Socio-economic determinants of demand for private tutoring

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Abstract
This study examines socio-economic factors underlying the demand for private tutoring. The analysis utilizes two samples of students from lower- and upper-level secondary schools in Poland based on the PISA 2006 data set. Special attention is paid to channels through which private tutoring may endure socio-economic inequalities, especially in the context of the gender gap in education outcomes. We find that parents’ decisions concerning private education are sensitive to student gender, which may rise concerns for policymakers committed to provide equal opportunities and outcomes in education. At the level of gymnasium (lower-level secondary school), female students are more likely to enroll in private tutoring in mathematics than male students. The evidence indicates the opposite with respect to private tutoring in Polish and preparatory courses for the gymnasium final examination. The grade from the final exam does not affect the probability of graduating from gymnasium, but it is used by upper secondary schools for the admission purpose. In upper secondary schools, we find that male students are less likely to participate in private education services than female students. This may be indicative of an increase in power of students in household’s decision-making as they graduate from gymnasium.

Keywords: social inequalities, educational choices, gender, private tutoring
JEL codes: D1, I21, D63
1. Introduction

Although private tutoring has become a widespread phenomenon over the last 20 years, research on tutoring is still in infancy (Bray, 2010). Private tutoring can be defined as “tutoring in an academic school subject (e.g., mathematics, history, or English), which is taught in addition to mainstream schooling for financial gain. This definition of private tutoring includes private tutoring lessons (offered by individuals) and preparatory courses (offered by institutions)” (Bray and Silova 2006, p. 29). So far, there is no clear evidence whether private tutoring improves economic opportunities of low-performing students from middle class backgrounds, or it is rather a reflection of socio-economic advantages of upper class students, which reproduces further socio-economic inequalities (Briggs, 2001; Lee et al., 2009).

On the one hand, tutoring can be seen as private investment in education which brings both individual and societal returns. Private lessons can be easier tailored to individual needs and interests of students than the content of mainstream classes. By helping students to fill in gaps in their knowledge, private tutoring may enable lower-achieving students to catch up with their peers, and thus to improve the quality of mainstream education. However, empirical evidence regarding the efficiency of private tutoring is ambiguous so far. Some studies provide evidence that students, who take private classes, tend to receive better grades (Elbaum et al., 2000; Mischo and Haag, 2002; Tansel and Birckan, 2005); other studies show no statistically significant relation between tutoring and educational achievements (e.g. Han et al., 2001); while others claim that attending preparatory courses may have a negative impact on school grades (Ban et al., 2005). Similarly, studies show contradictory results concerning the effect of private tutoring on the college entrance (Lee et al., 2009).

On the other hand, opponents of the liberal approach in education emphasize the role of tutoring in widening the education gap between wealthy and poor families, which in turn can cause social exclusion of the latter (Sweetman, 2002). In particular, schooling can contribute to the reproduction of class differences through the process of intergenerational transmission of economic, social, cultural resources and advantages (Edgerton et al., 2008). Private tutoring can enhance this trend if more privileged households invest more in private education. However, the impact of private tutoring on education inequalities may be minor compared to other advantages children from wealth families enjoy, such as better learning equipment, private schooling etc. (Dang and Rogers, 2008).

All in all, empirical evidence on specific causes and consequences of private tutoring is partial, often inconsistent, and requires further scrutiny. This relates to the fact private tutoring is a complex phenomenon which is affected by, and has impact on, multiple domains, such as teachers’ performance, textbooks production, students’ aspirations and learning achievements (Poisson, 2007). Factors behind the demand for private tutoring can be broadly classified into cultural, economic and educational (Bray and Silova 2006). Cultural factors relate to the perceived role of effort in educational success. In particular, private tutoring is widespread in cultures which stress effort as a
factor explaining and determining success (Bray, 2007). Empirical evidence indicates that economic characteristics, such as household income, parental education and urban location are important determinants of demand for private tutoring in most countries (Dang and Rogers, 2008). On the contrary, education systems (e.g. education quality, salaries of teachers) vary across countries. In post-communistic regimes, the disparities between requirements for the university entrance (or final school examination) and the content of mainstream schooling creates demand for private lessons (Putkiewicz, 2005). In many Asian countries, high returns to education contribute to the intense competition for university placement. Here, private tutoring is seen as a means of getting ahead of others during the university admission process. In addition, changes brought by transformation to a market economy, e.g. in the examination system or mainstream schooling, may increase the popularity of private tutoring (Bray and Silova, 2006; Dang and Rogers, 2008).

The goal of this paper is to examine socio-economic factors underlying demand for private tutoring in Poland, paying special attention to gender issues. The analysis utilizes the sample of 5978 fifteen years-old students from randomly selected lower-level secondary schools and 5195 students of upper-level secondary schools in various regions in Poland from the PISA 2006 dataset. Thus far, it is the largest sample analyzed so as to assess the scope of private tutoring in Poland at the level of secondary schools. Private tutoring in Poland is relatively undertheorized despite of its significance for the educational and economic outcomes after the transformation to a market economy in 90ties. There are large discrepancies found in empirical studies concerning the scope of private tutoring in secondary schools, ranging from 10 to 66 percent (Murawska and Putkiewicz, 2005; Putkiewicz, 2005; Reclik, 2007). Some of existing studies rely on responses by university students about their past experience. However, there is a concern that studying the phenomena of tutoring based on the university samples is biased towards high academic achievers, and thus provides little information about private tutoring at the level of secondary schools (Bray, 2010). In fact, Poland is an interesting case to study not only because of the unique dataset on private tutoring (questionnaire on private tutoring was not included in all countries that participated in PISA 2006). Results from Polish experience can provide insights to determinants behind private education in other post-communistic countries, with similar to Polish education system and socio-institutional context.

