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QUALITY OF SECONDARY EDUCATION IN RUSSIA: BETWEEN SOVIET LEGACY AND CHALLENGES OF GLOBAL COMPETITIVENESS

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Abstract: In this paper we examine determinants of the quality of secondary education for making informed policy decisions at the levels of student / family, school, country's education system institutions and macroeconomic indicators. The quality of education is estimated by the outcomes of the latest round of PISA from 2009 on mathematics and science skills of 15-year old students from 67 countries. After regression analysis for the pool of countries, we estimate the same determinants for Russia in order to reveal in what way the Russian secondary education system is different from other countries, with a special attention paid to possible explanation of a surprisingly different performance of Russian students on TIMSS and PISA tests. We conclude with the discussion of the limitations of analysis based on international tests and possible policy issues related to the factors of quality of secondary education in Russia.

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Content

Introduction

The Russian secondary education system has been in transition over the last decade. This process was delayed compared to the economic transition that happened in 1990s, partly due to relative stickiness of institutions to which school system belongs, but, more importantly, due to widespread belief in the Russian society in quality of the national educational system inherited from the Soviet Union. We have witnessed hot debates inside and outside Russia about the quality of public education and its adequacy for the new, market economy, when scientists and educators with international reputation backed either "status quo camp" or their reformist opponents. This separation is evident in discussion about higher education system (with administrative leaders of the Russian Academy of Sciences and Moscow State University representing the first group and their counterparts from highly influential Higher School of Economics and, to some extent, Ministry of Education and Science are among most outspoken players of the second), but it's much more subtle in case of secondary education. Some experts believe that the Soviet school system was one of the top in the world and led to significant achievements in basic natural science, space and atomic engineering. Others would say that the quality was sometimes illusionary, suffering from disparities between groups of disciplines (priority of natural sciences over social ones), urban and rural schools, and schools with general curriculum versus specialized ones. Both groups, however, agree that some changes are necessary nowadays, but since they refer to different root causes of the current quality problems (departure from the previous system versus inadequacy for the market economy and the goal of maintaining international competitiveness of Russia), proposed solutions are radically different. Performance of Russian students on international achievement tests is a frequent argument in this discussion.

What do we mean by the Soviet legacy in the Russian secondary education system? It can be summarized in the following features:

- Two tracks of secondary education at age 15-17: academically-oriented in high schools and professional in technical schools. Although students had to study the same core curriculum in both types of institutions, quality of teaching as well as students motivation were much lower in technical schools that prepared skilled workers.
- Academically-oriented rather than applied content of secondary education.

- Highly centralized curriculum which was set at country's level, with only minor variations in national republics, mostly related to national language and history. Minor variations in curriculum were also made for schools specialized in teaching of specific subjects (foreign language, physics, math, etc.): their students had to study the same list of subjects as their counterparts in other schools, but more hours were designated for disciplines of specialism.
- Assessment of student achievement was performed at school's level only based on unified subject exams guidelines, but not through unified external examination. These exams were intended to give a final assessment of studying at school, but students had to pass separate entry exams when applied to higher education institutions.

This system shaped allocation of resources, education of teachers, behavior of families, and other elements of education system. For instance, many parents tried to do their best to provide an opportunity for their child to continue studies at the tertiary education level. Since all prospective students were allowed to apply only in one university for just one full-time program each year, passing university's entry exams was crucial for their success. As a result, a market for private tutoring was well developed across the country.

Nowadays the secondary education system in Russia is different in many aspects from what we just described:

- Due to the demographic decline, decrease in demand for workers professions, and rise in demand for higher education, vast majority of students continue their study in high school at age 15-17, thus changing their attitude for more academically-oriented education at the secondary level.
- The national curriculum provides more opportunities for schools and for students to differentiate their educational programs. This move caused a lot of criticism from "status quo" camp, but also from representatives of virtually all professional groups among teachers that in general support the idea of choice, but fighting against cutting mandatory programs in their respective disciplines.
- Unified state exams have been introduced since the mid of 2000s, being mandatory now as the only vehicle of enrolling to higher education institutions[1].

[1] Minor exception is done for the winners of competitions in different subjects with a national status.

- Resource allocation decisions are made by regional and local authorities, thus creating significant differentiation in funding between regions and municipalities.

So far, these changes had very limited impact on the most conservative part of the education system – program design and content; learning tools and pedagogy; educating, hiring and paying teachers; schools autonomy and parents involvement in decision making. The question then is whether the Russian secondary education needs further transformation – both in its content and organization – in order to meet the challenges of global competitiveness, or allocating more money to the system will bring the quality level up without major organizational changes. Publication of international student achievement outcomes added fuel to this discussion, since national data on quality are scarce. What PISA and TIMSS results tell us about the type of reforms needed in Russia, and to what extent they are sufficient and relevant for such decisions, are the main questions of this paper.

First, we discuss the methodology of international tests and their relevance for judgments about the quality of secondary education. Second, we try to reveal major factors behind nations' performance on PISA. Finally, we discuss the relevance of these factors for Russia.

1. International competitiveness, student achievement, and quality of education

1.1. Human capital and student achievement

Human capital is considered to be one of the key factors of economic development and growth, albeit there are different estimations of relationship between them. From this perspective, many economists (J. Stiglitz and others), international organizations (World Bank in particular), private consultancies or think tanks (e.g. World Economic Forum with its Competitiveness Report), and national governments consider human capital as a key to establishing and maintaining international competitiveness of nations in the long run.

A long tradition based on Mincer (1970, 1974) equalized human capital with school attainment (years of schooling). But this approach ignores other factors: individual abilities, family environment, and quality of education. Still, years of schooling are used widely as a proxy for human capital, partly because of absence of data on education quality, comparable across different countries.

For many years researchers treated variables related to an individual, family or school as unobservable in international studies.

A different and more sophisticated approach to measuring human capital assumes that cognitive skills are good measures for human capital (Hanushek, Woessmann, 2011, p. 92), and can be estimated by tests. The reason for this belief is related to the fact established in neurosciences and psychology: development of cognitive skills by the age of 15 pre-determines much of skills development of an individual.

PISA versus TIMSS

Although international tests of student achievement date back to 1960s, two most important (by scope, comparability and number of countries participated) endeavors started recently: TIMSS in 1995 (IEA) and PISA in 2000 (OECD).

PISA and TIMSS represent two different types of skills, so their outcomes should be considered as complimentary unless there's a correlation in achievements on these tests. PISA estimates ability to apply knowledge, claimed to be crucial for a success in a new, knowledge-based economy. PISA consists of three parts: math, science, and reading.

TIMSS assesses student achievement relative to current curriculum in a country, but within broadly defined body of knowledge in a discipline. TIMSS includes questions on math and science only, less focused on knowledge application, and more on academic component of education.

Both tests are performed for students of the age of 15. This is the age when basic general skills are leant by the end of the secondary education (level 4 by the UNESCO classification). Besides, since measures of quality of vocational and higher education are not available, comparability between countries is only possible for this age, before students start to specialize. To make PISA and TIMSS outcomes comparable across countries, both are normed with a mean of 500 and a standard deviation of 100.

Although, the tests are different in many ways, their outcomes are highly correlated. According to (Hanushek, Woessmann, 2011, p. 105), correlation coefficient for outcomes in math is 0.87, and in science is 0.97 for the 2003 rounds.

One of the key limitations of both tests for educational and economic studies is their cross-sectional design, with no opportunity to compile a panel and track individual or school performance.

1.2. Student achievement and quality of education

Besides saying that human capital is estimated by cognitive skills, which can be assessed as student achievement on PISA / TIMSS test, some researchers and policy makers immediately imply that student achievement on PISA / TIMSS is an assessment of the quality of education. A fundamental problem with this approach is the fact that although it's important what an individual achieved by the age of 15, the quality of education (and, separately, human capital) depends on life-time learning, in particular on the quality of post-secondary education and the university sector.

