School autonomy and student achievement. An international study with a focus on Italy

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Countries involved:

International analysis: 32 countries involved in the ICCS survey

In depth analysis: Italy

Tag words:

School autonomy, Multiple outcomes, School effectiveness

Aim of the study and theoretical framework

To assess the impact of policy initiatives focused on school autonomy, the research tradition in the field is to link them with measures of student achievement (especially with achievement in "traditional" subjects such as mathematics and reading). A particular advancement in the field was done by secondary analyses based on international comparative studies such as OECD-PISA and IEA-TIMMS (e.g. Fuchs & Woessmann, 2007; Hanushek et. al. 2011; Maslowski, et al 2007 etc.). However, researchers note that school autonomy is a rather complex concept to measure and the picture that emerged from several investigations showed rather mixed results indicating both positive and negative effects of school autonomy on educational performance. Scholars were nevertheless able to conclude that these differential effects might depend on the area of decision-making under instigation and also on other characteristics of the educational system such as levels of development and accountability. Regarding the level of development, the study of Hanushek et. al., 2011, showed that "autonomy affects student achievement negatively in developing and low-performing countries, but positively in developed and high-performing countries". Among the countries in which this effect is expected to be negative is Italy, a country in which (since the Bassanini Law of 1997) several efforts were made for granting schools higher levels of autonomy but in which such efforts were not necessarily found to make a difference for students' success.

The current study will investigate the effect of school autonomy on student achievement in an international context with a focus on Italy. A particular distinctive feature is that, next to traditional outcomes we consider also an alternative measure of student achievement, student civic knowledge.

We intend to address the following research questions:

- What is the relationship between school autonomy and student civic knowledge? To what extent is the size and direction of this relationship generalizable across countries?
- What is the relationship between school autonomy and multiple measures of student achievement (civic knowledge, math and reading) in the Italian context? To what extent is the size and direction of this relationship generalizable across diverse outcome variables?

Method

Sample

For this study we make use of two data sets: the International Civic and Citizenship Education Study (ICCS) 2009 (Schulz et al. 2010) and the ICCS data for Italy matched with national data on student achievement collected by INVALSI[i], Italy.

For the analysis we excluded data for countries in which the instrument measuring school autonomy showed poor internal consistencies ($\alpha < .70$) (data reported in Schulz et al., 2011, p. 213). This resulted in excluding Belgium (Flemish), Bulgaria, Cyprus, Ireland and Norway. We also excluded Liechtenstein which had a very limited number of participating schools (N = 9) and complete missing data for most of the control variables used in this study. Therefore, this procedure resulted in using data for 32 countries, 4423 schools and 116118 students.

The other dataset we used was the ICCS data for Italy which was matched with national achievement data. The sampling procedure is identical with the one described above. However, because the ICCS data was matched with available national data, information was excluded for 19 ICCS schools and 767 students in these schools. Therefore, this procedure resulted in using data for 153 schools and 2599 students. Further analysis revealed that the selected sample does not differ from the original ICCS Italian sample.

Variables

From the *international ICCS 2009 data*, the following variables were included in our analysis:

Outcome variable – Civic knowledge

The construct refers to the application of the civic and citizenship cognitive processes to the civic and citizenship content and measures students' factual knowledge of civics and

citizenship, as well as understanding and reasoning. Students' levels of civic knowledge were assessed with an 80 items test. Using the Rasch model, a cognitive scale (average α = .84) was derived by the ICCS experts (Schulz et al., 2010) based on 79 items which showed satisfactory scaling properties. Applying a plausible values methodology, five separate estimates were generated for each student. Due to the complexity of our analysis (random slopes & multivariate multilevel models) we use only the first plausible value for the reported analyses. Higher scores on the scale reflect higher levels of civic knowledge.

Main explanatory variable - School autonomy

Information on school autonomy was collected through the ICCS school questionnaire. Principals were required to indicate on a 4 point scale (full," "quite a lot," "little," "none") how much autonomy they perceive to have in taking decisions about curriculum planning, curriculum delivery, choice and use of textbooks, appointing teachers, dismissing teachers, establishing student assessment policies, determining the content of in-service professional development programs for teachers, teacher appraisal, budget allocations within the school, extracurricular activities, student admittance policies and establishing teachers' salaries. Using IRT Rasch modelling procedures, a scale measuring school autonomy was created based on these 12 items. The scale has a good reliability (average α = .82)[ii] and good construct validity across ICCS countries (see Schulz et al. 2011, p. 215). Higher values on this scale reflect perceptions of relatively high incidences of school autonomy.

