

Predictors of Academic Achievement at Different Levels of Socioeconomic Status

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Abstract

Success is a concept that is desired by everyone. In the Turkish education system, Anatolian high schools are considered one of the most prestigious schools which accept students via national central exams. The purpose of this study is to reveal indicators explaining the placement into Anatolian high schools, which is an important sign of success, in socioeconomically different regions. Logistic regression analyses were used as a prediction design. Data was collected from the 1049 10th grade high school students in Istanbul. According to findings, the indicators affecting the probability of studying in Anatolian high school differ between the low life quality indexed region (LLQR) and the high life quality indexed region (HLQR). In LLQR GPA, gender, number of people in the household, and mother's monetary contribution were found as significant indicators. In HLQR GPA, father's income and mother's education level were found as significant indicators. These results are discussed using the main theories of educational sociology.

Keywords: inequalities in education, Anatolian high schools, socio-economic factors, logistic regression, academic success, low and high quality of life indexed regions

1. Introduction

Success is a status that an individual needs to have to continue his/her assertion in a specific field. The education system is one of the areas where this status is emphasized the most. Academic achievement is also a determinant of the position that a person has in life. In this context, the failure and success status of a person is justified within the framework of individual-based factors. Genetic inheritance, motivation, interest/apathy were the first factors chronologically that are used to explain success/failure. Because the human being is a social creature and social order has important effects on human life (Berger & Luckman, 1966; Weick, 1995), the existence of some variables that are not under the control of the individual related to his/her success/failure is thought-provoking.

There have been plenty of theories put forward regarding the relationship between academic achievement and social background (Bernstein, 1961; Boudon, 1974; Bourdieu & Passeron, 2015; Coleman, 1988; Erikson & Jonsson, 1996; McDermott, 1974; Şirin, 2005; Willis, 1981). According to OECD data (2004; 2016; 2019) there exist a strong relationship between socioeconomic status and academic performance so much so that socioeconomic status explains student achievement by 20 percent. Many indicators of education such as educational attainment, academic achievement or drop out and their relationship with socioeconomic status have been studied in many researches (Ataç, 2017; Belzil & Hansen, 2003; Bülbül, 2021; Davies et al., 2002; Dearden, Machin, & Reed, 1997; Dearden, 1999; Ekinçi, 2011; Ermisch & Francesconi, 2001; Fuchs & Sixt, 2007; Hansen, 1997; Lauer, 2003; Munk, 2013). In all these articles, as indicators of socio-economic status, the education level of the parents, their occupation, household income, and the number of people living in the house were examined separately, to find out the indicator with a significant effect on academic achievement. In the study conducted by Belzil and Hansen (2003) demographic structure of the family explains educational attainment by 68%. Especially education level of parents is the most contributing variables as constituting the half of this percentage. Lin (2020) revealed that one standard deviation increase in parental education is associated with a 53% increase in the likelihood of advancing to the next level of education. Additional researches (Munk, 2013; Ermisch &

Francesconi, 2001; Ekinci, 2011), also support these findings. Other than that, there are studies that have found mother's education more effective (Cameron & Heckman, 2001; Cemalcilar & Gökşen, 2014; Dearden, 1999), others concluded that father's education is more effective (Engin-Demir, 2009). In many countries, it has been found that children whose fathers have received higher education are more likely to take place in higher education (OECD, 2007). Especially in Austria, France, Germany, Portugal, and the UK, this situation doubles the likelihood of students participating in higher education.

Studies have shown that there is a significant relationship between the number of people living in the household and academic achievement (Belzil & Hansen, 2003; Cemalcilar & Gökşen, 2014; Downey, 1995). On the other hand, Engin-Demir (2009) has found that the number of siblings does not have a significant effect on academic achievement.

As being a socioeconomic variable that affects academic achievement, household income has also taken place frequently in studies. Engin-Demir (2009) and Cemalcilar and Gökşen (2014) have indicated that academic achievement is significantly related to the father's income and his job security. Tieben and Wolbers (2010) in their study on the Dutch education system revealed that the fathers' occupation is effective in school preferences during the transition between education levels. More on more education level of parents is effective in school success even when the effect of the school was controlled. On the one hand, Belzil and Hansen (2003) and Erikson (2016) found a weak relationship between income and achievement in their studies.

It is thought-provoking that these studies have different results. The fact that the study samples are selected from different regions may be the reason for this differentiation. For example, Ekinci (2011) has conducted his research among university students in Kayseri, Ankara, and Sivas. Cemalcilar and Gökşen (2014) have worked with dropped-out and non-dropped-out teenagers in six different cities in Turkey. Finally, Engin-Demir (2009) has collected data from children at the secondary level in different regions of Ankara where the rates of children who both work and study were high. These different locations and sample units might affect and predominate the socioeconomic variables that predict the academic success of students. In different regions with different social contexts, the factors that predict academic success might differ. In this study, it will be investigated which factors affect academic achievement in regions with different socio-economic backgrounds and whether these variables differ between regions.