1.3. International studies of student achievement

It's well known from existing literature that the quality of human capital, and the quality of education as its component, cannot be only explained by the level of economic development and the amount of resources spent on the secondary education. Chinese students constantly score high on PISA while students from some developed countries are worse than their counterparts from less prosperous societies. The gap in quality is significant even between countries with similar levels of GDP per capita and proportions of education expenditure in GDP (e.g. Germany and Finland).

Attempts to explain the variation in individual results on standard tests are related to three groups of factors:

- Student/family-specific (time spent on studies, number of siblings in a family, income per family member, etc.);
- School-specific (school type, autonomy in decision making, competition, teachers compensation scheme, etc.);
- Country-specific factors that we can divide further into institutional (governance, culture towards education, educational services delivery) and economic (educational expenditure as a share in GDP and overall level of economic development among others).

Most of the studies using PISA data are conducted on individual and school levels. A number of studies included cross-country comparisons, but none of them used the latest, most comprehensive round of PISA to directly assess the relative importance of institutional and economic factors.

There are two major lines of research, based on international tests outcomes:

- Why countries different in their student achievement results? (a subquestion: why they may be different on PISA and TIMSS), and
- What is the impact of student achievement on growth and other development indicators?

The methodology used in these studies is based on estimation of the educational production functions for different countries. Initially estimation was done at the macro (country) level only, then, with emergence of cross-country comparable TIMSS and PISA data, researchers added micro level information about students / families and schools.

Besides evident advantage of student performance comparison across countries, international comparative studies are preferable over studying cases of individual countries for several methodological reasons:

- Lack of within-country variation in institutional features, so institutional variation can be studied mostly on cross-country basis. More generally, estimation of the quality of education on the cross-country basis may reveal country-specific factors, so recommendations on development of the education sector can be more country-specific. In other words they become more relevant, especially if provided by international organizations that, in the absence of country-specific information, normally promote a relatively homogenous set of policy measures for different countries.
- When studying aggregated variables at the country level, we escape a selection problem. Otherwise, we have to control for possible reasons for selection bias, but still may suffer from possible unobserved characteristics (Hanushek, Woessmann, 2011, p. 94).
- Estimating institutional competition or spillover effect – comparing countries with different levels of an institutional variable (e.g. a proportion of private schools), we can capture effects of institutional competition and mutual impact of different institutions and rules (e.g. effect of competition from private schools).

A number of studies are based on PISA data that estimate the impact of different factors on student achievement. Ammermueller (2007) studied the reasons for the gap in performance of Finland and Germany on PISA outcomes. Since both countries are very close in the level of GDP per capita, the differences were analyzed mostly on individual and school levels, with a particular focus on student background (favorable, unfavorable) and school types. Woesmann (2011) concentrated on performance pay to teachers as one of the determinants of performance. He combined country-level performance-pay measures with PISA micro data to reveal that “scores in countries with performance-related pay is about one quarter standard deviation higher”.

Fuchs and Woβmann (2007) found that 25% of the variation in country performance can be attributed to the institutional factors, such as general level of school autonomy, budget formulation, and external exams. Dronkers and Avram (2008) studied more closely the impact of different school types on

performance and found that private schools did better than public ones (even when controlling for selectivity of students – one of the key differential between two types of school). Moreover, private independent schools outperformed private government-dependent ones. Falch and Fischer (2010) found that budget spending decentralization has a positive impact on performance on PISA tests. Ponzo (2011) found the positive effect of school competition, measured as a number of schools available in a given area.

Botezat and Seiberlich (2011) research is particularly relevant for our paper. The authors studied the difference in performance between the best scoring country on PISA tests (Finland) and 6 countries of Eastern Europe, all belonging to emerging market economies. They failed to find differences in characteristics of students that would explain any significant portion of the gap between countries. Rather they attributed the major portion of variation to efficiency of school systems (country-level factors, as we defined them) and found that the best students scored in Eastern Europe scored much closed to their Finish counterparts while the difference between poor-performing students is the most striking across countries.

1.4. Estimating student achievement in Russia

PISA and TIMSS data are explored by Russian researchers for a long time, but mostly in the area of educational studies. One of the very few economics-related papers published in English is (Amini, Commander, 2011) where authors run regression on student and school level indicators with Russia interaction terms for each indicator. They used pooled data from different rounds of PISA and TIMSS which requires a check for the appropriateness of pooling: it may reduce error variation, but data of different PISA and TIMSS rounds have to be comparable. Amini and Commander postulate that due to the problems with old curriculum, there is only a limited opportunity to use the TIMSS data, so their primary focus is on the PISA datasets. We believe, however, that existence of the "old curriculum" problem should be formally proved (see paragraph 5 of this paper), since Russia's performance on TIMSS is remarkably better than on PISA, and rejecting TIMSS data may lead to a significant bias in both research outcomes and policy recommendations.

2. Methodology of the study

2.1. Econometric approach

We use OLS estimation of educational production function on macro (country-level) and micro (student- and school-level) data with continuous

and instrumental variables, controlling for possible covariates and countries' fixed effects (unobserved country heterogeneity, like different attitudes and culture of education), represented by country dummies.

The educational production function used for this estimation can be presented in the following form:

$$H = I + S + C + CD + z,$$

where H is quality of human capital, represented by PISA scores; I – student / family level factors, S – school-related variables, C – country's economic indicators, CD – country dummies that reflect unobserved country-level effects (e.g. cultural values), and z – error term.

We estimate three cross-country models, containing:

(1) Student-, school-, and country-level indicators (without country dummies)

$$H = I + S + C + z,$$

(2) Student-, school-, and country-level indicators (with country dummies)

$$H = I + S + C + CD + z,$$

(3) Student- and school-level variables only

$$H = I + S + z.$$

When studying the case of Russia, we use a reduced form of the function with variables at student / family and school levels (Model 4):

$$H_R = I_R + S_R + z_R.$$

Therefore, the comparison of Russia with other countries is based on the regression estimation of the same set of variables as in Model (3) where we exclude the Russian data from the sample.

2.2. Variables

The quality of education is estimated by the outcomes of the latest round of PISA (The OECD Program for International Student Assessment) from 2009 (release of December 16, 2011) on reading, mathematics, and science skills of 15-year old students from 67 countries.

PISA contains student performance scores in three areas: reading, math, and science. We ran regressions with math and science scores only, in order to make outcomes of analysis comparable with TIMSS data (where only math and science knowledge is assessed). Our decision to omit reading scores out of the index is also supported by the discussion in the education studies literature about the differences in relative proficiency in reading among the stu-

dents of the same age depending on the type of language. PISA does not provide information on a single score of educational achievement for each student, estimating five plausible values for each subject instead. Regressions are run for all ten plausible values with a special add-in for Stata.

We relate the results of the PISA survey with the World Bank development and governance indicators, and inequality index compiled by the Economist Intelligence Unit. Variables of interest for us are GDP per capita in PPP, public expenditure on education, income Gini coefficient, and share of urban population on the economic side; duration of secondary education, secondary school enrollment, and quality of governance (government effectiveness index) on the institutional one.

The summary of independent and control variables is presented in Table 1. We use independent variables at three levels: student/family, school, and country. They are also classified as continuous or binary. All binary variables are created by us based on the PISA dataset.

