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Determinants of Educational Outcomes in Yaroslavl, Russia

Determinantes de progresos educativos en Yaroslavl, Rusia

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Abstract

This paper examines the determinants of educational outcomes in Yaroslavl, Russia. Previous findings for this country point out that parents' educational level and income are the main explanatory variables. To investigate these factors, in 2009 we applied a questionnaire to a random sample of two thousand ninth grade students from 65 schools. We performed a regression analysis with ordinary lest squares and Newey-West robust standard errors and probit analysis. We found that the most common explanatory variables, family resources (including cultural capital, social capital and socioeconomic status), have a small but statistically significant positive effect on educational achievements and trajectories.

Keywords: Educational outcome, academic achievement, educational quality, social structure.

Resumen

Este trabajo examina los factores que determinan los resultados educativos en Yaroslavl, Rusia. Estudios anteriores señalan que el nivel de ingreso y educación de los padres son las principales variables explicativas. Para investigar estos factores, en 2009 se aplicó un cuestionario a una muestra aleatoria de 2,000 estudiantes de noveno grado de 65 escuelas. Se realizó un análisis de regresión Newey-West y el análisis Probit. Los resultados indican que las variables explicativas más comunes, los recursos familiares (incluyendo capital cultural, social y nivel socioeconómico), tienen un pequeño pero estadísticamente significativo efecto positivo en los logros educativos y las trayectorias de los estudiantes.

Palabras clave: Resultado educativo; progreso escolar; calidad de la educación; estructura social.

I. Introduction

In underdeveloped countries, the family resources (including cultural and social capital) are key predictors of educational outcomes. The empirical findings suggest that school grades, dropout rates, enrollments, and in general educational trajectories, are strongly influenced by parental education, occupation, and income; in other words, by the socioeconomic status (SES).

In this context, the study examined factors that explained educational outcomes of students in Yaroslavl Oblast, Russia. We focused on the effects of the family resources and investigated to determine if the educational outcomes in Yaroslavl were strongly explained by family resources, as in underdeveloped countries or on the contrary; did these resources have a relevant influence, like we usually find in developed countries.

These factors have already been analyzed in Russia. The main results suggest that the family resources, the parental education and income, in particular, are key predictors of Russian educational outcomes (Roshchina, 2010). But this is a large country with different regions and characteristics. It is therefore important to investigate the determinants of educational outcomes with a regional perspective, because the manner in which governments interpret findings will influence the policies designed to improve educational outcomes, and the recommendations for all Russia may not be good advice for its regions.

The paper is as organized as follows: Section 2 briefly discusses the theory and previous empirical studies. Section 3 presents the data sets and indicators for Yaroslavl (a sample of 2 thousands students in 9^{th} grade). Section 4 specifies the econometric models: least squares with Newey-West standard errors, and probit models, and it reports the results of the estimates. Finally, there is a discussion of findings, conclusions and future lines of research.

II. Brief Review of Theory and Previous Empirical Results

Pascarella & Terenzini (1991) identifies over 3 thousands studies regarding the determinants of educational outcomes (as cited in Robbins *et al.*, 2004). However, in this section we will only present some of the most relevant studies and work that helped us develop econometric models.

DiMaggio (1982) based on Bourdieu's contributions points out the relevance of cultural capital to explain educational outcomes. Cultural capital is defined as "instruments for the appropriation of symbolic wealth, socially designated as worthy of being sought and possessed" (DiMaggio, 1982, p. 190 referring to Bourdieu, 1977). This is to say, instruments used to promote intergenerational status persistence (Weberian tradition). Supporters of the cultural capital approach argue that teachers have a better relationship with students who show some high cultural characteristics. These students take advantage of this good relationship and feel comfortable in school. Therefore, their educational outcomes are better than the culturally poor students.