Control variables

To control for *student characteristics* related to student achievement we used the following covariates collected trough the student questionnaire: *age* - estimated as the difference between the year and month of the testing and the year and month of a student's birth; *gender* – dummy coded 0 = boy, and 1 = girl; *socioeconomic background* - derived from the following three indices: highest occupational status of parents, highest educational level of parents in approximate years of education, and the approximate number of books at home; *language spoken at home* - dummy coded 0 = the language spoken at home most of the time differs from the language of assessment and 1= the language spoken at home most of the time is the language of assessment.

To describe the *context of the school* we used the following covariates collected trough the school questionnaire: *school location* - the size of the community in which this school is

located; *school size* - the number of students at the school; *school type* - dummy coded 0 = public, and 1 = private; *teacher student ratio* - the number of students at the school divided by the number of teachers at the school; *average socioeconomic status* – mean of student socioeconomic background at school.

At the *country level* we controlled for the general level of economic and social development measured by the human development index.

For our analysis based on the *Italian ICCS data* we used most of the variables described above with a few exceptions. First, two other measures of student achievement were included: *student mathematics performance* and *student performance in reading* – Italian language measured in the school year 2008-2009. Both outcomes are assessed with standardized test developed within the INVALSI framework[iii] measures which showed very high internal consistencies ($\alpha > .80$). Second, one school control variable, school type, was discarded from the Italian analysis due to the fact that most of the schools in this sample are public schools.

Data Analysis

Cross- country multilevel analysis – international ICCS data

To answer the first research question concerning the relationship between school autonomy and student achievement (civic knowledge) across the 32 ICCS countries, three level multilevel regression analyses (Snijders & Bosker, 2011) were conducted. The advantage of using the international ICCS data is that the concept of school autonomy (as well as all other variables) is measured in the same way in all countries and its relationship with the dependent variable can be tested based on the same model (controlling for the same covariates in each country).

The analysis was performed using MLwiN software (Rasbash et al., 2009). We specified the following models: M0 – an unconditional model, where the total variance in student civic knowledge was partitioned into three components: variance between students within schools, variance between schools within countries and variance between countries; M 1 – model in which we added the covariates at student, school and country level which were selected based on previous studies addressing factors related to student achievement; M 2 – model in which school autonomy is added to the previous model; M 3 – model in which we test whether the effect of school autonomy is generalizable across countries by testing a

random slope for this variable at the country level. Furthermore, based on M 3 we estimated the specific effect of school autonomy in each of the 32 ICCS countries using the *Predictions* option in MLwiN. The data was imported in SPSS for further descriptive analysis.

Multivariate multilevel analysis- Italian data

To answer our second research question concerning the relationship between school autonomy and multiple measures of student achievement (civic knowledge, math and reading) in the Italian context, multivariate multilevel regressions were performed using the same software (MLwinN). The choice of analysis was guided by the research questions as well as the characteristics of the data. Specifically, the multivariate multilevel procedure (see Snijders & Bosker, 2011) has a series of advantages. First, it addresses the issue of correlated dependent variables. Using this approach the correlation can be taken into account by estimating a regression model for the three dependent variables simultaneously. Moreover, it gives the possibility to test whether the explanatory variables have a unique or common effect on the different outcome variables. In this manner we can test for instance whether school autonomy shows a different relationship with each of the student achievement measures or whether the effect is generalizable across the three indicators.

We specified the following models: M0 – a multivariate unconditional model, where the variances and covariances are decomposed into parts at two levels: within schools and between schools; M 1 – model in which we added the covariates at student and school levels; M 2 - model in which school autonomy is added to the previous model; M 3 – model in which we test whether the effect of school autonomy can be attributed to higher autonomy levels (non-linear effect) by testing both linear and quadratic effects.

For all explanatory variables, we tested by means of Chi-square statistics whether the effect differed statistically among the dependent variable. Where the differences were statistically different, we estimated separate coefficients for that variable.

