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Do human and cultural capital lenses contribute to our understanding of academic success in Russia

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ABSTRACT

Using newly available data from the Trajectories in Education and Careers Study, the first longitudinal study on a representative sample of high school students in Russia, we examined the importance of investments in human and cultural capital on students' mathematics and reading standardized examinations, as well as on the likelihood of matriculation into a selective institution of higher education. Studying mathematics and the Russian language on one's own for more than a year was positively and significantly associated with standardized scores and with an increased likelihood of matriculating into a selective university. A higher number of books at home was also associated with an increased likelihood of matriculating into a selective university. The findings are discussed within the particular institutional context of the Russian educational system.

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Human capital; cultural capital; academic achievement; Russia

Introduction

Sociology of education has a rich tradition of examining the explanatory power of human and cultural capital in determining the educational success of students from different socioeconomic backgrounds. In most general terms, human capital theory examines the importance of direct investment in one's skills, knowledge, and eventual productivity, whereas cultural capital theory concerns itself with activities fostering social class-specific preferences, tastes, and styles. In sociology of education research, human capital theory (Schultz 1961; Becker 1993) is associated with a broader view on societal realities that posits that one's success in the educational system is the result of a greater investment in ability and effort to yield higher academic achievement and eventual attainment, thus seeing the educational field as a truly meritocratic system. Conversely, cultural capital theory highlights the stratified nature of the education field and the privileges that students from upper-class families derive from it. It is important to note that while the human capital perspective is derived from the rational/economic approach that focuses on individuals and their capabilities, cultural capital is derived from a sociological perspective that is concerned with the interaction between the individuals and their social surrounding (an interaction between *habitus* and *field*, in Bourdieu's terms).

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A plethora of studies has examined the effects of cultural capital on academic achievement and attainment in the western context (De Graaf 1986; DiMaggio 1982; Farkas 1996; Jæger and Møllegaard 2017; Kalmijn and Kraaykamp 1996; Lareau 2011; Lareau and Weininger 2003; Mohr and DiMaggio 1995; Sullivan 2001) and several studies examine these effects in the East Asian context (Byun, Schofer, and Lim 2012; Yamamoto and Brinton 2010). However, limited research exists on the post-socialist countries of Eastern Europe (Bodovski, Jeon, and Byun 2017). Furthermore, research on cultural capital rarely examines its activities alongside human capital investments (Farkas 1996).

Our study makes several important contributions to the literature. First, we examined the role of activities that fall under the umbrellas of cultural capital and human capital in students' high-stakes standardized examinations in mathematics and the Russian language and in their likelihood to matriculate into a selective university. Second, we examined these relationships in the understudied context of post-socialist Russia using newly available data from the Trajectories in Education and Careers Study (TrEC), the first longitudinal study on a representative sample of high school students in Russia. The high level of standardization and strong differentiation across secondary schools in Russia provides an interesting institutional context to study the effects of capitals and compare them to other national contexts.

Theoretical background

Human capital, shadow education, and academic achievement

Human capital refers to skills and knowledge that people acquire in order to maximize their own individual benefits (Blaug 1992; Poterba 1996). A core assumption of human capital theory is that the accumulation of human capital leads to increased individual productivity, and thereby improves economic growth (Becker 1993; Schultz 1961). The term 'shadow education' refers to a variety of academically oriented activities that take place outside the hours of formal schooling and typically outside school walls. These may include private tutoring or different types of organized after-school activities (e.g. cram schools) that either help struggling students to catch up or provide enrichment activities (Bray 2007; Bray and Silova 2006). Although the research on shadow education has rarely explicitly acknowledged shadow education as a form of human capital accumulation, we argue that direct investment in children's knowledge and skills through participation in organized academic activities, private tutoring, or independent study constitutes an investment in their human capital. Parents believe that participation in shadow education increases student prospects of entering tertiary institutions. These beliefs are especially apparent in the Eastern European context, where participation in shadow education activities before entering institutions of higher learning has become the norm (Bray 2007; Bray and Silova 2006).

Despite the fact that the stated goals of tutoring often include raising school achievement and the chances of entering higher education institutions, cross-national analyses show that the effects of shadow education on educational outcomes vary both in direction and magnitude (Park et al. 2016). For example, in his analyses of a large sample of countries that participated in the Trends in International Mathematics and Science Study (TIMSS), Wolf (2002) found that participation in extra-school instruction is associated with an increase in student mathematics scores on a standardized test but also with a decrease on a science

test. Huang (2013) found that when students in a country engage in more intensive after-school tutoring, this raises mathematics and science mean achievement on average without widening the achievement distribution. Interestingly, Baker et al. (2001) found that the extent to which students within a country participate in shadow education does not have an effect on mean national mathematics achievement.