In Turkey increase in socioeconomic status scores heightens mathematics achievement scores in the PISA exam (OECD, 2014). According to the 2018 PISA results, the achievement differences within and between schools is another point that draws attention. In Turkey, the achievement differences between schools are 43.6% whereas the OECD average for this ratio is 29%. On the other hand, achievement differences within schools are 34.6 % in Turkey while the OECD average is 71%. This case poses the idea that students who are successful in the education system in Turkey are gathered at certain schools.

Within the Turkish education system, two central exams which are conducted before high school and university entrance, perform the function of placing students into schools. Although there are many different types of high schools in our country, it is possible to say that secondary school graduates are faced with basically four options: Anatolian high school, Imam hatip high school (religious school), Vocational high school, and distance education. Within these school types, Anatolian high school is the most prestigious and most desired type of high school (Çavuşoğlu-Deveci, 2020; Gündüz, 1996). Before 2017 all types of schools accepted students based on the exam score. Starting with the 2017 academic year, a limited number of Anatolian high schools accept students using an exam score, where only the top 10% of the high school candidate students can be placed. Those schools called as "qualified high schools". The enrollment process for other Anatolian high schools occur according to an address based placement system (MEB, 2019). The studies reveal that school type affects mathematic achievement by 62%, reading skills by 43.6% (Karaağaç, 2019; TEDMEM, 2014). This points that school type is a highly effective factor in students' success (Alacacı & Erbaş, 2010). Therefore, the school type is an important achievement indicator for the student.

This study aims to reveal to what extent indicators explain the placement into Anatolian high schools, which is an important sign of success, in socio-economically different regions. The findings obtained from this study help present a concrete picture of inequality in education and will give an idea about the differing results of previous studies. Thus, the results obtained from this research can influence regional policies to be developed in this field. In the next section, the theories on the relationship between socioeconomic status and academic achievement are summarized and different ideas in the relevant literature are discussed.

1.1 Failure is a Choice or Necessity

It is possible to examine the approaches in the related literature in two separate branches, one sees individuals as

active actors and the other considers them as passive figures. The first of these claims is that individuals make an 'educational choice' (Boudon, 1974, p. 29) based on their social position. In these educational preferences, the primary factor is the opportunities of the family due to their social position. A child who is a member of an educated family grows up in an intellectually nurturing environment. This child can 'choose' easily an advanced level of education, with the confidence that he/she can meet the higher academic expectations of these educational tracks. According to Boudon, the second factor affecting educational choice is the different evaluation of the benefits and economic costs of education by individuals from various social classes. Erikson and Jonsson (1996, p. 14) have developed a model called 'Subjective Expected Utility' that reveals the effects of social position on educational preferences. In other words, families put the benefits of children's receiving a higher level of education and children's probability to achieve on one hand; they place the cost of this education on the other hand and they make an evaluation accordingly. According to this formula, working-class families make an educational choice in a way that is less costly and can provide a contribution to the household income in a short time, while a middle-class family will verge a preference that will maintain or increase its social status (Goldthorpe, 1996, p. 493).

Another researcher who considers the effects of social class on education as a 'choice' is Paul Willis. Willis (1981) interprets the situation as the resistance of the subculture to the dominant culture and claims that working-class children exhibit behaviors like causing disciplinary problems and having absenteeism in the school to protect their own culture and eventually these behaviors cause them to fail. According to Willis, the educational 'choices' of the lower class symbolize the liberation from the order that is constituted by the dominant culture. Additionally, the researcher thinks that these children reject the idea of having better life standards via education because they think that very few people from their group can benefit from this opportunity and they do not consider this low possibility worth turning back on their own culture (Willis, 1981). In both of the aforementioned Willis' and Boudon's theories, educational orientations of different classes have been tried to be explained in both economic profit and cultural contexts and the existing situation is evaluated as 'choice'. Therefore, in these theories, the social groups themselves are considered as active in segregation.

Pierre Bourdieu explained this situation with his 'reproduction' theory in which he claims that the segregation in the education system is not a result of 'choices', but a situation realized through higher social mechanisms (Bourdieu & Passeron, 2015). According to him, education is one of the important structures that ensure the continuity of the existing order. When an individual is born, he/she is born in a certain 'habitus' and learns the codes of behavior within that habitus. The Education system, on the other hand, validates the behavioral codes of the dominant culture and enables students with these codes to progress smoothly within the system (Bourdieu & Passeron, 2015). In his theory, Bourdieu drew attention to different types of capitals as economic, social, and cultural (Bourdieu, 1986). Economic capital involves entities which are directly transferable into money. Cultural capital is the knowledge sets or academic capabilities that can be acquired via both school and family. Finally social capital is human sources which established in the long run relations. Bourdieu states that different types of capitals that come through family inheritance are also effective in actualizing the reproduction function of the school. According to Nash (1990), Bourdieu stated that there is arbitrariness in the determination of the culture conveyed by schools and since this culture is compatible with the middle-class culture, the alienation of the working class from school is an automatic result of the system.

