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Evaluating the Impact of School Decentralization on Educational Quality

Decentralization is a major feature of current institutional innovation throughout the world. In Latin America, most countries have recently implemented decentralization policies following a long tradition of centralized government.¹ Argentina has not been the exception. The decentralization of educational services from the federal to provincial governments was an important component of the structural reforms undertaken in Argentina in the early 1990s.

The main argument in support of decentralization policies is that they bring decisions closer to the people. Information asymmetries, agency costs, and problems of collective decisionmaking can be alleviated through decentralization. Decentralization can worsen the provision of public goods, however, in the presence of positive spillovers, lack of technical capabilities by local governments, or capture of low-level administrations by the local elite. The theoretical literature identifies trade-offs without establishing universal superiority of either centralization or decentralization in the provision of public services. The problem needs to be analyzed empirically.

In this paper, we evaluate the effect of secondary school decentralization on educational quality. Between 1992 and 1994, the Argentine

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1. Burki, Perry, and Dillinger (1999). Recent studies analyzing decentralization processes in Latin America include Lopez Murphy (1995); Tendler (1997); Bird and Vaillancourt (1998); Fukasaku and Hausmann (1998); Savedoff (1998); Willis, Garman, and Haggard (1999). On Argentina, see Porto and Gasparini (1998); Grindle (2000); Tommasi, Saiegh, and Sanguinetti (2001).

national government transferred all its dependent secondary schools to the provincial governments.² This political experiment generated an exogenous variation in the jurisdiction of secondary school administration across time and space. We exploit this instrument to identify the causal effect of school decentralization on educational quality, measured by the outcome of a standardized test in Spanish and mathematics administered to students in their final year of secondary school.

An advantageous feature of our study is that not only do we control for the effect of the evolution of observable variables on student test scores, but by contrasting public and private school test outcomes, we also control for the effect of unobservable factors that could differentially affect the evolution of student performance in each province. Thus our estimator of the effect of school decentralization on test outcomes is the conditional difference-in-difference of the difference of public and private test outcomes. Our results suggest that, on average, decentralization resulted in better student performance.

As theoretical results suggest, we also interact the decentralization policies with measures of provincial characteristics: fiscal performance, political alternation, and size (surface area, population, and population density). We find that the effect of school decentralization on test outcomes is heterogeneous with respect to provincial fiscal performances. The effect of decentralization on test scores is positive when schools are transferred to provinces that are fiscally in order, but it becomes negative when provinces run significant fiscal deficits. If fiscal performance is a proxy for the technical capabilities of local administrations, our results suggest that decentralization is deleterious when services are transferred to low-quality local governments. We also find that the effect of school decentralization on test outcomes is not heterogeneous with respect to the other characteristics interacted.

Two related papers analyze the effect of decentralization on education in Argentina. Their approaches are quite different from ours. Eskeland and Filmer find that school decision autonomy and parental participation (proxied by survey measures) raise test scores.³ However, their cross-

2. This devolutionary decentralization of educational services was part of an extensive program of fiscal and structural reforms accomplished in Argentina in the early 1990s. Other prominent components of the reforms include the massive privatization program, the trade liberalization process, the reform and privatization of the national pension system, and the emancipation of the Central Bank.

3. Eskeland and Filmer (2000).

section study does not rule out the possibility that autonomy and participation are endogenously determined. Habibi and others find a positive effect of fiscal decentralization (measured by revenue-sharing ratios between the provinces and the federal government) on secondary school enrollment at the provincial level.⁴ Since the authors do not control for trend or year effects, their results may be capturing a spurious correlation. Neither paper analyzes an explicit policy intervention of school decentralization.

The organization of the paper is as follows. The next section discusses potential trade-offs in school decentralization, while the subsequent section explains the process of decentralization of secondary schools in Argentina. We then describe our empirical exercise and present the results. The final section summarizes our conclusions.

The Trade-offs of Decentralization

As mentioned above, the theoretical literature identifies trade-offs without establishing absolute dominance of either centralization or decentralization in the provision of public services. Oates considers central governments that produce a common level of public goods for all localities, while local governments can tailor public goods output to local tastes.⁵ In his analysis, local governments are preferable when the better match between local government outputs and local preferences is not outweighed by spillovers or economies of scale in central government provision. Studies by Lockwood and by Besley and Coate allow for heterogeneous local provision but central policymaking, in which elected representatives bargain over public goods provision.⁶ With heterogeneous provision, the case for decentralization has to be driven by political economy considerations, that is, drawbacks in the political and legislative processes of centralized systems that may induce inequity, uncertainty, or excessive public spending.

Bardhan and Mookherjee consider the trade-off to lie between limited central government ability to monitor the bureaucrats and capture by the

4. Habibi and others (2001).

5. Oates (1972).

6. Lockwood (1998); Besley and Coate (2000).

local elite under decentralization.⁷ If interest groups that are locally strong but nationally weak can easily capture political processes at the local level, then decentralization will tend to favor those local groups disproportionately. Tommasi and Weinschelbaum compare the advantages of centralized decisionmaking (through the internalization of externalities) with those of decentralized decisionmaking (such as increased control of agents by citizens through lower information asymmetries, less free-riding, and easier coordination).⁸ Decentralization may have the additional advantage of encouraging competition if citizens “vote with their feet.”⁹

Thus the main argument in favor of decentralization is that it brings decisions closer to the people. Decentralization can alleviate problems of information asymmetries over heterogeneous preferences, collective decisionmaking, and accountability in controlling political agents. It may also encourage competition. Decentralization may worsen the provision of public goods, however, if there are positive externalities, if low-level governments lack technical capabilities, or if local administrations are captured by a local elite that faces reduced political competition within the region.

These potential advantages and disadvantages of decentralization are relevant to an analysis of the provision of educational services in Argentina. Lack of expertise on the part of local management and capture by a local elite, for example, are likely to be pertinent.¹⁰ Adam Smith and Alfred Marshall were among the first to point out the presence of positive externalities in education. Becker and Lucas both argue that the social returns of education exceed private returns, but Heckman and Klenow question these externalities.¹¹ In the context of Argentina, however, it is arguable whether these externalities are exhausted at the provincial level, or whether they spill over to the whole country.

The advantages of having a policy that is closer to the people may also be relevant in this context. The explicit reason for the school transfer in Argentina was to increase efficiency through proximity to demand and the unification of management and control at the provincial level.¹²

7. Bardhan and Mookherjee (1998).

8. Tommasi and Weinschelbaum (1999).

9. Tiebout (1956).

10. Bardhan and Mookherjee (1998); Rose-Ackerman (1999).

11. Becker (1964); Lucas (1988); Heckman and Klenow (1997).

12. Llach, Montoya, and Roldán (1999).

Faguet's results on Bolivian decentralization suggest that local governments have better knowledge of idiosyncratic preferences.¹³ As mentioned above, Eskeland and Filmer find a positive effect of parental participation on school performance.¹⁴ Paes de Barros and Mendonca find no effect on test performance of school financial autonomy and school boards in Brazil, but register positive effects of decentralized director appointment.¹⁵ Decentralization in El Salvador and Nicaragua seems to have lowered the cost to citizens of pressuring the schools to improve their services.¹⁶

Finally, empirical work shows that competition can improve schools.¹⁷ As we describe in the next section, however, decentralization of secondary schools in Argentina implied less, rather than more, competition in the provision of public school services. In most Argentine provinces, federal and provincial schools competed in cities before decentralization, but only provincial provision remained after decentralization.