Many studies examine tutoring participation in the East Asian context, perhaps due to the rich tradition of tutoring in this region of the world (Byun and Baker 2015). For example, Stevenson and Baker (1992) examined shadow education in Japan and showed that participating in correspondence courses aimed at preparing for university entrance examinations increases one's chance of university attendance, but taking lessons from a private tutor does not. Stevenson and Baker (1992) note that students engaged in tutoring and correspondence courses specifically to make themselves more competitive when sitting for entry examinations to tertiary institutions. Similarly, South Korean parents report enrolling their children into shadow education schools and spending as much as 30% of their income on this type of education to increase their children's odds of success on the nationwide college entrance examination (Dawson 2010).

The phenomenon of private tutoring is not new to post-Soviet Russia because tutoring, while not as widespread, still existed in Soviet countries (Silova and Bray 2006). However, perhaps due to data availability, studies that estimate the effects of tutoring on academic outcomes are more recent. In this vein, Loyalka and Zakharov (2016) show that engaging in human capital accumulation through shadow education only improves the high-stakes standardized test scores of high-achieving students. At the same time, Prakhov (2016) examined the selectivity of the tertiary institutions that students matriculate into and showed that families' investment in shadow education prior to entry into tertiary institutions predicts the selectivity of the university attended. Similar to Japanese and South Korean students discussed earlier, Russian students also engaged in tutoring activities with the specific goal of preparing for entry examinations to institutions of higher learning (Bain 2001; Loyalka and Zakharov 2016; Prakhov 2016).

Parental income and wealth tend to predict students' likelihood to engage in shadow education activities (Buchmann, Condron, and Roscigno 2010; Dawson 2010; Jung and Lee 2010; Smyth 2009). This is because shadow education is costly and families with more disposable income are more likely to be willing and able to set aside funds for additional classes and tutors. Another predictor of participation in out-of-school academic activities is parental education (Jung and Lee 2010; Park et al. 2016; Smyth 2009). The logic here is that better educated parents might understand the importance of education-related activities more than those who are less educated, and thus are more willing to enroll their children in them. Further, both wealthier and better educated parents are more likely to hold jobs with schedules that allow them to ensure that their children can participate in these activities (Heinrich, Meyer, and Whitten 2010). Moreover, depending on the type of shadow education and the country studied, there are gender differences in shadow education participation (Buchmann, Condron, and Roscigno 2010; Stevenson and Baker 1992). For example, in the United States females are more likely to enroll in shadow education (Buchmann, Condron, and Roscigno 2010), whereas in Japan males are more likely to participate in a correspondence course and a practice examination while females are more likely to have a tutor (Stevenson and Baker 1992). Thus, parents might tailor the types of shadow education in which they enroll their children based on their gender.

Cultural capital and academic achievement

Bourdieu's cultural capital theory argues that the elites create and reproduce the educational system in ways that serve the interests of the privileged by ensuring the advantage of upper-class children in school. Bourdieu (1986) differentiated between three states of cultural capital: the embodied state (preferences, attitudes, tastes, dispositions), the objectified state (possession of high culture objects), and the institutionalized state (symbolic aspect of educational credentials). Within the research following the cultural capital tradition, there is an ongoing debate as to how to empirically capture it. Some scholars argue for an approach focused on high-brow cultural activities and participation (DiMaggio 1982; Kalmijn and Kraaykamp 1996; Mohr and DiMaggio 1995; Sullivan 2001), whereas others conceptualized cultural capital more broadly, arguing for including habits, styles, and soft skills under its umbrella (De Graaf, 1986; Farkas 1996, 2003; Jæger and Møllegaard 2017; Lareau 2011; Lareau and Weininger 2003; Swidler 1986).

The concept of cultural capital is tightly connected to Bourdieu's notions of *habitus* and *field*. Certain skills or activities do not become capital unless they are internalized into the 'feel for the game' (i.e., habitus) within a particular context (i.e. field). A specific national educational system can be seen as a field within which capitals are generated and used to the benefits of (some) actors. As such, it is possible that cultural participation would be beneficial for students in a certain country but may hurt students in another. Indeed, studies in different countries yielded inconsistent findings showing that the effects of cultural capital vary greatly by the context in which it is studied (Jæger 2011; Sullivan 2001). Several studies reported positive, albeit modest, effects of cultural capital on reading and/or mathematics achievement (Barone 2006; Bodovski 2010; Jæger 2011; Xu and Hampden-Thompson 2012).