Coleman (1988) argues that social capital is another type of capital that researchers have to consider in their instigations. Social capital has a variety of elements with "two common traits: they all contain some aspect of social structure and they facilitate certain actions of the actor (within the structure)" (p. 98). It is the relationship among people that facilitate the action. Coleman points out that the social capital in the family (the relationship between parents and children) and in the community, is a way to catch the human capital[1] from parents, with consequences on educational outcomes.

Lucas (2001) points out the relevance of the socioeconomic status (SES). He proposes the theory of Effectively Maintained Inequality which "posits that socioeconomically advantaged actors secure for themselves and their children some degree of advantage wherever advantages are commonly possible" (p. 1652). If a particular level of education is not universal (free and compulsory), the socioeconomically advantaged actors use their advantages to secure that level. "Once that level of schooling becomes universal, the socioeconomically advantaged seek out whatever qualitative differences there are at that level and use their advantages to secure quantitatively similar but qualitatively better education" (p. 1652).

To study inequity in the accessibility of professional education in Russia, Roshchina (2010) employed data from the Russia Longitudinal Monitoring Survey (RLMS). She used a sample of 6 thousands respondents ages 21-60, although the sample considerably lost observations in the regression analysis. The level of education was the main dependent variable. She used a large list of explanatory variables, where the main role was played by family capital that included; social capital (relations with pupils and social networks), cultural capital (computer at home and size of home library) and SES

[1] The human capital approach is based on the investigations of Gary Becker, Theodore Schultz and Jacob Mincer, it sustains that higher levels of education (knowledge and skills) raise the value of the individuals' human capital, which in turn is used in the labor market. Then, the decision to start and to finish an educational trajectory depends on estimations of the future return that an individual is able to attain in a job.

(parental occupation, income and education). Nationality, age, sex and place of birth (city or village) were other independent variables. Roshchina concluded that parental social status, specially their education and income, was the main obstacle to access professional education. In other words, the education of the respondents depended on the parental education and income. Thus, in Russia SES indicators explain educational outcomes.

It is interesting to note that in developed countries SES indicators (parental occupation, income and education) do not strongly influence on educational achievements and trajectories. But, in underdeveloped countries, SES is still a major explanatory variable. For example, in Australia, Rothman (2003) found a decrease in the impact of socioeconomic status in educational achievement. In Germany Schildberg-Hoerisch (2011) found that parental occupation does not affect children's educational attainment. However, in India Dostie & Jayaraman (2006) found that school enrollment generally increases with parental education and wealth. In Guinea Glick & Sahn (2000) found that the improvements in the father's education raise the schooling of their children. In Ethiopia, Mani *et al.* (2009) found that parental schooling is positively associated with schooling enrollment.

On the other hand, if family background does not explain educational outcomes, it is possible to argue that the effects may be due to school itself (Rothman, 2003). That is to say, the defining factor could be school resources (Hanushek, 1996). However, studies showed that schools with similar resources showed different educational results, hence the school quality influences on educational progress. After the results reported by Coleman *et al.* (1966), who found that family characteristics are more important determinants of educational achievements than school quality or teacher experience, the subsequent investigations used school indicators mainly as control variables.

Additionally, psychologists emphasize that educational outcomes are determined by factors that affect the people's behaviors. If cognitive skills (usually measured by tests) are not good predictors of educational outcomes, then other individual characteristics should be able to explain them. Thus, non-cognitive traits and behaviors may be more important than cognitive skills (Bowles & Gintis, 1976 as cited in Farkas, 2003).

Finally, it is worth mentioning that in the related literature, it is possible to find large lists of explanatory variables related to educational outcomes, such as: intelligence, gender, race, health, peers and diverse activities such as smoking, drinking, working, watching television, using computers, hobbies, physical activities, etc. (see Perna, 2000, Huurre *et al.*, 2006, Dumais, 2009). It concludes that intelligence is the most important predictor because it explains the majority of successes in under any circumstance. Duckworth et al. (2007) point out that the correlation between intelligence and whichever result is around 0.6.