Results

School autonomy and student civic knowledge – International context

Table 1 displays the results of multilevel analysis based on the international dataset. As M 1 reveals, most of the control variables were found to be related to student civic knowledge.

Together they explain 27% of the total variance in civic knowledge of students in the 32 ICCS countries.

Insert Table 1 here

The effect of school autonomy on student civic knowledge is tested in M 2. The analysis shows that across countries, school autonomy does not have a significant effect on student civic knowledge. However, M 3 reveals that the effect depends to some extent on the country context. Adding a random slope for school autonomy at the country level slightly improves model fit ($\Delta\chi^2$ (2*df*) = 5.007; $p < .10$). The coefficients representing the effect of school autonomy on civic knowledge in each of the 32 ICCS countries is reported in Figure 1. The figure shows that although in most countries, the effects are nearly nil, in some contexts the parameters are significantly higher than the average effect ($\beta = 0.008$, SE = 0.011). Furthermore, Figure 1 also shows that the higher effects can be both positive (e.g. in Slovak Republic, Lithuania, Sweden, Switzerland and Malta) and negative (e.g. Greece, Thailand, Italy and Hong Kong).

Insert Figure 1 here

School autonomy and multiple measures of student achievement – Italian context

Table 2 displays the results of multivariate multilevel analysis based on the Italian data. M 1 shows that especially the student control variables are related to student achievement in all domains. Together, the control variables explain 17% of the total variance in civic knowledge, 8% of the total variance in reading (Italian language) and 2% of the total variance in the mathematics achievement of the students in the Italian sample.

Insert Table 2 here

The effect of school autonomy on all measures of student achievement was tested in M 2. The results show that school autonomy shows a statistically significant negative relationship ($\beta = - 0.105$, se = 0.033) with all three outcomes (this effect is common for all achievement measures) and explains nearly 1% of the total variance in civics, reading and mathematics. Furthermore, M 3 reveals that the negative effect cannot be attributed to higher levels of autonomy since only the linear term shows a statistical significant effect ($\beta = - 0.109$, se = 0.035) while the effect of the quadratic term is almost nil ($\beta = 0.006$, se = 0.013).

Discussion

Our results are consistent with previous findings suggesting that in an international context the effects of school autonomy can be both positive and negative depending on the context. Moreover, the results showed that such results hold not only when one looks at traditional outcomes but even when we use an alternative measure of student achievement, student civic knowledge. Furthermore, the evidence gathered for Italy suggests that higher levels of school autonomy are associated with lower student achievement irrespective of the subject in which achievement was measured. This finding is again consistent with the results of Hanushek et. al., 2011 which hint that Italy is not yet at a sufficient level of development for granting the existence of the strong underneath institutions that are conducive to an effective use of autonomy. These findings could be however further explored by looking at different effects of different areas of decision-making as well as measures of school accountability.

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[i] INVALSI = National Institute for the Evaluation of Education and Training
[ii] Average reliability reported only for the 32 countries used in this study.
[iii] See INVALSI framework: http://www.invalsi.it/snv1011

Table 1. Results of multilevel analysis to explain variation in students Civic Knowledge across 32 ICCS countries

Fixed Part	**M0 - Empty**		**M1 - Control Variables**			**M2 - School Autonomy**			**M3 – School Autonomy Random slopes**		
	Par.	SE.	Par.	SE.	*p*	Par.	SE.	*p*	Par.	SE.	*p*
Intercept	0.005	0.081	-0.270	0.070		-0.269	0.070		-0.270	0.071	
Age			-0.063	0.009	***	-0.063	0.009	***	-0.063	0.009	***
Gender (girl = 1)			0.178	0.018	***	0.178	0.018	***	0.178	0.018	***
SES (GMC)			0.159	0.016	***	0.159	0.016	***	0.159	0.016	***
Speaking the language of the test at home			0.187	0.043	***	0.187	0.043	***	0.187	0.043	***
School location			-0.012	0.010		-0.012	0.010		-0.011	0.010	
School size			0.034	0.012	**	0.035	0.012	**	0.035	0.012	**
School type (private = 1)			0.011	0.030		0.006	0.032		0.006	0.033	
Teacher student ratio			-0.007	0.010		-0.007	0.010		-0.007	0.009	
Average SES			0.219	0.017	***	0.218	0.017	***	0.218	0.017	***
Country level of development			0.370	0.058	***	0.370	0.058	***	0.372	0.059	***
School Autonomy						**0.005**	**0.009**		**0.008**	**0.011**	
Random Part											
Country level variance	0.209	0.053	0.080	0.019		0.080	0.019		0.082	0.020	
Covariance (School autonomy, Civic knowledge'									0.000	0.003	
School Autonomy Slope									**0.002**	**0.001**	
School level variance	0.227	0.018	0.123	0.011		0.123	0.011		0.122	0.011	
Student level variance	0.551	0.028	0.519	0.023		0.519	0.023		0.519	0.023	
Deviance	271216.08		262049.17			262048.69			262043.68		
Deviance difference			9166.908	(10df)***		0.479	(1df)		5.007	(2df)†	