Yamamoto and Brinton (2010) and Byun, Schofer, and Kim (2012) examined the role of cultural capital in non-western countries. These studies showed different effects of embodied and objectified cultural capital on educational performance. In Japan, embodied cultural capital had a positive effect on ninth-grade academic performance, whereas objectified cultural capital did not. Both types affected students' probability to enter highly ranked high schools; in addition, objectified cultural capital predicted women's participation in higher education (Yamamoto and Brinton 2010). Interestingly, parental objectified cultural capital had a positive effect on students' academic achievement in South Korea, whereas children's embodied cultural capital had a negative effect on their academic performance (Byun, Schofer, and Kim 2012). This last finding can be explained by the fact that the post-secondary transition in South Korea is solely based on academic factors, thus making extra-curricular activities a distraction to that pursuit. Further, a high level of standardization provides students and their parents with a clear sense of the criteria used to measure academic success, thus minimizing the role of cultural activities. Taken together, the existing research shows that the importance of different forms of capital in determining educational outcomes varies greatly by the national context (i.e. field in Bourdieu's terms). The characteristics of the educational systems, including their standardization and differentiation, as well as the criteria for university admission, play a role in the process of capital conversion into academic success.

In this study we build upon previous research and improve on it using a longitudinal sample of high school students in Russia. We examine the influence of both human and

cultural capital accumulation on the educational achievement of students and on the selectivity of the tertiary institutions that they enter. Moreover, the Russian educational system is characterized by high level of standardization and strong differentiation at the secondary school level, and the university admission is strictly based on the academic factors potentially making activities under the cultural capital umbrella less salient. We aim to answer the following research questions:

- What role do various activities under the umbrellas of cultural and human capital play in determining students' mathematics and Russian language standardized scores?
- What role do these activities play in predicting the likelihood of students' matriculation into a selective institution of higher education?

Russian context

Grade school in Russia lasts for 11 years, and includes primary (Grades 1–4), middle (Grades 5–9), and high (Grades 10–11) school. In most cases, all three levels are combined in one school structure (physically and administratively). As such, students progress from grade to grade essentially attending the same school. Separate primary schools or high schools are rather rare. After completing the ninth grade, students have a choice between continuing on to the academic track for two more years of high school or transferring to vocational education for various programs lasting two to four years. Between one third and half of the cohort pursue the latter option after the ninth grade. With a few exceptions, admission to vocational schools does not include any entry examinations. The same is true for academic high school, especially when students continue within the same school (the vast majority of students do not change schools). The track decisions are made based on students' choice, their grades, and teachers' recommendations. Both low-performing and high-performing students have an option to continue their education in academic high schools or exit to vocational education; however, low-achieving students are more likely to pursue vocational education. In principle, both tracks could lead to higher education, but a transition from the academic track is more straightforward and usually leads to matriculating into more prestigious institutions of higher education.

Beginning in 2009, all students at the end of high school (11th grade) have had to take the Unified State Exam (USE) – a series of standardized tests that serve both as school exit and university entrance matriculation examinations. Before USE introduction, school exit examinations had limited influence on students' future academic trajectory as they were not taken directly into account during the university admission process. Universities had their own entry examinations, both in written and oral forms, which required the physical presence of the applicants. During Soviet times, students could only apply to one institution of higher education; in 1990, this was changed to three choices. Sitting for multiple series of entrance examinations became increasingly impractical. Furthermore, universities' own examinations were highly specific and passing them was rather difficult without attending special university-organized preparatory courses or taking lessons with a private tutor. As universities, especially selective ones, were located in the capital and other big cities, access to these extra-curricular activities was limited for those who lived outside the big cities or did not have resources to pay for courses and tutors. Moreover, the entire system was highly corrupted, allowing faculty from particular universities to facilitate the admission process for

students of their choice (Osipian 2009). All these issues led to launching the higher education reform that began in 2000 and resulted in the introduction of the USE across Russia in 2009.

Mathematics and Russian language examinations are obligatory for all high school students, regardless of their postsecondary plans. The examinations in other academic subjects are chosen by students according to the specific requirements of their chosen university majors (students typically choose two to three additional USEs). The Ministry of Education prescribes the list of examinations for each existing major and all universities in the country follow it. The Russian language USE is obligatory in every list of required USE subject scores, at least on a pass or fail basis. The university admission decisions are made based on the sum of the required USE scores.