In studies carried out in Turkey, the effect of socioeconomic status on academic achievement has been demonstrated with its different aspects. Suna et al. (2020) tried to reveal the effect of socioeconomic status and school type on academic achievement by using the data of three national replacement exams conducted in the past years. They found that more socioeconomically advantageous students were more successful. In another study, it was asserted that the education level of the father, the employment status of the parents, and the lack of a computer at home are important factors that predict success. In the same study, it was determined that Anatolian high school students were more successful than General high school students (ERG, 2009). In a study conducted on students' university entrance exam scores and family characteristics, it was revealed that the education level of both mother and father are important factors that affect the success (Çiftçi & Çağlar, 2014). In the study where Smits and Gündüz Hoşgör (2006) aimed to reveal the factors that affect educational attainment, education level of the parents, the number of siblings, household income, parent's occupation stands out. In the study, it was mentioned that the education level of the mother and her role in the household is vitally important for female students, while household income is determinant for male students. In another study examining the relationship between placement in higher education and socioeconomic status, it was observed that the education level of parents is a determinant in entering higher education. Especially the children whose parents graduated from higher education are represented in higher education by higher rate and the representation rates of these students in departments with

high demand due to the expectation of return have been found to increase even more (Ekinci, 2011).

In this study, entering an Anatolian high school has been accepted as an achievement criterion and the socioeconomic factors that are effective in achieving this success are revealed. In parallel with the literature, the relationship between the education level of mother and father, the income of mother and father, the number of people in the household, GPA, gender, and placement in an Anatolian high school were examined. Unlike the literature, this relationship has been discussed separately for different regions of Istanbul having distinct socioeconomic development levels. These regions will be called as low life quality indexed region and high life quality indexed region as cited in Şeker's (2011) study. Şeker defined life quality as the way people perceive their situation in the cultural context and the value systems they live in, associated with their goals, expectations, standards, and interests. Differences in the results of the existing research triggered the researchers to conduct a study having these two distinct regions. Thus, this study claims to provide an idea about whether the thesis on indicators of educational success is valid for socioeconomically distinct regions. It will also provide insight into different research results available in the literature. The findings of this study help decision-makers to improve their regional policies that prevent educational inequality.

1.2 Purpose of the Study

The purpose of this study is to reveal the socioeconomic indicators that provide an advantage in the placement of Anatolian high schools, which is accepted as a success criterion in this study, and what these indicators are in socioeconomically different regions. The research questions below are attempted to be answered:

- 1) Which socioeconomic indicators are effective in placing an Anatolian high school in a region having a low life quality index?
- 2) Which socioeconomic indicators are effective in placing an Anatolian high school in a region having a high life quality index?

2. Method

2.1 Research Design

The purpose of this study is to reveal the relationship between socioeconomic status indicators, GPA, gender, and being an Anatolian high school student, which is a pointer to academic success. For this reason, logistic regression analyses were used as a prediction design. Prediction design is a type of correlational design with the purpose of identifying variables that predicts an outcome of interest (Cresswell, 2014).

2.2 Sampling

Purposeful sampling was used in this study. Purposeful sampling is a method in which individuals having specified properties can be studied to have a deeper understanding (Cresswell, 2014). This study has been conducted in two regions of Istanbul. One region has a low-quality life index (LLQR); another region has a high-quality life index (HLQR) having reference the research of Şeker (2011). After determining the districts three types of schools (Anatolian, Vocational, and Religious high schools) have been elected in each district. The schools were selected according to their scores in the central high school entrance exam. In the 2017-2018 academic year all the schools matriculated students according to their central high school entrance exam scores. After that year some Anatolian high schools were defined as "qualified high schools". Since 10th-grade students were the sample group of this study, central high school entrance scores were taken into consideration. The number of schools was limited in LLQR, therefore equivalent scored schools have been selected in HLQR. Table 1 indicates the related score of the selected schools.

Table 1. The central high school entrance exam scores in the year 2017

| School Type | District | Score |
|------------------------|-------------|--------|
| Anatolian High School | HLQR | 432.46 |
| | LLQR | 426.63 |
| Vocational High School | HLQR | 336.66 |
| | LLQR | 346.74 |
| Religious High School | HLQR-Female | 317.06 |
| | HLQR – Male | 101.50 |
| | LLQR | 143.87 |

All 10th-grade students in these selected schools were delivered to fill the survey. Since the project applied in the first semester, ninth-graders were not settled down the enrollment procedure continued until the end of the first month of the school year. For 11th and 12th grade students there was a high proportion of disenrollment to enroll in another institution for the preparation of the university entrance exam. In total 1048 participants were included in the sample. The table below shows the distribution of the number of surveys according to district and school.

Table 2. The allocation of the number of surveys according to district and school type

| | LLQR | HLQR |
|------------------------|------|------|
| Anatolian High School | 150 | 172 |
| Religious High School | 154 | 149 |
| Vocational High School | 206 | 218 |

2.3 Data Collection

A survey is delivered to the 10th-grade high school students in which information about themselves and their families as education of mother and father, the income of mother and father, GPA, number of people in the household, gender was required to be filled. The surveys were applied in the 2018-2019 fall season as a part of a participant selection tool in the study of Çavuşoğlu-Deveci (2020) with a full university ethical approval.