Table 1. Independent and control variables

1. Continuous variables	
1.1. Student / family level	
Learning time (minutes per week) - Mathematics Learning time (minutes per week) - Science Index of economic, social and cultural status (WLE)	Home educational resources Wealth
1.2. School level	
Teacher student relations Funding Student fees Ratio of computers and school size Proportion of girls in the school Proportion of qualified teachers Total school enrolment Student-Teacher ratio	School responsibility: resource allocation Quality of the schools educational resources Student behavior Teacher participation Teacher shortage Teacher behavior
1.3. Country level	

GDP per capita School enrollment, secondary (% gross) Secondary education, duration (years) Public expenditure on education as % of GDP	Government effectiveness index (WB governance indicator) Urban population (% of total) Income Gini coefficient
2. Binary variables	
2.1. Student / family level	
Gender (male) Mother schooling of level 3 Mother working full time Father highest schooling of level 3 Father working full-time Student born in a country of test Mother born in a country of test Father born in a country of test Language at home is not test language Desk at home Room at home Textbooks at home More than 200 books Read nonfiction several times a month or more Strategy: Memorize often or always Strategy: Figure out often or almost always Strategy: Relate new often or almost always	Strategy: Check if understand often or almost always Strategy: Relate to real life often or almost always Enrichment lessons in math Enrichment lessons in science Remedial lessons in math Remedial lessons in science Out of school lessons in math Out of school lessons in science Teacher get along well: agree and strongly agree Strategy: Ask if understood (most or all lesson) Strategy: Mark work (most or all lessons) Use computer at home Expected to complete Level 5A or 6 Private tutoring (yes one to one private tutoring) Parents tertiary education (highest education level of parents - 5A or 6) Private school
2.2. School level	
School competition (2 or more schools around) Shortage of science teachers (to some extend and a lot) Shortage of math teachers (to some extent and a lot) Shortage of science equipment (to some	Responsibility for hiring teachers Responsibility for forming budget Responsibility for budget allocations Responsibility for budget allocations (School Body) Responsibility for student assessment (National)

extent and a lot) Shortage of instruction materials (to some extent and a lot) Shortage of library books (to some extent and a lot) Class size reduced Standard tests frequency (more than 3 times a year) Student assignment (monthly or more often) Student disruption at lessons (to some extent and a lot) Student-Teacher relation are good (to some extent and a lot) Staff resistance to change (to some extent and a lot) Admission by residence principle (always) Teachers peer review External observers	Responsibility for student assessment (Regional or Local) Responsibility for choosing textbook (Teacher) Responsibility for content (Teachers) Responsibility for content (National) Influence on staffing (National or Regional) Parents influence budget Parents influence content Principal inform teachers about professional development opportunities Principal gender (male) Academic selectivity (at least one factor)
2.3. Country level	
67 dummies for individual countries (3 PISA countries are excluded from our sample due to absence of country-level economic and institutional data). See the full list of countries in Appendix 1.	

3. Results: Cross-country study

The outcomes of cross-country regression are presented in Table 2. A number of variables are statistically significant as determinants of student achievement (which we use as a proxy for quality of education). Among them are indicators related to education, country of origin, and employment status of parents; family resources available for education (books, individual desk for a student, computer); some learning strategies of a student; private tutoring and additional lessons; school autonomy, competition and ownership of school. Similar determinants of student achievement were found by other authors.

We ran this regression with and without country dummies (Models 1 and 2 respectively). Adding country dummies that are supposed to capture

country-level unobservable effects does not the list of significant variables, but improves adjusted R-squared by 1.84 percentage points only to 45.2%. It means that the rest of the variation in student achievement scores may be attributed to unobservable effects at the student or family levels.

Standard errors are reported in parentheses. No country dummies are shown.

Table 2. Regressions with student-, school- and country-level variables

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Learning time (minutes per week) - Mathematics	-0.003*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.004*** (0.001)
Home educational resources	-0.001 (0.001)	-0.001 (0.001)	-0.002*** (0.001)	0.001 (0.002)
Wealth	0.011*** (0.001)	0.011*** (0.001)	0.012*** (0.001)	-0.001 (0.002)
Highest parental education in years	-0.118*** (0.029)	-0.086** (0.032)	0.068** (0.028)	0.198 (0.207)
Teacher student relations	-0.003*** (0.001)	-0.002*** (0.001)	-0.003*** (0.001)	0.006*** (0.002)
Funding student fees	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.267 (0.678)
Ratio of computers and school size	0.000 (0.000)	0.000 (0.000)	-0.001*** (0.000)	0.000 (0.002)
Proportion of girls in the school	-0.002 (0.001)	-0.001 (0.001)	-0.003** (0.001)	0.001 (0.002)
Proportion of qualified teachers	-0.001** (0.000)	-0.001* (0.000)	-0.001** (0.000)	-0.001 (0.002)
Total school enrolment	0.000 (0.000)	0.000 (0.000)	0.000 0(.000)	0.000 (0.000)
Student-Teacher ratio	0.001*** (0.000)	0.001** (0.000)	0.001 (0.000)	0.000 (0.003)
School responsibility: curriculum and assessment	2.204** (1.064)	0.144 (1.100)	4.055*** (0.954)	-5.005 (5.023)
School responsibility: resource allocation	-2.630** (1.072)	-0.984 (1.039)	0.002 (0.002)	-7.358* (4.405)

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Quality of the schools educational resources	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.001)	-0.010* (0.005)
Student behavior	0.000 (0.002)	0.000 (0.002)	-0.001 (0.002)	5.389 (3.635)
Teacher participation	0.429 (0.980)	0.842 (1.022)	-4.048*** (0.954)	2.508 (5.663)
Teacher shortage	0.000 (0.002)	0.000 (0.001)	-0.002 (0.001)	0.009*** (0.003)
Teacher behavior	0.000 (0.002)	0.000 (0.002)	0.000 (0.002)	-9.000 (5.774)
Gender (male)	11.736* (5.643)	11.531* (5.587)	11.579* (5.832)	7.829** (3.176)
Parents tertiary education	19.560*** (1.111)	18.985*** (1.112)	14.471*** (1.103)	20.039*** (4.626)
Mother schooling of level 3	15.455*** (1.250)	17.623*** (1.116)	22.733*** (1.151)	19.551*** (4.328)
Mother working full time	2.072** (0.830)	2.095*** (0.756)	4.355*** (0.751)	10.200** (4.673)
Father highest schooling of level 3	12.685*** (1.007)	14.722*** (0.990)	16.639*** (0.795)	7.356** (3.661)
Father working full-time	8.897*** (0.935)	8.704*** (0.961)	10.618*** (0.874)	4.103 (3.938)
Student born in a country of test	5.458** (2.357)	6.778*** (2.282)	9.611*** (1.775)	12.213 (9.105)
Mother born in a country of test	5.432*** (1.855)	5.760*** (1.844)	-4.017** (1.685)	6.242 (4.263)
Father born in a country of test	8.425*** (2.018)	8.781*** (2.014)	1.872 (1.773)	-0.585 (3.491)
Language at home is not test language	-7.424*** (1.863)	-1.837 (2.432)	-9.481*** (2.778)	-26.116** (11.025)
Desk at home	14.638*** (1.303)	11.413*** (1.120)	17.136*** (1.388)	17.296*** (6.179)
Room at home	3.786*** (0.841)	4.612*** (0.901)	11.849*** (1.030)	-4.063 (4.015)
Textbooks at home	15.138*** (1.474)	14.432*** (1.085)	10.978*** (1.414)	26.631*** (4.861)

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Use computer at home	5.723*** (1.756)	0.001 (1.319)	21.981*** (2.537)	-5.461* (2.749)
More than 200 books	37.013*** (1.261)	36.250*** (1.178)	45.116*** (1.441)	27.319*** (3.858)
Read nonfiction several times a month or more	1.759 (1.836)	2.648 (2.156)	-1.702 (1.814)	8.142** (3.128)
Strategy: Memorize often or always	-9.478*** (0.921)	-8.612*** (0.772)	-8.410*** (0.852)	-7.242** (3.373)
Strategy: Figure out often or almost always	11.123*** (1.406)	11.629*** (0.950)	9.951*** (1.246)	13.305*** (2.707)
Strategy: Relate new often or almost always	10.631*** (0.834)	10.672*** (0.901)	12.177*** (0.923)	0.465 (2.597)
Strategy: Check if understand often or almost always	14.435*** (0.999)	14.241*** (1.162)	14.052*** (0.903)	12.418*** (2.595)
Strategy: Relate to real life often or almost always	-4.193*** (0.750)	-3.786*** (0.761)	-8.890*** (0.860)	0.513 (2.436)
Enrichment lessons in math	-9.098*** (1.948)	-8.394*** (1.985)	-14.244*** (1.492)	-4.985 (3.157)
Enrichment lessons in science	-12.470*** (1.608)	-9.805*** (1.684)	-15.736*** (1.884)	-9.607** (4.238)
Remedial lessons in math	-10.878*** (2.379)	-12.323*** (2.256)	-11.590*** (2.016)	-14.801*** (2.633)
Remedial lessons in science	-12.149*** (1.568)	-10.487*** (1.285)	-12.650*** (1.850)	-10.373*** (3.152)
Out of school lessons in math	8.601*** (1.030)	6.969*** (1.086)	8.200*** (1.298)	24.117*** (4.059)
Out of school lessons in science	3.880*** (0.959)	3.583*** (0.985)	1.176 (0.912)	24.167*** (3.575)
Teacher get along well: agree and strongly agree	16.299*** (1.154)	17.525*** (1.219)	16.584*** (1.274)	13.093*** (4.419)
Strategy: Ask if understood (most or all lesson)	0.823 (2.096)	1.547 (1.821)	-2.143 (1.806)	-2.708 (3.813)
Strategy: Mark work (most or all lessons)	7.830*** (1.308)	6.766*** (1.286)	4.297*** (1.281)	23.089*** (4.763)
Expected to complete Level 5A or 6	42.756*** (5.809)	41.959*** (2.049)	42.772*** (6.502)	-