In the paper, we pay special attention to gender issues in private education while studying socio-economic determinants of private tutoring. In particular, we examine whether gender attitudes affect investments in private education. Analysing gender inequalities in education is important so as to understand the origins of, and mechanisms underlying, the gender gap in the labour market, and thus to target them with appropriate policy instruments. So far, there is little research on how gender-related stereotypes affect investments in private education (Buchmann et al., 2008). Our analysis suggests that the observed polarisation of competencies in reading and mathematics between male and
female students may stem from gender stereotypes. The latter may also explain the gender gap in the use of private education services.

The remainder of this paper is as follow. Section 2 describes a sampling method. Section 3 discusses determinants of demand for tutoring in lower and upper secondary schools in Poland based on results from logistic regressions. Section 4 concludes and formulates suggestions for further research.

2. Data and sample design

The statistical analysis conducted in this paper utilizes the two datasets of the PISA 2006 study on students from lower- and upper-level secondary schools in Poland. The methodology employed to analyze both sets of data is consistent with recommendations of the PISA program as explained below.

The Program for International Student Assessment (PISA) compares key competencies of 15-years old students across OECD countries. The PISA sample for Poland was obtained using a two-stage, stratified sampling strategy. The first stage involved sampling individual schools with probabilities proportionate to their size. In the second stage, 30 students from each school were randomly selected (if a school had fewer than 30 students then all of them were selected). The final sample consists of 5978 students of lower-level secondary school (gymnasium), including 5503 students of public and 475 students of private institutions. In addition, 141 students of the upper-level secondary schools were included. Students were asked questions designed to assess their competencies in science, reading and mathematics. A separate questionnaire inquired about their home backgrounds and learning attitudes. In addition, their parents were asked about family income, material and cultural possessions, taste for education etc. A parent questionnaire was not obligatory, and thus not administered by all countries participating in PISA 2006. In the case of the complementary study of upper secondary schools, the sample consisted of 5195 students from 150 schools: 30 vocational schools, 60 high schools with a vocational profile and 60 high schools.

The two-stage stratified sampling design of the PISA survey implies that sampling variance may be biased when using traditional statistical methods such as OLS (ordinary least squares) regression. OLS requires residuals to be normally distributed, independent with a mean of zero and a constant variance. The design of the PISA complex survey is likely to result in correlations of residuals because of the data clustering. In particular, students selected from the same school are likely to be more similar in certain characteristics than students randomly selected from the total population. PISA recommends the Fay Modification of the Balanced Repeated Replication (BRR) with 80 replicate subsamples to obtain accurate estimates of sample variances (PISA, 2006). The method is implemented as follows: schools are paired within groups formed on the basis of stratification used for sampling (e.g. region defines strata), referred to as variance stratum. A set of 80 replicas is created by multiplying the sampling weights of one of the two schools in each variance stratum by 1.5 and the
weights of the remaining schools by 0.5, according to the Fay modification with a factor 0.5. Without
the Fay modification, some replicate estimates may be undefined due to division by zero (Judkins,
1990). Statistics are then computed for each replicate and compared to the whole sample estimate. The
mean square difference of between-replicate estimates is set as the variance estimate. Further details
on data, tests, and sampling strategies are available in the official PISA reports (2006, 2009).

3. Results from statistical analysis
In this section, we examine determinants behind private tutoring. The analysis is divided into two
sections. In section 3.1 we discuss results for lower-level secondary schools, while in section 3.2 we
conduce analysis of private tutoring in upper-level secondary schools. We expect that students in the
latter group are more likely to invest in private education as the grade from the final exam in upper
secondary schools (“matura”) determines students’ chances of continuing education at the higher
level. In particular, universities rank results from the final exam for the admission purpose, and thus
low-performing students have low prospects for entering universities. On the contrary, regardless of
results from the gymnasium final exam, all students have their placement in an upper-level secondary
school secured, as education until age of 18 is obligatory in Poland. Admission rules are defined by
each upper secondary school. They rely on results from the gymnasium final exam, but they can also
include other criteria, such as voluntary work, participation in competitions organized by education
authorities etc.

3.1 Private tutoring in lower-level secondary school
In section 3.1.1 means and proportions for the total population of 15-years old students are estimated
based on the sample of 5570 students. In Section 3.1.2, determinants of private tutoring from logit
regressions are presented. In both cases, the reported estimates are derived using a complex sample
design with replicate weights as described in Section 2.

3.1.1 Bivariate analysis
Table 1 presents frequencies of private tutoring in Poland based on the PISA 2006 data. The results
reveal that on the average 19 percent of student use private tutoring. Male students use private tutoring
in polish, physics, biology and chemistry, as well as they attend preparatory courses, more frequently
than female students (Table 1). The preparatory courses intend to prepare students for the gymnasium
final exam. The results from the exam do not affect the probability of graduating from gymansium, but
they are used by upper-level secondary schools for the admission purpose. The exam is obligatory and
it is composed of two parts: in mathematics and science (we refer to this course as to ‘preparatory
courses in mathematics’ throughout the paper) and in humanities. We find that 27 percent of male
students follow the preparatory course in mathematics for the gymansium final exam as compared to
23 percent of female students. These figures are 22 and 19 percent, respectively, for male and female
students in the case of the preparatory course in humanities.

The data indicates a positive relationship between the frequency of private tutoring and
income group (Figure 1). Among families with the net monthly income exceeding 5 thousands zlotych
(local currency) nearly 40 percent of students take the advantage of private tutoring. In the lowest
income group (income groups are described in Appendix A) less than 15 percent of students obtains
private lessons. On the contrary, income appears to have a negligible effect on the decision of
attending preparatory courses. The estimated frequencies here are similar across income groups,
namely: 25 percent for the preparatory course in mathematics and 20 percent for the preparatory
course in humanities. High demand for preparatory courses may stem from parents seeking a means to
provide their children with comparative advantages during the admission process to upper-level
secondary schools. They may also consider the preparation for the final exam beyond responsibility of
mainstream schools - as the exam does not affect the probability of a student graduating from
gymnasium. This distinguishes preparatory courses from private tutoring; the latter typically covers
the material of mainstream classes. Consequently, we expect that parents who are not satisfied with
the quality of mainstream schooling are more likely to invest in private tutoring. In fact, our data
suggest that the higher the income group, the higher frequency of parents who are not satisfied with
the quality of the school, and the higher frequency of students who take private lessons.

