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THE EFFECT OF ONE EXTRA YEAR OF SCHOOLING ON PISA RESULTS: A CASE OF COUNTRIES WITH DIFFERENT TRACKING SYSTEMS

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THE EFFECT OF ONE EXTRA YEAR OF SCHOOLING ON PISA RESULTS: A CASE OF COUNTRIES WITH DIFFERENT TRACKING SYSTEMS[3]

The purpose of our study is to compare the impact of an extra year of schooling on PISA achievement across several national education systems and explore why that impact may differ across systems. We first attempt to measure and compare the impact of an extra year of schooling on PISA achievement in selected countries. Second, we conduct analyses of possible interaction effects: whether the impact of an extra year of schooling differs for female vs. male students and for students of higher and lower social class. Third, we explore whether splitting students into general vs. vocational tracks changes the effects of an extra year of schooling on achievement. The paper addresses the issue of PISA result interpretation for policy-making: whether countries with low scores also have low school effectiveness and vice versa. Also looking at the specific effects of tracking allows us to consider the academic-vocational problem in a new way.

Keywords: effect of schooling, Programme for International Student Assessment (PISA), quasi-experimental design, selection in education

JEL Classification: I21, C21.

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Introduction

For the people who make decisions concerning national education, data about school efficiency are indispensable, especially if the information stems from comparable perspectives. An inference about school effectiveness can be made on the basis of value-added data for some fixed period of time. Usually data of this type come from longitudinal research. Unfortunately longitudinal data are expensive and infrequent. In some cases an inference about school effectiveness can also be reached using cross-sectional design. The OECD Programme for International Student Assessment (PISA) is such a study.

Achievement in PISA shows the cumulative effect of age, learning experience, curriculum, and the family environment of students rather than a pure schooling effect (OECD, 2006; OECD, 2010). To disentangle the effect of schooling from others a regression discontinuity (RD) approach can be applied. Since the PISA sample includes students of the same age (generally 15 years old) and enrolled in a higher or lower grade, the RD method is used to assess the grade effect.

In trying to assess the effect of one extra year of schooling on PISA data, there is only one serious drawback: the different educational tracks that pupils can take up to their 16th birthday. Usually tracking takes the form of clear separate sectors in the education process, typically specializing in general and vocational education. In many countries students have to choose between the tracks at about 15 years of age. If the PISA outcomes occur after this branching has happened, it is difficult to say which effect of schooling we assess with PISA scores: general education, vocational education or a mix of both. This problem can guide many of the current studies as most of them, to assess a grade-effect in a cross-sectional frame, treat the cases without a division in different educational tracks.

Many authors show that vocational education affects academic achievement (and PISA results as well) systematically and negatively (Hanushek & Wößmann, 2006; Ammermüller, 2005; Schuetz et al., 2005). So a direct comparison of student achievement from a country with early tracking and a country where all 15-year-olds are included in the same general track is not quite fair. This can lead to the under- or overestimation of school efficiency depending on the intensity and scale of tracking in a country.

Also, politically, it is very important to know what the efficiency of different educational programs is.

Unfortunately it is not possible to compare directly the grade effect for students from different tracks because the selection is not random, but sometimes via individual talent and skills, sometimes via parental pressure and lobbying. Furthermore, individual skills and talents are also affected by many factors and only part of them relate to schooling. If one ends up in the vocational track, it might be a part of the whole previous personal and educational story. It means that any track has an indirect effect, acting through or together with many aspects of the student's background. If we used longitudinal data we could fix the starting point of some tracks, calculate value-added effect for each, and then to compare the direct effect of every track. Because PISA does not allow for a value-added approach, the separation of the direct and indirect effect of the tracks still remains challenging when PISA data are used.

This research will be devoted to an evaluation of the absolute effect of schooling based on data from PISA-2009. In this paper we are going to suggest a way to handle the issue of tracking and to find the grade-effect for different schooling systems.

Literature review

The body of the previous studies on the grade effect, when the cross-sectional data are involved, has focused on following points. First, an absolute grade effect has been assessed (Ceci, 1991; Cascio & Lewis, 2006; Cahan & Davis, 1987; Cliffordson, 2010; Frenette, 2008; Luyten, 2006). Second, factors associated with efficiency of schooling have been revealed (Heck & Moriyama, 2010; Artman, 2006). Third, an optimal age to start school has been identified (Fertig & Kluve, 2005; Mayer & Knutson, 1997; Sprietsma, 2010). Fourth, the grade effect has been compared to the effect of aging (Alexander & Martin, 2004; Cahan & Cohen, 1989; Cahan & Davis, 1987; Cliffordson, 2010; Crone & Whitehurst, 1999).

Our study will be devoted mainly an evaluation of the absolute grade effect of schooling.

The most widespread methods to handle cross-sectional data to reveal the grade-effect are instrumental variable (IV) and regression discontinuity (RD) analysis (Imbens & Lemieux, 2008). These methods allow us to avoid a misinterpretation of the grade effect assessed, when there was a non-random earlier start of schooling. Also IV analysis helps to separate age and grade effects from each other. The RD method, if it applies to assess the grade effect, supposes that in every country the start of schooling is based on the age of child. Also the IV method exploits variation in a student's age relative to age entry cutoffs for primary school (these cutoffs are different for each country). A combination of these methods with propensity score matching helps to understand to what extent tracking changes the effect of an extra year of schooling on academic achievement (Schneider et al., 2007; Brodziak, 2009).

Applying pure RD design on samples without tracking, the achievement gain between students with an extra year of schooling, and those without have been assessed. Typically the measured grade effect varied from 0,18 SD (Cascio & Lewis, 2006) to 0,53 SD (Luyten, 2006) and depended on students' age, race and cognitive domain. Ceci in a literature review on the grade effect pointed out a variation in the size of the grade effect from 0,25 to 6 IQ points (Ceci, 1991).

Judging by PISA data about 0,5 SD is the typical effectiveness of one extra year of schooling. Frenette (2008), using the strict RD analysis on Canadian PISA data, showed that the reading and math domains are more sensitive to schooling (grade effect in these domain was (0,41 SD), than science (0,33 SD). However the results varied for students with different SES.

For TIMSS[4] scores (when the national TIMSS sample included students from different grades) one extra year of schooling also had a positive impact, though with a large variance between countries, schools and subjects (Luyten, 2006). Besides, the grade effect has depended on the level of academic achievement of primary school students: when achievements were high, the grade effect was small. Again it has been found that the effectiveness of one extra year of schooling was lower for science than for math for all countries included (except Iceland): the grade effect for math varied from 0,25 SD (England) to 0,8 SD (Norway); for science the range was from 0,19 SD (England) to 0,53 SD (Norway).

