FAMILY BACKGROUND, SCHOOL QUALITY AND RURAL-URBAN DISPARITIES IN STUDENT LEARNING ACHIEVEMENT IN LATVIA

Andrejs Geske, Andris Grinfelds, Indra Dedze and Yanhong Zhang

Introduction

Over the course of the fifteen years since 1991, Latvia has been undergoing rapid political changes from a party controlled state to a market economy. These changes have affected the system of education. The issue of quality and equity of educational outcomes is gaining increasing importance as schools are expected to adjust to the new economic situation and to the requirements of a democratic society.

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Andrejs Geske (Latvia)
Professor at the Faculty of Education and Psychology, University of Latvia. He was the National Research Coordinator of IEA TIMSS projects in 1995, 1999, and 2003. He has experience in large-scale assessment programmes, including staff recruiting and training, procedures for test construction, trial testing, sampling, test distribution and logistics, free response item coding, test and item statistics, representing research results. He also was involved as an administrator and data analysis specialist in IEA CivEd and PIRLS studies and OECD PISA project in Latvia. E-mail: andrejs.geske@lu.lv

Andris Grinfelds (Latvia)
Professor at the Faculty of Education and Psychology, University of Latvia. He was the national project manager of international IEA COMPED and SITES research projects and the OECD

Latvia's desire to better understand the needs of its education system in response to changing realities has led to its participation in a series of major comparative studies of learning achievement right after regaining independence.[1] Results from these surveys paint a mixed picture about the quality and equity of student learning outcomes in Latvia. Take the outcomes of mathematics learning as an example. In the Programme for International Student Assessment (PISA) in 2003, Latvia was ranked between twenty-fifth and twenty-eighth out of forty countries on the mean scores of mathematical literacy of 15-year-old students. This level of performance was similar to that in Hungary, Poland, the Russian Federation, Spain, Slovak Republic, and the United States, lower than most of the OECD countries but higher than about a dozen middle-income countries participating in the study (OECD, 2004). A similar story emerged from the Trends in Mathematics and Science Study (TIMSS) in 2003. Compared to other countries in Europe, Latvian eighth-graders scored lower than their counterparts in Estonia and Hungary, at similar levels to Lithuania, the Russian Federation, and Slovak Republic but higher than Armenia, Bulgaria, Romania, the Former Yugoslav Republic of Macedonia, the Republic of Moldova, and Slovenia (Mullis et al. 2004).

PISA data also revealed that the overall gaps in the mathematical literacy scores among students in Latvia – as indicated by the total variance – were smaller than the average of the OECD countries and comparable to most of the countries in the same region. Just slightly over twenty percent of the performance differences existed among students rather than among schools in Latvia. In contrast, the within-school variance in OECD countries accounted for almost thirty-four percent of the total variance, implying that school differences in student performance in Latvia were relatively

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Biographical note: continued
PISA. His research interest is educational management and integration process of ICT in education, as well as use of quantitative methods to examine the student achievement and influencing factors both in the education system of Latvia and worldwide. E-mail: andris.grinfelds@lu.lv

Indra Dedze (Latvia)
Senior Programme Manager at the Open Society Institute (OSI), Budapest. Her research interest is education policy, particularly issues of equity, quality and transparency in education. Prior to joining OSI in 2005, she was a Fulbright Fellow at Vanderbilt University, USA; worked at Centre for Public Policy PROVIDUS, Latvia and the Soros Foundation–Latvia, and Stockholm University, Sweden. She was the National Coordinator for the IEA Reading Literacy Study in Latvia. E-mail: indra@lanet.lv

Yanhong Zhang (China)
Programme Specialist and Policy Analyst at the UNESCO Institute for Statistics based in Montreal, Canada. He has conducted research on poverty and school access, school quality and student learning outcomes. His research interest is applying quantitative methods to examine issues related to educational quality and equity around the world and the use of international student assessment to inform policy debates and formation. Prior to joining UNESCO in 2001, he worked at Statistics Canada, the World Bank, and China Association for Science and Technology. He started his career as a teacher in a rural high school in China. E-mail: y.zhang@uis.unesco.org

modest. In addition, a measure of the socio-economic status of students' family background both at the individual and school level explained about eight percent of the within-school variance and five percent of between-school variance, in contrast to twenty-three percent and four percent, respectively, for OECD countries on average, suggesting that the Latvian school system has been relatively successful in containing gaps among students along socio-economic lines (OECD, 2004).