Data and method

We used data from the TrEC, the first longitudinal study of a representative sample of high school students in Russia. The data were collected by the Center for Cultural Sociology and Anthropology of Education, at the Institute of Education in the Higher School of Economics, Moscow, Russia.[1] The first wave of the study is TIMSS 2011, which was collected when students were in the eighth grade. The same students were then followed twice when they were in the ninth grade: for Wave 2, students received a proprietary questionnaire; and for Wave 3, Program for International Student Assessment 2012 questionnaires were used. After that, the students were followed twice in the 11th grade. These were Wave 4 and Wave 5 of the data collection. The final Wave 6 of data collection occurred a year after students graduated from high school. As such, the TrEC is a rich dataset that allows for a detailed exploration of student achievement in Russia. The students who withdrew from the academic track of the public school to vocational education after the ninth grade were followed as well. However, only students in academic tracks are required to take the USE. As such, our study solely focuses on students in the academic tracks. Appendix 1 displays a comparison between the original sample, Wave 6, and our analytic samples. As expected, our analytic samples are more selective and include a larger proportion of girls, students with highly educated parents, and students in urban areas. This should not, however, bias our estimates because in our analysis we control for these variables, as well as for other characteristics potentially related to these differences.

Dependent variables

Our outcomes of interest are student USE scores in mathematics and the Russian language (Wave 6) and whether a student matriculated into a selective tertiary institution (Wave 6). The *USE Russian score* and the *USE mathematics score* are the scores that a student received on the USE in the respective subject. *Matriculation into a selective university* is a binary indicator that is measured using the data for a mean admitted USE score for the university that a student matriculated into. These data were obtained from Monitoring Quality of Admission to Russian Universities (NRU HSE 2015). As such, each student in our data has three USE scores associated with them: their USE mathematics score, their USE Russian score, and the mean admitted USE score of the institution that a student matriculated into. We coded a university as selective if the mean USE score of the entering cohort falls in the

top 30% of the distribution of the scores. This means that students who matriculated into a university with a mean admitted USE score of 73.9 and higher are coded as attending a selective institution. This measurement strategy is consistent with the previous studies using these data (Prakhov 2016).

Independent variables

For the human capital domain, we used three variables: whether students had a *tutor* (Wave 4), whether they participated in a *USE preparatory course* (Wave 4) in either mathematics or Russian, and whether they *studied on their own* (Wave 4) for more than a year. *Study on one's own* was coded as 1 for students who studied either mathematics or Russian for more than a year as opposed to those who did so for less than a year or did not study the subject independently at all. We believe this type of coding helps us capture students who are truly committed to their studies as opposed to those who are trying to quickly catch up before sitting for the USE test. The activities that relate to the Russian language only enter the models that predict the *USE Russian score*; the activities that relate to mathematics only enter the models that predict the *USE mathematics score*. For models that examine matriculation into selective institutions, we combine Russian-related and mathematics-related human capital activities. For these models, we used three variables: *mathematics and/or Russian tutor, mathematics and/or Russian preparatory course, and mathematics and/or Russian study on one's own*. These variables range from 0 to 2, where 0 represents students who did not participate in either Russian-related or mathematics-related human capital activities (tutoring, preparatory course, or study on one's own for each respective variable), 1 represents students who participated in either Russian-related or mathematics-related human capital activities, and 2 represents students who participated in both.

We measured cultural capital by the following measures, available in the data set: the number of books (Wave 4) that a student has at home, whether a student has *classical literature* (Wave 4) at home, whether a student participates in a *sports section* (Wave 4), and whether they attend music and/or arts school (Wave 4). Participation in a *sports section* and *music and/or arts school*, as well as having *classical literature* at home, are dichotomous. Prior studies routinely use participation in sports, art, and music as measures of cultural capital (Bodovski and Farkas 2008; Bodovski 2010; Cheadle 2008, 2009; Dumais 2002, 2013). The *number of books* is coded 1 for 0–10 books, 2 for 11–25 books, 3 for 26–100 books, 4 for 101–200 books, 5 for 201–500 books, and 6 for more than 500 books.

Control variables

In line with the relationships outlined in existing studies, we controlled for prior achievement (Wave 1), gender (Wave 1), parental education (Wave 3), parental occupation (Wave 3), parental expectations regarding their child's educational attainment (Wave 5), whether a student has siblings (Wave 4), and whether they live in a two-parent family (Wave 4). *Prior achievement* is the mean of the five plausible values of student's mathematics and science TIMSS scores. Female is coded 0 for males and 1 for females. Parental education is coded 1 for parents who have a Bachelor's degree or above, and 0 if otherwise (in the case of two parents present, we used the higher educational attainment). *Parental occupation* is the occupational status as measured on the International Socio-Economic Index of Occupational

Status scale (as with *parental education*, in the case of two parents present we used the higher number) (Ganzeboom 2010). *Parental expectations* is coded 1 for students who reported that their parents expect them to achieve a college degree or higher, and 0 for those whose parents expect them to achieve less than a college degree or have not discussed this question with the student, as well as the students who found the question hard to answer. *The number of children* is the number of children in the family including the surveyed student. A *two-parent family* is coded 1 for children who live with two biological parents and 0 for everyone else.

