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# Social Selectivity in Higher Education: A Case Study of Canada and the Czech Republic

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*This work examines the choices of individuals with respect to higher education in the Czech Republic and Canada. Specifically, how do the students' socioeconomic backgrounds influence their study decisions. Data from the Czech edition of* The European Union Statistics on Income and Living Conditions *survey and the* Canadian Survey of Labour and Income Dynamics *was used to identify influences of students' entry to university. Individuals from households with higher socioeconomic status were more likely to enter university than people who were less well off in both countries. Social selectivity is much more present in higher education in the Czech Republic than in Canada.*

*Ce travail examine les choix des personnes en matière d'enseignement supérieur en République tchèque et au Canada, notamment comment les antécédents socio-économiques des étudiants influencent leurs décisions relatives aux études. Les données de l'édition tchèque de l'enquête* Statistiques sur le revenu et les conditions de vie de l'Union européenne *et de* l'Enquête canadienne sur la dynamique du travail et du revenu *ont été utilisées pour identifier les influences sur l'entrée des étudiants à l'université. Dans les deux pays, les personnes issues de ménages ayant un statut socio-économique élevé étaient plus susceptibles d'entrer à l'université que les personnes moins bien loties. La sélectivité sociale est beaucoup plus présente dans l'enseignement supérieur en République tchèque qu'au Canada.*

## Social Selectivity in Higher Education

The analysis of education is crucial, as higher education increases the potential for economic growth and an improvement in the quality of life for members of society. Education should be accessible to any member of a society with the ability and motivation to participate. Despite this, historically it has been proven that this is not the case (Belley et al., 2011; Chevalier et al., 2013; Frenette, 2007; Savas, 2016). Families with lower educational and financial status are at risk of social exclusion in education. In other words, they are at risk of being victims of social selectivity in higher education. In most cases, the upbringing of individuals, specifically the actions of parents, have a profound impact on the way children live their lives (Frenette, 2007). A lot of these parental influences cannot be quantified in the sense of a cause and effect on their children's decisions, specifically when discussing education. Fortunately, key variables like household

income and parental education can be quantified and used in analysis. Considering this, the impact of a predisposition of certain family members to study will be compared across two different systems of higher education from the Czech Republic and Canada. Other research, that will be outlined in the literature review, has proven that the socioeconomic background of students has an influence, however, the strength of this impact is debated. Furthermore, much of the research has focused on the United States or comparing the United States with Canada (Belley et al., 2011; Frenette, 2007; Savas, 2016).

The direct comparison of two nations, one with tuition fees and the other without, motivates the selection of the Czech Republic and Canada. The presence of tuition fees in Canada may reduce accessibility to higher education for individuals from families with lower incomes. This research will examine the accessibility of higher education for people from different socioeconomic backgrounds in Canada and the Czech Republic. Historically, the presence of social selectivity in education has been proven in Canada and the United States; but this phenomenon hasn't been deeply examined in the seemingly more egalitarian, tuition free, Czech Republic. Despite this, there are definitely some signals that higher education is influenced by social status of family and as the social status is connected with education level of parents, there is also correlation with this which was observed in the survey *EUROSTUDENT V and VI* (Fischer & Vltavská, 2017).

Data from the *Czech EU-Statistics on Income and Living Conditions* (EU-SILC) from 2009 to 2015[1] and the 2011 *Canadian Survey of Labour and Income Dynamics* (SLID)[2] surveys contain information about the presence of a student in the household and the level, and if they were studying at the secondary/high school or university level. This newer Canadian data will provide insight into the direction of social selectivity in Canadian higher education. Furthermore, information about other members of the household is also quantified in the data sets. The education attainment levels of members of the household, material deprivation, and income variables are found in both sets of data. These key comparable socioeconomic variables provide a context for comparability and overall selection of these datasets. Binary logistic regression estimated using the maximum likelihood method will be applied in the case of dichotomous explanatory variables to estimate the significance and influence of explanatory variables included in the estimated model.