It is interesting to note that the assessed effectiveness has not been associated with countries' ranks in PISA or TIMSS league. In other words, national performance in the international programs and an effectiveness of a year of schooling stem from different sources: PISA/TIMSS scores reflect the cumulative effect of very different factors, while the grade effect, as we said, shows precisely the schooling impact on national achievement.

Among the factors which change the size of the grade effect, researchers have pointed out gender (for girls the grade effect was higher than for boys), and the number of books in the home (this factor affected grade effect positively) (Luyten, 2006). These two factors were not stable across countries assessed. Another strong factor affecting the grade effect was the teaching practice which included the quality of teaching, student support, professional training for teachers, and how much attention the school pays to improving instruction. In general this factor could change the grade effect by half (Heck & Moriyama, 2010).

When a large proportion of students in each country does not comply with the birth date cutoff rule, the student's relative age as an instrumental variable for grade level has been used instead of a sharp RD design (e.g., Fertig & Kluve, 2005).

All of the above studies, in assessing the grade effect deal with only the general educational track. Indeed, the educational systems in the countries Sweden, Norway, England,

[4] Trends in International Mathematics and Science Study (Третье международное исследование по оценке качества математического и естественнонаучного образования).

Canada, Iceland and some others provide only one track for the cohort of students who are in the research sample. As a result the researchers did not have to take into account learning on different tracks. Methodological differences in these studies have mainly stemmed from the specific research questions.

We did not manage to find any studies on the grade effect which took the different educational tracks into consideration as a factor biasing the assessed effectiveness of schooling.

Certainly, vocational tracks in education have become the subject of attention for many researchers. They treated the vocational pathway in four different ways. First, they compared the effect of tracking on achievement by a pretest, controlling for prior ability before tracking, and post-test for achievement after tracking (Alexander & Cook, 1982; Jencks & Brown, 1975). Second, tracking (vocational vs. general) can be considered as an outcome of previous educational background (Sprietsma, 2010). Third, tracking was treated as the independent factor for future educational carriers (Hanushek &Wößmann, 2006). Fourth vocational education was considered as a specific subject to reveal the principal features of this type of training in terms of teacher experience and expectations, curriculum, parental involvement - all of which can cause specific outcomes for vocational students.

In terms of our research questions we cannot rely fully on the methods used in the above-mentioned studies. We assess the effect of schooling when this period is divided into different tracks and we can avoid possible bias caused by the selection process. The other particularity of our study is that we cannot pretest student skills before their segregation into different programs.

PISA data show that students from the vocational tracks have systematically lower academic results than students from the general track (Hanushek & Wößmann, 2006; Ammermüller, 2005; Schuetz et al., 2005). The factors affecting these differences are very complex. Some combination of interacting factors like student academic achievement and aspirations, teachers' and parents' expectations can lead to different tracks, and thus selection is only part of the story. Being allocated to different programs students are exposed to different curriculums, peer influence, and social expectations (Gangl et al., 2003; Manning & Pischke, 2006). Even if there are no final conclusions about the effect of differentiation on student achievements, we have enough information to see a potential bias when comparing the effectiveness of educational systems with different tracks and systems without tracking.

There are several programs and a selection process based on non-measured characteristics of students for many countries. A methodological way to take this factor into account is crucial for an accurate comparison between schools, tracks and countries.

This work is focused on revealing the grade effect in the countries addressing selection bias problem. Additionally we included the countries without tracking to compare the grade effect with the first group of countries.

This study answers the following research questions:

1. What is the effectiveness of one extra year of schooling in Russia and how does this compare with other countries that showed diverse PISA results?
2. What is the grade effect on students from general education in Russia and in other countries with early tracking?
3. To what extent does the grade effect depend on the social and demographic characteristics of students?

Method

Sample

In PISA the target population is fifteen-year-old students who attend formal schooling and can be enrolled in seventh to twelfth grade, although a very high percentage of students are in the ninth and tenth grades in the most countries.

Countries that were included in analysis: Russia, Germany, Czech Republic, Slovakia, Hungary, Canada and Brazil.

Repeaters were removed.

Table 1. The description of country samples

	N	**Total sample**		**9 grade**		**10 grade**		
		9	10	General*	vocational	General**	Pre-vocat	vocational
		N	N					
Russia	5308	60%	28%	100%		81%		19%
Slovakia	4555	36%	57%	100%		29%	42%	29%
Czech R.	6064	49%	47%	100%		39%		61%
Germany	4979	55%	33%	100%		100%		
Brazil	20127	37%	36%	100%		100%		
Hungary	4605	67%	22%	82%	18%	86%		14%
Canada	23207	14%	84%	100%		100%		

*from all 9th graders **from all 10th graders

Variables

Outcome variables were math, reading and science performance in PISA 2009.

Treatment was being in 10th grade up to the moment of PISA testing.

Instrumental variable was the age of the student. In the selected countries all the students in the sample were born between January and December 1993. The age was measured as the month of birth minus the month of the cutoff which was identified for each country.

The other students' and schools' characteristics were taken into account:

- gender of student (a binary variable equal to 1 if the student was female and 0 otherwise),
- socioeconomic status (SES) of student, which was derived from three variables related to family background: the higher parental occupation status, the higher parental education expressed as year of schooling and the index of home possession, SES score was obtained as component scores for the first principal component with zero being the score of an average OECD student and one being the standard deviation
- school location (4 dummy variables: village, small town, town, city; large city is the reference category[5]).

Analysis Strategy

We identify the causal effect of an extra year of schooling on student achievement using an instrumental variables strategy based on the regression discontinuity design. In the regression discontinuity design (RDD), the probability of receiving a given treatment jumps at the cutoff point along a continuous variable (Hahn et al., 2001). The cutoff point, when established by policymakers, can often be used as a source of exogenous variation in treatment assignment (Imbens and Lemieux, 2007). For example, in the sharp RDD, where the probability of receiving the treatment changes from zero to one at the cutoff point, an average treatment effect can be identified by comparing the outcomes of "treated" students to the right of the cutoff point with the outcomes of "control" students to the left of the cutoff point. In the fuzzy RDD, where the probability of receiving the treatment jumps by less than one at the cutoff point, a local average treatment effect (LATE) can be identified by using variation in the treatment assignment because of the cutoff as an instrument for the treatment variable.[6] In contrast to the sharp RDD, the fuzzy RDD identifies a treatment effect for an unidentifiable group of compliers (Hahn et al., 2001).

