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# Public sector decentralization and school performance: International evidence

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## Abstract

Using a panel of international student test scores 1980 – 2000 (PISA and TIMSS), 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 educational spending.

**JEL codes:** C33; H2; I2, H40

**Key Words:** Fiscal decentralization; Student achievement; federalism; PISA; TIMSS; education; school quality

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## **1. Introduction**

In political economy and public finance, the linkage between government decentralization and the quality of public sector services has been much debated. However, empirical evidence is limited since, in general, the quality of public sector activities is hard to measure, and decentralization varies mainly 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 political decision-making allows better adjustment of (local) supplies to locally heterogeneous demands. 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 preferences. In Seabright's (1996) framework with incomplete contracts, the main advantage of decentralization is that it is easier to hold decision-makers accountable. For other, possibly detrimental effects of decentralization, see, e.g., Bjørnskov, Dreher, and Fischer (2008).

In the economics of education literature, the empirical evidence mainly supports the view that decentralized education systems improve on student achievement. In a cross-country analysis, Wößmann (2003) finds that school autonomy exerts a beneficial impact. Hoxby and Rockoff (2004) report that autonomous charter schools perform better than public sector schools in the US, Clark (2009) identifies a positive effect of a major reform granting larger school autonomy in the U.K. Galiani and Schargrodsky (2002) show that the decision to decentralize public education in the early 1990s raised student achievement in Argentina, while Naper (2010) reports that decentralized hiring of teachers increases school effectiveness in Norway. On the other hand, Merrouche (2007) finds that decentralization of education spending responsibility in Spain did not affect the illiteracy rate. Regarding general government decentralization, Barankay and Lockwood (2007) identify for 26 Swiss states a positive effect

on the share of high school graduates in the 19-year old population. The literature is inconclusive on whether measures of school spending decentralization just approximate general government decentralization, 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 available comparative international achievement tests from 1980 to 2000 assessing students aged 13-15 years.<sup>1</sup> We use the national average of the scores in mathematics and natural science tests, and standardize them in order to ensure comparability across tests. Our procedure standardizes the test scores for the most frequently participating (“core”) countries. For each test, the mean of our adjusted score is set equal to zero with standard deviation of unity within the group of “core” countries. For a given test, the overall average value then depends on the test performance in “non-core” countries, and consequently on which “non-core” countries participated or not.<sup>2</sup>

Decentralization is commonly defined as the percentage of sub-national government spending in general government spending, calculated by the World Bank up to 1999.<sup>3</sup> 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. Any reform in government decentralization may need some time to influence behavior. The size of the lag will depend on to what extent the change in decentralization was expected and student learning is cumulative. We will use a lag of one year in the

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<sup>1</sup> 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.

<sup>2</sup> For a detailed description of the standardization procedure, see Falch and Fischer (2008a).

<sup>3</sup> The index is more closely described in Dreher and Fischer (2010).

decentralization variable to account for sluggish responses, but will also present results from models allowing for more lags in the variable of interest.

In addition, the empirical model includes as co-variables GDP per capita, population size, and the size of the public sector that insures against income shocks, particularly government social expenditures and government consumption spending (for sources see Falch and Fischer, 2008a).<sup>4</sup> Country fixed effects account for time-invariant features such as institutions and culture (e.g., the national school system, school autonomy, population preferences, etc.). They are expected to mitigate potential endogeneity biases. We also include a dummy variable for the only OECD PISA test in the regression sample.

The way the dependent variable is constructed is an argument for not including time fixed effects in the baseline model. With time fixed effects, the within-country variation in student performance would depend on the composition of participating countries in the specific tests. The motivation for the standardizing procedure we apply is exactly to avoid this flaw. However, to assess the robustness of the specification, we test for the presence of time effects.

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Insert Table 1 about here  
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For reasons of comparability, we restrict the sample to well-established OECD countries (as of 1990) with relatively stable political and administrative systems, excluding the post-communist countries. 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 large to justify a country fixed effects specification.

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<sup>4</sup> We have also estimated models including the population share with at least a secondary education. The t-value of this variable was always below unity, and values are missing for some observations.