Using Binary logistic regression and comparative statistical tests, the data from both nations will be analyzed. The existence of social selectivity with regards to entry to university will be evaluated and compared to the pre-existing literature. Furthermore, conclusions from this analysis about the similarities and differences in the impacts of the variables from both nations will be drawn. The conclusions drawn from this analysis will be conducted within the framework of previous research. Comments will also be made addressing the existence of tuition as a potential catalyst for social exclusion in higher education. Ideas regarding the causes and potential impacts of the results will also be addressed and explored. Construction of analysis such as this has never been completed between the two nations in this field; the results obtained here could provide a platform for further comparisons of this nature. Using newer Canadian data and different variables than previous research, this work contributes valuable insight about the Czech Republic and Canada to the conversation about social selectivity in higher education.

## Literature Review

Human capital is defined as an investment in school, training, or medical care with the purpose of adding to the person's knowledge or wellbeing (Becker, 2009). Furthermore, Becker (2009)

argued that education and training are the most important investments in human capital as higher education leads to higher average income. Increased education has a positive influence on earning potential in the labour market for individuals from The Organization for Economic Co-operation and Development (OECD) countries (OECD, 2020a.). Research into the attendance of tertiary education is being done for many countries throughout the world. Tertiary education, mainly university, refers to all education classifications above "Post-secondary non-tertiary education", including: "Short-cycle tertiary education", "Bachelor's, Master's, Doctoral studies, or their equivalents" (Eurostat, 2016). The attainment levels of tertiary education in many countries have been increasing in recent history as measured by OECD (OECD, 2020b). The OECD is an organization made up of 35 countries including Canada and the Czech Republic; "to promote policies that will improve the economic and social well-being of people around the world" (OECD, 2020a). Therefore, an increase in education and potential earnings are good examples of measures available to improve the socioeconomic wellbeing of an individual. With this in mind, it seems intuitive that students would wish to venture beyond basic secondary school education. Identifying factors of influence that may limit the accessibility of higher education to students could be a good first step towards ensuring equal access to students from all backgrounds, leading to more opportunities to improve the overall socioeconomic wellbeing of individuals.

## Accessibility of Higher Education

Even though education is a valuable tool for improving socioeconomic status, the accessibility of higher education appears to be unequally distributed across socioeconomic classes (Belley et al., 2011). According to regression models constructed for data from Canada, it was found that students whose parents' income is in the highest quartile are 20 percentage points more likely to go to university than the students who come from families in the lowest quartile of income (Belley et al., 2011). The results of social selectivity were even stronger when examining data from the United States. Students whose parents' income is in the highest quartile are 45 percentage points more likely to go to university than the lowest quartile (Belley et al., 2011). In other words, students from poorer backgrounds are the least likely to attend university in Canada and the United States (Belley et al., 2011). Accordingly, similar results were obtained when examining students in the United Kingdom (Chevalier et al., 2013). These results were obtained through the construction of regression models using the parental income and parental education of the students as explanatory variables. Both variables proved to be significant in the models where male students with uneducated parents were most likely to drop out of school in the United Kingdom (Chevalier et al., 2013). In these OECD nations the parental income of students seems to influence their decision to attend university. These results do not bode well for young people from lower income families who would like to surpass their parents' labour market earnings, as an increase in education attainment generally leads to an increase in labour market earnings (OECD, 2010).

From a research and a policy perspective it is important to continue to monitor the impacts of socioeconomic class on accessibility to higher education. For example, the data used for the analysis on Canadian students by Belley et al. (2011) was created in 2000. Though providing important insight into the restriction at the time, it is important to examine potential changes since then.

Prokop (2020) found that in the Czech Republic there is an intergenerational transmission of poverty which is visible in the proportion of children attending university. Prokop (2020)

compared the proportion of these at-risk children with the levels of education of their parents. Children (up to age 30) from parents with an education level below post-secondary non-tertiary education (level 4, ISCED classification) are two times more likely to be at risk of poverty than children with higher educated parents (Prokop, 2020). One third of these children are in the poorest 10% of society and have no savings of their own (Prokop, 2020). Furthermore, in the Czech Republic, it was shown that few children with parents that have low levels of education attended university (Prokop, 2020).