Each country in our analytical sample has established a specific birth cutoff to determine when students were old enough to attend primary school.

Table 2 also shows more clearly that a certain proportion of students in each country did not comply with the birth cutoff rule. For most countries, the proportion of students that did not

[5] For the Slovakia sample "city" has been reference category because there was no category "large city"

[6] The probability jumps by less than one at the cutoff point in the fuzzy RDD because individuals do not comply with the treatment (or control) condition to which they are assigned.

with comply the birth cutoff rule was around 20% or less.[7] Because of imperfect compliance around the birth cutoff, we estimate the LATE of an extra year of schooling in each country using student's relative age (age relative to the cutoff point in each country) as an instrumental variable for grade level.

Table 2. **The birth cutoffs and proportion of non-compliers in each country**

Country	Birth cutoff	Non- compliers	10th graders who were born after birth cutoff (% from all 10th graders)	9th graders who were born before birth cutoff (% from all 9th graders)
Russia	October, 1st	52%	11%	74%
Canada	October, 1st	18%	14%	18%
Slovakia	September, 1st	17%	7%	26%
Czech	September, 1st	20%	1%	38%
Brazil	September, 1st	29%	24%	38%
Germany	July, 1st	12%	12%	11%
Hungary	June,1st	20%	6%	25%

We assume that relative age is a pre-treatment variable that plausibly affects student PISA scores through the grade level but not through any other (observed or unobserved) pre-treatment covariate. Given the general level of compliance with the birth cutoff rule in most countries, relative age should also be correlated reasonably well with grade level.

We also examine whether an extra year of schooling affected certain subgroups of students (namely female students and students of lower socioeconomic status) more than others. We ran IV regressions with two interaction terms (grade effect*SES and grade effect*gender) to estimate the impact of attending an extra year of schooling on different types of students.

The above mentioned models were estimated for the whole national samples for all tracks combined. After that IV analysis results for general and vocational tracks separately. In situations with early tracking it was very important to select the students for this kind of analysis correctly.

If we compare all 9th graders with 10th graders from the general track, we risk over-estimating the grade effect, because we are not able to take into consideration those 9th graders who are likely to attend the vocational track and be poor achievers in PISA. Instead we analyzed the restricted sample: 10th graders from the general track and 9th graders with high probability of being in the general track in 10th grade.

[7] In the case of Russia (and to a lesser extent Brazil), however, the percentage of non-compliers was rather large.

These calculations included:

1) First, the regression coefficients were calculated on the sample of all 10th graders (from both tracks) using logistic regression with the dependent variable of being in general track and independent variables of the student's SES and gender.
2) Second, the probability of continuing education in general schools was calculated for all 9th graders. For this calculation the coefficients from the first step were used.

As a result only 9th graders with a high probability of being in general track and 10th graders from general schools were selected for the RD analysis. To estimate the value of the grade effect more accurately in each country with general and vocational tracks we choose 9th graders with three different probabilities of being in the general track and compare the results for each subsample.

IV analysis for this restricted sample was carried out in the same manner for the whole sample.

Finally, in all regressions, we accounted for the clustered nature of our sample by constructing Huber-White standard errors corrected for school-level clustering (relaxing the assumption that disturbance terms are independent and identically distributed within schools).

Results

Descriptive statistics

Canada and Germany have the highest results in math, reading and science among the selected countries. These countries have the highest level of socioeconomic status also. Brazil has the lowest average results in 3 domains and the lowest average SES.

In every country 9th graders have significantly lower results than 10th graders in all domains. According to our descriptive analysis for the sample without repeaters 9th graders have lower results than 10th graders in every selected country regardless of whether we take into account the division into different tracks or consider all 10th graders combined. The highest difference between scores of 9th and 10th graders was found in Germany, it was more than 50 points or 0,5 standard deviations[8]. In Canada the difference between results of 9th and 10th graders was estimated as 0,1-0,2 standard deviations and it was the lowest difference among all selected countries.

There are clear differences in the results between general and vocational schools in every country where this takes place (see Table 3). Results of 10th graders on general track are better

[8] In PISA the average score among OECD countries is 500 points and the standard deviation is 100. About two-thirds of students across OECD countries score between 400 and 600 points (for details see OECD, 2012).

than those of vocational students. In Russia and Slovakia 10th graders from vocational schools are weaker than 9th graders in general schools. The largest difference between the results of general and vocational 10th graders is estimated in Slovakia for every PISA achievement domain. For reading and math performance this difference is more than 130 points and for science it is 127 points. In Czech Republic and Hungary the difference between general and vocational students in all PISA domains is more than 100 points (1 standard deviation in PISA scores). In Russia 10th graders from general schools have higher results than vocational students although among other countries the difference between their scores 9th and 10th grades is lowest.

Also it should be noted that 10th graders from the general track have a higher level of SES than students from vocational track and there is a higher proportion of female students (see Appendix, Table 1).

Table 3. PISA scores for each country, grade and track

Countries	Program	Math		Read		Science	
		9	10	9	10	9	10
Russia	general	466(80)	506(78)	459(85)	499(82)	481(87)	511(84)
	vocational		444(76)		428(79)		452(78)
	All	466(80)	496(82)	459(85)	487(86)	481(87)	501(86)
Slovakia	general	492 (81)	580(72)	463(79)	558(60)	481(84)	568(69)
	vocational		444(73)		421(72)		441(78)
	prevocational		501(71)		499(65)		503(73)
	All	492 (81)	508(89)	463(79)	494(84)	481(84)	504(88)
Czech	general	482 (84)	604(69)	469(83)	590(58)	494(89)	609(67)
	vocational		497(77)		481(75)		504(76)
	All	482 (84)	523(88)	469(83)	508(86)	494(89)	530(87)
Hungary	general	516(76)	538(73)	519(71)	548(68)	527(69)	549(66)
	vocational	408(60)	427(60)	408(63)	437(60)	427(62)	456(60)
	All	499(84)	526(80)	502(80)	536(75)	511(77)	539(71)
Germany	general	517 (87)	575 (79)	504(84)	557(71)	528(90)	579(78)
Brazil	general	397(75)	432(77)	430(82)	469(82)	418(76)	454(76)
Canada	modular	525(85)	536 (83)	516(83)	535(85)	519(84)	539(85)

Causal (IV) analysis' results for all programs combined

Differentiating the educational programs (general or others) was not taken into account and the grade effect was estimated for the whole sample of 9th and 10th graders without repeaters for every country. The entire results of IV analysis for all programs are presented in Table 4.