III. Data for Yaroslavl Oblast

According to Roshchina, (2010) there have been some interesting investigations in all of Russia although the theories discussed above have been little studied in remote regions of this country. This is why we decided to study Yaroslavl Oblast (federal subject), in the East European region. It is not far from Moscow, (the Central Federal District), which covers an area of 36,400 km², with a population of 1.27 million, where approximately 96% of the people are Russians (2010 census).

To investigate the determinants of educational outcomes in Yaroslavl, in the year 2010, we applied a questionnaire to 2,003 students in 9th grade from 65 schools. In our simple random sampling, the units of the population were schools of general education (including gymnasium boarding schools) in cities and villages. The survey included questions about demographic traits, family characteristics, life in the school, plans for future studies and work, and personal qualities. In this section we will briefly describe some of the main results and indicators that we used our econometric models.

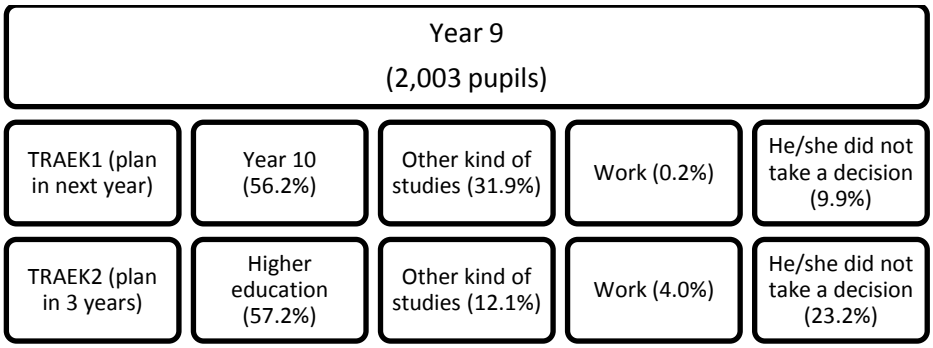
3.1 Educational outcomes

To measure students' achievements, we asked them their yearly average grade in the following subjects: algebra, geometric, Russian language, literature, history, physics, chemistry and biology. We also asked students about their academic achievements in the past 3 years. These are the results: 1) 53.5% said they participated in Olympiads or competitions in mathematics, history, and other subjects. 2) 37.3 said they won an award because of educational progress. 3) 18.5% said they sent their work to a competition in arts, science, etc. 4) 42.5% said they won (individually or in a team) places as contest participants. 5) 37% said they won a prize in music, arts, dance, etc.

We developed dichotomous variable for each item considering the value of 1 if students answered yes and 0 if they answered no. Later, we employed the principal components analysis to reduce the grades by subject and the previous variables into one principal component: the educational achievement index (RESULT).[2]

In addition, we developed two dichotomous variables regarding plans in educational trajectories. Students were asked what they plan to do after 9th grade. We gave the value of 1 if the student responded that he/she planned to continue to 10th grade and 0 if he/she will not continue onto 10th grade, will continue with other kinds of studies, had not made a decision, did not answer or will only work). This dichotomous variable is called TRAEK1. The students were also asked what they planned to do in 3 years. We assigned the value of 1 if the student answered that he/she will study in an institute of higher education and 0 if he/she will continue with other kinds of studies, had not made a decision, did not answer or will only work). This dichotomous variable is called TRAEK2 (see Figure 1).

[2] In general, all the analyses of principal components of this study presented good communalities and eigenvalues.



Source: Author with survey data

Figure 1. Dichotomous variable

3.2 Indicators of family background

In the literature it is possible to find a large list of indicators of cultural capital and social capital, and on occasions they are mixed. In other words, the same indicator can measure two kinds of capitals with different types of approaches. Parental education and occupation frequently are proxies of social or cultural capital, because higher educational and occupational status implies the possibility of better social network and preferences for cultural activities. Furthermore, socioeconomic status (SES) is usually based on 3 variables: parental income, education and occupation. Theoretically, the person who has parents with high levels in these variables, also has the best educational outcomes.