This cross section of literature strongly suggests that an individual's socioeconomic background directly impacts their entry into higher education. Understanding this impact and identifying ways of eliminating it are key to creating an equally accessible higher education system.

## Canada and the Czech Republic

Beyond the comparison of two OECD countries with and without tuition fees there are several key similarities and differences between Canada and the Czech Republic. When focusing on higher education, examining the age range of 25–34-year-olds, both nations' educational attainment levels are higher than the OECD average for individuals with education higher than education level 2 (below upper secondary) (OECD, 2020b). Moreover, 39% of the 25–34-year-old age range in Canada have completed a bachelor's, master's, or doctoral degree and 33% of this age range in the Czech Republic have completed a bachelor's, master's, or doctoral degree which are both below the OECD average of 40% (OECD, 2020b). In other words, both nations on average have higher secondary school attainment levels than the OECD average but lower university education (levels 6,7 and 8) attainment than the OECD average.

Notably, most individuals with tertiary education in Canada in the 25–34-year-old age range have a bachelor's degree where the majority of the 25–34-year-old individuals with tertiary education in the Czech Republic have a master's degree (OECD, 2020b). Furthermore, over 20% of individuals with tertiary education in Canada in the 25–34-year-old age range have completed short-cycle tertiary education where less than 1% of their Czech counterparts have this level of educational attainment (OECD, 2020b). There is direct comparability in the education attainment levels of the two countries.

Tertiary education appears to be more advantageous in the Czech Republic than in Canada. In the Czech Republic the average increase in relative earnings by obtaining tertiary education is 58% (OECD, 2020b). In Canada the average increase in relative earnings by obtaining tertiary education is 39% in Canada (OECD, 2020b). Although the financial returns of higher education seem to differ between the nations, the attainment levels are similar.

## Educational Costs

Equal opportunity in education can be achieved if certain barriers are removed. One of the largest barriers to entry is monetary and without external support the poorer students may be unable to afford higher education. Results of a study conducted on British data indicate that family financial constraints influence students' choice of university (Callender & Jackson, 2008). In many OECD nations tuition is not constant; in other words, tuition may differ between universities and across study fields (OECD, 2010). Intuitively, this means that universities of a perceived higher standard with sought after programs may cost more than their less prestigious counterparts. Therefore,

people from more modest backgrounds may not have the possibility or may be more hesitant to spend large amounts of money on tertiary education or other educational resources.

Student performance during compulsory school also influences a student's decision to attend post-secondary education (Frenette, 2007). Examining students at 15 years of age and then the same students at 19 years of age, it was found that students from lower income families had lower standardized test scores and were less likely to go to university; supporting the argument that the socioeconomic backgrounds of students have influences very early on in their academics (Frenette, 2007). Using logistic regression on data from the United States, it was shown that the socioeconomic background of the students and their grade school results influence their entry to university (Savas, 2016). Specifically, students with lower grade school results and with a lower socioeconomic status were less likely to enter university (Savas, 2016).

Conversely, other work has shown that the financial constraints of a family do not have a strong influence on the ability of the student to afford university; however, it does limit their access to academic support earlier in life (Frenette, 2007). This academic support comes in the form of museum trips, additional books, and even the ability to move to a neighbourhood with better schools (Frenette, 2007). Before needing to overcome the possible burden of tuition costs it appears that many students are already at a disadvantage due to their socioeconomic backgrounds. These findings suggest that the presence of tuition is not the primary driving factor in limited access for certain individuals to higher education.