Table 4. The grade effect for PISA 2009 (all programs combined)

Countries		Model 1	Model 2	Model 3		Model 4	
		Grade effect (s.e.)	Grade effect (s.e.)	Grade effect (s.e.)	Grade effect*SES (s.e.)	Grade effect (s.e.)	Grade effect*female(s.e.)
Russia	Math	1,98 (11,8)	6,48 (10,8)	9,41(11,1)	14,13(16,1)	-2(15,1)	17,55(23)
	Read	10,49(12,7)	14,48(12,21)	17,46(12,67)	14,38(19,1)	18,66(17,76)	-8,64(25,44)
	Science	11,72(12,57)	17,26(12,51)	18,54(12,73)	6,22(18,92)	20,91(18,28)	-7,54(24,35)
Slovakia	Math	-10,8**(4,4)	-13,94(9)	-13,03(8,8)	17,03***(5,6)	-8,38(10,8)	-10,9(10,6)
	Read	8,36*(4,32)	-2,04(8,39)	-1,37(8,19)	12,63*(6,76)	1,26(10,72)	-6,48(10,15)
	Science	2,09(4,41)	-1,69(9,22)	-0,93(9)	14,44**(7,3	6,58(11,13)	-16,24(10,29)
Czech Republic	Math	29,69***(3,5)	23,38***(7,14)	23,36***(7,12)	4,47(6,11)	20,7**(9,23)	5,39(8,98)
	Read	18,32***(3,55)	15,12**(6,2)	15,11**(6,19)	2,42(5,58)	10,89(7,98)	8,51(8,94)
	Science	23,45***(3,63)	20,43***(7,11)	20,43***(7,11)	0,94(6,07)	18,74***(8,72)	3,4(9,08)
Germany	Math	39,46***(4,47)	33,45***(3,5)	36,85***(4,9)	-10,16**(4,5)	41,79***(6,08)	-15,45**(7)
	Read	31,84***(3,65)	26,79***(3,68)	29,63***(4)	-8,49**(3,93)	29,79***(5,27)	-5,57(6,5)
	Science	35,5***(4,01)	29,34***(4,41)	34,63***(4,68)	-15,8***(4,4)	38,76***(5,83)	-17,43***(6,61)
Brazil	Math	25,89***(5,4)	28,47***(5,04)	34,65***(6,8)	7,31(4,6)	32,26***(6,8)	-6,93(9,7)
	Read	24,41***(5,74)	27,96***(4,8)	33,5***(5,98)	6,55(4,54)	32,26***(7,4)	-7,84(10,71)
	Science	16,88***(5,48)	19,53***(4,42)	25,53***(6,01)	7,09*(4,25)	25,36***(6,39)	-10,62(9,55)
Canada	Math	37,28***(8,11)	31,56***(8,72)	31,9***(9,4)	-0,73(10,5)	29,38***(12,7)	4,32(16,15)
	Read	27,47***(8,23)	24,94***(7,84)	23,98***(9,09)	2,03(10,17)	31,1**(12,08)	-12,22(16,42)
	Science	30,23***(8,33)	24,79***(8,06)	21,56**(9,13)	6,88(11)	25,81**(12,22)	-2,02(16,73)
Hungary	Math	12,12**(4,8)	10,96**(4,38)	11,04**(4,42)	4,49(4,13)	12,9*(7,12)	-3,46(8,49)
	Read	14,78***(4,61)	13,88***(4,18)	14,04***(4,27)	8,75**(3,9)	15,63**(6,76)	-3,09(7,81)
	Science	14,47***(4,33)	13,28***(4,01)	13,4***(4,08)	6,62*(3,79)	17,64***(6,68)	-7,72(7,98)

In the first model the grade effect without covariates was estimated. As we can see from Table 4 the grade effect in Russia is non-significant for all domains. For Slovakia the grade effect is significant only for math and reading. The grade effect for math in Slovakia is negative.

Other countries demonstrated significant positive grade effects. In the first model the relationship between the effectiveness of schooling for all three domain is not consistent. While in Germany and Czech Republic the grade effect for reading is the lowest and for math performance it is the largest, in Slovakia we can see opposite pattern with the highest grade effect in reading and the lowest in math. Brazil has the biggest grade effect in math and the smallest in science. Grade effect in Hungary is nearly the same for all PISA domains.

In the second model SES, gender and school location was controlled. In Slovakia and Russia grade effect was non-significant for every domain. For other countries the grade effect remained significant and the size of it was close to the grade effect in the model without covariates.

In Germany and Czech Republic the pattern remains the same: the grade effect for math performance is the highest and for reading it is the lowest in all three domains. In Brazil the grade effect for science is the lowest. In Canada again the grade effect in math is higher than in reading and science. In Hungary the grade effect in math is lowest among other domains, although the differences are minimal.

In the third model interaction term between SES and grade effect was added. The coefficient of this term was significant in four countries: Germany, Slovakia, Hungary and Brazil. In Germany this coefficient was negative for three domains showing that the size of the grade effect increases with decreasing SES. In science performance, for instance, it is 15,8 points (nearly half of the mean grade effect in Germany), meaning that difference in results for 9th and 10th graders with high SES is smaller than for students with low SES. In other countries a contrary pattern was found. In Slovakia the grade effect increases for student with high SES for math, reading and science achievements. The size of coefficient of the interaction between 12,6 (for reading performance) and 17 points (for math). In Hungary the interaction term between SES and the grade effect was significant in science and reading performance and it is less than 10 points (0,1 standard deviation). In Brazil the coefficient of the interaction term was significant (at level 0,1) only for science performance.

In the fourth model interaction term between gender and the grade effect was added. The coefficient of this term was significant only in Germany for math and science achievements. This coefficient is negative meaning that girls have a lower grade effect in science and math than boys. The size of the grade effect is nearly half of average grade effect in Germany.

The results of the estimation of the grade effect without taking into account different educational tracks show that the grade effect is higher in countries where all 9th and 10th graders are on the same track (Germany, Canada and Brazil). The low value of the grade effect in countries with vocational and prevocational students in the PISA sample suggests it can partially depend on the low results of vocational students. That is why it is important to estimate the grade effect for general schools to compare it with the grade effect for all programs.