At the school level, we controlled for *mean school socioeconomic status (SES)* (Wave 3), for whether a student attends an *elite school* (measure collected from the administrative records for Wave 1 and added to the data post hoc), and for whether a school is an *urban school* (this measure was also collected separately). We used the PISA index of economic, social and cultural status (ESCS) as a measure of SES, and aggregated it to the school level to get a measure of the *mean school SES*. *Elite schools* are public schools that have a special license to teach advanced curriculum in all or select subjects. These schools usually have a more demanding curriculum and may administer a special entrance examination. *Urban school* is coded 1 for schools located in urban areas. All independent and control variables that were used in the analyses were collected prior to our dependent variables, thus reducing the possibility that the relationships we observe are endogenous.

In order to account for error dependence among students who attend the same schools, we estimate a series of multilevel models with random intercepts, with students nested in schools (Raudenbush and Bryk 2002). We use pairwise deletion of missing data. Also, 224 students in our sample changed schools over the span of survey administration. As we are including random intercepts for schools, we limit our analyses only to students who have not changed schools over the span of the survey, in order to ensure proper nesting of students in their respective schools.

Results

Descriptive statistics are presented in Table 1. Some descriptive results deserve particular attention. Specifically, 32% of students in our sample used a Russian tutor and 46% used a mathematics tutor. Regarding USE preparatory courses, 49% of students attended a Russian language USE preparatory course and 55% attended a mathematics USE preparatory course. These numbers indicate how prevalent shadow education activities are in Russia, and that generally more students seek help in mathematics than in Russian. Only a quarter of students reported studying the Russian language and/or mathematics on their own for more than a year. All three measures were collected in the Fall semester of the 11th grade and thus reflect well students' strategy of USE preparation.

Table 2 presents the results predicting the USE mathematics score. Studying mathematics on their own for more than a year predicted a higher USE mathematics score: these students on average received a score about one quarter of a standard deviation higher than those who did not. Attending a mathematics preparatory course is statistically significant as well, but the effect is substantively smaller. Having a private tutor was not associated with an increase in student's USE mathematics score. None of the cultural capital variables predicted a change in student's USE mathematics score. Parental education, mean school SES, and having a two-parent family consistently and positively predicted USE mathematics scores, as did prior achievement measured in the eighth grade.

Table 1. Descriptive statistics of the variables used in the analysis.

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
USE Russian score	1961	68.213	13.943	4	100
USE mathematics score	1961	51.125	16.436	3	100
Matriculation into selective university	1367	0.292	0.455	0	1
Prior achievement	1961	569.842	63.345	346.948	803.790
Female	1961	0.564	0.496	0	1
Parental occupation	1549	57.108	14.574	16	89
Parental education	1845	0.663	0.473	0	1
Two-parent family	1961	0.660	0.474	0	1
Number of children	1958	1.598	0.865	1	14
Parental expectations	1903	0.906	0.2913	0	1
Elite school	1961	0.301	0.459	0	1
Mean school SES	1938	0.166	0.326	−1.311	0.843
Urban	1961	0.797	0.403	0	1
Russian tutor	1961	0.324	0.468	0	1
Mathematics tutor	1961	0.459	0.498	0	1
USE Russian preparatory course	1961	0.490	0.500	0	1
USE mathematics preparatory course	1961	0.547	0.498	0	1
Studying Russian on one's own	1951	0.261	0.439	0	1
Studying mathematics on one's own	1950	0.241	0.428	0	1
Mathematics and/or Russian tutor	1367	0.821	0.826	0	2
Mathematics and/or Russian preparatory course	1367	1.017	0.886	0	2
Studying mathematics and/or Russian on one's own	1355	0.525	0.765	0	2
Music and/or arts school	1942	0.144	0.351	0	1
Sports section	1953	0.449	0.497	0	1
Number of books	1877	3.773	1.290	1	6
Classical literature	1961	0.844	0.363	0	1

Table 3 presents the results for models that predict the USE Russian score. As with the USE mathematics score, the USE Russian score was predicted by studying Russian on one's own, although the effect is smaller than the effect of engaging in mathematics study. Notably, attending a preparatory course was not associated with a change in the USE Russian score but having a tutor was in one of the models. As with USE mathematics scores, the cultural capital variables did not predict a change in USE Russian scores. Since the influence of cultural capital may have occurred prior to the eighth grade, we re-estimated the models presented in Table 2 and Table 3 without controlling for prior achievement (the results are available upon request). In these models, the number of books positively predicted USE mathematics scores. Having classical literature positively predicted USE Russian scores across models, and the number of books positively predicted USE Russian scores in the model that did not include human capital activities. Students who attended a school with a higher mean SES received higher USE Russian scores. Parental expectations for a college degree positively predicted a higher USE Russian score. Also, female students outperformed their male counterparts on the USE Russian test across all models. Prior achievement measured in the eighth grade and parental occupation were positively associated with the USE Russian score.