Table 1 Frequencies of private tutoring (percentage)

<table>
<thead>
<tr>
<th></th>
<th>Private tutoring</th>
<th>Private tutoring in math</th>
<th>Private tutoring in polish</th>
<th>Private tutoring in biology</th>
<th>Private tutoring in chemistry</th>
<th>Private tutoring in physics</th>
<th>Preparatory course math</th>
<th>Preparatory course humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>19.16</td>
<td>15.73</td>
<td>5</td>
<td>2</td>
<td>4.4</td>
<td>4.4</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>19.22</td>
<td>15.84</td>
<td>3</td>
<td>1</td>
<td>3.8</td>
<td>3.9</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Male</td>
<td>19.10</td>
<td>15.62</td>
<td>7</td>
<td>3</td>
<td>4.9</td>
<td>4.8</td>
<td>27</td>
<td>22</td>
</tr>
</tbody>
</table>

* Estimated standard errors < 1 percent

Figure 1  The frequency of private tutoring and income groups

Figure 2  The average grade and income groups
Figure 2 illustrate that higher-achieving students are more frequently encountered in higher income groups, which suggest that income may be an important stratification factor. Student achievements are measured here with the average grade obtained by each student at the end of school semester (in mathematics, polish, geography, biology, chemistry and physics). In all income groups, female students are observed to have higher average grades than male students. Our data indicates also that grades of female students in mathematics are higher than grades of male students, despite of their lower reported competencies in mathematics reported in PISA (2006) results. The gender discrepancies in student achievements, depending on whether grades or test scores are compared, have been confirmed in other empirical studies (see Duckworth and Selingman, 2006). This may suggest that competence tests and school grades capture different elements of academic performance and ability (Buchmann et al., 2008). As an alternative explanation, Niederle and Vesterlund (2009) argue that in competitive environments the reported test scores do not necessarily reflect the magnitude of the gender differences in math skills. The number of experiments shows that when female students believe that a task measures their math ability then they underperform in mixed-sex groups, but not in all-females groups (Gneezy et al., 2003; Huguet and Regner 2007). In addition, gender stereotypes may affect female self-efficacy when performing math tests. Experiments revealed that women, who were reminded of their female identity, expressed more stereotype attitudes towards the academic domains of mathematics (negatively stereotyped) and the arts (positively stereotyped) (Wheeler et al. 2004; Steele and Ambady, 2005).

Gender gap in mathematics is of special interest to policy makers, as it may be indicative of the future career choices of female and male students. We find that the gap widens at the higher scores in the PISA competence tests. In the PISA surveys, each student is awarded a score based on the difficulty of tasks he or she performed. In OECD countries, the average score of students is 500 points, while most students scored between 400 and 600 points. We find that the frequency of female and male students with the score in mathematics below 750 is equal. However, among high-achievers, with scores above 750 points in mathematics, only 15-48 percent of students are female depending on which plausible value is used1 (Figure 5b). On the contrary, the frequency of high-achieving female students in reading is 50-85 percent (Figure 5c). The results are consistent with Ellison and Swanson (2010) results for the USA, who found that gender gap increases at the higher percentiles in the score from the American Mathematic Competition test. Their analysis suggests that high-scoring male students come from a variety of backgrounds, but top-scoring female students come exclusively from the elite schools. In our sample for Poland, mother education seems to be important in explaining gender gap among high-achievers.

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1 PISA (2009) recommends studying population statistics using five plausible values separately. Accordingly, figure 3a and 3b compares students’ competencies using five plausible values.
Finally, we look at the frequencies of female and male students, who obtained private tutoring, depending on the final grade at the end of semester in mathematics (Figure 4a) and in polish (Figure 4b). In Poland, a 6-grade scale prevails with a grade below 2 implying that a student fails the class. In general, the higher grades, the fewer students are using private tutoring, which supports that tutoring is mostly remedial in nature. The patterns observed in Figures 4a-b do not reveal significant gender differences with the exception to low-achieving students (who obtained a grade 2 or less). In particular, the frequency of low-achieving male students benefiting from private tutoring in mathematics is much lower than of female students. On the contrary, fewer female than male students, who fail classes in polish, receive private help.

(a) Private tutoring in mathematics

(b) Private tutoring in polish

Figure 4. Frequency of private tutoring
3.1.2 Results from logit regression

In this section, we present results from five logit regressions with replicate weights based on the BRR with the Fay factor 0.5 method. The models differ with respect to the dependent variable: private tutoring in general (in any academic subject), private tutoring in mathematics, private tutoring in polish, preparatory courses in mathematics and in humanities. The dependent variable takes value 1 if a student uses private tutoring or preparatory course, and 0 otherwise. The questionnaire items used to compute the dependent variables are provided in Appendix B.

Formally, the logit model can be expressed as:

$$\Pr(y_i = 1) = \frac{\exp(\beta x)}{1 + \exp(\beta x)},$$

where $y_i$ equals 1 if the an event occurs at time $t$ and is 0 otherwise, $x$ is a vector of independent variables, and $\beta$ the vector of coefficients.

We transform the above functional form into:

$$\text{Log}(\frac{\Pr(y_i = 1)}{\Pr(y_i = 0)}) = \alpha + \beta x$$

As a consequence, coefficients $\beta$ reported in Table 2 can be interpreted as a one unit increase in the dependent variable leads to an increase of $\beta$ in the log odds or $e^\beta$ in the odds ratio. We analyze impacts of 11 independent variables on the logarithm of odds ratio (as defined above):

1. Income is a binary categorical variable, which describes the average monthly family income after taxes. It takes value 0 if the monthly net income is below 2400 of local currency (zloty), and 1 if it is above. The expected sign of this variable is positive.\(^2\)

2. Mother education takes value 0 if a mother has primary education, 1 if she graduated from an upper-level secondary school and 2 if she holds a university diploma (bachelor or above). An expected sign of the variable is positive: better educated parents may be more willing to substitute other expenses for spending on education. The inclusion of mother’s education into regression is motivated by empirical evidence showing that mothers are generally more concerned with (put greater emphasis on) their children education than fathers (Lundberg et al., 1996; Duflo, 2000).