Causal (IV) results for general track

In three countries (Slovakia, Czech Republic and Russia) all 9th graders are in the general schools, but some of them can pass to vocational school after finishing 9th grade. That is why our first aim was to select 9th graders who have a high probability of continuing general education in order to compare them with 10th graders of general schools.

The first step was to calculate the probability of being in a general program for 10th graders in all these three countries (Russia, Czech Republic and Slovakia). According to the results of a logistic regression girls and high SES students have higher probability of continuing education in general schools. In Slovakia and Czech Republic SES is the most meaningful predictor, in Russia gender is more important than SES (See Appendix, Table 2).

The next step was calculating the predicted probability of continuing education for 9th graders in general track (See Appendix, Table 3).

In Slovakia and Czech Republic the average probability of being in the general track is not very high in comparison with Russia where the average value of the predicted probability was estimated as 0,79. For Slovakia average value of the predicted probability to continue education in general program was 0,28; it is the lowest result among the three countries.

The third step was to select 9th graders with a high probability of continuing a general education. At this stage some issues can arise. The value of the grade effect will depend on which value of probability we estimate as “high”. At the beginning we selected 9th graders with probability higher than the average value in each country (more than 0,8 in Russia; more than 0,3 in Slovakia; and more than 0,4 in Czech Republic). Then we tried some other indicators of “high” probability to analyze how the grade effect can change depending on different values of probability of continuing general education. In Russia and Czech Republic we have chosen two other values of predicted probability: the first is lower than the average value, the second is higher than the average value. In Slovakia we have chosen two indicators also; but both of them were lower than the average value (0,2 and 0,25) because of the small number of 9th graders that would remain in the sample if we choose probability more than 0,3. It may be explained by the small number of 9th graders in the Slovakian sample and the small number of 10th graders in general schools in comparison with Russia and even Czech Republic. The values of the probability and the number of 9th graders with this value in each country is given in Table 5.

Table 5. The number of 9th graders with a different value of probability of continuing education on a general track (without repeaters)

	Russia			Slovakia			Czech Rep		
Probability	>0,7	> 0,8	>0,85	>0,2	>0,25	> 0,3	>0,3	> 0,4	>0,5
Number	2174	1713	1073	889	665	511	1570	1164	843
% (from 9th or 10th graders)	74%	58%	37%	60%	45%	35%	55%	41%	29%

In Hungary the selection process to estimate the grade effect in general schools was easier. We selected 9th and 10th graders from general schools and we did IV analysis for this restricted sample.

For each selected country which differentiated the educational tracks after the 9th grade we assessed the grade effect using four models (as for all programs) for three subsamples. In each subsample 10th graders of general schools and 9th graders with different values to continue general track were included (See Table 6).

Table 6. The grade effect for general track (PISA 2009)

Countries		Probability to be in general	Model 1	Model 2	Model 3		Model 4	
			Grade effect (s.e.)	Grade effect (s.e.)	Grade effect (s.e.)	Grade effect*SES (s.e.)	Grade effect (s.e.)	Grade effect*female(s.e.)
Russia	Math	>0,7	15,6(12,9)	25**(11,9)	25,41**(11,9)	5,47(18,4)	29,56*(16,7)	-7,85(25,5)
		>0,8	16,3(12,8)	22,44*(13,3)	22,59*(13,3)	2,46(15,5)	14,93(22,8)	10,7(28,9)
		>0,85	11,37(13,4)	29,05*(15,9)	27,35*(16,1)	20,5(17,7)	57,48(45,7)	-33,32(47,3)
	Read	>0,7	16,58 (13,6)	31,1**(13,1)	31,9**(13,3)	11,04(19,9)	53,2***(18,2)	-38,2(27,8)
		>0,8	6,63(13,2)	26,56*(15)	27,55*(14,9)	15,88(17,1)	53,9*(22,8)	-38,98(29,8)
		>0,85	-8,43(14,2)	29,08(18,9)	27,52(18,8)	18,8(21)	98,39*(46)	-81,26*(46)
	Science	>0,7	19(13,8)	29,6**(13,3)	30,31**(13,4)	10,58(19,9)	47,52*(18,7)	-31,08(25,92)
		>0,8	15,32(13,57)	23,82(14,96)	24,57*(14,91)	11,95(16,6)	40,22*(24,1)	-23,39(28,41)
		>0,85	8,18(14,26)	28,79(17,52)	26,72(17,32)	25,02(19,3)	100,9**(47,3)	-84,48*(46,49)
Slovakia	Math	>0,2	59,9***(6,5)	51,6***(9,5)	51,9***(10,3)	-0,89(10)	77,5***(13,5)	-42,5***(13,6)
		>0,25	53,14***(7)	49,8***(10,4)	47,1***(12,6)	5,2(12)	79,1***(15,3)	-46,8***(14,7)
		>0,3	50,59***(7)	50,54***(10,6)	46,9***(14,5)	5,5(14)	77,7***(14,6)	-44,3***(14,8)
	Read	>0,2	69,6***(6,2)	53,45***(8,4)	55,1***(9,1)	-4,53(8,8)	77,5***(13,7)	-39,4***(13,3)
		>0,25	62,5***(6,4)	48,94***(9)	48***(10,5)	1,8(10,1)	70,9***(14,5)	-35,2***(13,6)
		>0,3	60,1***(6,5)	45,33***(9,3)	40,2***(11,8)	7,9(11,4)	66,4***(14)	-34,3***(13,9)
	Science	>0,2	64,3***(6,7)	55,04***(9,2)	57,47***(9,9)	-6,76(8,74)	83,9***(13,5)	-47,2***(13,6)
		>0,25	57,88***(7)	51,89***(9,8)	53,6***(11,6)	-3,2(10,5)	79,9***(14,4)	-44,9***(14,5)
		>0,3	54,2***(7,2)	49,89***(9,8)	51,3***(13,2)	-2,2(12,5)	77***(13,4)	-44,2***(14,6)
Czech Republic	Math	>0,3	95,5***(6,5)	90,05***(6,5)	102,8***(7,3)	-28,2**(7,8)	103***(10,3)	-19,4*(10,4)
		>0,4	86,8***(5,3)	86,24***(7,1)	102,5***(8,4)	-29,5***(9)	98,7***(11,4)	-18,46(11,3)
		>0,5	82,5***(5,6)	83,65***(7,7)	107,8***(11)	-34,6***(11)	92,7***(12,6)	-13(12,3)
	Read	>0,3	75,8***(5,2)	76,12***(5,6)	90,3***(7,27)	-31,5***(8,3)	82,27***(9,7)	-9,19(11,34)
		>0,4	67,8***(5)	70,36***(6,2)	85,97***(8,3)	-28,3***(8,7)	76,6***(10,6)	-9,24(11,6)
		>0,5	61,6***(5,2)	65,48***(6,7)	85,26***(11)	-28,3***(11)	66,38***(14)	0,7(12,55)
	Science	>0,3	95,5***(5,2)	90,05***(6,5)	102,8***(7,3)	-28,2***(7,8)	103***(10,3)	-19,4*(10,4)
		>0,4	81,7***(5,5)	83,51***(8,3)	101,1***(11)	-31,9***(10)	94,8***(12,7)	-16,68(12,85)
		>0,5	76,1***(5,7)	78,91***(8,8)	102***(14,3)	-33,06*(13,4)	87,3***(13,6)	-11,95(13,88)
Hungary	Math	From general schools	14,7***(4,6)	12,26***(4,29)	7,74(13,22)	-5,16(15,4)	6,66(6,9)	12,91*(7,5)
	Read		17,7***(4,3)	15,78***(4,03)	15,44***(4,1)	4,24(3,84)	16,24**(6,46)	-0,79(7,4)
	Science		15,4**(7,01)	6,09(6,39)	5,98(6,57)	12,69*(6,98)	16,27 (11,12)	-16,84(13,45)

