The Impacts of Shadow Education on High School Student Achievement
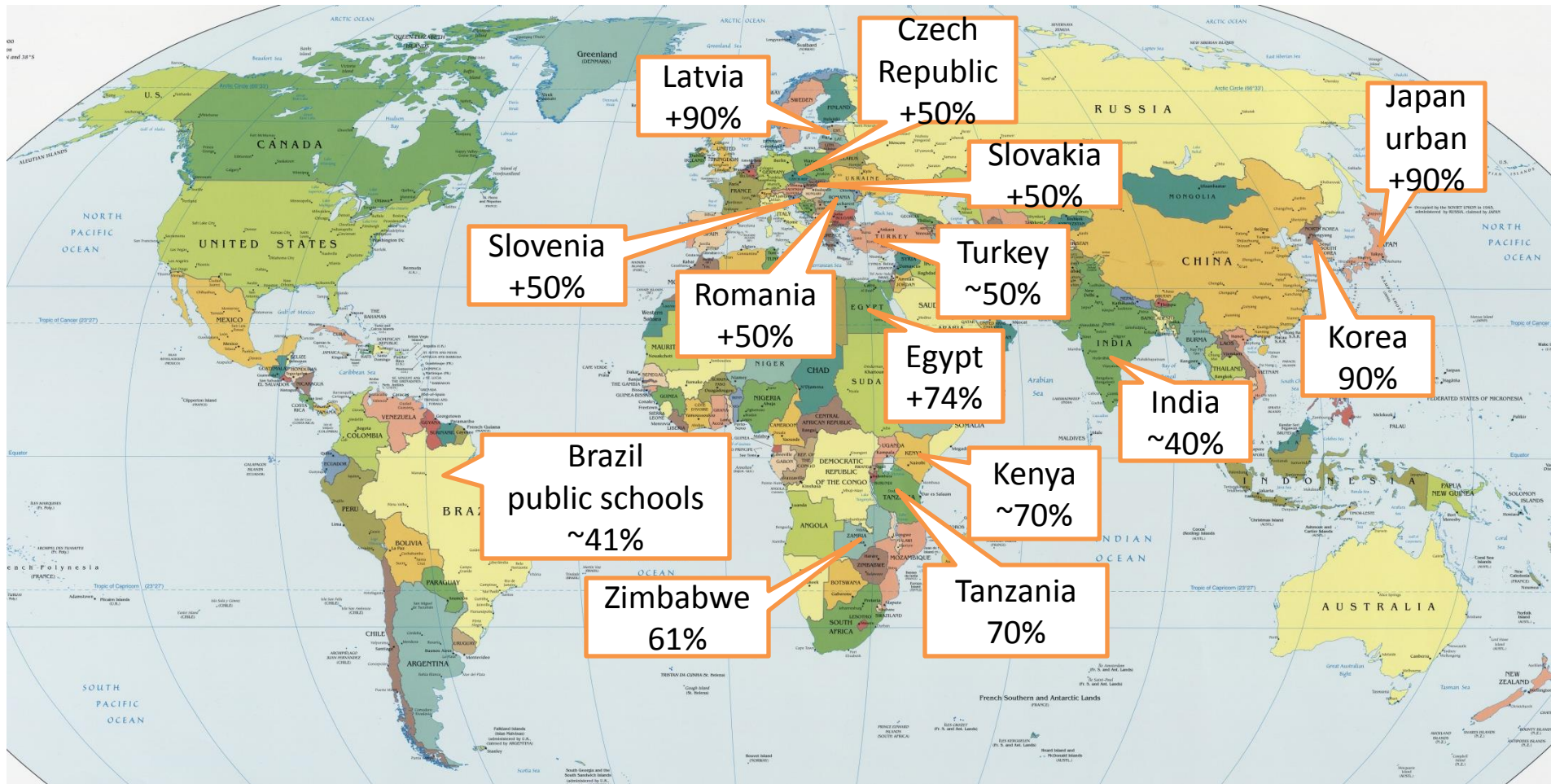
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There is a high and increasing prevalence of shadow education across the world

(Bray, 2006; Baker et al., 2001; Wolf, 2000; Guimarães & Sampaio, 2011)

Growing in UK and USA/Canada

High school students participate even more in shadow education – why?