3. Education resources is a continuous measurement of home educational resources, including computer, education software etc. (variable HEDRESS in the international PISA program).

4. Cultural resources is a continuous measurement of home cultural resources, e.g. books (variable CUTPOSS in the international PISA program). Variables education and cultural resources can be also interpreted as capturing social status of the family.

\(^2\) Variables: income, mother education, community size and the desired level of education were dichotomized/trichotomized. These items in the original questionnaire included 8 no/yes categories.
5. Community size is a categorical variable, which takes value 0 if a student come from a village to 15 thousands inhabitants; 1 if the community size is above this value but below 500 thousands habitants (level 1); and 2 if the community size is above 500 thousands (level 2). Also here, the expected sign of the variable is positive. In larger communities, an array of educational choices is expected to be wider than in smaller areas. Moreover, families in larger cities are likely to be more affluent and thus they may easier afford paying for private classes.

6. Gender is coded 1 for female students and 0 for male students.

7. Immigrant captures immigrant status; it takes value 0 for native students and 1 otherwise. A positive coefficient of this variable may indicate that students with foreign family backgrounds take private classes more often they native students due to learning difficulties because of, for instance, insufficient language skills.

8. The variable satisfaction takes value 1 if parents indicate that they are satisfied with the methods and the content of teaching at school and 0 otherwise. We expect that parents who are less satisfied with the mainstream teaching are more likely to hire private tutors. On the other hand, in the case private tutoring reflects the desire for competitive advantage and personalized education for children, dissatisfaction with mainstream education will not be indicative of willingness to hire tutors (Davies, 2004).

9. Final grade is measured as the average of grade in polish, mathematics, and geography obtained at the end of semester. A negative sign of the variable may suggest that private tutoring is treated as a remedy strategy, or as a means to improve grades.

10. The variable desired level of education takes value 1 if a parent desires his/her offspring to obtain a university degree (bachelor and above) and 0 otherwise. Education expectations are a form of social capital, which is likely to directly influence academic achievements of students (Southgate, 2009). The expected sign of this variable is ambiguous: parents with higher aspirations regarding their children education tend to invest more in private education, which and thus the expected sign is positive. On the other hand, the variable may take a negative sign in the case such parents are more involved themselves in education of their children.

11. Average frequency of tutoring in school measures the frequency of tutoring prevailing at the school level. The inclusion of this variable into regressions intends to capture whether private tutoring is characterized by the network effect. If this is the case, the more students take private classes, the more likely others will imitate them.
Table 2. Results from logit regressions with the dependent variables: private tutoring in general; private tutoring in polish and in mathematics; preparatory courses in mathematics and in humanities

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Private Tutoring in general</th>
<th>Tutoring in polish</th>
<th>Tutoring in mathematics</th>
<th>Preparatory course in mathematics</th>
<th>Preparatory course in humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Income</td>
<td>0.82* (0.00)</td>
<td>0.55* (0.00)</td>
<td>0.51* (0.01)</td>
<td>0.74* (0.00)</td>
<td>0.70* (0.00)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.17</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.15** (0.10)</td>
<td>0.01 (0.19)</td>
</tr>
<tr>
<td>Mother education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>0.46* (0.02)</td>
<td>0.31 (0.32)</td>
<td>0.47* (0.03)</td>
<td>0.39** (0.08)</td>
<td>-0.02 (0.89)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.03 (0.75)</td>
<td>-0.18 (0.20)</td>
</tr>
<tr>
<td>Level 2</td>
<td>0.87* (0.00)</td>
<td>0.95* (0.01)</td>
<td>0.69* (0.02)</td>
<td>0.49* (0.04)</td>
<td>0.22 (0.26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.19 (0.33)</td>
<td>0.06 (0.77)</td>
</tr>
<tr>
<td></td>
<td>Cultural endowments</td>
<td>0.06 (0.21)</td>
<td>0.08 (0.35)</td>
<td>0.07 (0.25)</td>
<td>0.05 (0.39)</td>
</tr>
<tr>
<td></td>
<td>0.06 (0.12)</td>
<td></td>
<td></td>
<td>0.11* (0.02)</td>
<td>0.10* (0.02)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.08** (0.08)</td>
<td>0.08** (0.08)</td>
</tr>
<tr>
<td></td>
<td>Education endowments</td>
<td>0.13* (0.03)</td>
<td>0.04 (0.59)</td>
<td>0.03 (0.68)</td>
<td>0.17* (0.00)</td>
</tr>
<tr>
<td></td>
<td>0.03 (0.68)</td>
<td></td>
<td></td>
<td>0.15* (0.01)</td>
<td>0.09** (0.08)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.09** (0.10)</td>
<td>0.11* (0.02)</td>
</tr>
<tr>
<td></td>
<td>Average grade</td>
<td>-0.11 (0.00)</td>
<td>-0.10* (0.00)</td>
<td>-0.09* (0.00)</td>
<td>-0.11* (0.00)</td>
</tr>
<tr>
<td></td>
<td>0.45* (0.00)</td>
<td></td>
<td></td>
<td>-0.11* (0.00)</td>
<td>-0.11* (0.00)</td>
</tr>
<tr>
<td></td>
<td>Immigrant</td>
<td>0.48 (0.40)</td>
<td>-0.21 (0.87)</td>
<td>0.47 (0.33)</td>
<td>0.07 (0.91)</td>
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<td></td>
<td>0.48 (0.33)</td>
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<td></td>
<td>0.31 (0.57)</td>
<td>0.23 (0.66)</td>
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<tr>
<td></td>
<td>Gender</td>
<td>0.37* (0.00)</td>
<td>-0.40* (0.01)</td>
<td>-0.42* (0.01)</td>
<td>0.36* (0.00)</td>
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<tr>
<td></td>
<td>0.37* (0.00)</td>
<td></td>
<td></td>
<td>0.33* (0.00)</td>
<td>-0.11 (0.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.12 (0.14)</td>
<td>-0.19* (0.05)</td>
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<tr>
<td></td>
<td>Community size</td>
<td>0.45* (0.00)</td>
<td>-0.27 (0.15)</td>
<td>0.51* (0.00)</td>
<td>0.06* (0.53)</td>
</tr>
<tr>
<td></td>
<td>- Level 1</td>
<td>0.45* (0.00)</td>
<td>-0.27 (0.15)</td>
<td>0.51* (0.00)</td>
<td>0.06* (0.53)</td>
</tr>
<tr>
<td></td>
<td>- Level 2</td>
<td>0.56* (0.00)</td>
<td>-0.29 (0.35)</td>
<td>0.69* (0.00)</td>
<td>-0.01 (0.95)</td>
</tr>
<tr>
<td></td>
<td>Parent expectations</td>
<td>0.29* (0.01)</td>
<td>-0.27 (0.15)</td>
<td>0.23* (0.04)</td>
<td>0.15 (0.20)</td>
</tr>
<tr>
<td></td>
<td>Satisfaction</td>
<td>-0.32* (0.00)</td>
<td>-0.23 (0.22)</td>
<td>-0.33* (0.00)</td>
<td>-0.30* (0.01)</td>
</tr>
<tr>
<td></td>
<td>Average frequency of tutoring in school</td>
<td>3.02* (0.00)</td>
<td>5.52* (0.00)</td>
<td>1.04</td>
<td>0.53* (0.00)</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-0.44 (0.12)</td>
<td>-1.12 (0.02)</td>
<td>-1.64* (0.00)</td>
<td>-0.55 (0.07)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>27.44</td>
<td>23.44</td>
<td>26.94</td>
<td>6.11</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>4472</td>
<td>4469</td>
<td>4469</td>
<td>4467</td>
</tr>
</tbody>
</table>