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Private tutoring (yes one to one private tutoring)	-23.398*** (1.217)	-23.433*** (1.604)	-25.208*** (1.688)	-
Private school	-0.988 (2.637)	1.823 (3.696)	-5.979** (2.924)	59.098 (65.881)
School competition (2 or more schools around)	5.828*** (1.708)	6.089*** (1.722)	6.876*** (1.661)	3.673 (7.473)
Shortage of science teachers (to some extend and a lot)	2.652 (3.004)	1.039 (2.663)	1.686 (3.068)	0.040 (8.027)
Shortage of math teachers (to some extent and a lot)	-3.743 (2.995)	-6.349** (2.897)	-2.267 (2.958)	-9.771* (5.727)
Shortage of science equipment (to some extent and a lot)	-5.999*** (1.954)	-6.269*** (1.935)	-14.089*** (1.897)	3.009 (6.932)
Shortage of instruction materials (to some extent and a lot)	-4.482** (1.983)	-3.547* (2.063)	-6.392** (2.483)	-7.893 (6.244)
Shortage of library books (to some extent and a lot)	-5.680** (2.310)	-5.422** (2.238)	-12.174*** (2.348)	-4.710 (6.117)
Class size reduced	-9.907*** (2.413)	-6.186** (2.535)	2.429 (2.325)	17.996 (17.246)
Standard tests frequency (more than 3 times a year)	-7.606*** (1.807)	-5.159*** (1.812)	-11.310*** (1.915)	-14.092** (6.045)
Student assignment (monthly or more often)	-5.577 (1.838)	0.187 (1.659)	-2.424 (1.717)	0.687 (5.084)
Student disruption at lessons (to some extent and a lot)	-4.943* (2.876)	-9.110*** (2.793)	-4.334* (2.451)	-7.456 (11.102)
Staff resistance to change (to some extent and a lot)	1.372 (1.636)	-0.270 (1.573)	1.533 (1.700)	-5.061 (7.588)
Teachers peer review	5.566*** (1.900)	4.465** (2.106)	-6.568*** (1.684)	-19.224 (16.737)
External observers	-8.955*** (1.619)	-5.407*** (1.630)	-9.534*** (1.787)	5.951 (5.541)
Responsibility for hiring teachers	3.727 (2.332)	3.066 (2.956)	15.590*** (2.497)	-60.565 (38.505)
Responsibility for forming budget	-3.130 (2.154)	-1.436 (2.158)	-6.409*** (2.316)	4.070 (7.633)
Responsibility for budget allocations	1.536 (2.490)	1.249 (2.359)	16.226*** (2.409)	13.931 (9.577)

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Responsibility for budget allocations (School Body)	1.711 (1.792)	0.732 (1.725)	9.158*** (2.020)	-1.721 (7.874)
Responsibility for student assessment (National)	2.330 (2.302)	4.457* (2.482)	-2.098 (2.395)	6.332 (7.919)
Responsibility for student assessment (Regional or Local)	1.200 (2.378)	1.778 (2.433)	4.133* (2.257)	-11.443 (7.360)
Responsibility for choosing textbook (Teacher)	1.094 (2.355)	0.500 (2.509)	-2.492 (2.635)	6.459 (10.976)
Responsibility for content (Teachers)	-4.311 (2.327)	-1.190 (2.430)	2.089 (2.478)	3.520 (8.655)
Responsibility for content (National)	3.751** (1.805)	0.449 (2.448)	-0.377 (2.350)	-11.145* (6.608)
Influence on staffing (National or Regional)	-4.304** (1.877)	-2.173 (1.873)	2.093 (2.036)	-8.153 (6.411)
Parents influence budget	1.030 (2.375)	0.040 (2.396)	-8.905*** (2.077)	-3.277 (6.943)
Parents influence content	5.393** (2.334)	0.874 (2.326)	2.267 (2.538)	2.809 (5.528)
Principal inform teachers about professional development opportunities	-1.557 (2.973)	2.256 (3.144)	-8.926** (3.259)	21.284 (21.758)
Principal gender (male)	-0.728 (2.016)	0.575 (1.953)	7.001*** (1.943)	6.629 (6.814)
Academic selectivity (at least one factor)	9.165*** (1.755)	8.107*** (1.928)	7.668*** (1.576)	7.123 (4.599)
GDP per capita	0.001*** (0.000)	-0.001*** (0.000)		
School enrollment, secondary (% gross)	-0.344*** (0.098)	-1.240*** (0.196)		
Secondary education, duration (years)	7.179*** (1.216)	-5.704*** (1.725)		
Public expenditure on education as % of GDP	-0.633 (0.371)	-1.184*** (0.219)		
Government effectiveness index	26.498*** (3.925)	62.972*** (8.004)		

	Model 1 Student-, school-, and country-level variables	Model 2 Student-, school-, and country-level variables	Model 3 Student- and school-level variables	Model 4 Student- and school-level variables
	No country dummies	With country dummies	No country dummies	Russia only
Urban population (% of total)	0.280*** (0.065)	0.778*** (0.176)		
Income Gini coefficient	-0.016*** (0.001)	-0.046*** (0.003)		
_cons	244.411*** (13.904)	333.886*** (17.495)	345.764*** (6.725)	370.512*** (39.887)
Observations:	412,794	412794	478146	5308
Average R-Squared:	.433	.452	.419	.278

Number of observations is less in the model with country-level economic and institutional variables (412,794) than in the Model 3, containing student- and school-level variables only (478,146) since some data on some countries were not available from the World Bank or Economist Intelligence Unit. Data from other possible sources were not used since they are not always comparable with those of the WB or EIU.

* Variable is significant at 90% level

** Variable is significant at 95% level

*** Variable is significant at 99% level

We can note from Table 2 that quite a few variables are statistically significant in all model specifications in cross-country regressions (Models 1-3). We can group them as follows:

- *Family wealth and available resources* (Wealth, Desk at home, Room at home, Textbooks at home, Use computer at home, More than 200 books). The last variable is a typical predictor of student achievement revealed in a number of studies. These factors are also related to an employment status of parents – having mother or father working full-time increases the chances of getting a higher score. We expect that full-time employment leads to greater availability of resources in family, but also reflects a higher social status of a family that may have an impact on motivation to learn as well as opportunity of students to get help and support in their studies within their families.