Costs associated with attending university include housing and general living expenses, transportation, books, and tuition in some countries. The average tuition cost in Canada for undergraduate students in the 2015-2016 academic year was 7,049 Canadian Dollars (CAD; Statistics Canada, 2020). Whereas, the average cost of tuition in the United States for the 2014–2015 academic year was 7,792 American Dollars (USD) for public universities and 24,928 USD for private universities (United States Government, 2020). Unassisted, these tuition fees represent an additional cost to higher education that does not exist in countries that do not charge tuition. Increases in tuition led to a decline in enrollment at the university level in the United States (Hemelt & Marcotte, 2008). More specifically, regression models were estimated quantifying that an increase of tuition by 100 USD forces a decline in enrollment of around 0.25% (Hemelt & Marcotte, 2008). It was also observed that the impact of tuition increase was more noticeable on the attendance of top research universities and less noticeable on the liberal arts and comprehensive universities; the tuition increases forced students to rely more on financial aid (Hemelt & Marcotte, 2008). In Canada, the effects of tuition were examined between Québec and Ontario due to a tuition freeze put in place in 2007 in Québec. (Bastien et al., 2014). With a 1,000 CAD increase in tuition, there is little to no decrease in overall enrollment (Bastien et al., 2014). Further manipulation of the model yielded that an increase in tuition of 1,000 CAD causes a decrease of 19% in enrollment of students whose parents had no postsecondary education and a 7% decrease for students with parental postsecondary education/training but no university education (without tertiary education; Bastien et al., 2014). Moreover, the enrollment increased by 10% for children of parents with tertiary education thus making the argument that both tuition and parental education influence the decision to study at university (Bastien et al., 2014). As a consequence, the poorest families are the hardest hit.

There are countries within the OECD that do not charge tuition at their public universities; some of these countries include: The Czech Republic, Denmark, Finland, and Sweden (OECD, 2010). In 2007, seven out of sixteen German states introduced tuition fees (Achelpöhler et al., 2007). This was used as an opportunity to examine the effects of the implementation tuition fees

and enrollment rates using the assumption that students prefer to attend university in the state in which they graduated secondary school (Hübner, 2012). As one might expect, the introduction of tuition fees in these German states led to a reduced probability of student enrollment for the states charging tuition (Hübner, 2012). This law has since been removed and Germany is a tuition-free nation for students at the bachelor's level (Veselinovic, 2014). Other research indicates that tuition does not play a significant role in a student's decision to enroll. Time series data from the Netherlands was used to show this to be the case, as the students viewed the cost as an important investment in human capital (Canton & De Jong, 2005). Moreover, the existence of financial aid for students in the Netherlands has a positive relationship with enrollment rates and may negate any adverse effects of tuition on enrollment (Canton & De Jong, 2005). The cost of tuition is just one of the costs facing students when they choose to attend university.

This work adds to the narrative surrounding tuition by comparing one country that charges tuition for public education with one that does not. Given the mixed results surrounding the impacts of tuition, developing a better understanding of this phenomenon is required.

### Gender

Gender is another aspect that influences students' tertiary education attendance. Female students are more likely to attend tertiary education than their male counterparts (OECD, 2010). This indicates that gender is an important factor for the decision of students to attend university in OECD countries. In contrast, this was not always the case; in 1947 undergraduate men outnumbered women 2.3 to 1 in the United States (Goldin et al., 2006). By the 1980s parity had been reached and by the early 2000s the enrollment ratio was 1.3 female students for every 1 male student (Goldin et al., 2006). The increase in labour force participation by females throughout recent history has paved the way for a higher share of females in higher education than males (Goldin et al., 2006). Furthermore, female students outperform their male counterparts on average during their secondary school studies, based on United States data; allowing female students to have an easier time with university as a whole (Goldin et al., 2006). Accordingly, females are almost twice as likely to go to university than males in the United States (Savas, 2016). Although gender is not a key focus of this work, it is important to understand as many influential factors regarding the entry into higher education as possible.