Note: t-statistics in bracket; * significant at the 5 percent level and ** at 10 percent level

For each of the dependent variables, Table 2 provides model estimates in two columns: the first column presents results from regressions of the basic model (Model 1) with independent variables 1-10. These variables capture individual characteristics of students. In column 2, an estimated model (Model 2) includes an additional variable 11 defined at the school level. A positive sign of any variable indicates that it has a positive impact on the logarithms of odds ratio, thus on the ratio of the probability of obtaining private tutoring (treatment) to the probability of not obtaining private tutoring (non treatment). To avoid repeating this lengthy expression, we will simply refer to the impact each variable has on the probability of private tutoring. The t and F statistics in the table evaluate,
respectively, individual and joint significance of variables in explaining variations in the dependent variable.

The sample includes 5208 observations on private tutoring. Some data were lost because of the missing data, which resulted in the reduction in the estimated sample by 33 percent (to 3008 observation). The most information was missing regarding household income (811 observations). To avoid biased coefficients, values of missing income were imputed using variable ESCS from the PISA dataset, which captures socio-economic status of the family. In addition, the missing data on the average grade were imputed using final grades from all available subjects.

**Determinants of private tutoring**

The results from the logit regression with the dependent variable: private tutoring in general and in mathematics supports that income and mother’s higher education (level 2) have positive and statistically significant effects on the probability of private tutoring. In addition, the community size was a significantly statistical determinant of the probability of private tutoring in general and in mathematics. The positive impact of these variables is consistent with the preceding studies for Poland and worldwide (e.g. Baker et al., 2001; Putkiewicz, 2005; Dand and Rogers, 2008). For instance, Silvova (2007) finds that in 12 countries of Eastern Europe tutoring was greater in urban than in rural areas. This may relate to the fact that poorer households are typically located in smaller rural areas and thus may not have access to, or may not afford, hiring high quality tutors. In addition, more competitive environments in big cities may create incentives for parents to seek private tutors as a means to provide their children with comparative advantages (Bray, 2009).

Dissatisfaction with schooling and parents’ expectations are statistically significant determinants of demand for private tutoring in mathematics (and in general), but not in polish. This can relate to the fact that jobs requiring technical credentials are usually better paid than employment in other fields. As a consequence, expenses on private tutoring in mathematics can be considered as investments for increasing students’ chances in the job market.

In all three models with the dependent variable: private tutoring in general, in polish and mathematics, the final grade and gender turned out to be statistically significant. The lower the average grade at the end of school semester, the more likely is that parents will hire a private tutor. These results confirm that private tutoring is mainly remedial in nature. In addition, female students are more likely to attend private lessons in mathematics, while male students in polish (for other conditions unchanged). In fact, in these academic subjects female and male students were shown to have respectively lower skills (see Section 3.1.1). Finally, we find that the higher the average frequency of

---

3 The variable ESCS is continuous, while the variable income in our estimations is binary. Therefore, imputed values of income below 0.5 were decoded as 0 and above as 1.
private lessons in gymnasium, the greater the likelihood that a student takes obtains private tutoring. This may be indicative of social pressure to hire private tutors.

**Determinants of preparatory courses**

Similarly to private tutoring, demand for preparatory courses appears to be remedial in nature. The variable average grade has a negative and statistically significant impact on the probability that a student attends the preparatory course in both subjects: mathematics and humanities. In addition, investing in private courses may be driven by parents’ desire to provide children with the comparative advantage during the admission process to upper-level secondary schools. Satisfaction with schooling turns out to be insignificant in explaining demand for preparatory courses. Instead, education and cultural resources have a positive influence on the probability of attending the course in humanities and mathematics, supporting the hypothesis that a socio-economic background is an important determinant behind investments in private education.