An important dimension of educational equity in Latvia is about rural/urban disparities in student achievement. Studies of IEA and PISA data indicated that students in the cities outperformed rural students both in reading and sciences. This is a lasting trend, although the more rapid growth of the achievement for rural students is observed lately (Dedze, 1999; Geske, Grinfelds, & Kangro, 2001; Geske & Kangro, 2004). Deeper analysis revealed that these differences could not be explained by socio-economic factors only. For example, in analyzing data from the CIVED study, it was discovered that family cultural capital, such as parental education and number of books at home, also influenced student achievement (Torney-Purta et al., 2001; Drivdale-Karuskina et al., 2003). In this study, we focus on systematically examining rural/urban disparities in students' learning outcomes in Latvia and explore the effects of a number of individual and school characteristics in contributing to such disparities.

Latvian school system and regional disparities of education

In order to understand the rural/urban disparities in education in Latvia, it is advisable to look first into the distinctiveness of the state administrative-territorial system in the country, which has shaped its system of education and has both directly and indirectly influenced student achievement. Latvia is divided into twenty-six administrative districts, despite its relatively 'compact' size. The country has a total area of a little more than 64,000 square kilometers and the distance from Riga, the capital city, to the remotest villages in any direction does not exceed 300 kilometers. The total population is 2.3 million and about one-third of them (about 750,000) live in Riga.

There are tremendous differences across the twenty-six administrative districts. We illustrate such variation by presenting a selective number of indicators in Table 1. As can be seen, in 2004 the most populated district, Riga, was about *fifty* times as large as the least populated one. The difference in population size was mirrored by that in a number of measures of economic conditions. For instance, while the wealthiest district had a per capita GDP of 4,000 Latvian Lat (about US$ 2,240), the poorest had only 1,000 (about US$ 560). The unemployment rate also varied from four to twenty-six percent. Even though car ownership in Latvia was more even, it still ranged between 0.2 per capita to 0.3. The overall economic conditions in individual districts have an impact on the migration patterns, with some districts gaining from domestic migration while others lose.

In sum, regardless of the rather 'compact' structure of the country, quite large differences exist among the various districts within the country. Even in neighbouring districts it is possible to find schools within a distance of several kilometers with a

TABLE 1. Variation across administrative districts in Latvia, 2004

	Minimum	Maximum
Total population	14,000	735,000
GDP per capita (in Latvian Lati)	1,000	4,000
Unemployment rate (%)	4.4	26
Investments in construction per capita (in Latvian Lat)	60	600
Number of cars per capita	0.2	0.3
Migration rate	−800	544
Number of secondary schools (per 10,000 residents)	1.1	3.1
Number of kindergartens (per 10,000 residents)	1.0	4.6
Number of students (per 10,000 residents)	112	169

Source: Central Statistical Bureau of Latvia (data.csb.lv).

different status according to the unofficial ranking system[2]. Lately, an increasing number of parents tend to send their children to highly ranked schools, even if they are located further away from their home.

The changing of demographics in Latvia has had an impact on rural schools. The birth rate over the last 10 years has been declining and consequently, the number of school-aged children has declined too. As a result, some small rural schools were closed, although the local population views the school as a significant cultural centre. The closure of these small rural schools often leads to family migration to towns where the school is nearby. This also exposes students to the better educational resources – access to books and equipment.

Even though we do not believe there are widespread gaps in terms of resource inputs between urban and rural schools in Latvia, such differences nevertheless may still exist. For instance, Gibs (2000) observed that half of the teachers from urban schools in Latvia had graduate degrees, in comparison to only about one-third of their counterparts working in rural schools. In addition, urban teachers were more likely to have graduated from top-ranked colleges or universities, though this applied only to a small proportion of both urban and rural teachers. To the extent that teachers' educational qualifications and academic achievement affect the quality of classroom instruction, such differences suggest that the existence of a rural/urban gap is an important input of school resources. The study also found that urban teachers who were just starting in their teaching profession and those with masters' degrees and 20 or more years of experience earned higher salaries than their rural counterparts, though rural teachers expressed as much satisfaction with their pay as urban teachers.