- *Country of origin and home language* (Student born in a country of test, Mother born in a country of test, Father born in a country of test, Language at home is not a test language). This group of factors reflects the difficulties of adaptation in a non-native environment (being born in a country of test or having parents born there increases student achievement score while speaking at home at a different language than at school substantially decreases the score).
- *Parental education* (Highest parental education in years, Parents having tertiary education, Mother and Father highest level of schooling is of level 3 or above). The sign of the first variable in this list is positive, as we predict, in Model 3, but surprisingly negative, albeit rather small, in Models 1 and 2. Other indicators of parental education have a predicted positive sign.
- *Learning strategies*. These variables have different signs, some of them unexpected by a researcher. As we could suggest before estimation, strategies of figuring out new information, relating it to already obtained knowledge, and checking your understanding all statistically significant and have a positive and substantial impact on student achievement score. We may assume that trying to memorize new information is something opposite to them and, therefore, has a negative impact on scores. But spending more time on learning (Learning time – Math) has almost no effect on scores (in fact, the effect is even slightly negative) – the fact that might be associated with zero marginal productivity of learning. More of surprise is statistically significant negative impact of a strategy of relating new knowledge to real life: since PISA is exactly about ability to apply knowledge to real life, this outcome demonstrates something opposite. Still, the effect is robust to changes in model specifications.
- *Additional lessons*, both inside and outside a school, have a statistically significant impact on the PISA scores of students. Their interpretation is quite interesting, although not totally surprising. Both remedial and enrichment lessons are negatively related to student achievement, while taking lessons out of school is predictably positive in its impact on scores. It seems that not only remedial, but also enrichment lessons are mostly taken by low performers to improve their knowledge and skills. They are, however, are outperformed by their classmates who live happily without enrichment in math or science. Private tutoring has a substantial negative relation to the PISA scores, being, as it seems, a private substitution for remedial classes for underperformers.

- *Availability of resources to a school*. Shortage of equipment, materials or library books is negatively related to student achievement, but, to a more surprise, shortage of teachers does not seem to be a major determinant of the scores. It is statistically significant only in one model specification and only for math teachers. Moreover, higher proportion of qualified teachers has a reverse relationship with student scores, although the size of the coefficient is very small. We can confirm these results by looking at the student-teacher ratio, which has small, but positive coefficient. Overall, it looks like for the countries in the PISA sample, shortage of teachers is not acute.
- *School autonomy and management.* Most of the variables that reflect autonomy of a school are not statistically significant. School responsibility for curriculum and assessment is significant in two out of three models with a positive coefficient. Responsibility for resource allocation has a negative sign, but is significant only in Model 1. We believe that it may be captured by country dummies in Model 2, since this type of autonomy typically reflects institutional arrangements in the whole secondary education system. Same is true for responsibility for content at national level, national or regional influencing on staff and parents influence on content, all three are also significant only in the first model.
- *External evaluation of teaching.* Both presence of teachers peer review within a school and external observers has significant impact on student achievement. The nature of these relationships is more of a puzzle. Having external observers has a negative impact on scores in all three models, while peer review is predictably positive in Models 1 and 2, not unexpectedly negative in Model 3 with student- and school-level variables.
- *Classroom environment.* Getting along well with teachers and student disruption at lessons are significant and have predicted signs (positive and negative, respectively). Having standard test more frequently than 3 times a year leads to a decrease in student achievement in all models – an observation that we leave to educational specialists to explain. Phenomenon of lower scores in schools with reduced class sizes may be interpreted as an estimation of achievement of underperformers if class sizes are reduced to accommodate their needs. Finally, academic selectivity in student admission is related positively with the PISA scores.
- *Competition.* Having 2 or more schools around leads to better results on student achievement, with coefficient statistically significant in all three models.

- *Country economic and institutional variables* are all significant, with exception of public expenditure on education in Model 1. Their signs may vary depending on adding country dummies in the model. So, GDP per capita is significant, but its coefficient is around zero. School enrollment is related negatively to the scores, less elitist education leads to lower scores as we can suggest. Duration of secondary education has a positive impact in Model 1 with no country dummies, while a share of urban population is positive in both models. Most importantly, as we expected to find, greater inequality brings the scores down (although the impact is rather modest), government effectiveness is the factor with the greatest impact on PISA scores in this group and one of the greatest among all variables.

4. Results: Russia

4.1. PISA outcomes

We can compare the determinants of the quality of education in Russia with other countries by running regression on student- and school-level variables only (Models 1 and 2 in Table 2). These results suggest that the quality of education in Russia may be impacted by the level of income (GDP per capita) and the inequality of its distribution in society (Gini coefficient), public resources available for education (public expenditure on education) and capabilities of government to use them effectively (government effectiveness), share of urban population, and institutional characteristics of the secondary education system (duration of education and enrollment level). While the last three indicators can be considered as given for a certain time period, others are determined by policy decisions. We believe that using education as a social lift – a significant achievement of the Soviet era system – is weakening by greater inequality in modern Russia. This must be one of the policy concerns in reforming secondary education in the country.

Comparing results of cross-country regression on the level of a student / family and a school with regression on Russian data (Model 3 and 4 respectively), we focus our attention on variables that:

- not significant in Russia, but statistically significant in other countries;
- significant in Russia, but not in other countries;
- have a different sign in Russia than in other countries.

The first group consists of some indicators where we expect the difference. For instance, Russia has fewer children of foreign migrants learning at

school than many countries. As a result, foreign origin of parents is not significant in Russia, although it is significant in a regression of the pooled data from other countries. Language spoken at home still matters for student achievement at school (if it is the same as a language of the test). But the most striking news here is that only few school-related variables are significant for explaining variation in student achievement. Exceptions here are teacher shortage (and shortage of math teachers in particular), frequency of standard test and strategy of teachers to mark students work (i.e. provide feedback).

In the pooled data of other countries, as many as 15 school-level variables are significant. We can easily explain why being a private school in Russia is not significant for explanation of student performance: private schools are relatively rare in Russia, with no obvious advantage in quality over the top performing public schools. Non-significance of other school-related variables, describing autonomy, competition, teachers' strategy, and school management has to be investigated further.

Variables significant in Russia, but not in the pooled data of other countries, include school responsibility for resource allocation, teacher shortage, reading nonfiction literature, and having national authorities responsible for content. Providing more autonomy by delegating resource allocation decisions at school level is very important in our discussion of Soviet legacy. Greater autonomy is strongly supported by those demanding more radical departure from the centralized Soviet-era school system. Still, we are not able to support a claim for greater efficiency of decentralization of resource allocation by our analysis, if efficiency is measured by the PISA test scores.

One of the two variables which has a different sign is Russia is using computer at home by a student. While in pooled data it has expected positive sign, in Russia it is negative. A possible explanation may be related to using computer for social networking and other activities by Russian students; while in some countries (developing ones) having computer indicates prosperity of a family. Besides, schoolchildren in countries, where computer at home is not considered as a luxury, use it more for learning purposes. The other variable is teacher-student relation – it is in Russia, where its sign is positive as we expect.

Overall, we can conclude by noting that fewer factors are statistically significant in explaining variation in student achievement in Russia, compared to the pooled data of the other countries. While personal learning strategies and additional lessons are as important as in the other countries on average, we are able to find far less determinants of student achievement at school level or related to country of origin of family members. Would these deviations of Russia

from the pool be able to explain the poor performance on PISA? We would rather speculate that government effectiveness is far more important in this respect. Still, we have to be sure that it is the PISA ranking that reflects the quality of secondary education in Russia, not TIMSS. Otherwise, the story of assessing the national education system adequacy from an international competitiveness perspective cannot be complete with looking at PISA only.

4.2. Is the national curriculum obsolete? Validity of TIMSS outcomes

Validity of our conclusions based on PISA data (Russia was #27 in the PISA 2009 exercise) should be checked for TIMSS data (where Russia came with the third highest score in the latest 2007 exercise). As we noted, a clear deviation in performance on PISA and TIMSS might be explained by the old curriculum in Russian secondary school since TIMSS adjusts the list of its questions to a national curriculum. This was the argument that Armini and Commander used in their study, explaining their reference to PISA data instead of TIMSS. We can check the hypothesis of significant deviation in curriculum that led to higher scores on TIMSS by looking at the difference between questions used in the Russian test and tests in other countries. We limit our consideration here only by countries which we expect to follow "modern" curricula, as opposite to the obsolete one in Russia (in Armini and Commander's view). The list of such countries includes Australia, England, Japan, Israel, South Korea, USA, Switzerland, Taiwan, and Massachusetts as a U.S. state.