School Decentralization in Argentina

The school system in Argentina was traditionally organized into three levels: preschool (one year), primary school (seven years), and secondary school (five to six years). Attending primary school was mandatory. Throughout the country, educational services were provided by public (federal, provincial, and municipal) and private schools. There were three types of secondary schools, depending on their curricular emphasis: arts and sciences (*bachiller*, five years), business (*comercial*, five years), and technical (*industrial*, six years).

In 1991, the Argentine Congress passed a law establishing the transfer of all federal secondary schools to the provincial governments.¹⁸ Most Argentine provinces already administered a significant proportion of schools. For historical reasons, this proportion was very heterogeneous

13. Faguet (2001).

14. Eskeland and Filmer (2000).

15. Paes de Barros and Mendonca (1998).

16. Jimenez and Sawada (1999); King and Ozler (2000).

17. Hoxby (2000).

18. We are referring to Law 24.049 of 5 December 1991. Decentralization of primary schools and preschools started in 1961 and ended in 1978 (Law-Decree 21.809 and Complementary Law 21.810). For a historical description of the Argentine educational system, see Llach, Montoya, and Roldán (1999, annex IV.1).

across provinces.¹⁹ Before the decentralization process, students in federal secondary schools represented 61 percent of total public students, fluctuating from 8 percent in Río Negro to 100 percent in Tierra del Fuego.²⁰ By 1994, less than 3 percent of public secondary school students studied in federal schools.²¹

The Decentralization Law stated that school transfers would be scheduled through bilateral agreements between the federal government and each province. These agreements introduced heterogeneity across provinces with regard to transfer dates, which took place between February 1992 and January 1994. The variability in transfer dates was unrelated to educational quality, but rather originated in political conflicts between the federal and provincial governments.²²

This significant variation in the degree and timing of decentralization across provinces allows us to identify the effects of the process on educational quality, controlling for fixed and year effects. Table 1 shows the month in which decentralization occurred and the initial and final shares of federal school students in the total number of public school students by province.

Decentralization in Argentina involved transferring secondary schools from the federal to the provincial governments. This reassignment included both the budget and the personnel, thereby increasing provincial revenues and expenditures by the same amount. The administration of subsidies and the regulation of private schools were also transferred. This devolutionary decentralization affected the most important educational

19. Dussel (1995).

20. In Río Negro, most secondary schools were transferred to the province in 1971 (Dussel, 1995). Tierra del Fuego, the most recent Argentine provincial addition, was originally a national territory and only became a province in September 1992.

21. A handful of secondary schools remained under federal administration after 1994, namely, a few specific technical schools and schools belonging to national universities, security forces, or other autarchic units. The share of municipal secondary school students grew with decentralization from 0.2 percent to 7 percent. However, 98 percent of this 7 percent correspond to the City of Buenos Aires, the only district in which municipal secondary schools are relevant. Although it is a federal district rather than a province, we treat the City of Buenos Aires as a province in this study. Until the Constitutional Reform of 1994, the President directly elected the city authorities. After the reform, they are appointed through general elections.

22. Rhoten (1999). The Spearman rank coefficients do not reject independence between the order of the transfer date and the test score rankings (for both the 1993 province scores and the 1994 public school scores).

TABLE 1. Variability in Decentralization across Provinces

Province	Transfer date	<i>Students attending federal secondary schools as a percentage of students attending public secondary schools</i>	
		<i>Before</i>	<i>After</i>
Buenos Aires	1 Jan 1994	58.10	0.38
Capital Federal	1 Jul 1992	98.36	4.61
Catamarca	1 Jan 1993	74.24	6.03
Chaco	1 Jan 1993	33.06	0.00
Chubut	1 Jan 1993	59.37	1.56
Córdoba	1 Jan 1993	57.05	2.06
Corrientes	1 Jan 1993	54.81	0.45
Entre Ríos	1 Jan 1993	77.79	0.00
Formosa	1 Jan 1993	37.38	0.00
Jujuy	1 Jan 1993	61.78	0.00
La Pampa	1 Jan 1993	75.58	1.52
La Rioja	1 May 1992	81.42	2.43
Mendoza	1 Aug 1992	70.39	5.14
Misiones	21 Aug 1992	39.33	0.73
Neuquén	1 Aug 1992	31.57	0.00
Río Negro	1 Dec 1992	8.28	0.00
Salta	1 Mar 1993	46.49	0.73
San Juan	15 Feb 1992	89.68	6.19
San Luis	1 Apr 1992	70.43	2.74
Santa Cruz	1 May 1993	19.99	0.00
Santa Fe	1 Feb 1993	52.01	2.71
Santiago del Estero	1 Jan 1993	59.81	0.00
Tierra del Fuego	1 Jan 1993	100.00	0.00
Tucumán	1 Dec 1992	83.45	4.38

Source: Ministerio de Educación.

decisions, which were never taken at the school level. The Organization for Economic Cooperation and Development (OECD) shows that most education decisions in Argentina are now taken at intermediate (that is, provincial) levels.²³ Schools choose textbooks, teaching methods, evaluation methods, and, to some extent, contents, but they do so in consultation with the provincial authority. The determination of expenditures, the allocation of personnel and nonpersonnel budgets, the appointment and dismissal of principals, teachers, and staff, wage decisions, the definition of the calendar year, and the opening or closure of schools and sections are all decisions that were transferred from the national to the provincial

23. OECD (1998).

levels.²⁴ Because of data restrictions and the fact that all these decisions were transferred simultaneously, we are not able to identify the isolated effect of the devolution of each individual decision, but only the joint effect.

The national government is in charge of measuring students' performance through the administration of standardized tests. Since 1993, the National Education Ministry annually tests fifth-year secondary school students in Spanish and mathematics through the National System of Educational Quality Evaluation (SINEC).²⁵ We use these test scores to measure school quality. The 1993 test was experimental, and the results are not available separately for public and private schools. For 1994 through 1996, a sample of students was tested in each province.²⁶ Since 1997, every fifth-year student has to take the test. The Education Ministry does not provide test results at the school level prior to 1997. Our measure of educational quality is thus available only at the provincial level, the unit of analysis for our study.²⁷

The results are available for three groups: public schools specializing in arts and sciences or business, private schools specializing in arts and sciences or business, and technical schools. Since separate results are not available for public and private technical school, we consider only non-technical schools. We averaged the Spanish and math grades for both public and private schools.²⁸ By 1998, all high school students had received the full five years of their secondary schooling under provincial administration, so we do not consider test results after that date. We thus have five observations (1994 through 1998) for twenty-four provinces, although for the province of Santa Cruz the results are not available for private schools for 1994 or for public and private schools for 1995.