High school students want to:

- qualify for college and elite colleges – e.g. pressure to perform well on entrance exams (Lee & Shouse, 2011; Baker and LeTendre 2005; Bray 1999; C. Lee et al. 2009; Stevenson and Baker 1992)

- complement low-quality schooling (enhance academic skills, prepare for college)

- improve low school grades (catch up with peers) (Baker et al., 2001)

However, shadow education can be costly

Financially:
- High fees (tuition and materials)

- Opportunity costs (time including travel)

But even academically:
- Students may engage less in school (which could lead to lower achievement)

- Psychological/mental fatigue; greater pressure/stress (which could lead to lower achievement)

The direct financial stakes can be high

- Estimated 100+ billion US dollars globally (Forbes, 2012)
  - Korea: ~$14 billion, 2.79% of GDP (Nam, 2007)
  - India: ~$6.4 billion
  - Japan: ~$12 billion
  - United States: ~$5 billion

- If shadow education has a negligible impact on academic achievement or college access (or if it has negative outcomes) given the costs, it is inefficient.

Another problem: Shadow education might also contribute to inequality in achievement/college access (and thus social inequality)

Whether shadow education does this depends on:

- Whether low/high social class kids participate more in shadow education

- shadow education affects low/high social class kids differently

Is shadow education worth it?

- Does shadow education improve achievement (& access to college)?

- Does shadow education increase/decrease inequality in achievement (access to college)?

Studies of the impacts of shadow education on achievement show mixed findings

- Medium-size positive impacts (more than 0.1 SD)
  - Buchman et al. (2010)

- Small positive impacts (less than 0.1 SD for reading and/or math)
  - Zimmer et al. (2007); Byun & Park for EA Americans (2011); Dang (2007)

- Negligible
  - Scott-Little et al. (2002); Zief et al. (2004), Byun & Park (2011)

Implications for inequality:
- Shadow education increases inequality in the United States (Buchmann et al., 2010; Buchmann et al., 1992)
  - vs.
- Shadow education can also help low-income kids (Lauer et al., 2003)

Limitations of past studies: Weak causal evidence
(Zimmer et al., 2010; Hollister, 2003; Fashola, 1998)

- Regression with covariate adjustments
  - Byun & Park (2011), Buchman et al. (2010); Aysit Tansel (2005), Stevenson & Baker (1992)
- Propensity score matching
  - Zimmer et al. (2010); Domingue et al. (2009); Hansen (2004)
- OLS with tests for omitted variable bias
  - Guimarães et al. (2011)
- Control for time-invariant characteristics
  - Zimmer et al. (2007), Zimmer et al. (2010)
- Instrumental variables
  - Dang (2007) – believable?
- Only a few, pre-1990, small RCTs in the US
  - Allalouf & Ben-Shakhar (1998)

Objective

- The purpose of our paper is to provide a better measure of the causal impact of shadow education on high school student achievement.

- And test whether the impact differs for different subgroups of students (by achievement level, social class, gender)—whether shadow education contributes to inequality.

Russian survey data

Spring 2010 survey

- 3 Russian regions highly varied by the indicators of economic development

- Respondents:
    - 2938 final year (11th grade) students in 127 schools,
    - 182 math and 182 Russian language teachers

- Multistage stratified random sample

- Students' outcomes – individual math and Russian USE scores

Basic OLS
(traditional way of measuring effects of shadow education)

$$y_{is} = \alpha_s + x'_{is}\beta_{1s} + s'_{is}\beta_{2s} + t'_s \beta_{3s} + \varepsilon_{is}$$

where

y_{is} - students i tests results on subject s (math, Russian)

x'_{is} - shadow education of student i on a subject s

$s'_{is}\beta_{2s}$ - vector of a student i subject s specific characteristics ()

$t'_s\beta_{3s}$ - vector of a teacher s, subject s curriculum characteristics (teacher experience, category, subject exposure,)

