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Olga Lazareva, National Research University Higher School of Economics
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School Financing, Teacher Wages and Educational Outcomes in Russia

The policy proposal to increase the share of budget spent on public education implies that higher financing leads to better quality of education. This, however, is far from certain. We test and compare the effects that different levels of financial resources available to schools and relative teacher wages have on educational outcomes. Russia provides a good opportunity for testing this relationship due to its high level of regional heterogeneity. We find that increasing school financing per se does not noticeably improve educational outcomes. Only when additional financing leads to an improvement of the position of teachers in the regional wage distribution, we observe higher educational outcomes for students. We provide some tentative evidence on the possible channels of this effect.

School education is a complex and multifaceted process, and measurable educational outcomes are affected by many different factors. These may include students' innate abilities and family resources as well as various characteristics of the school environment and teaching practices. In the literature, one of the important factors is the level of school financing provided by the government. This is also one of the key issues in the debates about the public policy in education. However, there is no consensus in the academic literature about the degree of influence of financial resources available to schools on educational outcomes.

The effect of school financing should depend on how it is spent. Since education is a human capital-intensive sector, a major part of this money is spent on teacher remuneration. Whether the size and structure of teacher pay affect the effectiveness of their work and ultimately the student outcomes is still an open question. Some studies argue that it is not absolute but that relative teacher wages matter (Loeb and Page, 2000; Britton and Propper, 2016). Hanushek et al. (2017) use cross-country data and show that the relative position of teachers in the wage distribution affects self-selection into the teaching profession in terms of skills, and that teacher skills in turn affect student outcomes.

While there are studies looking at various determinants of the quality of school education in the transition-economy context (e.g. Amini and Commander, 2012), the effect of school financial resources has not yet been studied. In Lazareva and Zakharov (2018), we exploit spatial variation in educational resources in Russia to try to answer this question. We test and compare the effects of school budget financing and relative teacher wages on educational outcomes for the period 2006–2014. We estimate these effects for two different measures of educational outcomes at different levels of school education system.

Institutional context and data

In Russia the system of general education covers eleven years: the first nine years are compulsory for all children, after that one can continue to high school for two more years or move into vocational education system. The school system is predominantly financed by the government and the share of private schools is very low.

In the 1990s and early 2000s, the system of general education was heavily underfinanced. Teacher remuneration was quite low compared to the average wage in the economy, and a job as a schoolteacher was not very attractive. In the mid-2000s, with the fast economic growth, the Russian government made an effort to increase school financing and to raise teacher wages. Importantly, schools are financed at the regional level, through the budgets of the regions, which results in significant cross-regional variation.

There are 85 administrative regions currently in Russia and they differ a lot in terms of economic conditions, regional budget income and expenditures. We use data on regional-level budget expenditures on general education from the Russian Treasury statistics (http://www.roskazna.ru/). In order to account for inflation and cross-regional differences in prices, we normalize the per-student amount of school budget financing by the minimum regional cost of living (as estimated by the Russian statistical office) in a particular year.

As our data show, the amount of budget financing of the general education system has been growing in real terms during 2006–2013. The average regional budget financing per student (adjusted for the differences in the cost of living across regions and years) has increased by 40% during this period. A large part of this growth occurred in 2012. In that year a presidential decree was adopted which required that teachers' wages should be raised to the level of the average regional wage. Regions had to allocate more money for teacher wages during

the following years in order to meet this target. Even after adjusting for the regional cost of living, the level of school financing differs a lot across regions throughout the period.

The amount of school financing is also significantly correlated with the gross regional product per capita, i.e. with the level of economic development of the region. We observe the largest gap in school financial resources between the small group of the richest regions (Moscow, Sankt Petersburg and resource extracting regions) and the remaining regions. Such persistent inequality in school resources may lead to unequal access to high quality education across Russian regions. This inequality is exacerbated by the fact that in less economically developed regions families have fewer resources to compensate for the underfinancing of public schools.