24. See Burki, Perry, and Dillinger (1999, table 4.2); Llach, Montoya, and Roldán (1999, table 9). See Hanushek (1986, 1997) for careful surveys of the educational production literature on the relation between school resources and student achievement.

25. Natural and Social Sciences were also evaluated for 1994 and 1997. Results are not internationally comparable, as Argentina does not participate in TIMMS (Third International Mathematics and Science Survey). Seventh-grade primary students are also regularly tested.

26. The sample design is described in Llach, Montoya, and Roldán (1999).

27. Habibi and others (2001) also consider provinces as the appropriate unit of analysis for their study of fiscal decentralization in Argentina.

28. The average test scores in our sample (percentage of correct answers) are 55 percent for public schools and 64 percent for private schools.

Other performance measures are also regularly used in school system evaluations. Typical measures include the gross schooling rate (the ratio of the number of students to population size of that age), the net schooling rate (the ratio of the number of students in the appropriate grade for their age to population size of that age), the repetition rate (the ratio of the number of repeating students to total students), the on-time graduation rate (the ratio of the number of on-time graduating students to the number of students in the initial class), and the over-age rate (the ratio of the number of students of higher-than-appropriate age to the number of students). These variables tend to measure coverage rather than quality. For example, a loosening of school requirements may induce lower repetition and over-age rates and higher schooling and on-time graduation rates, together with a deterioration in quality. Moreover, these variables are easily affected by administrative school decisions, which could be correlated with decentralization, and uniform measurement is unwarranted.²⁹ Most of these alternative measures are subject to significant data restrictions, in that they are not disaggregated for public and private schools. We prefer to use nationally administered test scores, as they offer a uniform, popular, monotonic, and good quality measure of school performance, although we recognize that standardized test scores do not capture all the dimensions of students' achievements.

Following school decentralization, the Argentine educational system underwent another significant reform when the Federal Education Law (Law 24.195 of 14 April 1993) replaced the seven years of primary school and five (or six) years of secondary school with a nine-year uniform cycle (*educación general básica*, or EGB) and a three-year specialized cycle (*polimodal*). Preschool and EGB were made mandatory. The law applies to both public and private schools in every province. The Federal Education Law is gradually being implemented in many provinces, and several issues are still pending.³⁰ Because the implementation of the law differs in time and degree across provinces, and because the policy applies to both public and private schools, we control for the effect of this additional reform on students' performance through our difference-in-difference estimate of the public-private difference.

29. Schools could also intentionally try to affect test scores, for example, through emphasis on test practice. However, in Argentina teachers and schools are neither rewarded nor punished on the basis of test outcomes.

30. Ministerio de Educación (2001).

Empirical Exercise

Our objective is to identify the effect of secondary school decentralization on educational quality measured by the outcome of a standardized test. As is generally recognized, however, the identification of the effect of school decentralization on educational quality requires attention to the fact that the variation in the jurisdiction of school administration may not be orthogonal to unobservable factors that jointly affect the outcomes studied. To address this endogeneity problem, we exploit an unusual policy experiment: the Argentine secondary school decentralization process of the 1990s. This political experiment generated an exogenous variation in the jurisdiction of secondary school administration across time and space that provides an instrument for identifying the causal effect of school decentralization on test outcomes.

Secondary school decentralization, as mentioned above, was an important component of the major structural reforms undertaken in Argentina during that period. All the provinces were affected (that is, all federal secondary schools were decentralized), although at different periods and with different intensities. For political reasons, decentralization took place gradually between 1992 and 1994. Most provinces already had a significant number of schools under their administration, and the proportion of students in the schools administered by provincial governments before the decentralization process varied significantly. The Argentine decentralization experiment induced an exogenous variation in the administration of secondary schools across units and time. Our identification strategy exploits the fact that the exposure to education decentralization of a final-year secondary school student varied by both province and student cohort.

Suppose one is interested in estimating the influence of a policy instrument on the outcome for a group (for example, the effect of school decentralization on test outcomes).³¹ The group consists of units $i = 1 \dots N$ observed over a sample horizon $t = 1 \dots T$. Suppose further that the policy instrument changes in a particular period t for a segment of the group (or, as in our case, that it changes for all the segments but at different points in time). Let dI_{it} be a zero-one indicator that equals unity if the policy

31. Economists extensively use experiments that allocate treatments exogenously to assess their effects in the presence of heterogeneity (see, for example, Angrist, 1995; Meyer, 1995; Rosenzweig and Wolpin, 2000).

change was operative for individual i in period t . Members of the group who experience the policy change react according to a parameter α_0 . The standard statistical model to estimate α_0 is the following two-way fixed effect error component model:

$$(1) \quad y_{it} = \alpha_0 dI_{it} + \lambda_t + \mu_i + \varepsilon_{it},$$

where μ_i is a time-invariant effect unique to individual i , λ_t is a time effect common to all individuals in period t , and ε_{it} is an individual time-varying error distributed independently across individuals and time and independently of all μ_i and λ_t .³² This difference-in-difference estimator of α_0 , possibly including a set of control regressors that vary across both units and time, is the most widely used estimator in policy evaluation.³³ Although the difference-in-difference approach is extensively applied in the economic literature, it is the exogenous treatment across units and time induced by a political or natural experiment that provides a reliable instrument for identifying α_0 .³⁴

Consider the evaluation of the impact of school decentralization on test outcomes. Suppose that test outcomes are available by school. Then, the difference-in-difference estimator of α_0 is obtained by estimating the following regression function:

$$(2) \quad \text{SCOREPUB}_{jit} = \alpha_0 \text{dSC}_{jit} + \lambda_t + \mu_i + \varepsilon_{jit},$$

where SCOREPUB_{jit} is the test outcome of public school j (the average test outcome of the school students) in province i and year t , and dSC_{jit} is a zero-one indicator that equals unity if school j in province i and year t is administered by the national government.

Unfortunately, test outcomes are not available at the school level, but are separately aggregated by province and year for public and private schools. Thus, we obtain

$$(3) \quad \text{SCOREPUB}_{it} = \alpha_0 \text{PC}_{it} + \lambda_t + \mu_i + \varepsilon_{it},$$

where SCOREPUB_{it} is the average test score of all students who attend the last year of public schools in province i and year t , and PC_{it} is the number

32. See Chamberlain (1984); Heckman and Robb (1985).

33. See, among many others, Rosenzweig and Wolpin (1986); PROGRESA (1999); Angrist and Lavy (2001); Duflo (2001).

34. Indeed, most of the debate around the validity of a difference-in-difference estimate revolves around the possible endogeneity of the interventions themselves.

of students enrolled in the last year of public federal schools divided by the total number of students enrolled in the last year of public schools in province i and year t . Therefore, at the provincial level, the effect of interest is that of PC_{it} on $SCOREPUB_{it}$.