The comparison results provided in Table 3 reveal a significant difference in the TIMSS questions on math used in Russia (on average, 19% different questions were used if compare pairwise with each of the countries in our sample). We should note, however, that differences in the math curricula in Israel (15.6%), Sweden (15%) and Japan (14.8%) are also high, and it seems that Russia is also playing in the same league. Differences in the science curricula (Table 4) are greater across countries than in math. While questions used for testing Russian students are different from other countries in the sample by 40.5%, Japan and Massachusetts have greater deviations. Both have up-to-date, "modern" curricula; Massachusetts is considered as a leader in math and science education in the U.S.

Why questions in the Russian TIMSS test are different? Does the scope of the Russian curriculum too narrow compared to some advanced economies? In other words, were Russian students asked questions that did not appear on tests in other countries (unique curriculum items in Russia), or, on the contrary, some questions typically asked in other countries were omitted (absence of certain curriculum items in Russia)? We calculated the share of spe-

cific questions asked in the Russian test, compared pairwise with other countries. In math (Table 5) the share varies from 13.9 to 45.8%, in science (Table 6) – from 9.9 to 64%. Still, with only two exceptions (but notable ones – Japan and Massachusetts in science), Russian curriculum lacks some questions, typical for countries with advanced economies. It is narrower in scope than curricula in these countries.

Table 3. Differences in Math Curricula in TIMSS assessment

	AUS	ENG	JAP	ISR	KOR	USA	SWE	TAI	MASS	RUS
AUS		4.2	14.0	13.6	3.7	3.3	13.6	0.0	0.0	15.9
ENG			13.6	15.0	5.1	6.5	13.1	4.2	4.2	20.1
JAP				18.2	11.2	15.4	18.2	14.0	14.0	20.6
ISR					14.5	15.0	21.5	13.6	13.6	20.1
KOR						6.1	13.6	3.7	3.7	16.8
USA							13.1	3.3	3.3	18.2
SWE								13.6	13.6	27.6
TAI									0.0	15.9
MASS										15.9
Average difference in math curricula with other members of the group	6.5	8.2	14.8	15.6	7.7	8.2	15.0	6.5	6.5	19.0

Table 4. Differences in Science Curricula in TIMSS assessment

	AUS	ENG	JAP	ISR	KOR	USA	SWE	TAI	MASS	RUS
AUS		16.2	49.5	13.8	14.8	11.0	11.0	12.9	40.5	38.1
ENG	16.2		42.9	22.4	25.2	18.6	19.5	19.5	43.3	40.0
JAP	49.5	42.9		49.0	45.2	45.2	49.0	47.1	45.2	47.6
ISR	13.8	22.4	49.0		24.8	18.1	13.3	16.2	44.8	36.7
KOR	14.8	25.2	45.2	24.8		17.1	21.0	21.0	39.0	39.5
USA	11.0	18.6	45.2	18.1	17.1		15.2	14.3	40.0	37.6
SWE	11.0	19.5	49.0	13.3	21.0	15.2		17.1	44.8	44.3
TAI	12.9	19.5	47.1	16.2	21.0	14.3	17.1		43.8	33.8
MASS	40.5	43.3	45.2	44.8	39.0	40.0	44.8	43.8		47.1
	21.2	26.0	46.7	25.3	26.0	22.4	23.9	24.0	42.7	40.5

Table 5. Specific Questions in the Russian Math Test (TIMSS)

	AUS	ENG	JAP	ISR	KOR	USA	SWE
Difference in tests, % to all curriculum questions	15.9	20.1	20.6	20.1	16.8	18.2	27.6
Share of specific questions in the Russian test, %	0.0	20.9	45.5	44.2	13.9	15.4	45.8

Table 6. Specific Questions in the Russian Science Test (TIMSS)

	AUS	ENG	JAP	ISR	KOR	USA	SWE	TAI	MASS
Difference in tests, % to all curriculum questions	38.1	40.0	47.6	36.7	39.5	37.6	44.3	33.8	47.1
Share of specific questions in the Russian test, %	11.3	23.8	64.0	16.9	25.3	15.2	20.4	9.9	59.6

We can conclude that although the Russian curriculum (or, more accurately, scope of the relevant TIMSS questions) is quite different from a sample of advanced economies, the differences are not significant enough to explain the better country's performance on TIMSS by the "old curriculum" factor only. It seems that the roots of the better performance are in academic orientation of the Russian secondary education. It's a different and more complicated question if this orientation, inherited from the Soviet era, allows maintaining international competitiveness of the secondary school students. Having narrower scope of curricula in math and science is not bad per se, since it may mean teaching fewer issues but at a greater depth. This would perfectly explain better performance on TIMSS than on the application-oriented and, therefore, broader in scope, PISA test.

5. Limitations of the study

Like other cross-country studies based on international student achievement tests, our research has a number of limitations:

(a) Omitted variables /Culture bias at country level refers to unobserved heterogeneity between countries. (Adams, Berezner, Jakubowski, 2010) noted that this may not be a significant problem since test results are consistent with results on items selected by countries' representatives as specific for their na-

tions. Still, we use country dummies to capture possible cultural and institutional differences. A more important bias takes place at individual / family level, with student ability as the most important omitted variable. This bias does not represent something unique for Russia; although the proportion of explained variation in scores (27%) indicate that individual abilities may contribute to student achievement to a greater extent than other countries of the sample.

(b) Curriculum bias. Since TIMSS is adjusted to the existing curricula in different countries, some researchers suggest that PISA offers more objective measurement of student achievement due to using the same test across all countries, while TIMSS can lead to overestimation of achievement in the countries with evident problems with their school curriculum. (Amini, Commander, 2011) express this doubt regarding Russia. As we found out, the scope of the Russian math curriculum may contribute to the explanation of the country's high position on TIMSS, but the scope of the science curriculum it does not deviate significantly from the other countries. Moreover, the differences in this curriculum between other countries are much more profound.

(c) Endogeneity arises from the fact that most inputs in the educational production function are not exogenous (Hanushek, 2010).

(d) Sample selection bias. Whether it does exit or not is a matter of continuous discussion, when some authors argue that the bias is not only in place, but quite significant (Rotberg, 1995; Prais, 2003), others believe that it is negligible (Baker, 1997; Adams, 2003).

(e) Cross-sectional structure. Prior inputs are unobserved, so we are not able to trace students or schools and re-confirm that the factors we revealed as significant in cross-sectional regressions are really the determinants of the quality of education over time.

Conclusion

Our analysis reveals determinants of student achievement, as measured by PISA, in a pool of 67 countries. We also indicate that Russia is different in many aspects from this pool of countries, most notably by number of statistically significant factors at school level. Still, we suggest that it is low government effectiveness that contributes most substantially to a poor performance on PISA. We also argue that the true quality of secondary education in Russia requires assessment based on both PISA and TIMSS data. TIMSS outcomes cannot be ignored based on the argument of this test adjustment to the Russian "obsolete" national curriculum. More careful analysis requires a detailed comparison of the curriculum with other nations not only in breadth, but also in depth. Based on this analysis we will be able to make policy decisions on changes in the curriculum. Besides the curriculum, another legacy of the Soviet era is centralization of the education system. So far, we are not able to find reliable confirmation that decentralization of resource allocation has a positive impact on school performance measured by PISA outcomes. At the same time, a remarkable lack of statistically significant school-level variables argues for unused opportunities for decentralization.