*** p<0.01, ** p<0.05, p* <0.1

The first model was a model without covariates and assessed the grade effect only. For Russia the grade effect was non-significant for any level of probability and for each PISA achievement domain. In Slovakia and Czech Republic the grade effect is significant and positive for any level of probability and in all three domains. It should be noted that the value of the grade effect decreases when the probability of continuing general education for 9th graders increases.

According to the results of the first model, in Czech Republic the grade effect for general schools is the highest among other selected countries. We can see the same pattern for all programs combined: the grade effects for math and science performance are nearly the same, and they are lower for reading than for math and science. For math and science the grade effect is about 90 points (0,9 standard deviation), for reading it is about 70 points (0,7 standard deviation).

Slovakia has a big grade effect too. For general schools in Slovakia the grade effect is higher than for any other country (except Czech Republic) with or without tracking. The Grade effect in Slovakia is nearly the same for all three domains and it is about 60 points (0,6 standard deviation).

The grade effect in Hungary for general schools does not differ very much from the grade effect for all programs and it is about 15 points for all PISA achievement domains.

The second model was a model with covariates. In Russia the grade effect becomes significant when we control for SES, gender and school location. Although for science the grade effect is significant only at a low level of probability (0,7) of continuing general education. The grade effect for general schools in Russia is higher than for all programs but not very large. It is lower than 30 points.

In Slovakia the grade effect becomes lower when SES, gender and school location are controlled for, although these changes are significant only for reading performance. For this domain the grade effect decreases by nearly 15 points in comparison with the estimated grade effect in the model without covariates. In the model with covariates the grade effect is about 50 points (0,5 standard deviation) and does not change significantly depending on PISA domain or 9^{th} graders' probability of continuing general education.

In Hungary the grade effect for science achievement becomes non-significant after taking into account student and school variables.

The results of the models with interaction terms for general schools differ from results of these models for all programs.

The grade effect in Czech Republic is significantly lower for general students with high SES. It is true for any level of probability and each domain of PISA achievements. The grade effect decreases by nearly 30 points when SES increases by 1 point. In Hungary the grade effect is higher for students with high SES only for science achievements.

In Slovakia the value of the grade effect does not change with an increase in a student's SES but it is different for boys and girls. Girls from general schools have a smaller gain in results for one year of schooling in math, reading and science than boys. The difference in the grade effect between boys and girls is about 40 points (0,4 standard deviation).

In Russia the grade effect does not differ across different SES and gender.

Causal (IV) results for vocational track

The grade effect for the vocational track was estimated only for Czech Republic and Slovakia because of the small number of vocational students in Russia and Hungary. In Hungary the sample included only 527 9th graders and 139 10th graders on vocational programs. In Russia the sample totals only 295 10th graders on vocational track.

To estimate the grade effect for the vocational track the predicted probability that 9th grader moves to the vocational track was assessed. We used the same method to estimate predicted probability as for general orientation but the outcome variable was "being on the vocational track".

The mean probability of being on the vocational track for 9th graders in Slovakia is 0,29. In Czech Republic the predicted probability of being on the vocational track is much higher than in Slovakia; it is nearly 0,6 (See Appendix, Table 4).

As for the estimation of the general track we chose three levels of predicted probability of being in a vocational school and ran IV analysis for three subsamples (See Appendix, Table 5).

According to IV results for the vocational track, the grade effect for the vocational track is much lower than for general programs.

Table 7. The grade effect for vocational schools

Countries		Probability to be in vocational	Model 1	Model 2	Model 3		Model 4	
			Grade effect (s.e.)	Grade effect (s.e.)	Grade effect (s.e.)	Grade effect*SES (s.e.)	Grade effect (s.e.)	Grade effect*female (s.e.)
Slovakia	Math	>0,2	-50,9***(5,4)	-62,2***(12,9)	-55,6***(13,9)	14,59(11,8)	-51,2***(14,6)	-32,46*(13,1)
		>0,3	-46,5***(5,7)	-55,5***(14)	-44,7***(16,3)	20,5(15,3)	-49,5***(15,1)	-25,1*(14,43)
		>0,4	-44,1***(6,1)	-47,4***(14,5)	-39,2**(18,1)	13,8(18,9)	-46,53***(15)	-6,93(19,1)
	Read	>0,2	-37,1***(5,4)	-49,4***(11,5)	-48,4***(11,9)	2,25(10,8)	-41,9***(12,2)	-22,41(14,1)
		>0,3	-24,1***(5,1)	-41***(12,6)	-36,8***(13,9)	7,99(13,1)	-39,1***(12,9)	-8,17(14,6)
		>0,4	-16,5***(6)	-35***(13,5)	-34,66**(15,8)	0,58(15,6)	-37***(13,2)	16,6(19,4)
	Science	>0,2	-40,1***(5,7)	-50,8***(13,3)	-45***(13,5)	13(14,1)	-38,2***(13,7)	-37,2***(14)
		>0,3	-32,8***(6,1)	-41***(14,6)	-27,53*(15,8)	25,5(18,3)	-34,1**(14,6)	-28,9*(15,7)
		>0,4	-29,2***(6,5)	-32,7**(15,4)	-18,7(18,1)	23,5(22,9)	-31,09**(14,9)	-13,1(21,4)
Czech Republic	Math	>0,5	17,5***(3,9)	5,8(8,3)	3,1(8,6)	-11,2(8,1)	6,98(10,3)	-2,81(10,9)
		>0,6	22,2***(4,1)	7,7(8,5)	4,45(9)	-10(8,89)	8,03(10,25)	-5,98(17,6)
		>0,65	24,3***(4,2)	7,17(8,6)	2,19(9,5)	-12,6(9,6)	7,19(10,3)	-0,05(11,5)
	Read	>0,5	9,09**(3,9)	-0,6(7,2)	-3,3(7,5)	-11,2(8)	-0,6(9,1)	-0,04(10,9)
		>0,6	15,7***(4,04)	1,28(7,5)	-1,95(8,01)	-10(8,9)	0,25(9,1)	2,58(11,43)
		>0,65	18,3***(4,2)	0,56(7,5)	-4,41(8,4)	-12,6(9,8)	-0,66(9)	3,23(11,7)
	Science	>0,5	10,7***(4)	2,85(7,5)	-1,46(8)	-18,1**(8,2)	5,45(9,5)	-6,06(10,5)
		>0,6	15,3***(4,2)	4,9(7,7)	-0,66(8,59)	-17,3*(9)	6,8(9,53)	-4,8(11,09)
		>0,65	17,3***(4,3)	4,86(7,8)	-3,4(8,9)	-20,9**(9,6)	5,99 (9,5)	-2,99(11,3)

