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Abstract

Using a panel of international student test scores, 1980 – 2000, panel fixed effects estimates suggest that government spending decentralization is conducive to student performance. The effect does not appear to be mediated through levels of, or decentralization in, educational spending.

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1. Introduction

In political economy and public finance, the linkage between decentralization and the quality in the provision of public sector services has been much debated. However, empirical evidence is limited because, in general, the quality of public sector services is hard to measure, and decentralization mainly varies across countries. In this paper we utilize a country panel based on several comparative international achievement tests of students to quantify the quality of compulsory education, and estimate the effect of public sector spending decentralization within a panel data framework.

2. Related literature

Oates (1972) argues that, in general, more decentralized decision-making allows better adjustment of (local) supply to locally heterogeneous demand. In the model of Hoxby (1999), public school productivity is higher with decentralized financing through local property taxes since Tiebout mechanisms reveal important information on local demands. In Seabright's (1996) framework with incomplete contracts, the main advantage of decentralization is that it is easier to hold decision-makers accountable. For some other arguments, including possible negative effects of decentralization, see for example Bjørnskov, Dreher, and Fischer (2008).

In the economics of education literature, the empirical evidence mainly supports the view that decentralized governance structure in the education system improves on student achievement. For example, Wößmann (2003) finds in a cross-country analysis that school autonomy exerts a beneficial impact. Similarly, Hoxby and Rockoff (2004) report that autonomous charter schools perform better in the US than public sector schools. For the UK, Clark (2005) identifies a positive effect of a major reform granting larger school autonomy. For Argentina, Galiani and Schargrodsky (2002) show that the decision to decentralize public education in the early 1990s raised student achievement, while for Norway Naper (2008) reports that decentralized hiring of teachers increases school effectiveness. On the other hand, Merrouche (2007) finds that decentralization of education spending responsibility in Spain did not affect the illiteracy rate and the probability of non-compulsory education. Regarding general

decentralization, Barankay and Lockwood (2007) identify for Switzerland a positive effect on the share of high school graduates in the 19-year old population. The literature is inconclusive on whether the employed measures of school spending decentralization approximate the general decentralization in governance structure, or whether educational decentralization is important per se.

3. The Model and Data

Our empirical model focuses on the relationship between school quality and public sector decentralization. We define school quality in terms of achievement in test scores obtained from all six comparative international achievement tests conducted by students aged 13-15 years during the relevant period 1980-2000.[1] We use the national average of the scores in Mathematics and Natural Science tests, and standardize them in order to ensure comparability across tests.[2] For a detailed description of the standardization procedure, see Falch & Fischer (2008).

Decentralization is commonly defined as the percentage of sub-national government spending in general government spending, calculated by the World Bank up to 1999. In order to keep PISA 2000 in the analysis, we use its one-period lag. Keman (2000) and Treisman (2000) argue that it is important to distinguish discretion in terms of financial policy implementations by local administrations ('the right to act'), which we measure directly, from local government political autonomy ('the right to decide'), which we capture only indirectly.

In addition, the empirical model includes as co-variates GDP in current 2000 $, population size, education in the adult population measured as the share with at least some secondary education, and the size of the public sector that insures against income shocks (see Falch and

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[1] We use the results of the SIMS and SISS tests conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 1980-81 and 1983-85, respectively, the IAEP test in 1990-91, IEA's TIMSS tests in 1994-95 and 1998-99, and the OECD PISA test in 2000.

[2] Our procedure is based on the fifteen most frequently participating countries. For each test, the results are standardized for these "core" fifteen countries such that the unit of the dependent variable is a standard deviation in the test result among the "core" countries. For a given year and test, the average value of the dependent variable for all countries then depends on the test performance in the participating "non-core" countries.

Fischer, 2008, for justification). We use two measures of public sector size: (a) Government social expenditures, obtained from OECD, which comprises expenditures on pensions, active labor market policies, subsidies for housing and families, and public health care, and (b) government consumption spending that measures public goods creation but excludes financial transfers to households. As for population size, GDP, and government consumption spending, the variables are obtained from the WDI (WDI, 2007). Country fixed effects account for time-invariant features such as institutions and culture (e.g., the national school system, school autonomy, population preferences, etc.). In addition, they mitigate potential endogeneity biases. We also include a dummy variable for the PISA test in the year 2000.[3]

Insert Table 1 about here

For reasons of comparability, we restrict the sample to well-established OECD countries with relatively stable political and administrative systems, excluding the post-communist countries. Thus, only OECD members as of 1990 are included. Table 1 provides descriptive statistics. The standard deviation of the dependent variable is close to unity. On average, local government spending constitutes 31 percent of total government spending, varying from four percent (Greece) to almost 60 percent (Canada). For all variables, the within-variation seems to be sufficiently strong to justify a fixed effects specification.