#### 4. Empirical Results

Table 2 provides the regression outcomes. Column (1) presents the simple correlation between spending decentralization and test score. The relationship is positive but small. The remaining models (columns (2) to column (10)) include country fixed effects.

Comparing the results in columns (1) and (2), we observe that including country fixed effects and covariates increases the size of the effect of decentralization (0.021 vs. 0.072) and its significance level (10 percent vs. 5 percent). In the full model (2), the result implies that rising spending decentralization by 10 percentage points increases student test scores by 0.7 standard deviations. This is a non-trivial effect given that three countries in the sample have within-variations in decentralization larger than 5 percentage points.

Model 2 does not include time specific effects as explained above, but a dummy variable for the PISA test of the year 2000, which is highly significant. Notice, however, that if time specific effects are included, they are jointly insignificant.<sup>5</sup> Column (3) in Table 2 replaces the PISA dummy variable with a time trend, without affecting the coefficient size of decentralization (0.074 vs. 0.072). Since the trend is not significant at conventional levels, the remaining models presented include only the PISA dummy variable but exclude the time trend. Excluding any time variable increases the effect of decentralization to 0.088 (column (4)).

The results in Table 2 also imply that student performance is not affected by GDP or population size. 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 does not alter the coefficient size of decentralization.

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Insert Table 2 about here  
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<sup>5</sup> The p-value on a test for joint significance using the model specification in column (2) in Table 2 is 0.47.

### *Public Sector Size*

Columns (5) and (6) in Table 2 show that the positive effect of decentralization is robust to the inclusion of public sector size, measured by either total government consumption spending or government social expenditures (0.074 and 0.073, respectively). The effect of decentralization 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 (2008a), but insignificant, probably due to fewer observations in the present analysis.

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 (7) and (8) add interaction terms between government size and decentralization. Contradicting our hypothesis, both interaction terms are negative. The performance-enhancing effect appears to decline in public sector size. One might speculate whether market distortions through non-internalization of inter-jurisdictional spillovers increase more in decentralized countries than in centralized countries as the government's involvement in the economy rises. The interaction terms are small, however, and only significant at the 10 percent level for social spending. The overall effect of decentralization is positive for the within-sample variation in social expenditures, for which it varies from 0.05 to 0.08.<sup>6</sup>

### *Robustness tests on decentralization*

One may suspect that the small within-country variation in the decentralization measure is due to minor changes in, e.g., accounting rules rather than changes in the real economy. However, some of the variation is clearly real. For example, the dip in decentralization by 3.5 percentage points in Germany in 1991 is a unification effect: The East German Laender were fiscally far less autonomous than the West German Laender. The continuous decline from 1991 on reflects the growing dependence of the East German Laender on federal transfers. The ongoing decrease in decentralization in Switzerland from 1990 on by roughly 0.5 percentage points per year seems to be related to continuously rising unemployment and old-

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<sup>6</sup> 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.

age pension expenditures at the federal level. Sweden experienced relatively large fluctuations in decentralization in the 1990s related to the major recession at the start of the decade and the governmental reforms that followed it. We have estimated the model on subsamples of countries with relatively small and large changes in decentralization, and find that the effect of decentralization is stable.<sup>7</sup>

The response time of student performance to changes in decentralization is not clear from economic theory, but one might expect that some time passes by before structural changes start having an effect. The model in column (9) of Table 2 uses five year moving averages of all explanatory variables. This specification also smoothes out minor fluctuations in the decentralization measure due to, e.g., changes in accounting rules. The effect of decentralization is now slightly smaller (0.062), but still significant at the 10 percent level. When testing for a more sluggish response to changes in fiscal decentralization, employing a three-year (two-year) lag of the variable of interest, we obtain a coefficient of 0.052 (0.062) (both significant at the 5 percent level, not reported).