In our questionnaire, students selected their parents' educational level. The lower level of parental education is 9th grade or less, and postgraduate education is the highest level. We gave increasing values of 1 point for the lowest level of education up to 7 points for the highest level. The majority of parents are at a technical educational level (30.9% of mothers and 29.5% of fathers) and in higher education (31.9% of mothers and 21.7% of fathers).

Additionally, we asked what kinds of job their parents had. We defined their professional status using the International Standard Classification of Occupation (ISCO) and the International Socio-Economic Index of Occupational Status (ISEI) developed by Ganzeboom, et al. (1992).[3] This index has values from 10 to 89. It reflects the level of education and economic resources typically defined by professions. We calculated the index separately for mothers (average 47.5 and standard error 18.1) and fathers (average 42.7 and standard error 13.3). In addition, we developed an indicator considering the value of 1 if the parent is a homemaker or if the parent is not working and has never worked before, 2 if the parent is currently not working, but has worked before and 3 if the parent is working.

[3] The same methodology is used in PISA (OECD, 2010).

We did not request the parental income, but students wrote about their economic situation, namely if there were sufficient funds in the household. They chose from six variants. 1 point was given if the money was sufficient to buy food; the lowest situation was 0.7% and 6 points if the family did not have monetary problems and if they had enough money to buy an expensive car; the highest economic situation was 10.8%. The majority of students were in level 5; they could buy everything, as long as it was not expensive (31.8%) and level 4; Money was sufficient to buy food, clothes, television, etc. (22%).

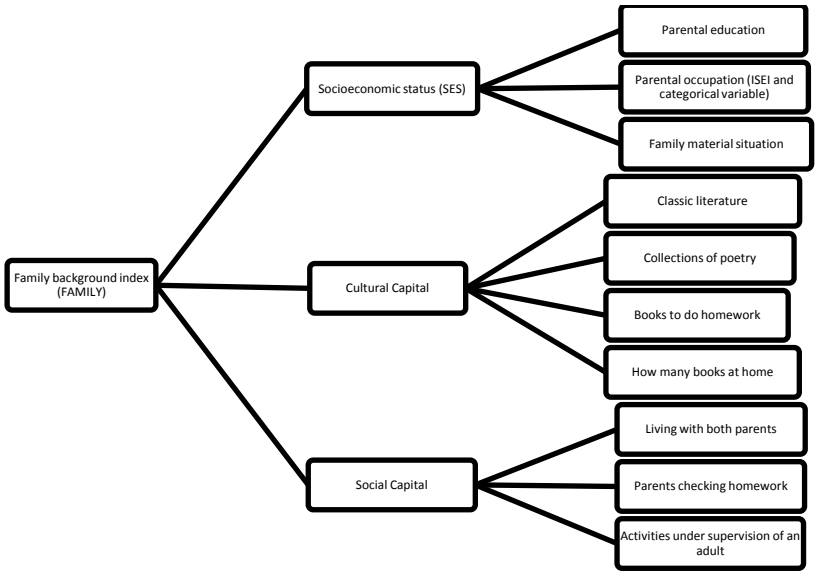
To measure the cultural capital we asked students if they owned classical literature, for example, Tolstoy, Pushkin, etc. (82.3%), if they had collections of poetry (80.8%), and reference books for homework, for example, encyclopedias and dictionaries, etc. (91.5%). We developed a dichotomous variable assigning the value of 1 if students answered yes and 0 if they answered no. Moreover, the students stated the amount of books they have at home; this question is repeatedly used to measure the cultural capital (Roshchina, 2010; OECD, 2010). Depending on the number of books, we gave points in an increasing order from 1 (0-10 books 7.4%) to 6 (more than 500 books 11.4%).