2.4 Data Analysis

The purpose of this study was to model the relationship between the probabilities of studying in Anatolian high schools using potentially related predictors. For this purpose, logistic regression analysis was implemented. In logistic regression, the dependent variable is a categorical or nominal variable with multiple response categories. For instance, the logistic regression model for a dichotomous random variable Y with response categories 1 and 0 representing success and failure would be

$$P(Y = 1|X) = \frac{\exp(\beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_p * X_p)}{1 + \exp(\beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_p * X_p)} \tag{1}$$

This model gives us the probability of success (i.e., Y=1) modeled by predictor variables X_i where i=1,2,...,p. β_i gives the change in the log-odds of P(Y=1|X) for one unit increase in the X_i while remaining predictors are constant. Log-odds of P(Y=1|X) is defined as log((P(Y=1|X))/(1-P(Y=1|X))). Predictor variables can be continuous, discrete or categorical. Coefficients are estimated using the maximum likelihood estimation. Hosmer, Lemeshow and Sturdivant (2013) give a more detailed explanation about it.

Direct, sequential, and stepwise logistic regression is well-known types of logistic regression (Tabachnick & Fidell, 2012). In this study, direct logistic regression with backward elimination was used since there is not any hypothesis about the order or importance of predictor variables. In direct logistic regression, predictors entered the model at the same time, and the contribution of each predictor is evaluated as if its entry to the model was the last. All analysis was conducted using the R program (R Core Team, 2018).

The predictor variables used in this study were gender (gender), ninth-grade grade point average (GPA), number of family members (NumPpl), mother’s income (income_m), education level of the mother (edu_m), father’s income (income_f), and education level of the father (edu_f). Gender and GPA are student-related variables, and the remaining variables are indicators of SES. They are chosen on purpose to uncover their role in predicting the school type. Missing cases for each variable were deleted. Descriptive statistics are presented in Table 3.

Table 3. Descriptive statistics

| | HLQR (N = 337) | LLQR (N = 371) |
|--------------------------|-------------------|-------------------|
| GPA | 71.23 (9.25) | 69.37 (10.07) |
| Mother’s income | 1056.1 (2179.36) | 338.61 (866.91) |
| Father’s income | 3688.5 (3765.76) | 2664.34 (1265.68) |
| Number of family members | 4.36 (1) | 4.94 (1.2) |
| Student’s gender | | |
| Female | n = 166 | n = 217 |

| | | |
|------------------------------|---------|---------|
| Male | n = 171 | n = 154 |
| Mother's education | | |
| No formal education | n = 27 | n = 60 |
| Primary school | n = 90 | n = 159 |
| Middle school | n = 91 | n = 74 |
| High school | n = 86 | n = 65 |
| University or higher degrees | n = 43 | n = 13 |
| Father's education | | |
| No formal education | n = 15 | n = 35 |
| Primary school | n = 68 | n = 143 |
| Middle school | n = 86 | n = 95 |
| High school | n = 109 | n = 75 |
| University or higher degrees | n = 59 | n = 23 |
| School Type | | |
| Anatolian High School | n = 111 | n = 114 |
| Not Anatolian High School | n = 226 | n = 257 |

Father's income followed skewed distribution and thus logarithmic transformation was applied. For the mother's income logarithmic transformation was not applied since there were many cases with zero income. And logarithmic transformation would result in the loss of these cases. Instead, income_m was dichotomized as mothers with zero income and mothers who earn money. This new variable is called working_m. This dichotomization resulted in 303 cases with zero income and 58 cases earning money at some amount between 500 and 5000 Turkish lira in LLQR. In HLQR, there were 199 cases with zero income and 121 cases earning money at some amount between 150 and 25000 Turkish lira. edu_m and edu_f were categorical variables with five levels. The first level also the reference group was the ones who did not have formal education. The rest of the levels in respective order were graduates of primary school, elementary school, high school, and university or master or doctoral programs.

Sampling design requires the model building of each region to be done within itself. However, for both towns, the same procedures were followed. First, direct logistic regression including all predictors was used. There were statistically not related variables and new models were formed by excluding them. The purpose was to examine if these variables were necessary for the model fit improvement. The order of excluding not significantly related variables started with the highest probability values. The exclusion of variables continued one by one until there is only significantly related variables left. The existence of interaction terms was assessed by visuals and the most parsimonious model was kept as the final model.

Models were compared using Likelihood Ratio Test, McFadden's R^2 , Akaike's Information Criterion (AIC), and visual assessment of residuals. Likelihood Ratio Test compares residual deviance of the models using χ^2 distribution. The smaller residual deviance means a better model fit. ANOVA is used to test if the observed difference between residual deviances of the models is statistically significant. McFadden's R^2 is a pseudo R^2 metric representing the predictive power of the model. It takes values between 0 and 1 (inclusive). Higher values indicate better model fit. However, this metric usually does not produce high values (James, Witten, Hastie, & Tibshirani, 2013). For instance, .40 indicates a very good fit. The following sections summarize the model building.

2.4.1 Model Building

HLQR

The first model included all variables. Coefficients of GPA, log_income_f have probability values smaller than 0.05. Therefore, new models excluding the variables that were not statistically related to the outcome variables were built and Table 4 displays the statistics used for diagnostic assessment.