Models 1 and 2, and thus also model 3, assume that the effect of the policy change on the dependent variable operates immediately. However, that may not be the case. The dependent variable may respond, instead, to the intensity of exposure to treatment which may accumulate over time. For example, in the case of school decentralization, test outcomes are most likely correlated to the number of years a student spent in a public school administered by a provincial government rather than to whether the student attends a public provincial school at the time the test is performed.³⁵ That is, we expect that individual test outcomes respond to the intensity of the treatment to which the student has been exposed.

Duflo also uses exposure to treatment as the measure of policy change in an experiment bearing some similarities to the one we analyze in this paper.³⁶ She estimates the effect of a large construction program of primary schools on school attainment in Indonesia. The policy variable in her study is the average number of schools constructed by the Indonesian program per year during the period spent in primary school by a child of a given birth cohort who followed the normal curriculum.

Similarly, we define our policy variable as the proportion of years that an average student in the final year of secondary school in region i and year t spent in a federal public school. At the provincial level, the effect of interest is the impact of the proportion of years that, on average, the students in their last year of public secondary school in province i and year t spent in a federal school (CEN_{it}) on $SCOREPUB_{it}$.³⁷ Consequently, the identification strategy in this paper uses the fact that exposure to school decentralization of a student in the final year of secondary school varies by both province and student cohort. Letting α be the impact of CEN_{it} on

35. See, for example, Meyer (1993). Test outcomes are available only since 1994, while the decentralization of schools took place between 1992 and 1994. Strictly speaking, if α_0 were of interest, it would not be identified with the available data. For that purpose, performance tests should have been administered before 1992.

36. Duflo (2001).

37. We recognize that we could have explored other functional forms. Our average, for example, could have given more weight to the decentralization status of the final secondary years than to the initial year status. We could also have considered lags if effects are not immediate.

SCOREPUB_{it}, its difference-in-difference estimator is given by running the following regression:

$$(4) \quad \text{SCOREPUB}_{it} = \alpha \text{CEN}_{it} + \lambda_t + \mu_i + \varepsilon_{it},$$

where, given the specification adopted, a negative (positive) α means that test outcomes increase (decrease) with the level of decentralization.

Naturally, the identification of α may require that we include a set of control variables $\mathbf{x}$ in the regression function 4. Thus, we have

$$(5) \quad \text{SCOREPUB}_{it} = \alpha \text{CEN}_{it} + \beta_0 \mathbf{x}_{it} + \lambda_t + \mu_i + \varepsilon_{it}.$$

A wide literature outlines the pros and cons of decentralization, but no causal evidence has as yet been provided on the impact of a national-level school decentralization program on educational quality. Theoretically, the effect may be negative, zero, or positive. Two problems may interfere with the experimental design generated by the decentralization policy that we analyze. First, the difference-in-difference estimator maintains the assumption that the composition of units remains stable before and after the policy change. In our case, this assumption would not hold if the composition of the pool of students of public schools changed in any way that is correlated with the level of centralization (CEN). This may occur if actual or prospective students nonrandomly change their choice between public and private schools after decentralization. We evaluate this important problem in our empirical analysis.

Second, even if the units treated are not selected in response to values of the error term ε in model 5, CEN and ε may be correlated, such that CEN is not exogenous for the parameter of interest, α .³⁸ Uncontrolled factors correlated with CEN could affect test outcomes, inducing a relationship between CEN and ε . A particularly worrisome case is one in which these unobservable factors cause the evolution of test outcomes to differ across provinces, thereby violating the common time effects assumption of model 5.³⁹

38. See Engle, Hendry, and Richard (1983).

39. Moreover, the evolution of test outcomes in a province could be related to unobservable factors that are correlated with the predecentralization level of CEN, inducing a correlation between this variable and ε in model 5. Unfortunately, the lack of preintervention test outcomes precludes us from testing the common time effects assumption of model 5 (see Heckman and Hotz, 1989).

Our empirical strategy to control for likely differences in the evolution of test outcomes across provinces is to contrast public test scores with private test scores by province. We thus argue that α , the causal effect of school decentralization on test outcomes, is identified by estimating the following two-way fixed effect error component model:

$$(6) \quad \text{SCORE}_{it} = \alpha \text{CEN}_{it} + \beta_0 \mathbf{x}_{it} + \tau_t + \nu_i + \omega_{it},$$

where the dependent variable is $\text{SCORE}_{it} = \text{SCOREPUB}_{it} - \text{SCOREPRIV}_{it}$, instead of SCOREPUB_{it} , and where SCOREPRIV_{it} is the average test score of all students who attend the last year of private schools in province i and year t . The statistical model to estimate α is a difference-in-difference of the difference of public and private test outcomes. The variable ν_i is a time-invariant effect unique to province i , τ_t is a time effect common to all provinces in period t , and ω_{it} is an individual time-varying error distributed independently across individuals and time and independently of all ν_i and τ_t and, crucially, uncorrelated with CEN .

Model 6 thus controls for the existence of province-specific trends in the evolution of test outcomes induced, for example, by local business cycles or idiosyncratic demographic trends. It also controls for the implementation of other educational programs affecting both public and private schools. For example, the implementation of the Federal Education Law introduced further reforms in the Argentine educational system. The degree of implementation of these reforms differs across provinces in a way that could potentially be correlated with the process of decentralization. As this new Law applies to both public and private schools, our empirical strategy would successfully control for this distortion. However, if, for example, some provinces implemented nutritional programs, and if the use of these programs happened to be correlated with decentralization, we would be less successful in controlling for the effect of these additional policies, as these nutritional programs should have a larger effect on public school students from lower income families than on private school students.

Our strategy also controls for any transitory shock in province i and year t that affects both private and public test outcomes. For example, if the Spanish test in a particular year was designed in a way that proved more difficult for students in some regions than in others (owing to regional differences in language use), then our estimates would take care

of any potential bias. Our estimate could be affected, however, if the effect of these idiosyncrasies is stronger for public than for private school students, who may have better access to national media (provided that the differential exposure to national media of public and private school students is correlated with decentralization).

In the presence of province-specific trends and shocks in the evolution of test outcomes, only the difference-in-difference estimate of the difference of test outcomes identifies the causal effect of school decentralization on test scores. Otherwise, shocks correlated with decentralization could severely distort the estimate of α in a small sample like the one we analyze. Note that α still represents the causal effect of school decentralization on public school test outcomes. This assumes that the decentralization of schools affects only the test outcomes of public schools.⁴⁰ Otherwise, α estimates the differential effect of decentralization on test outcomes between public and private schools.