Column (10) in Table 2 investigates one potential transmission channel for the effect of spending decentralization. We test the hypothesis that decentralization influences student performance through public expenditures levels in compulsory education (e.g. Fischer, 2005). Column (10) adds to model (2) primary school expenditures per pupil as percent of GDP<sup>8</sup>, but the effect is clearly insignificant. In contrast, the coefficient of decentralization stays significant (0.100), indicating that its effect is not transmitted through educational spending.<sup>9</sup>

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<sup>7</sup> Five countries have within-country standard deviation in decentralization above 2.5 in the regression sample (Sweden, USA, Iceland, Switzerland, and Germany). For this subsample of 17 observations, the coefficient (standard error) of decentralization is 0.088 (0.048). For the other countries (68 observations), the coefficient is 0.066 (0.046), and a statistical test cannot reject that the coefficients are equal (p-value of 0.74). When the sample is split into two equal-sized sub-samples of countries with small and large within-country variation in decentralization, the coefficients are 0.071 (0.074) and 0.083 (0.039), respectively.

<sup>8</sup> This data are obtained from the World Bank education database. In this database, there is much less observations for secondary education than for primary education.

<sup>9</sup> 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 referred above (section 2). Unfortunately, a measure for education spending decentralization is only available from 1997 on, which makes a thorough test of the hypothesis impossible. However, the preliminary findings in Falch and Fischer (2008b) suggest that it is general decentralization and not school decentralization which matters.



## **5. Conclusion**

A panel data analysis of international student test scores suggests that government spending decentralization is beneficial to student performance. This general decentralization effect appears not to be mediated by levels of educational spending. Our analysis also suggests that this advantageous effect decreases in public sector size. However, further research appears necessary on the transmission mechanisms through which the positive effect of local policy implementation works.

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## Tables

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Std.dev. within	Min	Max
Test score	-0.34	1.00	0.44	-2.86	2.10
Decentralization, lagged	31.3	14.2	1.61	3.84	58.7
Population size (log)	16.7	1.54	0.05	12.5	19.5
GDP per capita (log)	10.0	0.28	0.15	8.72	10.8
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

Note. Unbalanced panel data with 85 observations from 25 OECD countries. GDP per capita is measured in current 2000 US \$.

Table 2: Decentralization and student performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Decentralization, lagged	0.021+	0.072*	0.074*	0.088*	0.074*	0.073*	0.059+	0.062*	0.062+	0.100*
	[0.012]	[0.031]	[0.037]	[0.033]	[0.031]	[0.031]	[0.032]	[0.031]	[0.034]	[0.048]
Population size (log)	-	-0.765	0.053	-1.244	-1.388	-0.054	-1.847	0.394	-0.266	0.282
		[1.788]	[2.371]	[1.905]	[1.835]	[1.842]	[1.838]	[1.826]	[0.642]	[3.204]
GDP per capita (log)	-	0.067	1.812+	1.056+	0.0248	0.109	0.197	0.097	-0.128	0.323
		[0.647]	[1.017]	[0.598]	[0.643]	[0.649]	[0.645]	[0.637]	[1.762]	[0.948]
OECD PISA test, year 2000	-	0.465**	-	-	0.461**	0.442**	0.447**	0.421**	0.528**	0.409*
		[0.153]			[0.152]	[0.151]	[0.151]	[0.149]	[0.147]	[0.196]
Trend	-	-	-0.026	-	-	-	-	-	-	-
			[0.029]							
Government consumption spending as % of GDP (log)	-	-	-	-	-1.299	-	-1.049	-	-	-
					[0.972]		[0.974]			
Gov. cons. * decentralization	-	-	-	-	-	-	-0.083	-	-	-
							[0.054]			
Social spending as % of GDP (log)	-	-	-	-	-	-0.962	-	-0.851	-	-
						[0.598]		[0.591]		
Social spend. * Decentralization	-	-	-	-	-	-	-	-0.064+	-	-
								[0.037]		
Primary education spending per pupil as % of GDP (log)	-	-	-	-	-	-	-	-	-	-0.447
										[0.429]
Country fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85	85	85	85	85	84	85	84	85	66
R-squared	0.0902	0.8524	0.8422	0.8398	0.8667	0.8716	0.8723	0.8786	0.8594	0.8649
Number of id	-	25	25	25	25	25	25	25	25	23
R2 within	-	0.2890	0.1844	0.1721	0.3114	0.3320	0.3402	0.3681	0.2735	0.3169

Notes: '+', '\*', '\*\*' denote significances at the 10, 5, and 1 percent level, respectively. Standard errors are reported in brackets. In columns (6) and (7), interacted variables have been centered on the regression sample mean. In column (8), all explanatory variables are included as five years moving averages.