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[3] The way the dependent variable is constructed is an argument for not including time fixed effects in the model. With time fixed effects, the within country variation will depend not only on the performance relative to the "core" countries, but also on which other countries that have participated in the specific tests. On the other hand, there is some time-series variation in the independent variables (see also Falch and Fischer, 2008). With the dummy variable for 2000 included in the model, a test for joint significance of the remaining time specific effects has a p-value of 0.36 (F(7, 47) = 1.14)). Time specific effects are therefore not included in the models reported. The effect of decentralization changes only marginally if the dummy for 2000 is excluded (for column 2, coeff. of 0.084, significant at 5 percent level).

4. Empirical Results

Table 2 provides the regression outcomes. In column (1) we present the simple correlation between spending decentralization and test scores. The relationship is weakly positive and only significant at 10 percent level. The rest of the table presents results based on panel country fixed effects specifications. Column (2) excludes public sector size measures, while columns (3) and (4) include them.

Comparing the results in column (1) with (2) shows that omitting country fixed effects and covariates biases the effect of decentralization downwards. The effects of decentralization are 3-4 times larger in columns (2)-(4), and all significant at 5 percent level. This result implies that an increase in spending decentralization by 10 percentage points increases student test scores by 0.8 standard deviations. This is a non-trivial effect given that three countries in the sample have a within-variance in decentralization of above 5 percentage points.

Columns (3) and (4) show that the positive effect of decentralization is robust to the inclusion of public sector size, measured by either total government consumption or social spending. The effect of governance structure does not appear to be mediated through government spending activities. Both public sector size coefficients are negative and of similar magnitude as reported in Falch and Fischer (2008), but of lower statistical significance, probably due to fewer observations in the present analysis. Indeed, only social spending exerts an attainment lowering impact significant at 10 percent level.

Insert Table 2 about here

The results also imply that student performance is not affected by GDP, population size, or educational attainment in the adult population. Regarding GDP, there may be an endogeneity problem in the long-run because of a growth enhancing effect of student achievement (Hanushek and Kimko, 2000). However, excluding GDP from the model does not alter the effect of decentralization (column 2: coeff. of 0.071, significant at 5 percent level).

Given that decentralization increases student achievement while government size tends to reduce it, one would expect, in line with the finding for life satisfaction in Bjørnskov et al. (2008), that decentralization is more advantageous in the case of large governments than with small governments. Columns (5) and (6) add interaction terms between our measures of government size and decentralization. Both interaction terms are negative, contradicting our hypothesis, which indicate that the detrimental effect of a growing government sector is aggravated by more policy implementation at the local level. However, only the interaction with social spending is significant at 10 percent level, and the coefficient sizes are relatively small. This suggests that the contribution of decentralization to the total effect is only marginal; the greatest distortion of markets appears to be triggered by public sector size itself.

From the viewpoint of fiscal decentralization, its beneficial effect is reduced by expanding local government's involvement in the economy. In explanation, in decentralized countries, (labor) market distortion effects through non-internalization of inter-jurisdictional spillovers may increase as government's involvement in the economy rises. Nevertheless, the overall effect of decentralization remains positive: at face value, the results imply that the total effect of decentralization varies from 0.09 to 0.06 for the within-sample variation in social expenditures.[4]

Potential transmission channels

The last part of Table 2 investigates two potential transmission channels for the effect of spending decentralization. Column (7) tests the hypothesis that decentralization impacts test scores through an effect on expenditures levels for compulsory education (e.g. Fischer, 2005). We employ primary schooling expenditures per pupil, measured as percent of GDP.[5] The effect is clearly insignificant. In contrast, the coefficient of decentralization stays significant, unambiguously indicating that its positive effect is not transmitted through educational spending.

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[4] The estimated coefficients can readily be interpreted because all interacted variables are centered. For centered log of social spending the within-variation ranges from -0.248 to 0.198.
[5] Obtained from the World Bank education database. In this database, there is much less observations for secondary education than for primary education.

In principle, fiscal spending decentralization may only approximate decentralization of government spending on education, a finding that would be in congruence with the school autonomy effects found by Wößmann (2003). In this case, no beneficial effects of all-government decentralization should be present. We investigate this issue by including decentralization of educational spending in column (8). This variable is constructed analogously to general spending decentralization, equally taken from the OECD education database,[6] and is based on public expenditures on compulsory primary and lower secondary education. Since education decentralization is only available from 1997 on, we lag the general fiscal decentralization variable with three years in order to include the 2003 tests in the analysis. The effect of education spending decentralization is clearly insignificant, which indicates that it is general decentralization that is important for school performance. Column (9) shows that our findings for general government decentralization and social spending hold even with the altered lag structure. Taken all together, these findings rather suggest that decentralization in education system observed in the previous literature may approximate general government decentralization.