Contrary to our expectations, the community size above 500 thousands habitants has a negative effect on the probability of attending preparatory courses. It is possible that families trade-off investing in private tutoring and in preparatory courses. In larger cities, tutoring may be a preferable form of private education as it is more flexible, i.e. it can be better tailored to individual needs of students than preparatory courses. In addition, in bigger cities, individual tutors are likely to be better capable of preparing students to the (gymnasium) final exam.

The sign of gender is negative in both models with the dependent variable: preparatory course in mathematics and in humanities. This suggests that male students are more likely to attend preparatory courses than females. However, the gender effect is statistically significant only in case of preparatory courses in humanities. Still, the question arises whether differences in private education of female and male students are influenced by their diverse preferences and inherent abilities or rather can be attributed to the traditional gender roles. The view that male is responsible for the financial upkeep of the family, while female for providing child care can be often encountered in the Polish society (World Bank, 2004).

**3.2 Tutoring in upper-level secondary schooling**

In this section, we discuss the phenomena of private tutoring at the level of upper secondary schools. In section 3.2.1 we present results from the bivariate analysis, while in section 3.2.2 we discuss results from the logit analysis, and compare them to findings in section 3.1.2.
3.2.1 Bivariate analysis

Table 3 summarizes the frequencies of private tutoring prevailing in upper-level secondary schools. The table provides also information on frequencies of students who attended preparatory courses during gymnasium aimed to preparing students for the gymnasium final exam. The results indicate that more students tend to use private tutoring at the upper-level secondary schooling (Table 3) than at the level of lower secondary schools (Table 1). This can be partially explained by more importance being attached to the final exam in upper secondary schools (“matura”) than in gymnasium (as explained in the beginning of Section 3). In addition, the frequencies of students attending preparatory courses during gymnasium in 2006 (as discussed in section 3.1) are higher than frequencies of high school students, who claimed they have attended preparatory courses in the past. This may be explained by the fact that in the sample of upper-level secondary students, the question regarding their participation in preparatory courses was formulated differently (more broadly) than in the questionnaire for gymnasium students (see Appendix B and C). The latter questionnaire clearly distinguished between attending preparatory courses and private tutoring aimed at preparing students for the gymnasium final exam. On the contrary, this distinction was not made clear in the questionnaire for students of upper secondary schools.

Table 3 Frequencies of private tutoring

<table>
<thead>
<tr>
<th></th>
<th>Private tutoring</th>
<th>Private tutoring in math</th>
<th>Private tutoring in polish</th>
<th>Preparatory course in mathematics</th>
<th>Preparatory course in humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>28</td>
<td>12</td>
<td>1</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Female</td>
<td>29</td>
<td>13</td>
<td>1</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Male</td>
<td>27</td>
<td>12</td>
<td>1</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

* Estimated standard errors < 1 percent

Thus far, the literature has not provided a clear indication whether private tutoring improves students achievements (see introduction). The PISA dataset on upper school students includes information on whether a student attended a preparatory course for the gymnasium final exam and his scores from the exam (both: in mathematics and humanities). Table 4 summarizes the results.

Table 4. Average grades form gymnasium final examination

<table>
<thead>
<tr>
<th>Preparatory course or private tutoring aimed at preparing to the gymnasium final exam:</th>
<th>Mean grade from the gymnasium final exam</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>- In mathematics</td>
<td>Yes</td>
<td>23.94</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>25.04</td>
</tr>
<tr>
<td>- In humanities</td>
<td>Yes</td>
<td>30.02</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>31.00</td>
</tr>
</tbody>
</table>

4 or took private tutoring aimed to prepare for the gymnasium final exam
The mean scores from the gymnasium final exam indicate that on average students, who had attended preparatory courses in gymnasium, achieved (surprisingly) lower grades than students who had not used them. There is a number of potential explanations behind this phenomena. Students, who attended courses, might have been lower-achievers to begin with, courses might have been of low quality, or they might have discouraged students from (self) preparing for the exam. As the dataset does not provide information on the initial students’ achievements (scores or grades before taking the course), assessing efficiency of courses in improving student scores is impossible here.

3.2.2 Results from logit analysis

In this section, we present results from logit regressions with dependent variables defined as in previous section. Whenever possible, independent variables are also defined as in section 3.1.2. This includes: gender, mother education, average grade, and parents’ expectation regarding future education of their offspring. Other variables differ from section 3.1.2, which relates to discrepancies in questionnaires for gymnasium and high school students:

1. Income per person is defined as household income divided by a number of persons in the household. On the contrary, in the section 3.1.2, income was measured as a binary variable indicating whether household income was below/above a certain level. This discrepancy relates to the fact that in the questionnaire for lower-secondary schools, the question about income was ‘closed’ (parents were asked to indicate the relevant income bracket), while in the survey for upper-level secondary students, the question on income was ‘open’ (i.e. parents were asked to write down their household income).

2. Books is a binary variable taking value 1 if a student indicates that there are more than 100 books at his home, and 0 otherwise. This variable intends to capture household educational endowments. In the previous section, the PISA indicators of education and cultural resources were used for this purpose, which are unavailable for the current sample of high school students.

3. School type is included to the analysis. The variable takes value 2 if a student attends a (general) high school (41 percent of the sample), value 3 for students of technical schools (29 percent), value 4 for students of specialised high schools (12 percent), and value 5 for students of vocational schools (18 percent).