The discussion so far involves a stylized description of the world, wherein causal effects are the same for every unit (province). However, the theory of decentralization highlights several channels through which decentralization may affect outcomes differently. Decentralization effects may depend on the technical capabilities of local governments, the risks of capture by the local elite, or the significance of agency costs. Our estimate of α may thus subsume positive as well as negative impacts of school decentralization on test outcomes. This may not only obscure the existence of heterogeneous impacts on test outcomes, but also impede us from learning about the channels through which decentralization operates. To investigate this heterogeneity of program impact, we postulate the following model, which encompasses model 6:

$$(7) \quad \text{SCORE}_{it} = \alpha_1 \text{CEN}_{it} + \phi_0 (z_{it} \times \text{CEN}_{it}) + \phi_1 z_{it} + \beta_2 \mathbf{x}_{it} + \kappa_t + \mathbf{v}_i + \zeta_{it},$$

where z_{it} is a covariate assumed to affect the way decentralization affects test outcomes that may or may not vary over time. In the latter case, ϕ_1 is not identified. The variables $\mathbf{v}$, κ , and ζ satisfy the same properties as $\mathbf{u}$, τ , and ω , respectively. Then, the impact of school decentralization on test outcomes is given by

40. Student migration is the only relevant mechanism that could cause public school decentralization to affect private school scores in a nonnegligible way during the period studied. Our empirical results on migration presented in the next section do not support this possibility.

$$(8) \quad \frac{\partial \text{SCORE}_{it}}{\partial \text{CEN}_{it}} = \alpha_1 + \phi_0 z_{it}.$$

If $\phi_0 = 0$, the impact of decentralization on test outcomes is homogeneous with respect to z . If it is statistically different from zero, the impact of decentralization on test outcomes depends on z . This may allow us to identify channels through which decentralization affects different provinces in different ways.

Finally, we need to consider the instrumentation of the standardized tests. For 1994 through 1996, a representative sample of fifth-year students was tested in each province, while after 1996, every fifth-year student must take the test. Test outcomes thus present sampling variability between 1994 and 1996, while after 1996 they do not. Consequently, ζ_{it} in equation 7 is not an independent and identically distributed (i.i.d.) random variable. Rewriting equations 5 through 7 generates the following:

$$(9) \quad y_{it} = \psi \mathbf{w}_{it} + \varepsilon_{it},$$

where y_{it} stands alternatively for SCORE_{it} and SCOREPUB_{it} , ψ is the appropriate vector of parameters, and $\mathbf{w}_{it}$ is the vector of regressors (including the province and year fixed effects dummy variables), and where $\varepsilon_{it} \sim \text{i.i.d.}(0, \sigma_1)$ for all i and for $t = 1994, 1995, 1996$ and $\varepsilon_{it} \sim \text{i.i.d.}(0, \sigma_2)$ for all i and for $t = 1997, 1998$.

The estimator of ψ that we apply is the estimated generalized least squares dummy variables estimator (ψ_{GLS}). This estimator has an advantage over the least squares dummy variables estimator in that the estimator of the variance-covariance matrix of ψ_{GLS} is consistent. As a result, the statistical inference conducted in the next section is (asymptotically) valid. To estimate ψ , therefore, we first estimate σ_1 and σ_2 and then transform the observations of both y_{it} and $\mathbf{w}_{it}$ by dividing them by the estimate of σ_1 for $t = 1994, 1995$, and 1996 and by the estimate of σ_2 for $t = 1997$ and 1998 .

Results

Table 2 presents the results of the estimation of equation 6 under several specifications. The dependent variable is the difference in test outcomes between public and private schools (SCORE). We do not include any con-

TABLE 2. Test Outcomes: Homogeneous Impact^a

<i>Explanatory variable</i>	(1)	(2)	(3)	(4)
CEN_{it}	-0.14* (0.08)	-0.25*** (0.09)	-0.25*** (0.09)	-0.26*** (0.09)
$UNEMP_{it}$		2.83 (17.00)		
$INEQ_{it}$		-1.64*** (0.43)	-1.62*** (0.39)	-1.79*** (0.37)
$INCOME_{it}$		-0.024** (0.009)	-0.023** (0.009)	-0.018** (0.008)
$WAGE_{it}$		0.007 (0.006)	0.006 (0.005)	
No. observations	118	108	108	108
No. provinces	24	23	23	23

* Statistically significant at 0.1 percent.

** Statistically significant at 0.05 percent.

*** Statistically significant at 0.01 percent.

a. The dependent variable is SCORE. All parameters are estimated by the GLS dummy variable method. All regressions include year and province fixed effects. In column 1, we lose two observations because test scores are not available for 1994 and 1995 for Santa Cruz. In the rest of the table, we lose ten additional observations because the control variables are not available. Standard errors are in parentheses.

trol variables in the first column. We find a negative and statistically significant effect of CEN on SCORE, that is, we find that school decentralization improves the performance of public school students.⁴¹ The average effect of decentralization on test outcomes is notable. We estimate that between 1994 and 1998 test outcomes of public schools improved, on average, by 0.7 standard deviations of its distribution as a result of the decentralization process.⁴²

In column 2 we add a set of control variables: monthly average real teachers' wage (WAGE),⁴³ unemployment rate (UNEMP), household real

41. Remember that α estimates the causal effect of decentralization on public school outcomes, although we use SCORE as the dependent variable in the regression function in order to build what we believe is the correct counterfactual. As we already mentioned, however, if the decentralization of schools had also affected private test outcomes, then α would provide an estimate of the differential effect between public and private schools of the decentralization on test outcomes.

42. This statistic is calculated as $\frac{\alpha}{\sigma_{\text{SCOREPUB}}} \Delta_{98-94} \overline{CEN}$, where σ_{SCOREPUB} is the standard deviation of SCOREPUB, and $\Delta_{98-94} \overline{CEN}$ is the average change in CEN from 1994 to 1998. Note that $\sigma_{\text{SCOREPUB}} > \sigma_{\text{SCORE}}$.

43. Since secondary school teachers' wages are not regularly available, we use primary school wages, which must be strongly correlated with the former.

income (INCOME), and an inequality measure (INEQ) by province and year. The last three variables are obtained from the ongoing permanent household survey that covers, almost exclusively, the population of the capitals of the provinces. Thus, they are less than perfect estimates of the respective parameters at the provincial level. This is an important additional reason to look at the difference between the public and private school test outcomes when attempting to identify the impact of the decentralization of schools on public test scores.

In terms of the results, it is not clear *a priori* whether these variables should have any impact on SCORE and, if they do, what their sign is. Unemployment shows no effect on SCORE, while both income and inequality have a negative and statistically significant effect. We do not find any effect of teachers' wages on SCORE. More important, we find a negative and statistically significant effect of CEN on SCORE once we include this set of controls. The estimated average effect of decentralization on test outcomes is higher than the estimated effect without the control variables.