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Appendix 1
Distribution of observations by countries

Country Code	Frequency	Percent
ALB	4,596	0.89
ARE	10,867	2.11
ARG	4,774	0.93
AUS	14,251	2.76
AUT	6,590	1.28
AZE	4,691	0.91
BEL	8,501	1.65
BGR	4,507	0.87
BRA	20,127	3.90
CAN	23,207	4.50
CHE	11,812	2.29
CHL	5,669	1.10
COL	7,921	1.54
CRI	4,578	0.89
CZE	6,064	1.18
DEU	4,979	0.97
DNK	5,924	1.15
ESP	25,887	5.02
EST	4,727	0.92
FIN	5,810	1.13
FRA	4,298	0.83
GBR	12,179	2.36
GEO	4,646	0.90
GRC	4,969	0.96
HKG	4,837	0.94
HRV	4,994	0.97
HUN	4,605	0.89
IDN	5,136	1.00
IRL	3,937	0.76
ISL	3,646	0.71
ISR	5,761	1.12
ITA	30,905	5.99
JOR	6,486	1.26
JPN	6,088	1.18
KAZ	5,412	1.05

Country Code	Frequency	Percent
KGZ	4,986	0.97
KOR	4,989	0.97
LIE	329	0.06
LTU	4,528	0.88
LUX	4,622	0.90
LVA	4,502	0.87
MAC	5,952	1.15
MDA	5,194	1.01
MEX	38,250	7.41
MLT	3,453	0.67
MNE	4,825	0.94
MUS	4,654	0.90
MYS	4,999	0.97
NLD	4,760	0.92
NOR	4,660	0.90
NZL	4,643	0.90
PAN	3,969	0.77
PER	5,985	1.16
POL	4,917	0.95
PRT	6,298	1.22
QAT	9,078	1.76
QCN	5,115	0.99
QHP	1,616	0.31
QTN	3,210	0.62
QVE	2,901	0.56
ROU	4,776	0.93
RUS	5,308	1.03
SGP	5,283	1.02
SRB	5,523	1.07
SVK	4,555	0.88
SVN	6,155	1.19
SWE	4,567	0.89
TAP	5,831	1.13
THA	6,225	1.21
TTO	4,778	0.93
TUN	4,955	0.96
TUR	4,996	0.97
URY	5,957	1.15
USA	5,233	1.01
Total	**515,958**	**100.00**

Опубликованные научные доклады

№ 1 (R)–2005	А. В. Бухвалов Д. Л. Волков	Фундаментальная ценность собственного капитала: использование в управлении компанией
№ 2 (R)–2005	В. М. Полтерович О. Ю. Старков	Создание массовой ипотеки в России: проблема трансплантации
# 1 (E)–2006	I. S. Merkuryeva	The Structure and Determinants of Informal Employment in Russia: Evidence From NOBUS Data
№ 2 (R)–2006	Т. Е. Андреева В. А. Чайка	Динамические способности фирмы: что необходимо, чтобы они были динамическими?
№ 3 (R)–2006	Д. Л. Волков И. В. Березинец	Управление ценностью: анализ основанных на бухгалтерских показателях моделей оценки
№ 4 (R)–2006	С. А. Вавилов К. Ю. Ермоленко	Управление инвестиционным портфелем на финансовых рынках в рамках подхода, альтернативного стратегии самофинансирования
№ 5 (R)–2006	Г. В. Широкова	Стратегии российских компаний на разных стадиях жизненного цикла: попытка эмпирического анализа
№ 6 (R)–2006	Д. В. Овсянко В. А. Чайка	Особенности организации процесса непрерывного улучшения качества в российских компаниях и его связь с процессами стратегического поведения
№ 7 (R)–2006	А. Н. Козырев	Экономика интеллектуального капитала
№ 8 (R)–2006	Н. А. Зенкевич, Л. А. Петросян	Проблема временной состоятельности кооперативных решений
№ 9 (R)–2006	Е. А. Дорофеев, О. А. Лапшина	Облигации с переменным купоном: принципы ценообразования
# 10 (E)–2006	T. E. Andreeva V. A. Chaika	Dynamic Capabilities: what they need to be dynamic?
№ 11 (E)–2006	G. V. Shirokova	Strategies of Russian Companies at Different Stages of Organizational Life Cycle: an Attempt of Empirical Analysis
№ 12 (R)–2006	А. Е. Лукьянова, Т. Г. Тумарова	Хеджевые фонды как инструменты снижения рисков и роста ценности компании
№ 13 (R)–2006	Л. Н. Богомолова	Применение этнографических методов для изучения процессов принятия потребительских решений

№ 14 (R)–2006	Е. К. Завьялова	Особенности профессионально-личностного потенциала и развития карьеры линейных менеджеров отечественных производственных предприятий
№ 15 (R)–2006	С. В. Кошелева	Удовлетворенность трудом как комплексный диагностический показатель организационных проблем в управлении персоналом
№ 16 (R)–2006	А. А. Румянцев, Ю. В. Федотов	Экономико-статистический анализ результатов инновационной деятельности в промышленности Санкт-Петербурга
№ 17 (R)–2006	Е. К. Завьялова	Взаимосвязь организационной культуры и систем мотивации и стимулирования персонала
№ 18 (R)–2006	А. Д. Чанько	Алгебра и гармония HR-менеджмента. Эффективность обучения персонала и диагностика организационной культуры
№ 19 (E)–2006	T. E. Andreeva	Organizational change in Russian companies: findings from research project
# 20 (E)–2006	N. E. Zenkevich, L. A. Petrosjan	Time-consistency of Cooperative Solutions
№ 21 (R)–2006	Т. Е. Андреева	Организационные изменения в российских компаниях: результаты эмпирического исследования
№ 22 (R)–2006	Д. Л. Волков, Т. А. Гаранина	Оценивание интеллектуального капитала российских компаний
№ 23 (R)–2006	А. В. Бухвалов, Ю. Б. Ильина, О. В. Бандалюк	Электронное корпоративное управление и проблемы раскрытия информации: сравнительное пилотное исследование
№ 24 (R)–2006	С. В. Кошелева	Особенности командно-ролевого взаимодействия менеджеров среднего и высшего звена международной и российских компаний
№ 25 (R)–2006	Ю. В. Федотов, Н. В. Хованов	Методы построения сводных оценок эффективности деятельности сложных производственных систем
# 26 (E)–2006	S. Kouchtch, M. Smirnova, K. Krotov, A. Starkov	Managing Relationships in Russian Companies: Results of an Empirical Study
№ 27 (R)–2006	А. Н. Андреева	Портфельный подход к управлению люксовыми брендами в фэшн-бизнесе: базовые концепции, ретроспектива и возможные сценарии

№ 28 (R)–2006	Н. В. Хованов, Ю. В. Федотов	Модели учета неопределенности при построении сводных показателей эффективности деятельности сложных производственных систем
№ 29 (R)–2006	Е. В. Соколова, Ю. В. Федотов, Н. В. Хованов.	Построение сводной оценки эффективности комплексов мероприятий по повышению надежности функционирования объектов электроэнергетики
# 30 (E)–2006	M. Smirnova	Managing Buyer-Seller Relationships in Industrial Markets: A Value Creation Perspective
№ 31 (R)–2006	С. П. Кущ, М. М. Смирнова	Управление взаимоотношениями в российских компаниях: разработка концептуальной модели исследования
№ 32 (R)–2006	М. О. Латуха, В. А. Чайка, А. И. Шаталов	Влияние «жестких» и «мягких» факторов на успешность внедрения системы менеджмента качества: опыт российских компаний
№ 33 (R)–2006	А. К. Казанцев, Л. С. Серова, Е. Г. Серова, Е. А. Руденко	Индикаторы мониторинга информационно-технологических ресурсов регионов России
№ 34 (R)–2006	Т. Е. Андреева, Е. Е. Юртайкин, Т. А. Солтицкая	Практики развития персонала как инструмент привлечения, мотивации и удержания интеллектуальных работников
# 35 (E)–2006	T. Andreeva, E. Yurtaikin, T. Soltitskaya	Human resources development practices as a key tool to attract, motivate and retain knowledge workers
№ 36 (R)–2006	А. В. Бухвалов, В. Л. Окулов.	Классические модели ценообразования на капитальные активы и российский финансовый рынок. Часть 1. Эмпирическая проверка модели CAPM. Часть 2. Возможность применения вариантов модели CAPM
№ 37 (R)–2006	Е. Л. Шекова	Развитие корпоративной социальной ответственности в России: позиция бизнеса (на примере благотворительной деятельности компаний Северо-Западного региона)
№ 38 (R)–2006	Н. А. Зенкевич, Л. А. Петросян	Дифференциальные игры в менеджменте