Some of these challenges facing rural schools are not unique to Latvia. Take Canada for example. Baker (2003) found that small rural areas in Canada were also characterized by ageing and declining populations that led to the closure of local schools. It was difficult to attract and retain teachers in small rural schools. However, being in a small

and rural community could also be positive – small community size fosters higher teacher morale, better relationships between a school and parents and creates a more favourable educational environment. Cartwright and Allen (2002) found that relative to individual or family characteristics, community characteristics in Canada played a more important role in predicting both the overall level and the urban/rural gaps in student performance. The community characteristics used in their study included the aggregates of occupational status of parents, educational attainment of adults, the proportion of adults with postsecondary education, and the proportion of the jobs that required university training. While there were no apparent differences in student problem behaviours, interaction with parents, or student/teacher relationships between rural and urban school students, urban students were reported as more likely to aspire to university education, have higher career expectations, have higher family cultural capital than their rural counterparts (Cartwright & Allen, 2002). In another study in Canada, Lam (1996) found that urban teachers were increasingly facing problems with students tempted to engage in criminal activities or dealing with overcrowded classrooms, while rural teachers were more concerned about the curriculum revisions and the fear of possible reallocations due to school closure.

In sum, students attending schools in urban areas in Latvia tend to have superior performance than their counterparts in rural schools, and students' learning outcomes depend upon the socio-economic status of their family background. At the same time, there are vast regional differences in demographic, economic, and educational characteristics. We therefore speculate that the urban/rural disparities in learning achievement can be attributed, at least partially, to differences in the socio-economic conditions. Studies of urban/rural differences in schools in Latvia and elsewhere suggest that there exist differences in student motivations and aspirations, teacher qualifications, and pay, all of which are important for student learning. It would be of interest to find out the extent to which various student and school characteristics contribute to regional disparities in learning outcomes in Latvia.

Research questions

In this article, we use the 2003 PISA data to study in more detail the rural/urban disparities in student learning achievement in Latvia. Given the large population size of Riga and its special status as the national capital, we separate Riga from other urban communities. In other words, we examine the differences among Riga, the other urban communities and rural areas in terms of students' learning achievement and the extent to which such differences are attributable to a host of individual and school characteristics. More specifically, we explore the following research questions:

1. To what extent are the mathematical literacy scores of 15-year-old students from Riga, other cities, and rural areas different?
2. If substantial differences in mathematical literacy scores existed among the three groups of students, to what extent are such differences attributable to students' individual family background characteristics vis-à-vis school characteristics?

3. To what extent are students' individual, family background and school characteristics responsible for the differences in mathematical literacy scores, both within-school and between schools?

Data, variables, and analytic strategy

The data used for our analysis came from the OECD PISA 2003. A total of 5,370 15-year-old students from 165 schools in Latvia participated in the study. The variable of central interest is students' mathematical literacy scores which were scaled to have a mean of 500 and standard deviation of 100 for all students from forty-one countries participating in PISA 2003. The main objective of our research is to explore the disparities in students' learning achievement associated with school location. We divided school location into three categories. The first is Riga, the capital city, where close to 31% of the students in the sample were from. The second is ''Urban'' which includes the cities with the number of inhabitants over 35,000 and the third is ''Rural'', consisting of towns and villages with the number of inhabitants below 35,000. About 38% and 31% of the sampled students were from the urban and rural areas, respectively.

Two individual-level variables used for our analysis included one representing the student's sex (1 if female and 0 if male) and the other representing the socio-economic status (SES) of the student's family background, which was constructed using information about the parents' occupational status and educational attainment, as well as the possession of educational and cultural resources at home. The school-level SES was derived by taking the mean of the values of the individual SES of all sampled students in each school to reflect the average SES intake of the students. For school physical and human resources, we used variables representing the headmaster's perception of the quality of school infrastructure and instruction-related material resources, teacher/student ratio at the school, the headmaster's perception of shortage of teachers, proportion of certified teachers, and proportion of teachers with ISCED 5A in pedagogy. For school policies and processes, we used variables representing school autonomy and teacher participation in professional development as reported by the headmaster, the school-average of indices of students' mathematics anxiety, attitudes towards school, disciplinary climate in math lessons, student/teacher relations at school, and students' report of teacher support in math lessons. It should be pointed out that many of the school variables were constructed using headmaster's reporting and subjective opinion, which may be biased, especially when the questions are about teacher assessment, teacher morale or commitment.