In column 3, we exclude unemployment from the set of controls, and the results remain completely unchanged. Finally, in column 4 we also exclude wage from the set of control variables, and the results again remain unaltered. The effect of decentralization on test outcomes is similar across the specifications in columns 2 through 4. We thus find that the performance of public schools improves significantly with decentralization. We estimate that on average, between 1994 and 1998, test outcomes of public schools improved 1.2 standard deviations of its distribution as a result of the decentralization process.⁴⁴

Our estimates in table 2 consider that the causal effects of decentralization are the same for every province. As already mentioned, however, theory highlights several channels through which decentralization may affect test outcomes differently. In what follows, we investigate whether decentralization has dissimilar impacts on provinces with different characteristics, that is, we evaluate whether the impact of the decentralization of schools on test outcomes is homogeneous or heterogeneous across province characteristics.

44. When we estimate the same models reported in table 2 for SCOREPUB instead of SCORE, we do not find any statistically significant effect of CEN for any of the specifications.

Although bringing decisions closer to the people may be generally optimal, the advantages of decentralization may be diluted when local governments lack technical capabilities. We use provincial fiscal surpluses and deficits as a proxy for the quality of provincial governments. Provincial fiscal disorders in Argentina are frequent and typically associated with misgovernment. Moreover, provincial fiscal results may have an important impact on the educational sector. On several occasions, provincial fiscal deficits generated reductions and delays in teachers' wage payments, which prompted long strikes.⁴⁵ We first interact provincial fiscal results (normalized by provincial gross output) with our policy variable.⁴⁶

Table 3 reports the interaction of CEN with the fiscal result, that is, we estimate equation 7 where z first equals FISCALRESULT_{it} and then equals FISCALRESULT_i , the provincial average over time. The first column does not include control variables other than FISCALRESULT_{it} itself. We find that the effect of school decentralization on test outcomes depends on the provincial fiscal result. As expected, the higher the provincial fiscal deficit, the smaller the positive impact of decentralization on test outcomes, to the extent that this positive impact disappears or, worse, changes its sign for provinces with huge fiscal deficits. We also find that FISCALRESULT has a positive and significant direct effect on test outcomes.

In column 2 we add the complete set of control variables (UNEMP, INEQ, INCOME, and WAGE). As in table 2, the impact of school decentralization on test outcomes increases once we control for these variables. We still find that the positive impact of decentralization on test outcomes decreases as the provincial fiscal deficit increases. Again, the fiscal stance shows a positive and significant direct effect on test scores.

45. For example, in 1995 and 1996 wages were reduced in Misiones, Entre Ríos, San Juan, Santa Fe, Río Negro, Corrientes, and Neuquén, while payment delays occurred in La Rioja, Entre Ríos, Jujuy, Tucumán, Salta, Córdoba, Misiones, Río Negro, Capital, Neuquén, and Buenos Aires. Out of 170 total class-days in 1995, strikes lasted for 50 days in San Juan, 40 in La Rioja, 30 in Jujuy, 10 in Misiones, 120 in Río Negro, 20 in Salta, and 70 in Córdoba (Senén González, 1997). Provincial fiscal crises provoked federal interventions in Santiago del Estero in 1993 and in Corrientes in 1999. In Santiago del Estero, a teachers' strike lasted for 50 days (*La Nación*, 30 October 1993), while there were basically no classes in Corrientes during that whole year (*Clarín*, 16 November 1999 [www.clarin.com]). More recently, a long teachers' strike prompted by a fiscal crisis affected the province of Buenos Aires (*Clarín*, 14 September 2001 [www.clarin.com]).

46. Provincial fiscal results in our sample range from a 16 percent deficit to a 4 percent surplus, averaging a 2 percent deficit.

TABLE 3. Test Outcomes: Heterogeneous Impacts^a

Explanatory variable	(1)	(2)	(3)
CEN _{it}	-0.14* (0.08)	-0.27*** (0.09)	-0.30*** (0.09)
CEN _{it} * FISCALRESULT _{it}	-1.45* (0.88)	-2.55*** (0.99)	
CEN _{it} * FISCALRESULT _i			-4.92*** (1.73)
UNEMP _{it}		2.27 (16.24)	11.18 (15.45)
INEQ _{it}		-1.25*** (0.418)	-1.44*** (0.398)
INCOME _{it}		-0.025*** (0.009)	-0.023*** (0.008)
WAGE _{it}		0.006 (0.005)	0.006 (0.005)
FISCALRESULT _{it}	60.03*** (17.17)	50.50*** (15.81)	
Summary statistic			
F statistic ^b	F(1,87) = 1.84	F(1,74) = 6.0**	F(1,75) = 4.6**
No. observations	118	108	108
No. provinces	24	23	23

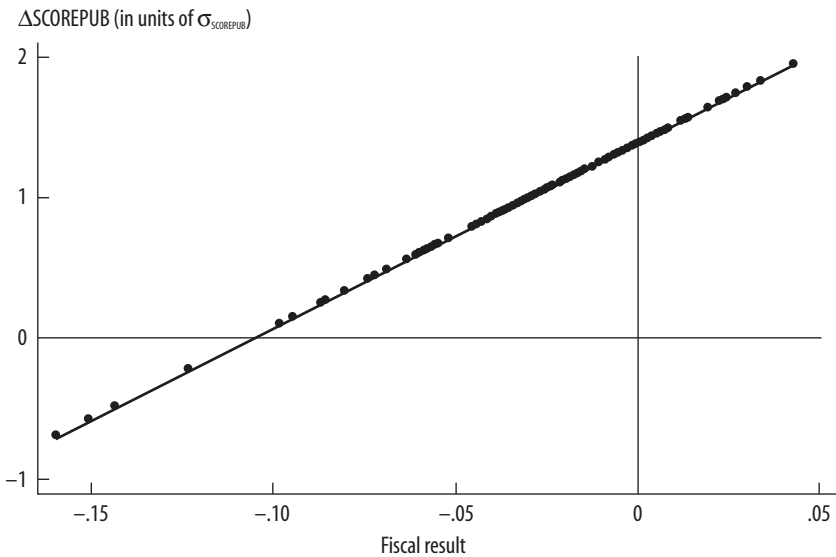
* Statistically significant at 0.1 percent.
** Statistically significant at 0.05 percent.
*** Statistically significant at 0.01 percent.

a. The dependent variable is SCORE. All parameters are estimated by the GLS dummy variable method. All regressions include year and province fixed effects. In column 1, we lose two observations because test scores are not available for 1994 and 1995 for Santa Cruz. In the rest of the table, we lose ten additional observations because the control variables are not available. Standard errors are in parentheses.

b. The F statistics test the null hypothesis that equation 8 evaluated at the average level of z is zero.