To measure the social capital we requested information about family structure (specifically who is living with the students). Using a dichotomous variable, the value of 1 was designated if student was living with both parents (70.9%) and 0 if they were not. The relationship between parents and students also reflect the social capital within the family. Therefore, students were asked how much time their parents spent checking their homework. A dichotomous variable was used, assigning the value of 1 if parents spent time checking homework (37.7%) and 0 if they did not. Furthermore, students wrote how down much time they spent on homework with a tutor, lessons with an instructor or coach, and other educational activities under supervision of an adult. We developed a dichotomous variable considering the value of 1 if student spent time in activities under adult supervision (82%) and 0 if the student did not.

Theoretically, there are correlations among indicators of cultural capital, social capital, and SES. Therefore, it is possible to say that the effects of SES on educational outcomes and trajectories use the cultural and social capital as intermediary channels and *vice versa*. As a result, many studies use only one indicator to reflect all these resources. We decided to unify SES, cultural and social capital in one index.[4] With principal components analysis we reduced all previous variables in one principal component and obtained a family background index (FAMILY), see Figure 2.[5]

[4] Besides, it helps to correct problems of multicollinearity in our econometric models

[5] In the case of individuals without information we used the average of the variable only to calculate the principal component.



Source: Author

Figure 2. Family background index

3.3 Other relevant determinants

Duckworth et al. (2007) point out that perseverance and passion for long-term goals (GRIT) is a very good predictor of every success outcome, including educational. This indicator has a strong correlation with other psychological factors, such as conscientiousness, honesty, motivation, etc., but it does not have a strong correlation with intelligence. In the questionnaire, students were asked how much they agree with 15 non-cognitive behaviors related with GRIT. Students marked values from 1 (strongly disagree) to 5 (strongly agree). We reduced the previous 15 variables and obtained one principal component: the psychological factors index (GRIT).

Students answered questions that help us to measure the school quality. We asked what the characteristics of their schools were. We developed dichotomous variables considering the value of 1 if student chose: 1) School was specialized in languages, mathematics, sports, etc. (37.5%); 2) School did not use traditional educational methods (7.4%), and 3) Students participated and won in Russian international educational Olympiads (13.4%). We reduced the previous variables in one principal component, and we obtained the school quality index (QSCHOOL).

The human capital approach says that the decision to begin or to finish an educational trajectory depends on personal plans regarding future jobs. Also, educational achievements depend on those plans. Students were asked about their professional plans and their choices regarding those plans. With this information, we developed a dichotomous variable and assigned the value of 1 if student chose a profession because it implied high-pay (39.6% of the respondents) and 0 if it did not (60.4% of the

respondents). This variable was named KHUMAN.[6]

It is possible to argue that good friends or peers have a positive impact on educational outcomes, because students will spend more time with them in activities that will help them to develop their capabilities (Huurre *et al.*, 2006; Dumais, 2009). In our questionnaire, students characterized the relationship with their friends and studies. They chose among the next variants: 1) Most of my friends do not plan to continue studying 10th grade (30.3%); 2) Half of my friends plan to continue studying 10th grade (33%), and 3) Everybody or almost all my friends plan to continue studying 10th grade 10 (23.9%). With this information we developed a dichotomous variable assigning the value of 1 if student said that everybody or almost all his/her friends will continue studying 10th grade and 0 if they did not. This variable is called PEERS.

Students' health can also influence educational outcomes (Huurre *et al.,* 2006). Therefore, students were asked about the frequency of health problems (chronic illness, poor eyesight, hearing, etc.) as it related to their studies. Students chose from one of four possibilities; 1 if they frequently had problems (5.1%) to 4 if they never experienced health problems (45.6%). This variable is called HEALTH.

Finally, the questionnaire was answered by girls (55.1%) and boys (44.9%) and we developed a dichotomous variable (SEX) taking the value of 1 if the respondent is a boy and 0 if it's a girl.