*** p<0.01, ** p<0.05, p* <0.1

In Slovakia the grade effect for the vocational track is negative for all domains and any value of predicted probability. It becomes smaller if the predicted probability increases. The most negative difference between results for 9th and 10th graders on the vocational track was found for math performance, it is nearly 50 points (0,5 standard deviation).

In Czech Republic the grade effect for the vocational track is significant and positive. It is almost the same as for all programs and it is about 20 points (0,2 standard deviation) for math, reading and science performance (See Table 7).

In Slovakia the negative grade effect for girls on the vocational track is higher for girls for math and science achievements. In Czech Republic grade effect is lower for high SES students but only for science performance.

Discussion

The objective of this paper was to estimate the effectiveness of one extra year of schooling based on PISA data. Despite having examples of similar attempts the existence of several educational programs in some countries complicate this task seriously. By and large the difference in PISA performance which students with almost the same age but in consecutive grades demonstrate can be regarded as the effect of one year of schooling. However for this interpretation the following demands have to be met.

First of all, the effect of maturing can lead to higher scores in a higher grade. We can see this pattern from our analysis as well as from PISA reports (OECD, 2007, 2010). Even if the age effect has been shown for younger students rather than for senior (Alexander & Martin, 2004; Cahan & Cohen, 1989; Cahan & Davis, 1987; Cliffordson, 2010; Crone & Whitehurst, 1999), it should be controlled.

The second problem was that more advantaged students start their schooling earlier than students. In other words the difference between students who have been taught one year more and those who have been taught one year less to the moment of PISA testing can be overestimated because of non-random allocation of students around cut-off date (Cascio & Lewis, 2006; Cliffordson, 2010; Frenette, 2008; Luyten, 2006; Heck & Moriyama, 2010; Brodziak, 2009). We can see an unequal distribution of social and cultural resources between students with earlier or later start of schooling. To take the age effect into account and to control for the bias due imperfect compliance with birth date rule we used instrumental Variable Analysis and Regression Discontinuity design.

The third problem was non-random selection into different educational tracks in the countries where the several programs exist. A large body of research has shown that school and parental expectations and pressure, selective support for individual abilities of students as well as the specialization effect and peer effect tracking can influence significantly academic achievements and skills (e.g., Hanushek & Wößmann, 2006; Ammermüller, 2005; Schuetz et al., 2005; Gangl et al., 2003; Manning & Pischke, 2006). We can see from our data that students from vocational schools have lower results than students from general programs. To handle this selection bias a restricted sample of students was analyzed. It consisted of only 9th graders with a high probability of being in general track and 10th graders from general track. This propensity score matching procedure allowed us to compare similar groups of students in terms of their SES, motivation, aspirations, abilities and other unmeasured characteristics.

Returning to our research questions it is possible to outline the main outcomes of this study.

What is the effectiveness of one extra year of schooling in Russia and how does this compare with other countries that showed diverse PISA results? One extra year of schooling in Russia for students from all tracks combined turns out to be insignificant for PISA results (in reading). It implies that for PISA achievements it does not matter whether students have been taught for 9 or 10 years up to the moment of PISA testing. In comparison with other countries included in the analysis, it has the lowest grade-effect, although an unfavorable pattern has been found for all ex-socialist countries: Hungary, Slovakia and Czech Republic show a lower grade-effect than Germany, Canada and even Brazil.

In addition to a shared socialist past, Russia, Hungary, Slovakia and Czech Republic have been linked with the practice of early educational tracking. In Hungary this educational diversification occurs earlier than in other countries studied – in the 9th grade. Taking into consideration the negative effect of the vocational track on academic achievements repeatedly confirmed (Hanushek &Wößmann, 2006; Ammermüller, 2005; Schuetz, Ursprung & Wößmann, 2005), it makes sense that in this case we are dealing with exactly this effect. If we want to compare the different national systems fairly, we need to allow for the presence of several educational tracks in some countries.

What is the grade effect on students from general education in countries with early tracking? Assessing the grade effect on students from the general education track, it can be seen that the grade effect is higher than the grade effect for all tracks combined. Thus, in Russia when we control for the social-demographic characteristics of students (Model 2), we find a significant grade effect for math and reading performance. In other countries with two educational tracks for 15-year-olds (Hungary, Slovakia and Czech Republic) the grade effect of the general track is also higher than for all tracks combined. It means that vocational tracks in all these countries have lower effectiveness than general tracks. In this case it is true even if all latent characteristics are controlled for. Being on a vocational track implies by itself a low effectiveness of schooling regardless of the initial skills and motivation of students.

In Czech Republic the gap between the grade effect for all tracks combined and the grade effect for the general track is the largest of the countries selected; in Hungary this gap is smallest. Obviously, this gap corresponds to the difference in the quality of education on different tracks. In Russia this gap, which is approaching one third of a standard deviation, shows a visible flaw in primary and secondary vocational education.