*Notes.*** p < 0.001; ** p < 0.01; † p< 0.10, GMC = group mean centered*

Figure 1. The effect of school autonomy on civic knowledge

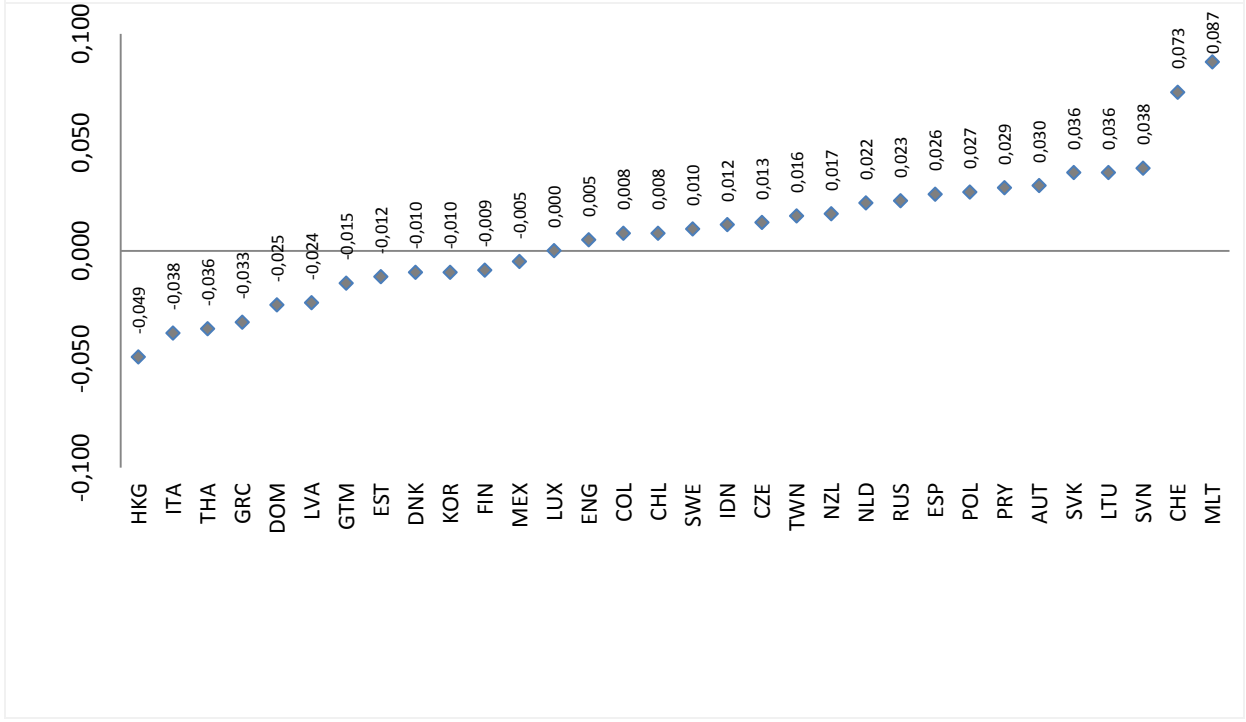

Table 2. Results of multivariate multilevel analysis to explain variation in students Civic Knowledge, Italian language and Mathematics for Italy

