Pavel Derkachev, Ph.D.

Lead Researcher,

Institute of Education, Higher School of Economics

pderkachev@live.ru

# THE IMPACT OF INDICATORS OF FUNDING GENERAL EDUCATION ON THE RESULTS OF THE UNIFIED STATE EXAM IN RUSSIAN REGIONS

# Thanks to team of project 'Atlas of Russian Education'

- Isak Froumin, prof., HSE
- Martin Carnoy, prof., Stanford University
- Vyacheslav Bashev, Ph.D., HSE
- Sergey Barinov, Ph.D., HSE
- Gordey Yastrebov, Ph.D., HSE
- Olga Beshkareva, HSE

# Problem

- The minimum value of the regions' budget expenditure on general education per student in 2012 amounted to 35 thousand rubles. In addition, the maximum value is 252 thousand rubles. Thus, the differences reach up to 7 times.

- Meanwhile, schools are required to provide the same set of public services, performing federal state educational curriculum. And the rage of USE results is 20 points.

# Aim of the research

- To estimate contribution of regional expenses on education for results of Unified State Exam, controlling context regional characteristics.

- In other words, to estimate beta coefficients of the production function of education

# Production Function of Education

- ⦿ Coleman (1966, USA)

The output of education process: achievement of individual student is directly related to inputs, controlled by policy makers (characteristics of schools, teachers, curricula) and not controlled (families, friends, innate endowment, learning capacity of students)

- ⦿ Yudkevich, Prakhov (2012, Russia)

Influence of learning outside school on the results of USE: expenses on tutors, intensiveness of courses outside schools.

- ⦿ Yastrebov, Bessudnov, Kosaretskiy, Pinskaya (2013, Russia)

2-levels regression: school level & municipal level.

There is no negative influence of marginal social groups on students' results

# Production Function

Z-score (USE) = $b_0$ +

$b_1$ * $\text{Log}_{10}$ (Budget expenses on primary and secondary education corrected by Index of Budget Expenses) +

+ $b_2$ * Percent of rural population +

+ $b_3$ * Percent of population with higher education +
+ $b_4$ * Gini index +

+ $b_5$ * Student per Teacher ratio +

+ $b_6$ * $\text{Log}_{10}$ (Gross Regional Product per capita)

# The study addresses the following questions:

1. What factors at the regional level do affect the costs of general education?

Hypothesis: proportion of people with higher education, the Gini coefficient, GDP per capita, student-teacher ratio, the proportion of the rural population.

Implementation: we can offer a formula to determine adjustments volume of transfers from the federal budget to the regions.

# The study addresses the following questions:

2. Issues of fiscal federalism.

What is the amount of contributions to the regional budget set for taxes?

Hypothesis: Additional spending on education in rich regions have no effect.

Implementation: it is necessary to redistribute more funds through the federal budget.

# Model 1: Independent variable is Z-score of USE math, 2011

| | | | | | Model Summary[c,d] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | R | R Square[b] | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | ,628[a] | ,394 | ,345 | ,81661978 | ,394 | 7,922 | 6 | 73 | ,000 | 1,653 |

# Model 1: Independent variable is Z-score of USE Math, 2011

Coefficients[a,b]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | Lg Budget expenses on primary and secondary education corrected by Index of Budget Expenses | 1,590 | ,463 | 7,572 | 3,437 | ,001 |
| | Percent of rural population | ,021 | ,009 | ,681 | 2,369 | ,020 |
| | Percent of population with higher education | 7,574 | 2,921 | 1,573 | 2,593 | ,011 |
| | Gini index | 6,073 | 5,162 | 2,357 | 1,176 | ,243 |
| | Student per Teacher ratio | -,045 | ,055 | -,561 | -,816 | ,417 |
| | Lg GRP per capita | -2,173 | ,486 | -11,532 | -4,467 | ,000 |

# Model 2: Independent variable is Z-score of USE Russian, 2011

Model Summary[c,d]

| Model | R | R Square[b] | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | ,445[a] | ,198 | ,132 | ,85423194 | ,198 | 3,006 | 6 | 73 | ,011 | 2,033 |

# Model 2: Independent variable is Z-score of USE Russian, 2011

Coefficients[a,b]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | Lg Budget expenses on primary and secondary education corrected by Index of Budget Expenses | 1,663 | ,484 | 8,711 | 3,436 | **,001** |
| | Percent of rural population | -,015 | ,009 | -,538 | -1,627 | ,108 |
| | Percent of population with higher education | 4,144 | 3,055 | ,947 | 1,356 | ,179 |
| | Gini index | -,326 | 5,400 | -,139 | -,060 | ,952 |
| | Student per Teacher ratio | ,006 | ,057 | ,083 | ,105 | ,917 |
| | Lg GRP per capita | -1,546 | ,509 | -9,028 | -3,039 | **,003** |

# Comments on Summer School on Institutional Analysis (1)

- Add independent variables:
  - Expenses of householders on tutors outside public schools
  - Year of USE's beginning
  - Index of Corruption
  - Density of population
  - Climate indicators
  - School recourses indicators (Teachers, Buildings, Computers, Internet Connection)

# Comments on Summer School on Institutional Analysis (2)

- Add independent variables:
  - Test scores of students in schools
  - Number of scientists
  - Centralization indicators
  - Distance from Moscow
- Switch to panel data analysis
- Transform USE results to the cost of each point of USE

# Comments on Summer School on Institutional Analysis (3)

- Shift to 2-stage model:
  - 1 stage: Budget -> Recourses
  - 2 stage: Recourses -> Results
- Use non-linear transformation of USE, because marginal cost of each point of USE increase
- Analyze changes in USE results between 2 years
- Correct endogenic characteristics
- Build model of decision making of funds' distribution
- Divide expenses on primary and secondary schools
- Eliminate lag between expenses and results