Our analytic strategy was determined on the basis of the research questions. In order to address the first research question, we examined the distribution of mathematical literacy scores of the three groups of students and tested the null hypothesis that the mean scores of the three groups were the same. A series of two-level hierarchical linear modeling (HLM) models were fitted to the data to explore the second and third research questions to account for the clustering of students within schools (Bryk & Raudenbush, 2002), similar to the approach used in the other articles in this volume. The first set of

models included two dummy variables representing a school located in the capital city Riga and rural areas (1 if yes and 0 if no). The category that was left out, ''urban,'' was thus used as the reference for comparison. The coefficients on the two dummy variables would be the difference in mathematical literacy scores between students in Riga and rural areas, respectively, compared to those in urban areas after adjusting for design effects. Blocks of variables, representing individual and school characteristics, were sequentially added to these models to detect the changes in the coefficients on the two dummy variables, representing the school location so as to explore the extent to which the original disparities are attributable to differences in these individual and school characteristics. To facilitate the interpretation of the intercept, the values of all the individual- and school-level variables were centred (Bryk & Raudenbush, 2002).

Results

Previous analyses of the PISA data concluded that in Latvia, and in several other countries, there are differences in the mean levels of achievement between urban and rural students with urban students having better performance (Geske, Grinfelds & Kangro, 2001; OECD, 2004; Geske & Kangro, 2004). Our detailed analysis of the Latvian PISA data confirmed this conclusion and revealed a more complicated picture. Figure 1 is a graphical display of the distribution of the mathematical literacy scores of 15-year-old students in Latvia in total, as well as by location, in comparison to all 15-year-old students in OECD countries participating in PISA 2003. As can be seen, the average score in Riga (497 points) was higher than that in other urban areas (490 points) and rural areas (460). In fact, the mean score of students in Riga was not only above the national mean (483 points) but also higher than that of all the students in OECD countries (489 points). Despite differences in mean scores, there was an overlap among large proportions of students attending schools in these three regions, as shown by the positions of the 5th, 25th, 50th, 75th and 95th percentiles of the mathematical literacy score distribution for students for each region. Figure 1 also shows that, while in Riga the number of students below and above the mean score was about evenly split, there were slightly more students performing below the average level in urban schools. In contrast, a

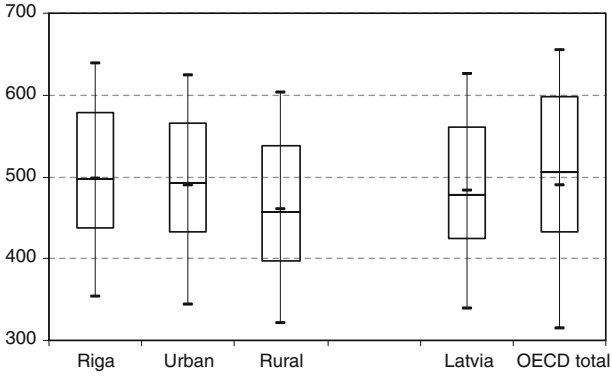

FIGURE 1. Regional disparities in mathematical literacy scores in Latvia.

TABLE 2. Summary of multilevel models to explain rural/urban gaps in mathematical literacy scores

	Null model		Adjusted for design effects		Adjusted for individual SES & student being female		Adjusted for mean SES		Adjusted for school resources		Adjusted for school processes	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Intercept	480.1	3.7	484.8	6.0	488.3	5.9	489.1	5.3	485.8	6.1	486.0	4.4
Riga			10.8	9.0	3.0	8.3	−14.0	7.3	−11.1	7.7	−8.4	6.9
Rural			−25.6	7.7	−18.4	7.0	−4.0	7.6	3.1	7.8	−1.3	6.2
Student-level variables												
Individual SES					20.4	1.7	19.4	1.7	19.5	1.7	19.3	1.7
Female student					−6.1	2.5	-6.1	2.6	−6.1	2.6	-6.3	2.5
School-level variables												
Mean SES							20.9	4.5	18.0	4.8	9.5	4.0
Teacher/student ratio									9.4	4.8	7.2	3.3
Shortage of teachers									4.9	3.1	5.2	2.7
Quality of material resources									2.8	3.4	2.2	2.6
Quality of educational resources									1.8	3.4	0.9	2.4
Proportion of certified teachers									−2.7	2.7	−1.0	2.5
Proportion of teachers with ISCED 5A in Pedagogy									5.3	2.7	3.4	2.6

TABLE 2. Summary of multilevel models to explain rural/urban gaps in mathematical literacy scores

	Null model		Adjusted for design effects		Adjusted for individual SES & student being female		Adjusted for mean SES		Adjusted for school resources		Adjusted for school processes	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
School autonomy											−1.1	2.4
Teacher participation											3.3	2.3
Mathematics anxiety											−14.1	2.8
Attitudes towards school											10.0	3.5
Disciplinary climate in maths lessons											7.5	3.2
Student-teacher relations at school											−7.3	4.7
Teacher support in maths lessons											−4.3	4.0
Variance decomposition												
Between-school	1775.6		1571.8		1282.1		1047.1		958.7		615.3	
Within-school	6059.2		6059.4		5649.3		5650.1		5650.2		5657.1	
Variance of SES slope					133.8		130.3		130.9		121.2	
Between-school as a % of total	22.7											
Reduction in between-school variance as %			11.5		27.8		41.0		46.0		65.3	
Reduction in within-school variance as %			0.0		6.8		6.8		6.8		6.6	

somewhat larger proportion of students had scores above the mean level in rural schools, though the mean score in rural schools was lower.