Figure 1 illustrates the relationship between FISCALRESULT and the effect of school decentralization on test outcomes measured in units of standard deviation of SCOREPUB, σ_{SCOREPUB} , at the average change of CEN between 1994 and 1998. The figure shows that the effect of school decentralization on test outcomes is null for a fiscal deficit in terms of gross product of approximately 10 percent. Only a province with a very high fiscal deficit could be negatively affected by the decentralization of schools.

In column 3 of table 3, we report the interaction of CEN and FISCALRESULT_i, the average of FISCALRESULT_{it} over time. The results are very similar to the estimates obtained in column 2. None of our conclusions change when we consider the average level of FISCALRESULT by province instead of the current level.

FIGURE 1. Change in Test Scores in Units of Standard Deviation of SCOREPUB^a

a. The figure is computed using the parameter estimates in table 3 (column 2) and the actual observations of FISCALRESULT_{it} .

We find similar qualitative results when we estimate the same model reported in column 2 of table 3 for SCOREPUB instead of SCORE. The effect of school decentralization on test outcomes is positive and significant, and it depends on the provincial fiscal situation. Under this specification, the straight line in figure 1 moves to the right. Test outcomes only improve for provinces running surpluses.⁴⁷

Table 4 estimates equation 7 to explore other possible channels through which the impact of school decentralization could be heterogeneous. Decentralization may allow for a better match between government outputs and local preferences. It may also reduce agency costs by improving the accountability of political agents. However, the heterogeneity of preferences and the collective decision problems may still be significant in large provinces, thereby weakening the decentralization benefits. The effects of decentralization may thus depend on province size.

In the first three columns of table 4, we use three alternative proxies for province size: surface area (SUR), population as of the 1991 Census

47. All results reported but not presented are available on request.

TABLE 4. Test Outcomes: Heterogeneous Impacts^a

Explanatory variable ^b	(1)	(2)	(3)	(4)
CEN _{it}	-0.25** (0.11)	-0.24** (0.10)	-0.24** (0.10)	-0.18* (0.12)
CEN _{it} * SUR _i	-0.008 (0.10)			
CEN _{it} * POP _i		-0.011 (0.01)		
CEN _{it} * DEN _i			-0.003 (0.007)	
CEN _{it} * ALT _i				-0.078 (0.007)
Summary statistic				
F statistic ^c	F(1,75) = 6.29***	F(1,75) = 7.13***	F(1,75) = 6.09**	F(1,75) = 5.26**
No. observations	108	108	108	108
No. provinces	23	23	23	23

* Statistically significant at 0.1 percent.
** Statistically significant at 0.05 percent.
*** Statistically significant at 0.01 percent.

a. The dependent variable is SCORE. All parameters are estimated by the GLS dummy variable method. All regressions include year and province fixed effects and UNEMP, INCOME, INEQ, and WAGE as controls. We lose two observations because test scores are not available for 1994 and 1995 for Santa Cruz, and ten additional observations because the control variables are not available. Standard errors are in parentheses.
b. SUR_i = Surface area of province *i* divided by 1,000,000; POP_i = Population of province *i* divided by 1,000,000; DEN_i = Population density of province *i* divided by 1,000.
c. The *F* statistics test the null hypothesis that equation 8 evaluated at the average level of *z* is zero.

(POP), and population density in 1991 (DEN). We find that the effect of school decentralization on test outcomes is not heterogeneous with respect to these size variables.

The benefits of decentralization may be diluted if the capture of the political process by interest groups is easier at the local level. Our proxy for political capture, ALT, is a zero-one indicator that equals unity if the political party governing the province has changed since the return to democracy in 1983. The interaction term reported in column 4 is not statistically significant. It thus seems that the effect of decentralization on test outcomes is homogeneous with respect to all the variables included in table 4.

Finally, we need to provide evidence in favor of our empirical strategy. To address possible objections to our interpretation of the results on the effect of school decentralization on test outcomes, we need to show that decentralization did not induce migration between public and private

schools during the period studied.⁴⁸ We explore whether the proportion of students in public secondary schools over total secondary school students (SHAREPUB) is correlated with decentralization. We estimate the following two-way fixed effect error component model:

$$(10) \quad \text{SHAREPUB}_{it} = \pi_0 \text{CEN}_{it} + \pi_1 \mathbf{x}_{it} + \lambda_t + \mu_i + \varepsilon_{it},$$

where μ_i is a time-invariant effect unique to province i , λ_t is a time effect common to all provinces in period t , and ε_{it} is an individual time-varying error.⁴⁹

Table 5 reports the result of estimating equation 10 for the period 1994–98, that is, the same period for which we estimate the models reported in tables 2, 3, and 4. We do not find any relation between SHAREPUB and CEN. In both regressions, the coefficient π_0 is numerically equal to zero and statistically insignificant.⁵⁰ Our empirical analysis thus shows no relation between the proportion of students in public secondary schools over total secondary school students and the level of

48. Strictly, we require that the distribution of student abilities between public and private schools does not change during the period studied. Because it is not possible to evaluate this condition, however, we evaluate the weaker requirement that the proportion of students in public (private) schools does not change during the period studied. It is practically unfeasible that the distribution of student abilities would have changed substantially without our observing a significant change in the distribution of students between public and private schools, which is what we test.

49. Alternatively, we could have estimated a model using a zero-one indicator variable that equals unity if the decentralization of schools is operative for province i in period t . However, given the potentially high costs of switching schools for existing students, school decentralization may not have an immediate effect on migration. Migration should mainly affect incoming first-year students. If the migration of students between public and private schools does, in fact, occur some time after decentralization, then the model we estimate is more appropriate.

50. It is practically unfeasible that the increase in public test scores would have been generated by the migration of students from private to public schools. Consider the following exercise: suppose that average students migrate from private to public schools. This would raise the average public test scores without reducing the private test scores. However, in order to increase the public test scores by 0.7 standard deviations of its distribution, 60 percent of the students in public schools would have to be migrants from private schools, which is not possible given that only 20 percent of all students attend private schools. The coefficient does show a negative sign, however, which is consistent with our previous results. Improvements in public schools after decentralization could have induced a tiny migration from private to public schools.

TABLE 5. Proportion of Secondary Students in Public Schools over Total Secondary Students

<i>Explanatory variable</i>	<i>(1)</i>	<i>(2)</i>
CEN_{it}	-0.0009 (0.017)	-0.01 (0.021)
$UNEMP_{it}$		0.60 (8.16)
$INEQ_{it}$		-0.16 (0.26)
$INCOME_{it}$		-0.003 (0.008)
$WAGE_{it}$		0.001 (0.004)
No. observations	120	110
No. provinces	24	23

* Statistically significant at 0.1 percent.

** Statistically significant at 0.05 percent.

*** Statistically significant at 0.01 percent.

a. The dependent variable is SHAREPUB. All parameters are estimated by the LS dummy variable method. All regressions include year and province fixed effects. In column 2, we lose ten observations because the control variables are not available. Standard errors are in parentheses.

decentralization for the period studied. Accordingly, we do not find any evidence indicating that students who would have attended public schools without decentralization and whose abilities were below the average abilities of private school students transferred to private schools as a result of decentralization, spuriously inducing the effect of school decentralization on test outcomes that we report in this section.