ε_{is} - error term

Limitations of OLS

Student fixed effects model

$$y_{is} - \bar{y}_i = (x_{is} - \bar{x}_i)'\beta_{1s} + (st_{is} - \overline{st_i})'\beta_{2s} + (t_{is} - \bar{t}_i)'\beta_{3s} + \varepsilon_{is}$$

where

y_{is} - students i tests results on subject s

x_{is} - shadow education of student i on a subject s

$\bar{x}_i = S^{-1} \sum_{s=1}^{S} x_{is}$

$st_{is}\beta_{2s}$ - vector of a student i subject s specific characteristics

$t_s\beta_{3s}$ - vector of a teacher s, subject s curriculum characteristics
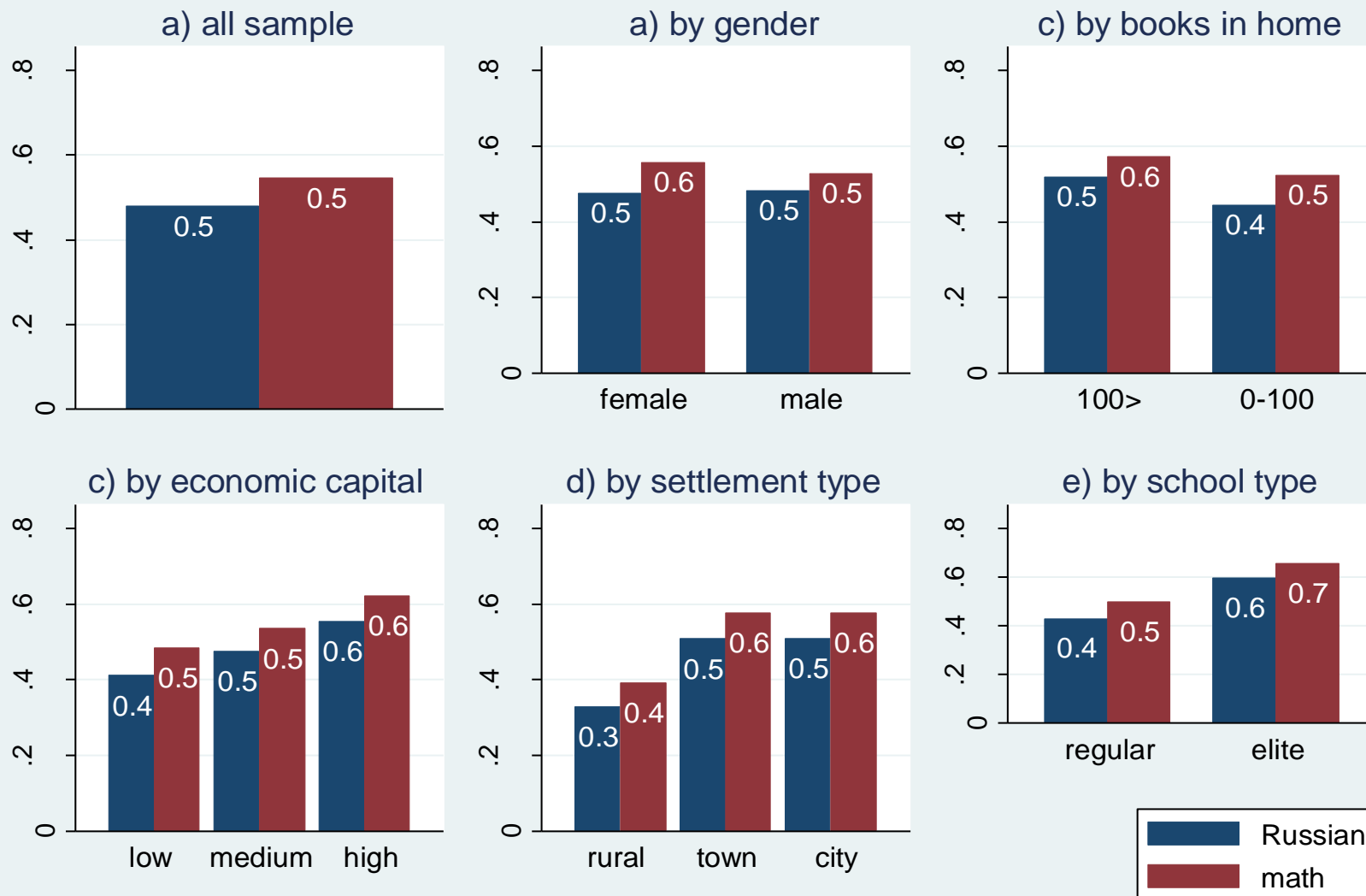
ε_{is} - error term