## Objective

This work set out to examine the existence of social selectivity in higher education in the Czech Republic and Canada. Using the newer data, a more up-to-date picture of the social selectivity in Canada will be drawn. Further intentions focused on identifying new influential variables not discussed in previous literature, examining the presence of tuition and making new comparisons between two countries with different educational systems. The existence of social selectivity in higher education has been shown in previous literature. What remains in question is the strength of the effects of certain socioeconomic variables such as parental education and parental income. Initially, the expectation that entry to university is partially driven by the socioeconomic background of students will be tested. If found significant, the magnitudes of these influences will be compared across the two nations. As a result of the literature mentioned above the following hypothesis will be evaluated: *Entry into university is influenced by students' socioeconomic backgrounds*. Furthermore, if social selectivity appears to be more present in Canada than the

Czech Republic the argument for reducing or eliminating tuition as a method of increasing accessibility to higher education can be made.

## Data

The two datasets examined come from the Czech Republic and Canada. The Czech data comes from the *European Union—Statistics on Income and Living Conditions* survey (EU-SILC). The Canadian data comes from the 2011 *Survey of Labour and Income Dynamics* (SLID) public use microdata file. The EU-SILC data is collected yearly as a joint effort between Eurostat and the National Statistical Institutes of the European Union, European Free Trade Association, and candidate countries (Mack, 2016). The main objective of the EU-SILC is to provide data for people at risk of poverty or social exclusion, income distribution and monetary poverty, living conditions and material deprivation (Eurostat, 2013b). The Canadian SLID is an annual voluntary survey covering the population of the 10 Canadian provinces with the exception of Native reservations, residents of institutions, and military barracks (Statistics Canada, 2011). The SLID was designed to be, first and foremost, a longitudinal survey, with primary focus on labour and income and the relationships between them and family composition (Statistics Canada, 2011). Then, the decision was made to extend the objectives of SLID to be the primary source of cross-sectional household income data (Statistics Canada, 2011).

### EU-SILC

EU-SILC survey data collected during the years 2009 to 2015 from the Czech Republic were compiled into one larger dataset. The data collected over this time period were reduced to only households containing a student in secondary school or university. This reduced dataset now included as many as four observations for each household as the EU-SILC survey is a panel survey where each respondent is interviewed for four consecutive years (Eurostat, 2013b). This was corrected by including only the most recent observations where the student still remained in the household; in other words, repeated households were removed keeping only one observation for that particular household. Without removing all but one of the repeated households, the regression results could have become biased due to the non-independence of the sample. This data reduction rendered 3748 usable observations with 1778 households containing at least one student only in secondary school and 1970 households containing at least one student in university.

### Canadian SLID

The sample size of this dataset is split into four categories: person file, economic family, census family, and key files (Statistics Canada, 2011). The data used in this analysis focused primarily on the economic family with some variables from the person file which will be explained in detail further on. This economic family file contained 25109 observations (Statistics Canada, 2011). Furthermore, the Canadian data is also weighted to reflect the structure of the survey population (Statistics Canada, 2011). Further deconstruction of this data was conducted to only include households with students in secondary school or university in the same way as the Czech EU-SILC data as this research is only focused on access to higher education.

The SLID 2011 data is from one year and includes the 10 Canadian provinces and excludes the

population that lives in the territories (Statistics Canada, 2011). This data is a public use microdata file and includes less detail and fewer observations than the complete original dataset (Statistics Canada, 2011). The educational status of each respondent was used to identify households with individuals who studied during the reference year. This educational variable was used to create an indicator variable containing two options: Households with students only in secondary school and households with at least one student in university. As mentioned earlier, one should note that all Native reservations, residents of institutions, military barracks, and Canadian territories are not included, resulting in estimates that only reflect the survey population. This data does contain many socioeconomic variables such as income levels and educational attainment levels as laid out in the objective of the survey.