Next, we examined the factors that predict matriculation into a selective university. Table 4 presents the results. In this analysis, the cultural capital variables are statistically significant. A higher number of books positively predicted attendance at a selective university, whereas participating in music and/or arts school negatively predicted such attendance. Interestingly, attending music and/or arts school was associated with a 48% decrease in the likelihood that a student will matriculate into a selective institution. Having a tutor did not positively

Table 2. Multilevel models predicting USE mathematics score from students' background characteristics and human and cultural capital measures.

Variable	Dependent variable: USE mathematics score			
	Model 1	Model 2	Model 3	Model 4
Prior achievement	0.128***	0.129***	0.131***	0.132***
	(0.007)	(0.007)	(0.007)	(0.007)
Female	−1.179*	−1.017	−0.981	−0.963
	(0.689)	(0.686)	(0.749)	(0.747)
Parental occupation	0.026	0.025	0.031	0.031
	(0.027)	(0.027)	(0.028)	(0.028)
Parental education	1.712**	1.497*	1.597*	1.494*
	(0.845)	(0.835)	(0.887)	(0.878)
Parental expectations	0.929	0.716	0.527	0.367
	(1.176)	(1.162)	(1.242)	(1.229)
Two-parent family	1.982***	1.842**	2.046***	1.915**
	(0.756)	(0.748)	(0.777)	(0.771)
Number of children	0.141	0.215	0.124	0.200
	(0.409)	(0.406)	(0.418)	(0.415)
Elite school	1.322	1.053	1.436	1.154
	(1.473)	(1.468)	(1.508)	(1.503)
Mean school SES	7.098***	6.972***	7.073***	7.072***
	(2.185)	(2.174)	(2.254)	(2.244)
Urban	−2.673*	−2.442	−2.550*	−2.337
	(1.501)	(1.501)	(1.542)	(1.543)
Mathematics tutor		0.552		0.416
		(0.713)		(0.734)
USE mathematics preparatory course		1.896***		1.542**
		(0.715)		(0.736)
Studying mathematics on one's own		4.363***		4.069***
		(0.790)		(0.810)
Music and/or arts school			−0.550	−0.762
			(0.999)	(0.992)
Sports section			0.089	−0.128
			(0.746)	(0.740)
Number of books			0.098	0.026
			(0.304)	(0.302)
Classical literature			−1.326	−1.310
			(1.081)	(1.069)
Constant	−25.98***	−28.95***	−26.80***	−29.12***
	(4.253)	(4.306)	(4.425)	(4.482)
Between-school variance component	31.191	31.208	32.325	32.25
	(6.153)	(6.071)	(6.486)	6.435
Number of level-1 observations	1497	1491	1422	1417
Number of level-2 observations	183	183	183	183

Note: Random intercepts are used at the school level. Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

predict attendance at a selective university. Studying on one's own positively predicted attendance at a selective university. Also noteworthy is that, holding all else constant, females were 75–87% more likely to attend a selective institution than males. Prior achievement measured in the eighth grade was positively associated with matriculation into a selective university.

In addition, we found that higher-achieving students and students with more siblings were less likely to take lessons from a mathematics or Russian language tutor. Students whose parents had a more prestigious occupation and held higher educational expectations and students in urban areas were more likely to have a mathematics or Russian language tutor. Being female was positively associated with studying Russian on one's own.

Table 3. Multilevel models predicting USE Russian score from students' background characteristics and human and cultural capital measures.