4. The community size is equal 1 if a student reports he lives in a village and 0 otherwise.

5. The average frequency of private tutoring, and of preparatory courses in mathematics and in humanities intend to examine whether students who attended preparing courses in gymnasium are also more likely to hire tutors in upper secondary schools.
Table 5 provides model estimates in two columns: the first column presents estimation results from the basic model (Model 1) with student characteristics as independent variables. Column 2 presents results from the basic model which includes additional variables defined at the school level (variables 5). As in the previous section, some observations on household income were missing. We used the data on socio-economic status (variable ESCS) from the PISA dataset to impute these missing values. In addition, we used grades from the gymnasium final exam to impute missing values of the average grades.\(^5\)

\(^5\) Comparison of estimates in table 5 with the one obtained through listwise deletion indicates that imputation did not impact signs and significance of most independent variables, with the exception of the effect of school type for the dependent variables: tutoring in mathematics and preparatory courses in mathematics. Most signs of the estimated coefficients of school types (3-5) are positive according to new estimates, while their coefficients obtained through listwise deletion were negative.
Table 5. Results from logit regressions with the dependent variables: private tutoring in general; private tutoring in polish and in mathematics; preparatory courses in mathematics and in humanities

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Private Tutoring</th>
<th>Tutoring in polish</th>
<th>Tutoring in mathematics</th>
<th>Preparatory course in mathematics</th>
<th>Preparatory course in humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income per person</td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 1</td>
</tr>
<tr>
<td></td>
<td>0.00*</td>
<td>0.00*</td>
<td>0.00**</td>
<td>0.00*</td>
<td>0.00**</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Mother education</td>
<td>- level 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.33*</td>
<td>0.26*</td>
<td>0.56</td>
<td>0.54</td>
<td>0.33*</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.03)</td>
<td>(0.14)</td>
<td>(0.15)</td>
<td>(0.05)</td>
</tr>
<tr>
<td></td>
<td>- level 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.74*</td>
<td>0.64*</td>
<td>0.82</td>
<td>0.78</td>
<td>0.79*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.11)</td>
<td>(0.14)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Books</td>
<td>0.21*</td>
<td>0.17**</td>
<td>0.63**</td>
<td>0.62**</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.10)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Average grade</td>
<td>-0.38*</td>
<td>-0.42*</td>
<td>-0.75*</td>
<td>-0.76*</td>
<td>-0.69*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Gender</td>
<td>0.13*</td>
<td>0.14**</td>
<td>0.12</td>
<td>0.13</td>
<td>0.22*</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.00)</td>
<td>(0.09)</td>
<td>(0.09)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Community size</td>
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<td>-0.08</td>
<td>0.14</td>
<td>-0.16</td>
<td>-0.33*</td>
</tr>
<tr>
<td>(village)</td>
<td>(0.09)</td>
<td>(0.34)</td>
<td>(0.63)</td>
<td>(0.58)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Parent expectation</td>
<td>0.12</td>
<td>0.05</td>
<td>-0.48</td>
<td>-0.47</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.62)</td>
<td>(0.27)</td>
<td>(0.24)</td>
<td>(0.98)</td>
</tr>
<tr>
<td>School type</td>
<td>- type 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.64*</td>
<td>0.05</td>
<td>-0.49</td>
<td>-0.34</td>
<td>-0.44*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.35)</td>
<td>(0.12)</td>
<td>(0.38)</td>
<td>(0.01)</td>
</tr>
<tr>
<td></td>
<td>- type 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.68*</td>
<td>0.01</td>
<td>-1.54**</td>
<td>-1.39**</td>
<td>-0.45*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.99)</td>
<td>(0.06)</td>
<td>(0.09)</td>
<td>(0.00)</td>
</tr>
<tr>
<td></td>
<td>- type 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.89*</td>
<td>0.12</td>
<td>-0.90**</td>
<td>-0.69</td>
<td>-1.24*</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.35)</td>
<td>(0.10)</td>
<td>(0.25)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Average frequency</td>
<td>5.01*</td>
<td>1.13</td>
<td>3.76*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of tutoring in</td>
<td>(0.00)</td>
<td>(0.38)</td>
<td>(0.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average frequency</td>
<td>-0.36</td>
<td>-0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of preparatory</td>
<td>(0.28)</td>
<td>(0.95)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>course in:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- humanities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.52*</td>
<td>-2.03*</td>
<td>-3.01*</td>
<td>-3.31*</td>
<td>-0.49</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.00)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>F</td>
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<td>83.76</td>
<td>3.43</td>
<td>14.09</td>
<td>21.51</td>
</tr>
<tr>
<td>N</td>
<td>4172</td>
<td>4172</td>
<td>4172</td>
<td>4172</td>
<td>4134</td>
</tr>
</tbody>
</table>

Note: t-statistics in bracket; * significant at the 5 percent level and ** 10 percent level

Results in Table 5 suggest that students of vocational, specialized and technical schools are less likely to obtain private tutoring as compared to students of general high schools. These findings may confirm that private tutoring is a strategy to increase chances of enrolling at university. Students of high schools are more likely to continue education after completing secondary schooling than students of other types of upper secondary schools. As in the previous section, income and average grade were statistically significant determinants of private tutoring (but not of preparatory courses), supporting that lower performing students, and from more affluent families, are more likely to use...
private classes. In addition, the more students hire tutors, the more others are likely to imitate them. In favor of this hypothesis, the coefficient of the average frequency of tutoring in school is positive. Interestingly, the only statistically significant determinant of students attending preparatory courses was the community size. Parents of students from small villages were more likely to invest in such courses.

Our results indicate that female students are more likely to obtain private tutoring as well as to attend preparatory courses than male students. The variable gender is statistically significant in the case of private education in mathematics (but not polish). This may relate to that fact that female students have often lower perception of their mathematical skills than male students, and thus they are more likely to seek private education as a means of reconfirmation of their knowledge before final exams (Jacobs, 1991; Niederle and Vesterlund, 2009). As an alternative explanation, some studies suggest that female students are generally better motivated and for this reason are more likely to use private education services than male students. Male students may be less willing to enroll in additional classes preferring, for instance, sport activities instead. Their lower participation in private education during upper secondary schools (as compared to gymnasium) may reflect their increasing participation in family decision-making over time, i.e. as they move along education levels. In favor of this hypothesis, parental expectations about education of their children are insignificant in explaining variations in the probability of student obtaining private tutoring in gymnasium but not in high school.