№ 39 (R)–2006	В. Г. Беляков, О. Р. Верховская, В. К. Дерманов, М. Н. Румянцева	Глобальный мониторинг предпринимательской активности Россия: итоги 2006 года
№ 40 (R)–2006	В. А. Чайка, А. В. Куликов	Динамические способности компании: введение в проблему
№ 41 (R)–2006	Ю. Е. Благов	Институционализация менеджмента заинтересованных сторон в российских компаниях: проблемы и перспективы использования модели «Арктурус»
№ 42 (R)–2006	И. С. Меркурьева, Е. Н. Парамонова, Ю. М. Битина, В. Л. Гильченок	Экономический анализ на основе связанных данных по занятым и работодателям: методология сбора и использования данных
# 43 (E)–2006	I. Merkuryeva, E. Paramonova, J. Bitina, V. Gilchenok	Economic Analysis Based on Matched Employer-Employee Data: Methodology of Data Collection and Research
№ 44 (R)–2006	Н. П. Дроздова	Российская «артельность» — мифологема или реальность' (Артельные формы хозяйства в России в XIX — начале XX в.: историко-институциональный анализ)
№ 1 (R)–2007	Е. В. Соколова	Бенчмаркинг в инфраструктурных отраслях: анализ методологии и практики применения (на примере электроэнергетики)
№ 2 (R)–2007	С. П. Кущ, М. М. Смирнова	Управление поставками в российских компаниях: стратегия или тактика
№ 3 (R)–2007	Т. М. Скляр	Проблема ленивой монополии в российском здравоохранении
№ 4 (R)–2007	Т. Е. Андреева	Индивидуальные предпочтения работников к созданию и обмену знаниями: первые результаты исследования
№ 5 (R)–2007	А. А. Голубева	Оценка порталов органов государственного управления на основе концепции общественной ценности
№ 6 (R)–2007	С. П. Кущ, М. М. Смирнова	Механизм координации процессов управления взаимоотношениями компании с партнерами
# 7 (E)–2007	D. Volkov, I. Berezinets	Accounting-based valuations and market prices of equity: case of Russian market

№ 8 (R)–2007	М. Н. Барышников	Баланс интересов в структуре собственности и управления российской фирмы в XIX – начале XX века
# 9 (E)–2007	D. Volkov, T. Garanina	Intellectual capital valuation: case of Russian companies
№ 10 (R)–2007	К. В. Кротов	Управление цепями поставок: изучение концепции в контексте теории стратегического управления и маркетинга.
№ 11 (R)–2007	Г. В. Широкова, А. И. Шаталов	Характеристики компаний на ранних стадиях жизненного цикла: анализ факторов, влияющих на показатели результативности их деятельности
№ 12 (R)–2007	А. Е. Иванов	Размещение государственного заказа как задача разработки и принятия управленческого решения
№ 13 (R)-2007	О. М. Удовиченко	Понятие, классификация, измерение и оценка нематериальных активов (объектов) компании: подходы к проблеме
№ 14 (R)–2007	Г. В. Широкова, Д. М. Кнатько	Влияние основателя на развитие организации: сравнительный анализ компаний управляемых основателями и наемными менеджерами
# 15 (E)–2007	G. Shirokova, A. Shatalov	Characteristics of companies at the early stages of the lifecycle: analysis of factors influencing new venture performance in Russia
# 16 (E)–2007	N. Drozdova	Russian “Artel’nost” — Myth or Reality' Artel’ as an Organizational Form in the XIX — Early XX Century Russian Economy: Comparative and Historical Institutional Analysis
# 1 (E)–2008	S. Commander, J. Svejnar, K. Tinn	Explaining the Performance of Firms and Countries: What Does the Business Environment Play'
№ 1 (R)–2008	Г. В. Широкова, В. А. Сарычева, Е. Ю. Благов, А. В. Куликов	Внутрифирменное предпринимательство: подходы к изучению вопроса
№ 1A(R)–2008	Г. В. Широкова, А. И. Шаталов, Д. М. Кнатько	Факторы, влияющие на принятие решения основателем компании о передаче полномочий профессиональному менеджеру: опыт стран СНГ и Центральной и Восточной Европы

№ 2 (R)–2008	Г. В. Широкова, А. И. Шаталов	Факторы роста российских предпринимательских фирм: результаты эмпирического анализа
№ 1 (R)–2009	Н. А. Зенкевич	Моделирование устойчивого совместного предприятия
№ 2 (R)–2009	Г. В. Широкова, И. В. Березинец, А. И. Шаталов	Влияние организационных изменений на рост фирмы
№ 3 (R)–2009	Г. В. Широкова, М. Ю. Молодцова, М. А. Арепьева	Влияние социальных сетей на разных этапах развития предпринимательской фирмы: результаты анализа данных Глобального мониторинга предпринимательства в России
# 4 (E)–2009	N. Drozdova	Russian Artel Revisited through the Lens of the New Institutional Economics
№ 5 (R)–2009	Л. Е. Шепелёв	Проблемы организации нефтяного производства в дореволюционной России
№ 6 (R)–2009	Е. В. Соколова	Влияние государственной политики на инновационность рынков: постановка проблемы
№ 7 (R)–2009	А. А. Голубева, Е. В. Соколова	Инновации в общественном секторе: введение в проблему
# 8 (E)–2009	A. Damodaran	Climate Financing Approaches and Systems: An Emerging Country Perspective
№ 1 (R)–2010	И. Н. Баранов	Конкуренция в сфере здравоохранения
№ 2 (R)–2010	Т. А. Пустовалова	Построение модели оценки кредитного риска кредитного портфеля коммерческого банка (на основе методологии VAR)
№ 3 (R)–2010	Ю. В.Лаптев	Влияние кризиса на стратегии развития российских МНК
№ 4 (R)–2010	А. В. Куликов, Г. В. Широкова	Внутрифирменные ориентации и их влияние на рост: опыт российских малых и средних предприятий
# 5 (E)–2010	M. Storchevoy	A General Theory of the Firm: From Knight to Relationship Marketing
№ 6 (R)–2010	А. А. Семенов	Появление систем научного менеджмента в России
# 7 (E)–2010	D. Ivanov	An optimal-control based integrated model of supply chain scheduling
№ 8 (R)–2010	Н. П. Дроздова, И. Г. Кормилицына	Экономическая политика государства и формирование инвестиционного климата: опыт России конца XIX — начала XX вв.

№ 9 (R)–2010	Д. В. Овсянко	Направления применения компонентов менеджмента качества в стратегическом управлении компаниями
# 10 (E)–2010	V. Cherenkov	Toward the General Theory of Marketing: The State of the Art and One More Approach
№ 11 (R)–2010	В. Н. Тишков	Экономические реформы и деловая среда: опыт Китая
№ 12 (R)–2010	Т. Н. Клёмина	Исследовательские школы в организационной теории: факторы формирования и развития
№ 13 (R)–2010	И. Я. Чуракова	Направления использования методик выявления аномальных наблюдений при решении задач операционного менеджмента
№ 14 (R)–2010	К. В. Кротов	Направления развития концепции управления цепями поставок
№ 15 (R)–2010	А. Г. Медведев	Стратегические роли дочерних предприятий многонациональных корпораций в России
№ 16 (R)–2010	А. Н. Андреева	Влияние печатной рекламы на восприятие бренда Shalimar (1925 – 2010)
№ 17 (R)–2010	В. Л. Окулов	Ценность хеджирования для корпорации и рыночные ожидания
№ 1 (R)–2011	А. А. Муравьев	О российской экономической науке сквозь призму публикаций российских ученых в отечественных и зарубежных журналах за 2000–2009 гг.
№ 2 (R)–2011	С. И. Кирюков	Становление и развитие теории управления маркетинговыми каналами
№ 3 (R)–2011	Д. И. Баркан	Общая теория продаж в контексте дихотомии «развитие – рост»
№ 4 (E)–2011	K. V. Krotov, R. N. Germain	A Contingency Perspective on Centralization of Supply Chain Decision-making and its Role in the Transformation of Process R&D into Financial Performance
№ 5 (R)–2011	А. В. Зятчин	Сильные равновесия в теоретико-игровых моделях и их приложения
№ 6 (R)–2011	В. А. Ребязина	Формирование портфеля взаимоотношений компании с партнерами на промышленных рынках
№ 1 (R)–2012	А. Л. Замулин	Лидерство в эпоху знаний