4. Econometric Models

After a reviewing literature of previous econometric models, we developed models where the educational achievements (RESULT) and the plans for educational trajectories (TRAEK1 and TRAEK2) depended on family resources and other independent variables. See models (1) and (2).

$$RESULT_i = \beta_0 + \beta_1 FAMILY_i + \beta_2 GRIT_i + \beta_3 QSCHOOL_i + \beta_4 KHUMAN_i + \beta_5 PEERS_i + \beta_6 HEALTH_i + \beta_7 SEX_i + u_i \quad (1)$$

$$TRAEK_i = \beta_0 + \beta_1 FAMILY_i + \beta_2 GRIT_i + \beta_3 QSCHOOL_i + \beta_4 KHUMAN_i + \beta_5 PEERS_i + \beta_6 HEALTH_i + \beta_7 SEX_i + u_i \quad (2)$$

We estimated model (1) with least squares. Table I shows the mains results. Tests of normality, multicollinearity and autocorrelation did not show problems, but a graphic exploration for heteroscedasticity perceptibly showed some problems. Our sample included many different kinds of students. An option was to cluster the standard errors,

[6] The effects of human capital on educational outcomes had been tested in many studies, but the analysis is concentrated in the Mincer's equation (a wage equation) that helps to know the percentage increase in earnings for each additional year of education relative to its cost. On contrary, we have few investigations about the hypothesis that individuals compute the income (returns) that they will be able to obtain thanks to their educational results. With the variable KHUMAN we can test this hypothesis.

but if we developed clusters in accordance with the family resources, then we could not correctly explore the effects of this explanatory variable, and we wanted to know if family resources differ in educational outcomes. Consequently, we employed the Newey-West standard errors to obtain robust estimators.

The independent variable FAMILY had statistically significant coefficient at the 1% level with the predicted sign. In addition, the other independent variables GRIT, KHUMAN, PEERS, and SEX had statistically significant coefficients at the 1% level and HEALTH at the 2% level, but QSCHOOL did not have statistically significant coefficient.

In other words, family resources and correct non-cognitive skills favor educational achievements. The indicator of human capital (KHUMAN) has a positive coefficient. That is to say, students who chose a profession because of high-pay also have better educational achievements. If a student has friends planning to go to 10^{th} grade (PEERS), he will also have better educational achievements than students with friends with others plans. In addition, students, that rarely get sick (HEALTH) have better educational achievements. The negative sign of SEX means that the girls have better educational achievements in comparison with the boys.

It is interesting to note that in model (1) R-squared is 0.24. In other words, 76% of the variation in the dependent variable is still depending on other factors (in this model it is considered a random error).

Table I. Multiple model (1)

Included observations: 1735
Method: Least Squares
Newey-West HAC Standard Errors & Covariance
Dependent Variable: RESULT

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.215	0.09	-2.392	0.02
FAMILY	0.212	0.023	9.133	0.00
GRIT	0.194	0.023	8.379	0.00
QSCHOOL	-0.013	0.025	-0.541	0.58
KHUMAN	0.239	0.044	5.365	0.00
PEERS	0.473	0.055	8.541	0.00
HEALTH	0.061	0.026	2.313	0.02
SEX	-0.368	0.049	-7.385	0.00

R-squared	0.24
Adjusted R-squared	0.24
F-statistic	79.05
Prob(F-statistic)	0.00
Durbin-Watson stat	1.87

We estimated coefficients of the model (2) with probit analysis. Table II shows the main results. In the case of TRAEK1, independent variables FAMILY and QSCHOOL have statistically significant coefficients at the 1% level, and GRIT at the 2% level. Therefore, the students with high family resources, correct non-cognitive skills and in good schools have higher probability to continue studying 10^{th} grade.

The negative coefficient of SEX means that the girls have higher probability to continue studying 10th grade than the boys. Students who chose a profession because of high-pay, who rarely get sick and who have friends that are planning to continue 10th grade also have higher probability to continue studying 10th grade.