Table 4. Diagnostics assessment - HLQR

| Model Number | Predictors | Residual Deviance/df | AIC | Mc Fadden's R2 |
|--------------|--|----------------------|--------|----------------|
| 1st Model | GPA, gender, NumPpl, working_m, log_income_f, edu_m, edu_f | 297.2/306 | 325.2 | 0.274 |
| 2nd Model | GPA, gender, NumPpl, working_m, log_income_f, edu_m | 302.21/310 | 322.21 | 0.261 |
| 3rd Model | GPA, gender, NumPpl, log_income_f, edu_m | 302.26/311 | 320.26 | 0.261 |
| 4th Model | GPA, NumPpl, log_income_f, edu_m | 302.26/312 | 318.26 | 0.261 |
| 5th Model | GPA, log_income_f, edu_m | 305.61/313 | 319.61 | 0.253 |

The second model excluded the education level of the father as can be seen in Table 3. A smaller AIC value obtained from the second model indicates a better fit of the second model compared to the first model. Moreover, residual deviance of the models was compared using the Likelihood Ratio Test. $\chi^2(1, N=320)=5.01, p=.29$ indicating that there was no a statistically significant difference between the first and the second models. The third model excluded the mother's income. A smaller AIC value was obtained from the third model indicates a better fit of the third model. $\chi^2(1, N=320)=0.467, p=.83$ indicating the second model against the third model was not statistically significant. The fourth model excluded gender. A smaller AIC value indicated a better fit of the fourth model. $\chi^2(1, N=320)=0.0000532, p=.99$ indicating the third model against the fourth model was not statistically significant. After excluding the number of family members in the fifth model, the variables left were all significantly related to the probability of studying in Anatolian high schools. Although the AIC value increased, this model was not statistically different from the fourth model, $\chi^2(1, N=320)=3.35, p=.067$. Therefore, the fifth model was kept as the final model as the most parsimonious model. McFadden's R^2 values of all these models were quite similar as can be seen in Table 3. This indicated that all models are equivalent in terms of explaining variance in the data. This confirms the choice of the fifth model which is given below.

$$P(sch = 1|X) = \frac{\exp(\hat{\beta}_0 + \hat{\beta}_1 * GPA + \hat{\beta}_2 * \log_income_f + \hat{\beta}_3 * edu_m)}{1 + \exp(\hat{\beta}_0 + \hat{\beta}_1 * GPA + \hat{\beta}_2 * \log_income_f + \hat{\beta}_3 * edu_m)} \tag{2}$$

Standardized deviance residuals of the final model were plotted against the data points in Figure 1. Standardized deviance residuals can show points that do not fit well to the model. Residuals whose values exceed 3 standard deviations might be potentially ill-fitting points and they should be examined closely (James et al., 2013). In our model, there was not any point exceeding 3 standard deviations as can be seen in Figure 1.

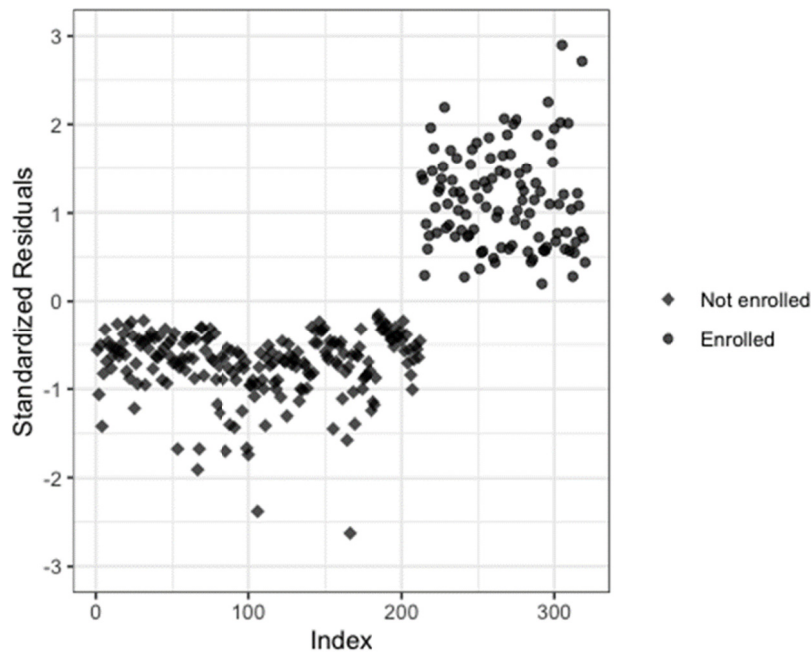


Figure 1. Standardized deviance residuals of the final model for HLQR

LLQR

The first model included all variables. Coefficients of the education level of father, education level of the mother, father’s income, and the number of family members have probability values bigger than 0.05. This finding indicates that there is not a statistically significant relationship between these variables and the probability of studying in Anatolian high schools. Therefore, new models excluding these variables were built and Table 5 displays the statistics used for diagnostic assessment of these models.