The data has been analyzed as a short panel data with t=2 (Russian - math): fixed effect (within student) estimation with error correction for cluster (student)

Results for Russia

(11th grade students, USE scores)

Descriptive statistics:
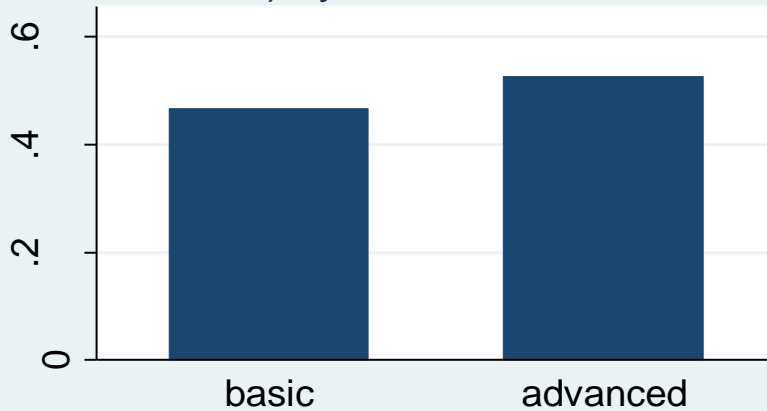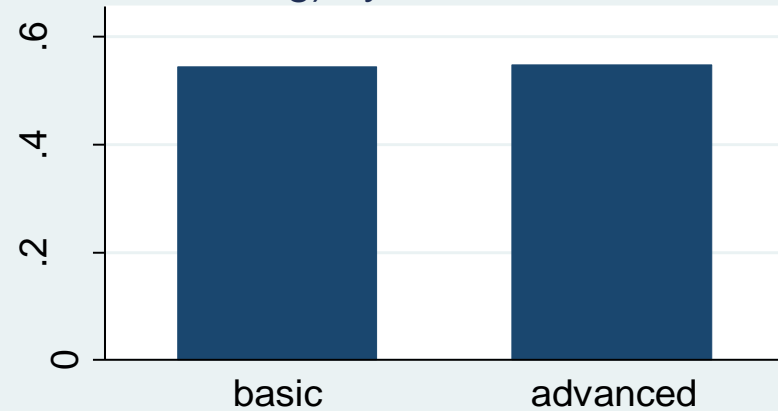What is the prevalence of shadow education?

Descriptive statistics:
What is the prevalence of shadow education?