## Methods

### Ordered Statistics

Non-parametric Mann-Whitney U Tests based on ordered statistics were conducted on the EU-SILC data and the SILD data to test for differences in distributions of explanatory variables. In this case, differences between households containing only secondary/high school students were compared to households with at least one university student. The Mann-Whitney U test sometimes called the Mann-Whitney-Wilcoxon test is used to test the rank homogeneity between two independent ordered samples (Bagdonavičius et al., 2013). This test was chosen instead of a t-test because the Mann-Whitney U Test does not assume normality of the compared distributions (Fay & Proschan, 2010). The application of this test compares the mean values of the ordered samples. In other words, the means of the ranked samples (mean rank; Fay & Proschan, 2010). A chi-squared test may be employed in place of this test, but the Mann-Whitney U Test was chosen under the assumption that at least some of the distributions are not the same to begin with. This version of the test was conducted due to its flexibility, the shape of the two distributions need not be the same, while still allowing for conclusions to be drawn about the sample means (Van den Berg, 2018).

### Regression

Binary logistic regression was used to model the odds of households containing only secondary school students compared to households with at least one university student given a set of explanatory variables from the EU-SILC and the SLID datasets. Logistic regression is defined by the use of the Bernoulli response distribution and the logit link function (De Jong & Heller, 2008). Logistic regression ensures that the estimates for the probabilities are on the interval (0,1) where the estimates may be outside of this interval with linear regression (De Jong & Heller, 2008). This regression predicts which of two categories a person is more likely to belong to given certain other information (Field, 2009). Given the binary nature of the dependent variable, logistic regression was deemed to be an appropriate method for modelling this data. These models were estimated using the maximum likelihood method within the context of generalized linear models.

## Analysis and Results

Binary logistic regression and Mann-Whitney U tests were conducted on the Czech EU-SILC and

Canadian SLID datasets. The two household groups were separated with the assumption that only some of the students in secondary school will go on to enter university. In other words, the households with students in high school represent the whole population and the households with university students represent a subpopulation. Identifying significant variables and their effects on the likelihoods of households having a university student was the primary goal of this analysis.

**EU-SILC Variables**

The dependent variable for the analysis conducted on the Czech EU-SILC data was a binary variable that indicated if the household contained only students in secondary school or if the household contained at least one student in university. Explanatory variables used in this analysis were included to determine factors that influence the likelihood that a household contains at least one university student.

1. The household income was examined by creating a variable "income per capita" expressed in hundreds of thousands of Czech koruna (CZK). All households without reported income and with only one person were removed from the analysis, as in this case the one person would be the student and considered economically inactive. One hundred-thousand CZK represents the approximate difference between the lower and upper quartiles.
2. The material deprivation is outlined as the number of items the household can't afford from the following list of nine items: to pay their rent, mortgage, or utility bills; to keep their home adequately warm; to face unexpected expenses; to eat meat or proteins regularly; to go on holiday; to own a television set, a washing machine, a car, or a telephone (Eurostat, 2013a).
3. The education level of the head of the household, either having no university education or being university educated was included. This variable was derived from a larger set of responses including various levels of education.
4. Another included variable contained two categories: Employed and unemployed. This variable determined the economic status of the head of the household with all pensioners removed from the analysis as they are again economically inactive.