Table 2 presents a summary of results from multilevel modeling analysis. As can be seen, after taking into consideration the design effects, the mean score for Latvia was 480 points, slightly lower than the original number, resulting from a greater number of larger schools with lower levels of test scores. This issue is more prominent for urban areas, where the mean score after taking into account design effects was 485 points, about 5 points lower than the original estimate.

To what extent do students' individual and school characteristics account for the observed differences in mathematical literacy scores among students from different regions? The results presented in the rest of the columns in Table 2, also displayed in Figure 2, address this question. As can be seen, after taking into consideration differences among individual SES and gender, the advantage in terms of average scores that students from Riga had dropped by about 8 points while that of students from rural schools rose by 7 points. In separate analysis of the data, we learned that the ratios of female to male students were almost identical across the three regions, but the average levels of individual SES were substantially different, with the mean level of individual SES of students in Riga about one standard deviation above that of students in rural areas. Thus, we conclude that the above-noted narrowing in the gaps among the regions was entirely attributable to differences in students' family SES. In other words, if students across the three regions had the same level of family SES, the average mathematical literacy scores of students attending schools in Riga would be lower and that of students from rural areas would be higher.

The overall inter-regional disparities in mathematical literacy scores would become even smaller if schools from the three regions had the same level of school SES, the national average. In fact, students in Riga would be expected to have even lower average

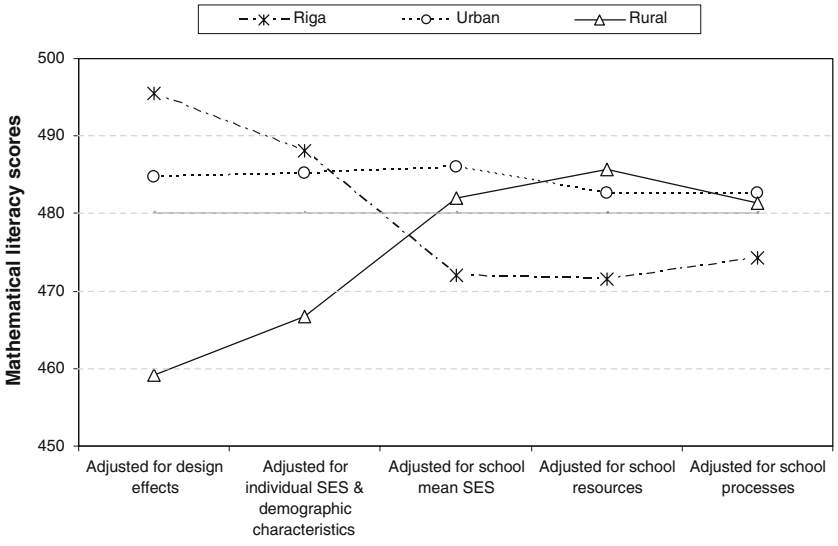

FIGURE 2. Explaining regional disparities in mathematical literacy scores.

score than their counterparts in both urban and rural schools, though such a difference from rural school students is not statistically significant. The pattern of inter-regional disparities remained almost the same after controlling for differences in material and human resources. However, the gaps would be further reduced after taking into consideration differences in a number of variables representing school processes, even though the reduction seemed relatively small. The coefficient on school SES was more than halved after including the resource and process variables, implying that a large part of the disparities in learning achievement associated with school SES are attributable to differences in the quality and amount of resources the school possesses, as well as how schools are managed on a day-to-day basis.

One might argue that schools of different student intake characteristics may be different in terms of the amount and quality of their resources, as well as school policies and processes, all of which are quite important for successful learning. To the extent that this claim reflects reality, then effects of school SES may be overstated and the actual effects of school resources and processes in explaining away the inter-regional disparities would be understated. To test this claim, we fitted models that excluded the mean SES. The changes in the coefficients on both the two dummy variables and the resource or process variables in these models were negligible. In addition, the changes in the coefficient on the resource variables were hardly noticeable after including the process variables, and vice versa. Thus, we conclude that the estimated effects as shown in the last column of Table 2 are relatively robust.