Variable	Dependent variable: USE Russian score			
	Model 1	Model 2	Model 3	Model 4
Prior achievement	0.095***	0.095***	0.095***	0.095***
	(0.005)	(0.005)	(0.006)	(0.006)
Female	6.715***	6.541***	6.516***	6.283***
	(0.550)	(0.552)	(0.602)	(0.603)
Parental occupation	0.058***	0.055**	0.064***	0.062***
	(0.022)	(0.022)	(0.023)	(0.023)
Parental education	0.397	0.380	0.220	0.264
	(0.675)	(0.674)	(0.713)	(0.710)
Parental expectations	4.391***	4.212***	4.030***	3.794***
	(0.939)	(0.940)	(0.998)	(0.999)
Two-parent family	−0.219	−0.176	−0.240	−0.200
	(0.604)	(0.602)	(0.625)	(0.622)
Number of children	−0.489	−0.473	−0.405	−0.387
	(0.327)	(0.326)	(0.336)	(0.335)
Elite school	−1.498	−1.555	−1.307	−1.339
	(1.209)	(1.197)	(1.225)	(1.216)
Mean school SES	10.77***	10.62***	10.58***	10.45***
	(1.787)	(1.769)	(1.827)	(1.814)
Urban	−0.207	−0.330	−0.300	−0.456
	(1.228)	(1.222)	(1.251)	(1.246)
Russian tutor		0.909		1.081*
		(0.616)		(0.640)
USE Russian preparatory course		−0.863		−0.927
		(0.579)		(0.600)
Studying Russian on one's own		2.321***		2.434***
		(0.610)		(0.628)
Music and/or arts school			−1.168	−1.176
			(0.803)	(0.798)
Sports section			−0.433	−0.556
			(0.600)	(0.599)
Number of books			−0.006	−0.131
			(0.245)	(0.245)
Classical literature			0.756	0.833
			(0.869)	(0.865)
Constant	2.274	2.437	2.301	2.449
	(3.411)	(3.439)	(3.564)	(3.575)
Between-school variance component	21.661	21.041	21.551	21.137
	(4.195)	(4.132)	(4.306)	(4.276)
Number of level-1 observations	1497	1492	1422	1418
Number of level-2 observations	183	183	183	183

Note: Random intercepts are used at the school level. Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Discussion

Using newly available data from the TrEC, the first longitudinal study based on a representative sample of high school students in Russia, we examined the role of various activities under the umbrellas of human and cultural capital in student's mathematics and Russian language standardized examinations, as well as in the likelihood of matriculation into a selective institution of higher education. Students who studied mathematics and Russian language on their own for more than a year received higher respective scores and were more likely to matriculate into a selective university. Participation in the preparatory course was associated with increased mathematics scores.

Studying on one's own and taking a preparatory course can be understood through the lens of human capital perspective because students make direct efforts to increase their

Table 4. Logit multilevel models predicting matriculation into a selective university.

Variable	Dependent variable: Matriculation into selective university					
	Model 1		Model 2		Model 3	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Prior achievement	0.012***	1.012	0.012***	1.012	0.012***	1.012
	(0.002)		(0.002)		(0.002)	
Female	0.557***	1.745	0.627***	1.872	0.606***	1.833
	(0.177)		(0.189)		(0.192)	
Parental occupation	0.025***	1.025	0.025***	1.025	0.025***	1.025
	(0.007)		(0.007)		(0.007)	
Parental education	–0.165		–0.186		–0.188	
	(0.225)		(0.237)		(0.239)	
Parental expectations	–0.109		–0.099		–0.131	
	(0.332)		(0.352)		(0.353)	
Two-parent family	–0.134		–0.220		–0.239	
	(0.183)		(0.191)		(0.191)	
Number of children	0.063		0.109		0.102	
	(0.099)		(0.105)		(0.105)	
Elite school	–0.158		–0.147		–0.135	
	(0.297)		(0.317)		(0.312)	
Mean school SES	1.572***	4.816	1.763***	5.823	1.699***	5.468
	(0.536)		(0.579)		(0.572)	
Urban	–0.080		–0.052		–0.095	
	(0.362)		(0.380)		(0.380)	
Mathematics and/or Russian tutor	0.167				0.126	
	(0.110)				(0.116)	
Mathematics and/or Russian preparatory course	–0.111				–0.067	
	(0.102)				(0.107)	
Studying mathematics and/or Russian on one's own	0.241**	1.273			0.252**	1.287
	(0.108)				(0.112)	
Music and/or arts school			–0.663***	0.515	–0.656**	0.519
			(0.254)		(0.257)	
Sports section			–0.189		–0.231	
			(0.185)		(0.186)	
Number of books			0.155**	1.168	0.137*	1.147
			(0.077)		(0.077)	
Classical literature			–0.337		–0.330	
			(0.323)		(0.325)	
Constant	–10.38***	0.001	–9.964***	0.001	–10.38***	0.001
	(1.284)		(1.299)		(1.337)	
Between-school variance component	0.925		1.082		1.005	
	(0.276)		(0.315)		(0.303)	
Number of level-1 observations	1052		1007		1001	
Number of level-2 observations	166		165		165	

Note: Random intercepts are used at the school level. Only statistically significant odds ratios are reported. Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