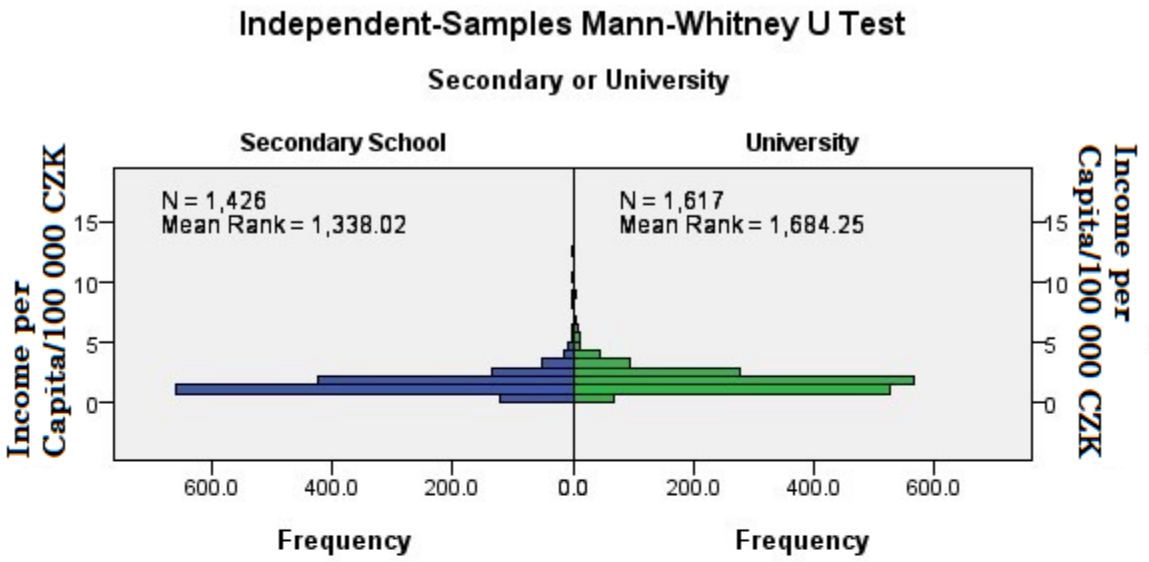
**EU-SILC Mann-Whitney U Tests**

Due to the non-normality of the data, Mann-Whitney U tests with $\alpha = .05$ significance were conducted on some of the explanatory variables to verify differences in the means of the ranked values; the null hypothesis of this analysis is that the mean of the ranks are the same.

The first of the Mann-Whitney U tests were conducted on the income per capita of the households. The distributions of the income per capita separated between secondary school and university households are found in Figure 1. In both cases, the distribution is positively skewed and appears to be leptokurtic. When comparing the two sample distributions it seems as if the university households shown in green, have more observations in the higher income sections. Visually, it also seems that households with only secondary school students are more concentrated at the income level just over zero. The results of Mann-Whitney U test in Figure 1 yield that significantly, the null hypothesis is rejected in favour of the alternative that there is a difference in ranked means.

Figure 1

*EU-SILC Income per Capita*

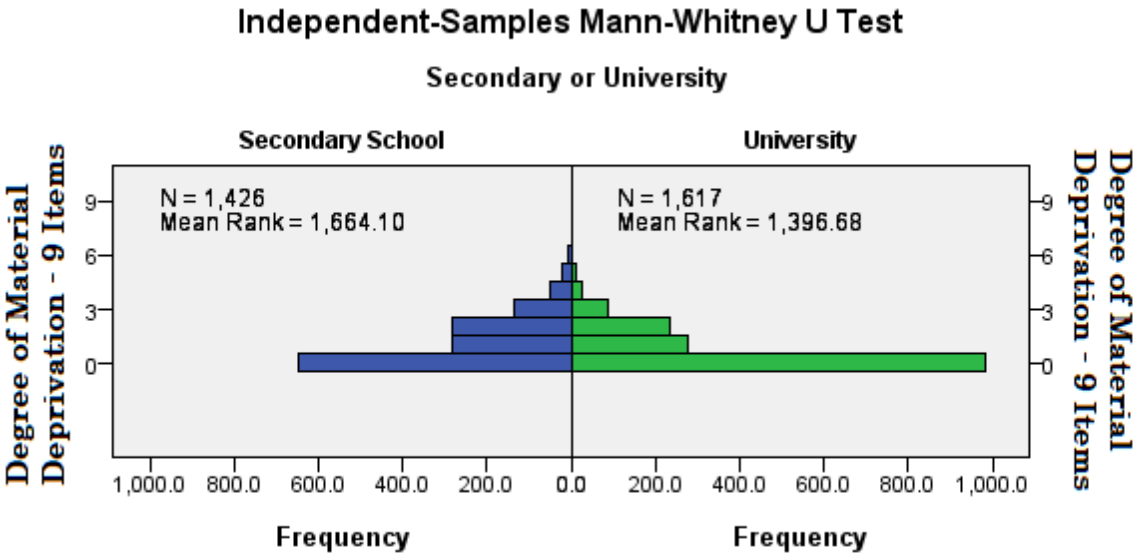



| | |
|---|---|
| **Total N** | 3,043 |
| **Mann-Whitney U** | 1,415,278.500 |
| **Wilcoxon W** | 2,723,431.500 |
| **Test Statistic** | 1,415,278.500 |
| **Standard Error** | 24,185.021 |
| **Standardized Test Statistic** | 10.848 |
| **Asymptotic Sig. (2-sided test)** | .000 |

