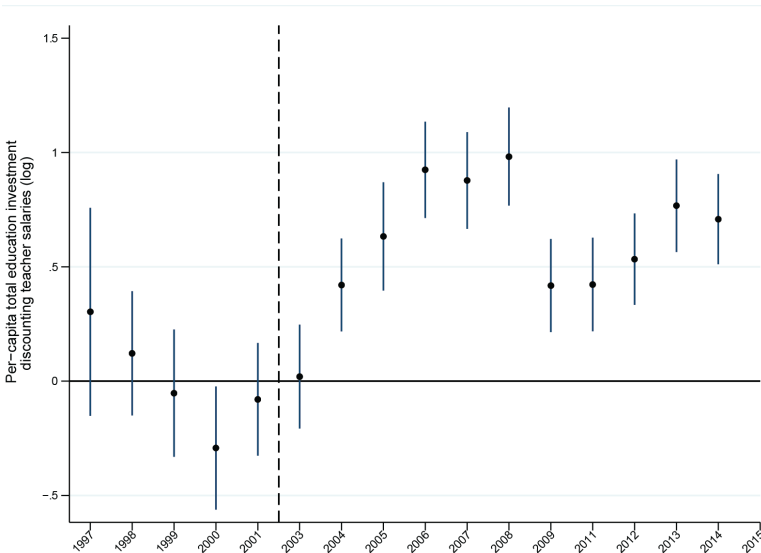
	<i>Dependent variable</i>		
	Change in share of public enrolment	Change in share of primary public enrolment	Change in share of secondary public enrolment
Certified×Post2002	0.057*** (0.003)	0.027*** (0.003)	0.095*** (0.004)
N	20,271	20,271	20,176

Figure 12.A: Yearly effects of certification on per capita education expenditure from locally raised resources and total per capita education expenditure (net of teacher salaries)

a. Per capita expenditure in education from locally raised resources



b. Per capita total expenditure in education deducting teacher salaries

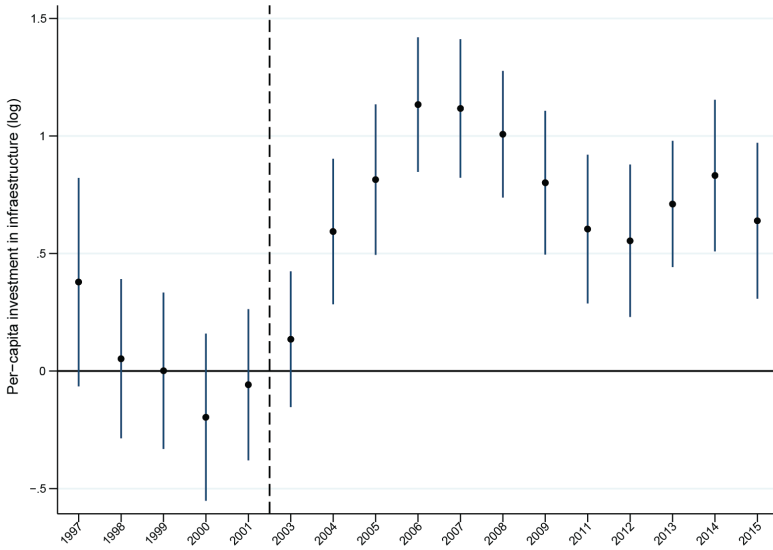


Source: Authors' calculations. Colombian National Planning Department.

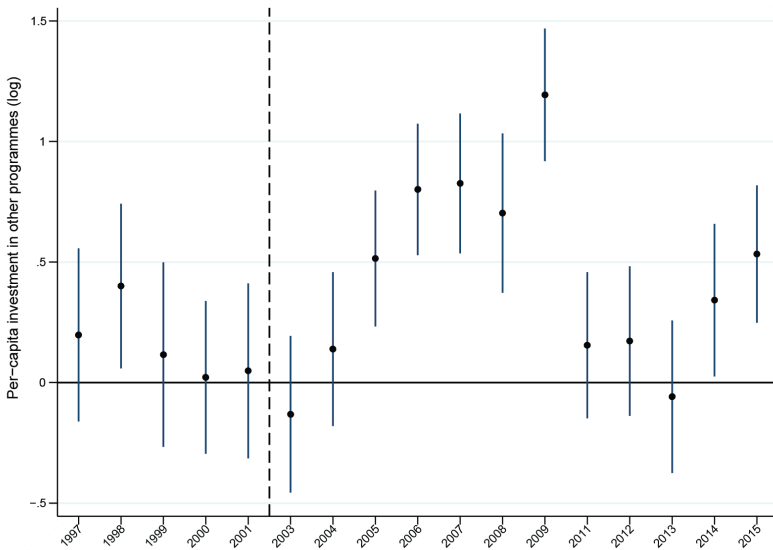
Note: These graphs show the estimated coefficients of a difference-in-difference estimation that regresses the municipal per capita investment in each item on municipal certification for each year from 1997 to 2015. Dots represent estimated coefficients and the lines their corresponding confidence intervals. Municipal investment had a logarithmic transformation for the ease of interpretation.

Figure 12.B: The yearly effects of certification on per capita education expenditure on key accounts

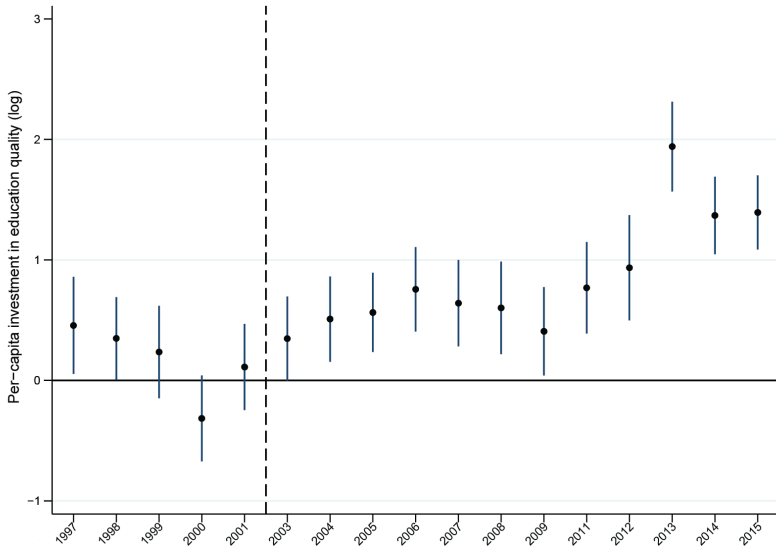
a. School infrastructure



b. Other education-related programmes



(Continued)

Figure 12.B: Continued**c. Education quality**

Source: Colombian National Planning Department. Author's calculations.

Note: These graphs show the estimated coefficients of a difference-in-difference estimation that regresses the municipal per capita investment in each item on municipal certification for each year from 1997 to 2015. Dots represent estimated coefficients and the lines their corresponding confidence intervals. Municipal investment had a logarithmic transformation for the ease of interpretation.

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