Table 5. Diagnostics assessment – LLQR

| Model Number | Predictors | Residual Deviance/df | AIC | Mc Fadden’s R2 |
|--------------|--|----------------------|--------|----------------|
| 1st Model | GPA, gender, NumPpl, working_m, log_income_f, edu_m, edu_f | 351.09/347 | 379.09 | 0.209 |
| 2nd Model | GPA, gender, NumPpl, working_m, edu_m, edu_f | 351.48/348 | 377.48 | 0.208 |
| 3rd Model | GPA, gender, NumPpl, working_m, edu_f | 354.08/352 | 372.08 | 0.202 |
| 4th Model | GPA, gender, NumPpl, working_m | 357.52/356 | 367.52 | 0.195 |

The second model excluded the income of the father. A smaller AIC value obtained from the second model indicates a better fit of the second model, $\chi^2(1, N = 361) = 0.385, p = .54$ indicating the second model against the first model was not statistically significant. The third model excluded the education level of the mother. A smaller AIC value obtained from the third model indicates a better fit of the third model $\chi^2(1, N = 361) = 2.6, p = .63$ indicating the second model against the third model was not statistically significant. The fourth model excluded the education level of the father. A smaller AIC value was obtained from the fourth model indicates a better fit for the fourth model. $\chi^2(1, N = 361) = 3.44, p = .49$ indicating the third model against the fourth model was not statistically significant.

The exclusion of variables resulted in a decrease for McFadden’s R² values of all these five models. However, the difference was in the second decimal as can be seen in Table 4. This indicated that all models are quite similar in terms of explaining variance in the data. Therefore, the most parsimonious model was determined as the final model, which was the fourth model and it is given below.

$$P(sch = 1|X) = \frac{\exp(\hat{\beta}_0 + \hat{\beta}_1 * GPA + \hat{\beta}_2 * gender + \hat{\beta}_3 * NumPpl + \hat{\beta}_4 * working_m)}{1 + \exp(\hat{\beta}_0 + \hat{\beta}_1 * GPA + \hat{\beta}_2 * gender + \hat{\beta}_3 * NumPpl + \hat{\beta}_4 * working_m)} \tag{3}$$

Standardized deviance residuals of the final model were plotted against the data points in Figure 2. In our model, there was not any point exceeding 3 standard deviations. This finding confirms the choice of the fourth model.

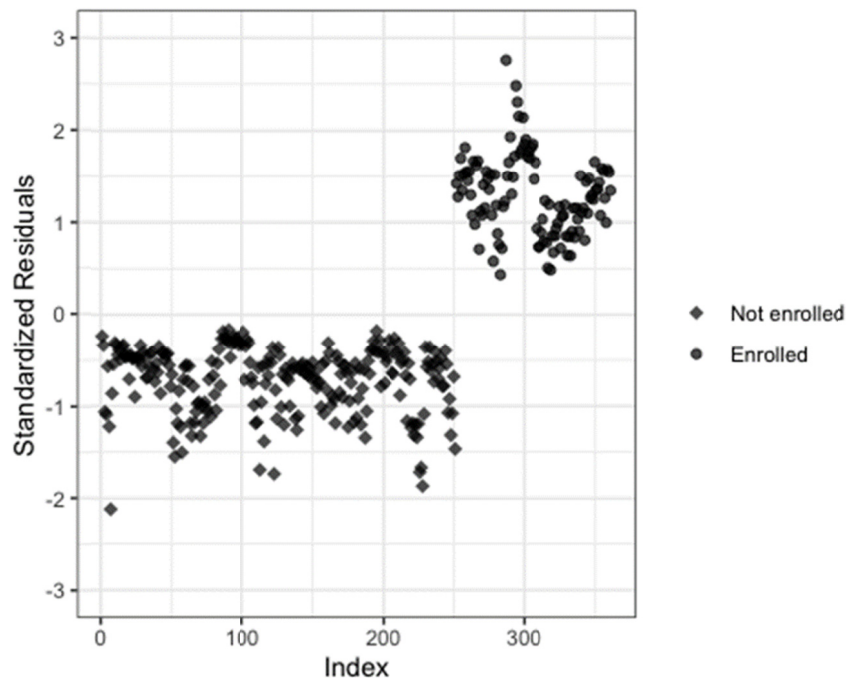


Figure 2. Standardized deviance residuals of the final model for LLQR

3. Results

HLQR

Table 6 displays the estimated coefficient, standard error of estimated coefficient, Wald statistic, p-value, estimated odds, and 95% confidence interval for each variable obtained from fitting the 4th model in predicting the probability of studying in Anatolian high school. In logistic regression, estimated coefficients are on a log-odds scale. Therefore odds, which are exponents of coefficient estimates, and respective confidence limits are given and interpreted.