The bottom panel of Table 2 contains the results of estimating the within- and between-school variances, as well as the variance reductions, after taking into consideration the individual and school characteristics. The total variability in students' mathematical literacy scores in Latvia is smaller than that of OECD countries (OECD, 2004), implying that the Latvian school system has been relatively successful in containing the overall disparities among students. Further evidence to this point comes from the modest between-school variance in mathematical literacy scores in Latvia (22.7%), which is lower than the average in OECD countries (33.6%). The variables used in our models were quite limited in explaining the within-school variation in learning achievement. However, they explained almost two-thirds of the between-school variation. School SES alone accounted for about 13% of the differences in students' mathematical scores at the school level.

It is particularly worth noting that the variables representing school processes alone explained almost 20% of the between-school variation, similar to the combined effects of school SES and resources. In other words, differences in how schools are managed on a day-to-day basis are much more strongly associated with the disparities in learning achievement at the school level than differences in physical and human resources among schools in Latvia.

Conclusions and discussions

In this article, we examined the rural/urban disparities in learning achievement of secondary school students in Latvia and a number of individual and school characteristics

associated with such disparities. While confirming the advantage that students attending school in Riga have over the rest of the country and the particular disadvantage of rural students in terms of the average mathematical literacy scores, we found that there was an overlap across different regions for a large number of students. In other words, many students in Riga and urban schools had low levels of performance despite relatively high overall average scores. Similarly, a significant number of students in rural areas had a quite superior performance, even though many more of their peers in rural schools scored lower in comparison to other students in Latvia or OECD countries.

We learned that differences in students' family background accounted for a large part of these regional disparities in learning achievement. The average test scores of students in Riga and other urban areas were much higher than that of students from rural areas. At the same time, students in Riga and other urban areas on average tended to have parents with better education and occupations with higher prestige, and came from homes with more educational resources, all of which are conducive to academic excellence. It is striking that after taking into consideration such family background characteristics at the individual and school level, the regional disparities largely disappeared. In fact, if we predict students' test scores on the basis of their family background at the individual and schools levels, students from Riga scored lower relative to their overall high levels of family SES. Similarly, students from rural schools outperformed what was expected of them on the basis of their family background.

There are at least three ways to interpret the relationship between students' test scores and their family background. The first is the SES index, in our data simply reflecting the aspects of home environment that are conducive to academic work. For instance, better-educated parents are in a more advantageous position to provide concrete assistance and guidance regarding their children's schoolwork. Students can also benefit from having more education-related resources at home. The second may be the "peer effects" – impact of interactions with other students on one's learning. For instance, one student's attitude towards academic work and style of learning can be influenced by that of his or her fellow students. A school having students with similarly strong motivation for academic success is likely to create a milieu where positive learning is reinforced. The third and related interpretation is that differences in school SES levels reflect the differences in the amount and quality of resources allocated, the emphasis on academic excellence by the school, the school disciplinary climate, the commitment and morale of teachers, and teacher support to students, all of which are crucial to students' learning outcomes. In our data analysis, the effects of school resource and process variables changed little before and after controlling for school SES. On the contrary, the coefficient of school SES almost halved after including the resource and process variables, providing support to the third interpretation.

We concluded from our data analysis that while the SES of students' family background was an important factor in explaining the regional disparities, school resources and school processes also played a role in explaining the differences between schools. We learned that the school process variables explained as much between-school variation in test scores as school SES and resource variables combined. Considering that improving school processes can be less resource-intensive than upgrading both physical and human

resources, this finding highlights the existence of relatively less expensive alternatives to improve student learning.

Notes

1. Latvia has participated in almost all the major studies organized by the International Association for the Evaluation of Educational Achievement since 1990. These include the Reading Literacy Study in 1992, Study on Computers in Education in 1999, the Third International Mathematics and Science Study in 1995 and 1999, the Civic Education Study in 1999 and 2001, the Progress in International Reading Literacy Study in 2001, the Second Information Technology in Education Study in 2000, and the Trend in Mathematics and Science Study in 2003. In addition, Latvia has also participated in the tri-annual OECD-organized Programme for International Student Assessment since 2001 and 2003.
2. Although the Ministry of Education and Science officially does not rank the schools according to their performance, the public perception considers some schools better than others based on word-of-mouth from students and the parents of respective schools

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