5. Conclusion

A panel data analysis of international student test scores suggests that overall public sector spending decentralization is beneficial to student performance. This general decentralization effect appears not to be mediated by levels of, or decentralization in, educational spending. Our tentative analysis suggests that the advantageous effect seems to be largest in countries with a small public sector, and diminishes when government size increases. However, further research is necessary on the transmission mechanisms through which the positive effect of policy implementation power at the local level work.

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[6] Public direct expenditures for educational institutions, excluding private expenditures.

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Tables

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Std.dev. within	Min	Max
Student achievement	-0.31	0.98	.44	-2.86	2.10
Decentralization, lagged	31.31	14.38	1.63	3.84	58.73
Population size (log)	16.73	1.54	.048	12.50	19.46
GDP per capita (log)	10.04	0.26	0.15	8.72	10.83
Adult education attainment (log)	3.64	0.32	0.11	2.65	4.20
Social spending as % of GDP (log)	2.95	0.28	0.09	1.76	3.48
Government consumption spending as % of GDP (log)	2.94	0.20	0.06	2.41	3.39
Primary educational spending per pupil (log)	2.86	0.30	0.16	2.14	3.74
Education decentralization[7]	65.98	38.92	0.98	0.00	99.99

Note. Unbalanced panel data with 83 observations from 24 OECD countries. For education decentralization, there are 54 observations from 23 OECD countries.

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[7] The countries with entirely centralized educational spending are New Zealand (1998, 2000, 2002, 2003) and Turkey in 2003. Their exclusion from the regression sample does not alter our main findings in Table 2, column (8).

Table 2: Decentralization and student performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Decentralization, lagged	0.021+	0.071*	0.082*	0.085*	0.061	0.076*	0.099+	-0.010	0.054*
	[0.012]	[0.033]	[0.034]	[0.033]	[0.037]	[0.033]	[0.049]	[0.059]	[0.025]
Population size (log)	-	-0.974	-0.429	1.957	-1.489	2.868	0.816	-3.826	0.517
		[2.448]	[2.450]	[2.681]	[2.551]	[2.680]	[4.757]	[5.269]	[2.104]
GDP per capita (log)	-	0.154	-0.288	-0.217	0.041	-0.435	0.507	0.563	-0.13
		[0.858]	[0.901]	[0.846]	[0.925]	[0.839]	[1.299]	[2.031]	[0.713]
Secondary education in adult	-	-0.078	0.487	0.783	0.157	0.957	-0.19	1.643	0.285
population (log)		[0.671]	[0.767]	[0.758]	[0.798]	[0.750]	[1.205]	[2.511]	[0.582]
Year 2000	-	0.461**	0.464**	0.427**	0.453**	0.418**	0.366+	0.549**	0.451**
		[0.158]	[0.156]	[0.154]	[0.155]	[0.151]	[0.195]	[0.127]	[0.125]
Government consumption spending (% GDP) (log)	-	-	-1.682	-	-1.189	-	-	-	-
			[1.143]		[1.189]				
Gov. cons. * decentralization	-	-	-	-	-0.082	-	-	-	-
					[0.060]				
Social spending (% GDP) (log)	-	-	-	-1.331+	-	-1.213+	-1.373	-1.749	-0.908+
				[0.665]		[0.655]	[0.888]	[1.044]	[0.530]
social spend.* decentralization	-	-	-	-	-	-0.067+	-	-	-
						[0.038]			
primary education spending per pupil (% of GDP) (log)	-	-	-	-	-	-	-0.339	-	-
							[0.448]		
decentralization in education	-	-	-	-	-	-	-	0.041	-
								[0.043]	
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	83	83	83	82	82	83	66	54	107
R-squared	0.0902	0.8556	0.8613	0.8694	0.8661	0.8768	0.8751	0.9585	0.8541
Number of id		24	24	24	24	24	23	23	24
R2 within		0.2873	0.3153	0.3509	0.3391	0.3878	0.3685	0.5218	0.2810

Notes: +, *, ** denote significances at the 10, 5, and 1 percent level, respectively. Standard errors are reported in brackets. Interacted variables have been centered on the regression sample mean. In columns (8) and (9) fiscal decentralization and adult education are lagged by three periods.

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