Conclusions

The theoretical literature identifies trade-offs without establishing absolute superiority of either centralization or decentralization in the provision of public services. Our contribution is to evaluate empirically the impact of the Argentine secondary school decentralization program of the early 1990s on students' standardized test scores.

The decentralization program generated an exogenous variation in the jurisdiction of secondary school administration across time and space, which provides an instrument for identifying the causal effect of school decentralization on educational quality. Our identification strategy uses the

fact that exposure to school decentralization varied both by province and by student cohort. We also exploit the fact that by contrasting public and private school test outcomes, we are able to control for the effect of unobservable factors that may differentially affect the evolution of student performance across provinces. Our estimator of the causal effect of school decentralization on test outcomes is thus the conditional difference-in-difference of the difference of public and private test outcomes. We provide arguments and evidence in favor of this identification strategy, although its validity could be disputed.

While we focus on the effects of school decentralization on educational quality, we recognize that standardized test scores do not capture all the dimensions of school system achievements. We could also be criticized for assuming that test outcomes reflect the amount of time a final-year secondary school student spent under a certain type of administration over his or her student life, rather than being a function only of the type of school the student attends at the time the test is performed or of alternative specifications.

In spite of these caveats, we find that decentralization appears to have significantly improved the performance of public schools as measured by student test scores. We estimate that, on average, public school test outcomes improved 1.2 standard deviations of its distribution between 1994 and 1998 as a result of the decentralization process.

Even though decentralization may be generally optimal, its advantages might be diluted when schools are transferred to severely mismanaged provinces. Indeed, the effect of school decentralization on test outcomes is heterogeneous depending on provincial fiscal performances. The higher the provincial fiscal deficit, the smaller is the positive impact of decentralization. Moreover, the effect of school decentralization on test outcomes may become negative for provinces running significant fiscal deficits. We therefore conclude that although school decentralization generally shows a positive impact on educational equality, policymakers should be cautious in considering such a program if they have doubts about the competence of local governments.

Appendix: Description of the Data

TABLE A1. Summary Statistics

<i>Variable</i>	<i>No. observations</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
SCORE	118	9.16629	4.56703	25.18	2.380001
CEN	120	15.92418	15.64173	0	60.968
UNEMP	115	0.115676	0.038741	0.040785	0.202752
INCOME	115	302.0589	86.63253	188.3864	579.403
INEQ	115	8.674907	1.171806	6.250445	12.11429
WAGE	114	552.026	150.4942	320.8194	969.48
FISCAL RESULT	120	-0.02045	0.033302	-0.15928	0.04288
SHAREPUB	120	80.7765	10.6301	52.2339	93.1644
SUR	24	156719.8	194090.1	200	1002445
POP	24	1448686	2683194	89992	13379401
DEN	24	641.8789	3087.995	0.089773	15139.43
ALT	24	0.583333	0.50361	0	1

T A B L E A 2 . Data Definitions and Sources

<i>Variable</i>	<i>Definition</i>	<i>Source</i>
SCOREPUB _{<i>it</i>}	Fifth year test scores (measured as the number of right answers as a percentage of total answers) for public nontechnical schools in province <i>i</i> in period <i>t</i> . Not available for Santa Cruz for 1995.	Ministerio de Cultura y Educación (MCyE); Operativos Nacionales de Evaluación; Llach and others (1999)
SCOREPRIV _{<i>it</i>}	Fifth year test scores (measured as the number of right answers as a percentage of total answers) for private nontechnical schools in province <i>i</i> in period <i>t</i> . Not available for Santa Cruz for 1994 and 1995.	See SCOREPUB
SCORE _{<i>it</i>}	SCOREPUB _{<i>it</i>} – SCOREPRIV _{<i>it</i>}	See SCOREPUB
SHARENAC _{<i>it</i>}	Students attending federal secondary schools as percentage of students attending public secondary schools in province <i>i</i> in period <i>t</i> .	MCyE, Centro Nacional de Estadísticas de la Educación, Dirección General Red Federal de Información; Instituto para el Desarrollo de la Calidad Educativa (IDECE)
CEN _{<i>it</i>}	$\sum_{j=0}^4 \frac{SHARENAC_{(t-j)}}{5}$ Proportion of years that fifth-year students of public secondary schools in province <i>i</i> and year <i>t</i> have spent in public federal schools, on average.	See SHARENAC
UNEMP _{<i>it</i>}	Unemployment rate (May and October average) in period <i>t</i> of the surveyed cities located in province <i>i</i> (population weighted average if data are available for more than one city in province <i>i</i>). None of Rio Negro cities are surveyed.	Permanent Household Survey (EPH), Instituto Nacional de Estadísticas y Censos (INDEC)
INCOME _{<i>it</i>}	Household income (May and October average in constant 1995 pesos) in period <i>t</i> for households with positive income in the surveyed cities located in province <i>i</i> (population weighted average if data are available for more than one city in province <i>i</i>). None of Rio Negro cities are surveyed.	See UNEMP
INEQ _{<i>it</i>}	Ratio of top 10 percent of household income to bottom 10 percent (May and October average) in period <i>t</i> for households with positive income in the surveyed cities located in province <i>i</i> (population weighted average if data are available for more than one city in province <i>i</i>). None of Rio Negro cities are surveyed.	See UNEMP
WAGE _{<i>it</i>}	Monthly gross wage in 1995 in constant pesos for public school primary teachers in province <i>i</i> in period <i>t</i> . Six observations are not available.	MCyE, Series Salariales 1989–97, Análisis de Composición (November 1998), and Informe Indicativo de Salarios Docentes (March 2000)

(continued)

TABLE A 2. Continued

<i>Variable</i>	<i>Definition</i>	<i>Source</i>
GDP_{it}	Gross geographic product for province i in period t at current prices.	Consejo Federal de Inversiones; INDEC
$FISCALLEVEL_{it}$	Fiscal result (deficit or surplus) of government of province i in period t .	DataFiel
$FISCALRESULT_{it}$	$FISCALLEVEL_{it} / GDP_{it}$. Fiscal result as percentage of gross geographic product of province i in period t .	See FISCALLEVEL and GDP
$SHAREPUB_{it}$	Students attending public secondary schools as a percentage (multiplied by 100) of students attending total secondary schools in province i in period t .	See SHARENAC
SUR_i	Area (in square kilometers) of province i .	INDEC
POP_i	Population of province i in 1991.	1991 INDEC Census
DEN_i	POP_i / SUR_i . Population density of province i in 1991.	See POP and SUR
ALT_i	Dummy variable that equals 1 if the political party governing the province changed between 1983 and 2000 and 0 otherwise.	Jones, Sanguinetti, and Tommasi (2000)