Table 6. Multiple logistic regression model for HLQR

| term | estimate | std.error | statistic | p.value | odds | conf.int (2.5%) | conf.int (97.5%) |
|--------------|----------|-----------|-----------|---------|------|-----------------|------------------|
| (Intercept) | -14.54 | 2.88 | -5.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| GPA | 0.08 | 0.02 | 4.56 | 0.00 | 1.09 | 1.05 | 1.13 |
| log_income_f | 0.96 | 0.30 | 3.22 | 0.00 | 2.61 | 1.47 | 4.76 |
| edu_m.L | 2.25 | 0.52 | 4.34 | 0.00 | 9.50 | 3.66 | 29.03 |
| edu_m.Q | 0.97 | 0.45 | 2.16 | 0.03 | 2.64 | 1.02 | 6.20 |
| edu_m.C | 0.16 | 0.34 | 0.48 | 0.63 | 1.18 | 0.61 | 2.37 |
| edu_m^4 | 0.00 | 0.28 | -0.02 | 0.99 | 1.00 | 0.57 | 1.73 |

GPA and income_f were statistically significant predictors of the probability of sch=1 (i.e., studying in Anatolian high school) at .005 significance level. The coefficient of GPA was positive and an increase in GPA was associated with an increase in the probability of sch=1. For one unit increase in GPA, the odds of the student studying in Anatolian high school increases by a factor of 1.09 after controlling for the effects of the other predictors. An increase in income_f was associated with an increase in the probability of sch=1. For one unit increase in log of income_f, the odds of the student studying in Anatolian high school increases by a factor of 2.61 after controlling for the effects of the other predictors.

The first two categories of edu_m significantly predicted studying in Anatolian high school compared to the reference category. Since Wald statistic exceeded 2, edu_m was kept in the model as a significant predictor. The reference category of edu_m was the ones illiterate or literate but did not have any formal education. The students whose mothers were graduates of primary school (i.e., edu_m.L) were 9.5 times more likely than the ones in the

reference category to study in Anatolian high school after controlling for the effects of the other predictors. The students whose mothers graduated from elementary school (i.e., edu_m.Q) were 2.64 times more likely than those in the reference category to study in Anatolian high school after controlling for the effects of the other predictors. Since the other two categories of edu_m were not significant predictors, their coefficients were not interpreted.

LLQR

Table 7 displays the estimated coefficients from fitting the 4th model in predicting the probability of studying in Anatolian high school.

Table 7. Multiple logistic regression model for LLQR

| term | estimate | std.error | statistic | p.value | odds | conf.int (2.5%) | conf.int (97.5%) |
|-------------|----------|-----------|-----------|---------|------|-----------------|------------------|
| (Intercept) | -6.97 | 1.22 | -5.69 | 0.00 | 0.00 | 0.00 | 0.01 |
| GPA | 0.11 | 0.02 | 7.16 | 0.00 | 1.12 | 1.08 | 1.15 |
| gender1 | -1.14 | 0.27 | -4.17 | 0.00 | 0.32 | 0.19 | 0.54 |
| NumPpl | -0.26 | 0.13 | -2.03 | 0.04 | 0.77 | 0.60 | 0.99 |
| working_m1 | 0.91 | 0.34 | 2.69 | 0.01 | 2.49 | 1.28 | 4.87 |

The estimated coefficient of GPA was positive and an increase in GPA was associated with an increase in the probability of sch=1. For one unit increase in GPA, the odds of the student studying in Anatolian high school increases by a factor of 1.12 after controlling for the effects of the other predictors. The estimated coefficient of NumPpl was negative and an increase in NumPpl was associated with a decrease in the probability of sch=1. For one unit increase in NumPpl, the odds of the student studying in Anatolian high school decreases by a factor of .77 after controlling for the effects of the other predictors. The estimated coefficient of gender was negative. Female students compared to male students were 0.32 times less likely to study in Anatolian high school after controlling for the effects of the other predictors. The estimated coefficient of working_m was positive. The students whose mother earns some money are 2.49 times more likely to study in Anatolian high school compared to the students whose mother has zero income.

4. Discussion, Conclusion, and Suggestions

The purpose of this study was to reveal the indicators that affect the probability of studying in Anatolian high school among 10th-grade high school students in low and high life quality indexed regions of Istanbul separately. Because the conditions in these regions were different, the effective factors would also be different. The result of this study shows that the socio-economic factors differ between these two regions.

In both regions, GPA is an effective factor which is not a surprising result considering that the entrance of Anatolian high school depends on how well it is scored in the high school entrance exam. The coefficient of GPA is slightly higher in LLQR. That result supports Boudon (1974) and the Subjective Expected Utility model of Erikson and Jonsson (1996). Moving on the academic track stands for an increase in financial expenses. Working class families need to see apparent success to vote for the utility of the academic path. In addition to that according to Willis (1981), it is not common to get higher grades among working-class children consequently the ones who get good scores can easily reach the 'successful school'. On the other hand, in the middle or higher class the proportion of students who gets higher grades in school increases in this case other factors become involved. That might reduce the effect of GPA in HLQR.