4. Conclusions
The debate exists whether private tutoring helps low-performing students, especially from middle class backgrounds, to improve their education outcomes, or it is rather a reflection of socio-economic advantages of students from more affluent families. With the aim of contributing to this discussion, this paper examined socio-economic determinants behind demand for private tutoring and preparatory courses in Poland. The analysis utilized the PISA 2006 dataset for students from lower secondary schools (gymnasiums) and upper-level secondary schools.

Our findings support that private tutoring is a remedial strategy for low-performing students. The frequency of students, who take private classes, is lower among students who obtained higher school grades. In addition, students from more affluent families, and whose mothers are better educated, are more likely to use private education. The evidence indicates also that in higher income groups students typically obtain better grades. This suggests that the socio-economic background can be an important stratification factor. The discussed variables were no longer significant in explaining demand for preparatory courses for the gymnasium final exam. The evidence suggests that families may trade-off investing in private tutoring and in preparatory courses: students from smaller communities are more likely to attend preparatory courses, while families from bigger cities prefer hiring private tutors.
The analysis of determinants of private tutoring reveals gender-specific patterns. In particular, female students are more likely to obtain private tutoring in mathematics than male students during gymnasium, although they also achieve better grades. This may reflect low self-evaluation of academic competences of female students, who may seek private tutoring as a means of re-affirmation of their knowledge. On the other hand, male students are more likely to use private tutoring in polish and attend preparatory courses. The analysis of our data reveals a polarization of skills among gymnasium students: male students outperform female students in terms of competencies in mathematics, while the opposite holds with respect to skills in reading. As jobs requiring technical credentials are usually better paid and also more prestigious, the polarization of skills and education choices between girls and boys at the level of gymnasium raises the concern for policymakers committed to provide equal opportunities in education for everyone.

At the level of upper secondary schools, gender is insignificant in explaining demand for private education, with the exception for private tutoring in mathematics. Female students are more likely to take the advantage of the latter than male students. This may be indicative that as students move along the education pathway, their parents become less involved in decisions concerning the use of private education. Male students may be more confident (than female students) about their knowledge and ability to pass exams without additional tutorials, and thus less often use them, or prefer other forms of activities instead of additional classes.

The PISA 2006 study provides a variety of data to explore causes of private tutoring. However, some hypothesis could not have been tested. No questions were asked in the PISA surveys about location, motivation, costs, the nature of learning, family involvement in helping student at home, the acceptance of private education and many other important aspects of tutoring. In addition, the analysis of the PISA data indicates some inconsistencies in how the questions are formulated, which makes impossible, for instance, to assess the costs of private education. In particular, 20-25 percent of students in the PISA surveys replied that they attend preparatory courses. On the contrary, only 7 percent of parents indicated expenses on preparatory courses as an element of their household budget.

All in all, drawing attention to the multitude of complex social, personal and environmental factors in explaining educational choices is essential for targeting inequalities in education with appropriate policy instruments. New methodologies and theoretical perspectives are needed which would allow differentiating between individual needs and social influences in explaining demand for private tutoring.

References


The World Bank, 2004. Gender and Economic Opportunities in Poland: Has Transition Left Women Behind?

### APENDIX A Income groups

<table>
<thead>
<tr>
<th>Income groups</th>
<th>Monthly net income (zloty)</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt;600</td>
<td>975</td>
</tr>
<tr>
<td>2</td>
<td>600&lt;x&lt;1200</td>
<td>1206</td>
</tr>
<tr>
<td>3</td>
<td>1200&lt;x&lt;1800</td>
<td>837</td>
</tr>
<tr>
<td>4</td>
<td>1800&lt;x&lt;2400</td>
<td>576</td>
</tr>
<tr>
<td>5</td>
<td>2400&lt;x&lt;3000</td>
<td>345</td>
</tr>
<tr>
<td>6</td>
<td>3000&lt;x&lt;4000</td>
<td>266</td>
</tr>
<tr>
<td>7</td>
<td>4000&lt;x&lt;5000</td>
<td>172</td>
</tr>
<tr>
<td>8</td>
<td>&gt;5000</td>
<td>257</td>
</tr>
</tbody>
</table>
Appendix B. Questionnaire items corresponding to the dependent variables in Section 3.1

P23 Are you taking private tutoring (Indicate yes/no):
   a) polish
   b) mathematics
   c) biology
   d) chemistry
   e) physics
   f) other subjects
   g) I do not take private tutoring at all.

Private tutoring in general was equal 1 if the student replied yes to (g). Private tutoring in polish and mathematics were equal 1 if a student replied yes to (a) and (b) respectively.

P32 Do you/did you attend preparatory courses or private tutoring before the gymnasium final exam?
   a) preparation for the part of gymnasium final exam in mathematics:
      - yes, preparatory courses
      - yes, private tutoring
      - no
   b) preparation for the part of gymnasium final exam in humanities:
      - yes, preparatory courses
      - yes, private tutoring
      - no

Preparatory courses in mathematics/ humanities takes value 1 if a student replied “yes, preparatory course” to questions (a) and (b) respectively.

Appendix C. Questionnaire items corresponding to the dependent variables in Section 3.2

P52 Are you taking private tutoring? If yes, indicate:
   a) No, I do not take private tutoring
   b) Yes, biology
   c) Yes, chemistry
   d) Yes, physics
   e) Yes, mathematics
   f) Yes, polish

Private tutoring in general was equal 1 if the student replied yes to (a). Private tutoring in mathematics and polish were equal 1 if a student replied yes to (c) and (f) respectively.

P54 Do you/did you attend preparatory courses or private tutoring before the gymnasium final exam? (Indicate yes or no)

   a) preparation for the part of gymnasium final exam in mathematics
   b) preparation for the part of gymnasium final exam in humanities

Preparatory courses in mathematics/ humanities take value 1 if a student replies yes to the questions above.