The structure of school expenditures in the regional budgets shows that the major part of financing (about 80 percent) is spent on remuneration of teachers and school administration. Hence, the effect of regional school expenditures on student outcomes should go through teacher wages. We use data on average regional teacher wages from Rosstat (Russian Federal State Statistics Service) and the Russian Ministry of Education. As we argued previously, it is important to test the effect of relative teacher salary. Our data show that the average regional school wage relative to the average regional wage has grown during the observation period, in particular in 2008–2009 and, at a higher rate, in 2012–2013 (due to the presidential decree mentioned above). Again, there is a significant variation among regions, which is observed throughout the period.

Empirical results

In order to test the effect of school resources and teacher wages on educational outcomes, we use two measures of educational outcomes. First, we use the average regional score on Unified State Examination (USE). It was introduced in all Russian regions starting from 2009 and students graduating from grade 11 take the test. This is a high stakes examination as the result of this exam is accepted as entrance exams at universities throughout the country. USE in mathematics and Russian language are compulsory for all graduates of grade 11. Therefore, we will use the scores in these subjects. Note that USE scores measure educational outcomes of those students that stayed in high school after grade 9 – this is about 60 percent of the age cohort.

An alternative measure of educational outcomes is the data from PISA international educational assessment.[1] Russia participates in PISA since 2003. We use data from waves 2006, 2009, 2012, and 2015. Students take this test at the age of 15, which means that the majority of this age cohort is in grade 9.

In our regression analysis on regional data, we additionally control for a number of regional characteristics that may be correlated with school financing or teacher wages, such as population size, share of urban population, regional poverty (share of population below the poverty line), within-region income inequality (decile coefficient), and gross regional income per capita (also adjusted for the cost of living). Since we have panel data, we use a panel fixed effects estimation method, which accounts for all unobserved time-invariant regional heterogeneity.

Our results show that the level of per-student school financing does not significantly affect USE results. At the same time, we find a significant positive effect of relative teacher wages on USE results both in math and Russian language with the lag of one to two years. We find the same results on PISA data: individual student scores in math, reading and science are significantly positively affected by the level of the relative regional teacher wages. Our results hold in

[1] PISA – Programme for International Student Assessment run by OECD (http://www.oecd.org/pisa/).

instrumental variable estimation, which we conduct in order to account for potential endogeneity problems.

What are the potential channels through which relative teacher wage may affect student results? One possible channel is self-selection of teachers. When teacher wages increase relative to other jobs, being a teacher become more attractive for higher skilled individuals. Higher skilled teachers help students to achieve better educational results. We cannot directly test this channel, as we do not have data on teacher turnover in Russian schools. Besides, we observe a positive effect of relative teacher wages on student scores with a lag of just one-two years. This seems to be a too short time period for teacher turnover to have a significant effect.

Another potential channel of the observed effect is an improvement in teacher motivation or teacher morale. We can only provide some suggestive evidence for this effect. In the early and mid-2000s, when teacher pay was quite low, a significant share of teachers were considering quitting their jobs or switching to another occupation. As teacher survey data show, after the significant increase in teacher pay in 2008–2012 this share declined and teacher motivation and job satisfaction improved. Additional evidence in support of this hypothesis comes from the school-level data in the PISA 2012 survey. We estimate the effect of relative regional school wage on teacher morale (as evaluated by a school head) and find a positive and statistically significant relationship.

Conclusion

We find that increasing school financing from the regional budgets per se does not noticeably improve educational results. Only when additional financing leads to an improvement of the position of teachers in the regional wage distribution, we observe higher educational outcomes for students. The potentially interesting future direction of research is to study how not just the relative size, but also the structure of teacher wages (i.e. elements of incentive pay introduced in Russian schools) affects educational outcomes.

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Olga Lazareva

National Research University Higher School of Economics
OLazareva@hse.ru
www.hse.ru/en/org/persons/14400402

Olga Lazareva is an Assistant Professor at the Faculty of Economic Sciences at the National Research University Higher School of Economics in Moscow. She received her PhD in Stockholm School of Economics in 2009. Previously she worked as a researcher at the Centre for Economic and Financial Research (CEFIR) in Moscow during 2000-2009.

Olga's research is focused on Russian labor market, migration, economics of education, as well as on corporate governance in transition economies. She has published her research in Economics of Transition and IZA Journal of Migration.

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