Gender is found to be a predictive factor in LLQR but not HLQR. Moreover, female students were less likely to enter an Anatolian high school in LLQR. This result is also parallel with other studies (Cemalcilar & Gökşen, 2014; Gökşen & Cemalcilar, 2010; Smits & Gündüz Hoşgör, 2006; Yıldız & Gültekin-Karakaş, 2019). On the other hand, in HLQR gender was not among the predictive factors. This can be explained by a combination of cultural and economic factors. If the families in LLQR suffer from financial scarcity they likely prefer to use less capital for girls than boys. Within Boudon's (1974) perspective they may consider girls' education as less profitable. However, it can also be interpreted with Bourdieu's (1990) 'habitus' explanation. In the LLQR region girls may have different roles other than taking part in education culturally. It may be required for girls to help household works and that may cause them to spend less time studying. This is related with also the gender roles in that culture. According to Cemalcilar and Gökşen (2014), limited labor participation opportunities for a woman may cause this result. Also, gender roles in Turkey locate women in the house (Bingöl, 2014). As the education level of the society increases the effect of these roles diminishes (Giddens, 2012). These may explain the result of having gender as a predictive factor only in LLQR.

Another difference between HLQR and LLQR is the number of people living in the household. In LLQR it is more common to have larger size families such as families with more than three children or families living with grandparents or other relatives. Family income must be shared and decreased per person. Since income is already low, division of it impacts the amount devoted to the education of the children. That is why the results of this research showed that in LLQR number of people living in the household effect the entrance of Anatolian high schools negatively. This is compatible with the findings of Downey (1995) and Belzil & Hansen (2003).

The importance of economic capital in HLQR reveals in the father's income variable. An increase in fathers' income increased the likelihood of studying in an Anatolian high school. In this district, there is great variety in father's occupation. This variation is also valid for incomes of fathers. That is why their income creates a difference between families economically. This affects academic success. This result is compatible with other research results (Cemalcılar & Gökşen, 2014; Engin-Demir, 2009; Smits & Gündüz Hoşgör, 2006).

A spectacular result of this study is that in LLQR mothers who earn money is the most effective factor. Even though there exists a variable as 'education level of mother', it doesn't have a significant contribution to having a place in Anatolian high school. The students whose mothers earn some incomes are 2.49 times more likely to enter an Anatolian high school. This does worth thinking about. There are studies that reveal the education level of the mother is a significant factor for academic success (Cemalcılar & Gökşen, 2014; Cameron & Heckman, 2001; Dearden, 1999;). In that sense, this study doesn't confirm these findings for the LLQR. It can be interpreted that in LLQR when a mother works that means the household budget increases. Therefore, the financial support for the education of children might also increase. Considering in this region fathers having similar occupations and incomes, allowance of mothers may cause a difference between families. As Bourdieu (1986) indicated economic capital determines other capital forms as social, cultural, symbolic, and eventually also academic success.

The education level of the mother is a significant factor for being placed in Anatolian high school in HLQR. Education level of mothers is indicated many times as a significant factor for academic success (Alacacı & Erbaş, 2010; Cameron & Heckman, 2001; Cemalcılar & Gökşen, 2014; Çiftçi & Çağlar, 2014; Dearden, 1999; Ekinci, 2011; Smits & Gündüz Hoşgör, 2006; Suna, Tanberkan, Gür, Perc, & Özer, 2020). By using the results of the central high school entrance exam between 2013-2017, Karağağaç (2019) found that the education of the family affected the academic success of the child by 27%. In this research, it is founded that a child having a primary school graduate mother is 9.5 times more likely to enter an Anatolian high school than a child whose mother does not have any graduation. It is also noteworthy that a significant difference didn't appeal in terms of high school graduate mothers. In this study, the achievement criterion was enrolling a high school. Elementary school graduate mothers can transfer their cultural capital to their children and this might be sufficient to enter a successful high school. It is intriguing to see the results of another study in which university entrance exam scores are accepted as a success criterion.

It is clearly stated that mothers play a predominant role in academic success in both regions. However, the significant factors related to mothers differ between regions. In LLQR mothers' monetary contribution is important rather than their education level. It is obvious that in that region the main problem is poverty. Bourdieu (1986) declared that economic capital is the source of other types of capital. Therefore, in LLQR mothers support their children's academic achievements by working. On the other hand, in HLQR mothers support their children via cultural capital gained by education. In an economically well-developed region instead of economic potential, mothers' education level creates differentiation among students' success. In none of the regions fathers' education levels was among the predictive factors. Cultural capital can be transmitted by interaction. Although the balances have changed a little today compared to the past, mothers still spend more time with their children than their fathers (Kuzucu, 2011). Therefore, the education level of the mother stands out more than the education level of the father in the success of the child.

Although this study has important findings and implications, it is not without limitations. As parallel with the purpose of the research, a purposeful sampling design was utilized. This resulted in not being able to satisfy the random sampling assumption. Therefore, findings should be generalized cautiously. New studies can be designed with random sampling. In addition to that in new studies "qualified Anatolian high schools" or "science schools" can be determined as success criterion.

The findings of this study contribute to the existing literature in two ways. First, there were different findings of previous research. It provides evidence for the potential reasons behind inconsistent research findings. Indicators of academic achievement differ concerning the socioeconomic status of regions. Second, it guides decision-makers on what to prioritize to improve academic achievement. For a short-term policy, mothers in lower socioeconomic regions should be provided opportunities to earn income. In the long run, the education level of females should be

given priority.

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