Table II. Multiple model (2)

Method: ML - Binary Probit (Quadratic hill climbing)
Dependent Variable: TRAEK1 (To continue in Year 10)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.269	0.13	-2.059	0.03
FAMILY	0.265	0.035	7.517	0.00
GRIT	0.075	0.033	2.279	0.02
QSCHOOL	0.091	0.035	2.594	0.00
KHUMAN	0.262	0.066	3.947	0.00
PEERS	0.734	0.083	8.829	0.00
HEALTH	0.124	0.038	3.261	0.00
SEX	-0.313	0.065	-4.786	0.00

McFadden R-squared	0.13
Total observations	1735
Obs. with Dep. = 0	680
Obs. with Dep. = 1	1055

Dependent Variable: TRAEK2 (To matriculate in institute of higher education)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.183	0.13	-1.401	0.16
FAMILY	0.287	0.035	8.173	0.00
GRIT	0.129	0.033	3.901	0.00
QSCHOOL	0.124	0.035	3.538	0.00
SEX	-0.322	0.065	-4.922	0.00
PEERS	0.452	0.08	5.597	0.00
HEALTH	0.111	0.038	2.937	0.00
KHUMAN	0.375	0.066	5.628	0.00

McFadden R-squared	0.12
Total observations	1735
Obs. with Dep. = 0	665
Obs. with Dep. = 1	1070

Source: Author

In the case of TRAEK2, independent variables FAMILY, GRIT and QSCHOOL have statistically significant coefficients at the 1% level with the predicted sign. Once more, students with high family resources, correct non-cognitive skills and in good schools have higher probability to continue studying in an institute of higher education.

Again, girls have higher probabilities of continuing their studies in an institute of higher education than boys. Students who chose a profession because of high-pay, who rarely got sick and with friends planning to continue 10th grade also had higher probabilities to continue their studies in an institute of higher education. In model (2) McFadden, R-squared is 0.13 in the case of TRAEK1 and 0.12 in the case of TRAEK2.

6. Discussion and Conclusion

Empirical research shows that family resources strongly determinate educational outcomes in Russia. In Yaroslavl Oblast, our investigation suggests that family resources have statistically significant and positive influence on educational achievements and plans for educational trajectories, but the variation in the dependent variables has a short explanation (we found low coefficients of determination). As a result, it is possible to argue that the most accepted explanatory variables, socioeconomic status, cultural and social capital, have done little to explain educational achievements and trajectories of the schoolchildren. Therefore, it is not possible to recommend projects and programs designed to reduce the negative effects of low SES on educational outcomes. These could be appropriate for all Russia, in a general perspective, but the programs and their implementation have to vary between regions. In Yaroslavl we found that other less accepted factors deserve more attention.

Our indicator GRIT, perseverance and passion for long-term goals, suggests that schools have to pay more attention to non-cognitive skills. In the same sense, our findings show that school quality has a relevant effect. Consequently, in Yaroslavl, it is also important to evaluate programs for school-level socioeconomic status. These kinds of programs might have a greater influence than programs on student-level socioeconomic status.

Our econometric results also show that girls have better educational outcomes than boys. For that reason, it is important that school programs, designed to increase educational outcomes, dedicate a special section for boys. In addition, future researches have to explore in more depth the causes of these disparities.

Students who rarely get sick, and who have friends planning to continue studying, have better educational outcomes. Of course, we expected these kinds of results, but it is important to consider two recommendations: for parents; they have to carefully watch what kind of friends their children have, for policy makers; they have to combine educational and health policies.

An interesting result, that especially supports hypothesis of the human capital theory, is the statistically significant effect on educational outcomes of students that considered a profession because of high-pay. Our findings suggest that individuals who evaluate their possible future achievements in the labor market and their educational outcomes depend, in part, on assessments. This is not a main hypothesis in this investigation, we did not explore it in depth, but it is an interesting result for more focused future research.

Although we included a large list of explanatory variables, a considerable proportion of the variation in the dependent variables is determined by other unknown factors, such as personal intelligence, a key variable that would explain the unknown variation. Hence, future research has to include indicators of personal intelligence and to explore whether the short effects of the family resources on educational outcomes promote social mobility. Finally, further research is required to examine the determinants of educational outcomes in higher levels of education, where the findings points out that the family resources are again the main explanatory variables.

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