Fixed Part	**M0 - Empty**		**M1 - Control Variables**			**M2 - School Autonomy**			**M3 – School Autonomy Linear & Quadratic**		
	Par.	SE.	Par.	SE.	*p*	Par.	SE.	*p*	Par.	SE.	*p*
Intercept for:											
Civic knowledge	-0.033	0.040	-0.635	0.087		-0.640	0.086		-0.646	0.087	
Italian	-0.049	0.062	-0.557	0.088		-0.562	0.087		-0.568	0.088	
Mathematics	-0.062	0.065	-0.132	0.090		-0.137	0.090		-0.143	0.090	
Age - Common coefficient			-0.025	0.012		-0.026	0.012		-0.026	0.012	
Gender (girl = 1) - Unique coefficient for:											
Civic knowledge			0.203	0.034	***	0.201	0.034	***	0.201	0.034	***
Italian			0.122	0.027	***	0.121	0.027	***	0.121	0.027	***
Mathematics			-0.123	0.026	***	-0.124	0.026	***	-0.123	0.026	***
SES (GMC) Unique coefficient for :											
Civic knowledge			0.287	0.020	***	0.287	0.020	***	0.287	0.020	***
Italian			0.158	0.016	***	0.158	0.016	***	0.158	0.016	***
Mathematics			0.114	0.015	***	0.113	0.015	***	0.113	0.015	***
Speaking the language of the test at home - Unique coefficient for:											
Civic knowledge			0.552	0.084	***	0.555	0.083	***	0.555	0.083	***
Italian			0.496	0.067	***	0.497	0.067	***	0.497	0.067	***
Mathematics			0.160	0.064	*	0.160	0.064	*	0.160	0.064	*
School location - Common coeficient			-0.023	0.032		-0.015	0.031		-0.016	0.031	
School size - Common coeficient			-0.004	0.034		-0.023	0.033		-0.020	0.034	
Teacher student ratio - Common coefficient			0.045	0.035		0.058	0.034		0.057	0.034	
Average SES - Common coeficient			0.277	0.032	***	0.307	0.033	***	0.306	0.033	***
School Autonomy - Common coeficient						**-0.105**	**0.033**	****			
School Autonomy^1									-0.109	0.035	**
School Autonomy^2									0.006	0.013	

*Notes.*** p < 0.001; ** p < 0.01; * p < 0.05, GMC = group mean centered*

Table 2. (continued) Results of multivariate multilevel analysis to explain variation in students Civic Knowledge, Italian language and Mathematics for Italy

Random Part	**M0 - Empty**		**M1 - Control Variables**		**M2 - School Autonomy**		**M3 - Autonomy Linear & Quadratic**	
School level variance	Par.	SE.	Par.	SE.	Par.	SE.	Par.	SE.
Civic knowledge	0.186	0.027	0.106	0.017	0.098	0.016	0.098	0.016
Italian	0.552	0.067	0.509	0.062	0.497	0.060	0.497	0.060
Mathematics	0.622	0.075	0.617	0.074	0.608	0.073	0.605	0.073
School level covariance								
(Civic knowledge, Italian)	0.163	0.034	0.101	0.025	0.091	0.024	0.091	0.024
(Civic knowledge, Mathematics)	0.117	0.034	0.074	0.026	0.066	0.025	0.065	0.025
(Mathematics, Italian)	0.255	0.055	0.232	0.052	0.222	0.051	0.220	0.051
Student level variance								
Civic knowledge	0.827	0.024	0.732	0.021	0.732	0.021	0.732	0.021
Italian	0.488	0.014	0.448	0.013	0.448	0.013	0.448	0.013
Mathematics	0.425	0.012	0.409	0.012	0.409	0.012	0.409	0.012
Student level covariance								
(Civic knowledge, Italian)	0.359	0.015	0.299	0.013	0.299	0.013	0.299	0.013
(Civic knowledge, Mathematics)	0.244	0.013	0.218	0.012	0.218	0.012	0.218	0.012
(Mathematics, Italian)	0.249	0.010	0.232	0.010	0.232	0.010	0.232	0.010
Deviance	16771		16276		16266		16266	
Deviance difference			495.2	(14df) ***	9.726	(1df) **	9.933	(2df)**

*Notes. *** p < 0.001; ** p < 0.01; * p < 0.05*