% of students who took shadow education

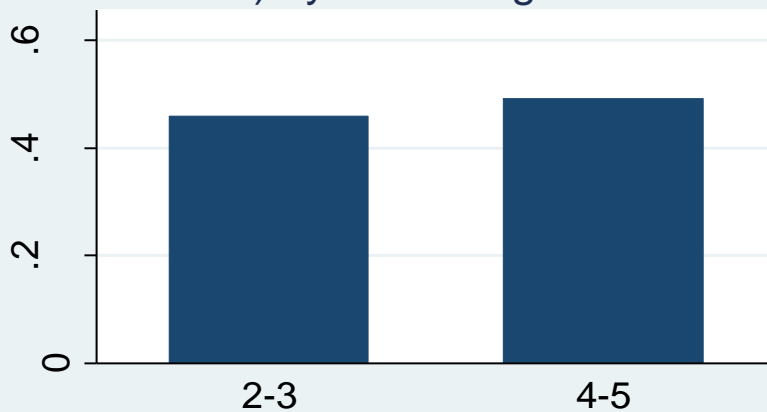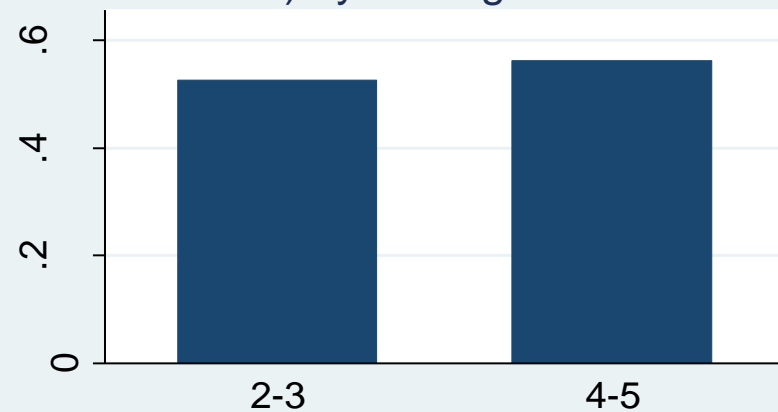f) by Russian track

g) by math track

h) by Russian grades

i) by math grades

Descriptive statistics:
Who takes shadow education?

Students taking any shadow education (on math or on Russian) are more likely to be

- the younger students
- having parents with higher economic and cultural capital
- living in a bigger town/city
- attending schools of a bigger size,
- attending schools with advanced study of the subjects
- and students who chose the college to enter beforehand

	1993 birth year	0-100 books in home	Economic capital, z-scores	College chosen before 11 grade	Rural place	Regional center	Elite school	School size
Any shadow education	0.08**	-0.09***	0.30***	0.08***	-0.13***	0.10**	0.18***	130.58***
	(0.03)	(0.03)	(0.06)	(0.02)	(0.03)	(0.04)	(0.05)	(38.44)
Constant	0.37***	0.59***	-0.19***	0.25***	0.25***	0.34***	0.18***	517.55***
	(0.03)	(0.02)	(0.06)	(0.02)	(0.04)	(0.06)	(0.05)	(38.58)
R-squared	0.006	0.007	0.021	0.007	0.028	0.009	0.036	0.034
N	2,938	2,938	2,938	2,938	2,938	2,938	2,938	2,938

Heterogeneity analysis: What is the effect of shadow education for different groups of students?

VARIABLES	(1)	(2)	(3)	(4)
Shadow education (0=no, 1=yes)	-0.06	0.02	0.05	0.02
	(0.04)	(0.04)	(0.05)	(0.04)
10th grade final grades (0=2-3, 1=4-5)	0.29***	0.35***	0.35***	0.35***
	(0.04)	(0.03)	(0.03)	(0.03)
Shadow education * 10th grade	0.13**			
	(0.05)			
Advanced study (0=no, 1=yes)	0.17***	-0.20	0.17***	0.17***
	(0.06)	(0.20)	(0.06)	(0.06)
Shadow education * Advanced study		-0.00		
		(0.05)		
Shadow education * College chosen <11th grade			-0.10	
			(0.07)	
Shadow education * Family economic capital				0.02
				(0.03)
Control for teachers and class characteristics	YES	YES	YES	YES
Constant	-0.11	-0.15	-0.15	-0.15
	(0.16)	(0.16)	(0.16)	(0.16)
R-squared	0.063	0.062	0.062	0.062
Total N	5,872	5,872	5,872	5,872
N of students	2,936	2,936	2,936	2,936

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

International Results

(TIMSS 1995 Math and Literacy Scores; Students in Last Year of High School)

Summary of results

We find that shadow education

- has no impact on high school student achievement

- has no impact on students of lower social class

- has a slight positive impact on higher achieving students (in Russia)

Conclusion

Altogether, shadow education appears to be inefficient (no effects but high costs) and may lead to some inequality (in Russia).

Next step: find out more about why shadow education has few significant impacts

THANK YOU!