'marketable value'; that is, receiving higher scores leads to continuing education in a (more prestigious) university. The narrative of seeing such activities as a human capital investment are supported by multiple studies in the Russian context (Bain 2001; Loyalka and Zakharov 2016; Prakhov 2016). However, these activities also can be seen as an indicator of cultural capital. Through this lens, these activities represent a practice that is shaped by the interaction between capital, habitus, and field. The use of standardized examinations in post-secondary transition was introduced in Russia in 2009, thus presenting a new challenge that students and parents need to adapt to. This change affects the capital (what a student

needs to possess to gain entry to tertiary institutions), habitus (how to go about it; whether to study on one's own, take a private tutor, or participate in a special preparatory course), and the field itself. The old rules of university-specific entrance examinations, as well as studying with a tutor who is teaching in a particular university to increase one's chances of acceptance, are no longer valid. Students and their families are adapting to the new field; they have to develop new habitus and activate new (or modified) forms of capital. Increasing self-effort to study the material for a particular subject unsurprisingly increases the performance on the examinations in that subject. As for the difference in the effects of preparatory courses (we found the association for mathematics but not for the Russian language), it is possible that obtaining a certain mathematics score requires more guidance and explanation than obtaining a comparable Russian language score. Despite the fact that human and cultural capital originate from different epistemological traditions (human capital from an economic/rational approach, whereas cultural capital from a sociological approach focused on the context/field), we have shown how these lenses can coexist and be useful in understanding the particular case of the postsecondary transition in Russia.

We found that the number of books that a family possesses is positively associated with the increased likelihood to matriculate into a selective university. Interestingly, participation in music or arts school had a negative association with the likelihood to matriculate into a selective university. In this aspect, our findings on the Russian context are similar to those presented by Byun, Schofer, and Kim (2012) on South Korea. A high level of centralization and standardization in both educational systems makes the criteria for educational success clear for the students and their parents, thus directing their efforts toward accumulation of specific knowledge. In this context, a pursuit of and engagement in the arts and music may be perceived as a distraction or an alternative venue for fulfillment and self-actualization of students who are not as strong academically. In contrast to the United States, where the process of postsecondary transition to the four-year institutions takes into account the extra-curricular activities and interests of the applicants, university admission in Russia is solely based on academic performance. This elevates the importance of activities directly contributing to academic knowledge and diminishes the role of cultural participation. Our findings highlight the importance of the field within which the capitals are utilized. Different institutional features shape the educational fields in ways that make certain activities more beneficial than others.

The present investigation sheds light on a severely understudied context of postsocialist countries in Eastern Europe, and specifically on Russia. It also contributes to our understanding of stratification processes in education and the role activities conceptualized as investments in children's human and cultural capital play in it. Furthermore, our findings highlight the role of the institutional characteristics of educational system in moderating the effects of individually possessed capitals on educational outcomes. Future studies should look at the effects of human and cultural capital in comparative perspective, examining their influences under different characteristics of the educational systems within various national contexts. A longitudinal investigation based on the data collected as early as school entry would have provided a more comprehensive test for the role cultural capital plays in shaping educational success since the ability exhibited by the eighth-grade students (as captured by their TIMSS scores) has been shaped by previous experiences and the environment in which children grow up. A limitation of almost any secondary data analysis is in the scope of the variables to operationalize the theoretical constructs, and this study is no exception. We

used the variables that were included in the data but there are many additional ways to capture human and cultural capital. Another limitation of the current study is that it focuses on students who continued to the academic, as opposed to the vocational, track in high school. The Russian educational system, with its strong institutional tracking during the last two years of school, requires only students in academic tracks to take the USE. As such, the processes described only apply to the students who attended and then graduated from an academic track in high school. It would be interesting to examine the determinants of high school track choice and to compare them to the processes found in other national contexts.

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Note

1. Detailed information about the sample and design can be found online (https://trec.hse.ru/).

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Appendix 1. Characteristics of the original TIMSS 2011 sample (Wave 1), Wave 6 of TrEC data, and analytic subsamples

	TIMSS 2011 (Wave 1), all respondents	Wave 6, all respondents	Targeted subsample, USE score	Analytic subsample, USE score analyses	Targeted subsample, matriculation analyses	Analytic subsample, matriculation analyses
N	4893	3618	2185	1417	1491	1001
Female (%)	49	52	56	58	57	59
Urban (%)	79	78	80	79	85	84
Parents with BA or more (%)	53	54	66	67	71	72

Note: Attrition between Wave 1 and Wave 6 is due to non-response. Sample decrease from column 2 to columns 3 and 5 is due to our interest in specific subsets of students. The analytic samples are further reduced due to missingness on the variables used in the models.