To what extent does the grade effect depend on the social and demographic characteristics of students? As a rule, the relationship between SES and the grade effect differs depending on the educational system. This analysis only confirms these previous conclusions. Among the countries selected only Germany shows a negative relationship between SES and the grade effect. It is probable that in Germany, the school system takes into account the needs of disadvantaged students. In Czech Republic such a negative relationship has been found only in the general education track.

In Slovakia and Hungary a positive relationship between SES and the grade effect has been found: students with high SES benefit from schooling more than disadvantaged students.

In Russia, Brazil and Canada the grade effect remains the same for students regardless of SES. Does it show the equality of educational possibilities in these countries? This is likely, although, in the case of Russia equality can only be found in the general track.

Generally in Russia the following picture can be drawn. The age to start schooling depends to a large extent on parental expectations and the preliminary skills of the child. More skilled children go to school earlier and, up to the moment of PISA testing, they learn longer than their less skilled peers. The effect of latent family presence can be traced to the link between PISA achievement and the SES of the student. This family trail will affect the selection of students after 9^{th} grade, when roughly one fifth of students leave general education and start the vocational track. From this moment we have two indicators for the grade effect. The first shows that students who remain in general education benefit from one year of schooling significantly: their reading literacy gains. The second indicator shows the grade effect for all students, those who leave general education and those who remain. Here it does not matter whether they have been taught for nine or ten years: there is no grade effect. The simple conclusion results from these two indicators and it concerns the grade effect for students who leave the general track after 9^{th} grade: one year of schooling affects their achievements negatively. In other words the grade effect for a fifth of Russian students is negative.

Unfortunately, it is impossible to specify which year of schooling exactly this is: whether this year has been spent in vocational school or it was a year of general schooling. As has been shown, it is not possible to specify the moment when the effect of vocational school occurs. If the student is recondemned to leave general school after 9^{th} grade based on past personal history, the anticipation of this event (from parents, teachers and students themselves) can affect the efficiency of learning from primary school. To speak more accurately about the grade effect in Russia, we need to keep in mind different groups of 15-year-olds and consider varied grade effects related to them: the significantly positive grade effect for students who remain in general school after 9th grade; the negative effect for students who leave the general school; and the neutral, that is no effect, for all 15-year-olds for both groups combined.

Summary and conclusions

1) PISA scores cannot be regarded as indicators for effectiveness of national educational systems. Firstly, the duration of schooling differs across different countries and the duration influences the PISA results. Secondly, the age to start formal education has its own effect on academic success and the age of starting school varies across countries. Finally, being in the vocational schools decrease PISA results and, as we can see, the proportion of general and vocational students in PISA sample is different across counties.
2) Regression Discontinuity design generally allows for the estimation of effectiveness of national educational systems based on the cross-sectional PISA data if we control the possible bias by additional analyses like IV and propensity score matching. In this case the grade effect is interpreted as a value-added estimation for schooling.

Considering the case of Russia, the grade effect is not significant for students from all programs combined. Also it should be noted that the grade effect in Russia was lowest among countries analyzed (except Slovakia). The effect of one extra year of schooling for students from the general track is higher than for students from all programs but still lowest among countries analyzed. In Russia the grade effect does not depend on student's gender and SES while in other countries the effectiveness of schooling was differ depending on gender and SES.

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Appendix

Table 1. Descriptive statistics for SES, gender and schools location (without repeaters)

Countries	Orientation	SES		Female		Schools in village		Schools in small town		Schools in town		Schools in city	
		9	10	9	10	9	10	9	10	9	10	9	10
Russia	general	-0,21(0,8)	0,11(0,8)	50%	59%	17%	8%	19%	14%	17%	24%	34%	35%
	vocational		-0,22(0,8)		31%		5%		11%		0%		45%
Slovakia	general	-0,09(0,8)	0,39(0,8)	44%	59%	19%	0%	25%	17%	34%	64%	22%	19%
	vocational		-0,48(0,7)		39%		1%		13%		82%		4%
	Prevocat.		-0,1(0,7)		66%		1%		10%		68%		21%
Czech	general	0,03(0,7)	0,48(0,7)	45%	64%	12%	2%	29%	31%	42%	55%	7%	7%
	vocational		-0,15(0,6)		49%		5%		23%		48%		15%
Hungary	general	0,01(0,88)	0,11(0,89)	50%	60%	1%	0,4%	15%	19%	40%	40%	24%	24%
	vocational	-0,81(0,7)	-0,89(0,7)	39%	45%	6%	5%	9%	16%	39%	38%	28%	27%
Germany	general	0,19(0,9)	0,46(0,9)	50%	57%	3%	1%	24%	21%	50%	56%	16%	16%
Brazil	general	-1,1(1,2)	-0,88(1,2)	58%	60%	3%	2%	12%	14%	35%	36%	37%	37%
Canada	modular	0,4(0,8)	0,5(0,8)	51%	52%	19%	16%	22%	23%	24%	22%	22%	28%

Table 2. Regression coefficients for dependent variable "to be in general" for 10th graders

Variables	Russia		Slovakia		Czech Rep.	
	Beta	Exp (Beta)	Beta	Exp (Beta)	Beta	Exp (Beta)
SES	0,629	1,875	1,047	2,849	1,489	4,434
Female	1,19	3,288	0,298	1,347	0,821	2,273
Constant	0,993	2,698	-1,096	0,334	-1,073	0,342

*All coefficients are significant on the level <0,01

Table 3. Predicted probability to continue the education in general track for 9th graders

	Russia	**Slovakia**	**Czech Rep**
Min	0,31	0,01	0,02
Max	0,97	0,85	0,94
Mean	0,79	0,28	0,37
25 percentile	0,69	0,16	0,19
75 percentile	0,88	0,36	0,53

Table 4. Predicted probability to be in vocational track

	Russia	Slovakia	Czech R.
Min	0,03	0,01	0,05
Max	0,69	0,98	0,98
Mean	0,21	0,29	0,6
25 percentile	0,12	0,13	0,41
75 percentile	0,31	0,43	0,79

Table 5. Number of 9th graders with different value to continue education in vocational orientation (without repeaters)

	Russia				Slovakia				Czech Republic			
Probability	>0,15	>0,2	>0,3	10th graders from vocational	>0,2	> 0,3	>0,4	10th graders from vocational	>0,5	>0,6	> 0,65	10th graders from vocational
Number	1859	1324	798	295	966	704	475	698	2064	1749	1542	1575
% (from 9th or 10th graders)	63%	45%	27%	18%	65%	48%	32%	28%	72%	61%	54%	59%

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