The differences in material deprivation were next compared across the two groups. Examination of the sample distributions found in Figure 2 seem to indicate that secondary school households have a higher level of material deprivation than university households. Both distributions are heavy-tailed with many households able to afford all of the items on the list although it appears that many more university households than secondary school households are without deprivation. The results of the Mann-Whitney U test are found in Figure 2; the null hypothesis is rejected in this test.

Figure 2

*EU-SILC Degree of Material Deprivation*




| | |
|---|---|
| **Total N** | 3,043 |
| **Mann-Whitney U** | 950,279.500 |
| **Wilcoxon W** | 2,258,432.500 |
| **Test Statistic** | 950,279.500 |
| **Standard Error** | 22,101.020 |
| **Standardized Test Statistic** | -9.169 |
| **Asymptotic Sig. (2-sided test)** | .000 |

**EU-SILC Logistic Regression**

The matrix of the Pearson correlations of the included variables can be found Table 1. This was examined to prevent the possibility of collinearity within the model estimations.

The results of the binary logistic regression estimation including: variables, parameter estimates, significances, and confidence intervals are shown in Table 2. Prior to the construction of the model outlined in Table 2, smaller regression models were estimated to understand and

Table 1

*EU-SILC Pearson Correlations of Explanatory Variables*

| | | Head of Household Education | Income per Capita/100 000 CZK | Head of Household Work Status | Degree of Material Deprivation —9 items |
|---|---|---|---|---|---|
| Head of Household Education | Pearson Correlation | 1 | 0.264** | -0.061** | -0.199** |
| | Sig. (2-tailed) | | 0.000 | 0.001 | 0.000 |
| | N | 3043 | 3043 | 3043 | 3043 |
| Income per Capita/100 000 CZK | Pearson Correlation | 0.264** | 1 | -0.138** | -0.338** |
| | Sig. (2-tailed) | 0.000 | | 0.000 | 0.000 |
| | N | 3043 | 3043 | 3043 | 3043 |
| Head of Household Work Status | Pearson Correlation | -0.061** | -0.138** | 1 | 0.204** |
| | Sig. (2-tailed) | 0.001 | 0.000 | | 0.000 |
| | N | 3043 | 3043 | 3043 | 3043 |
| Degree of Material Deprivation— 9 items | Pearson Correlation | -0.199** | -0.338** | 0.204** | 1 |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | |
| | N | 3043 | 3043 | 3043 | 3043 |

** Correlation is significant at the 0.01 level (2-tailed)

Table 2

*Czech Binary Logistic Regression*

| | Secondary or University | |
|---|---|---|
| | Odds Ratio: | 95% Confidence Interval: |
| Income per capita | 1.270*** | (1.156, 1.395) |
| Material Deprivation | 0.838*** | (0.784, 0.895) |
| Head of Family Education | 1.771*** | (1.463, 2.143) |
| Head of Family Work Activity | 0.647 | (0.579, 1.404) |
| Constant | 0.498** | |

*Note*. *p-value <0.1; **p-value <0.05; ***p-value <0.01

validate possible inclusions of variables in the final model, the results of these estimates will not be discussed further. As shown in Table 2, not all of the variables are significant in this estimated model. The explanatory variable describing the employment status of the head of the household was not significant in the model. Significantly, with an increase of one hundred-thousand CZK in income per person a household is 1.270 times more likely to have a student in university compared to just a secondary school student. Furthermore, with an increase in one item of material deprivation, the odds of the household having a university student decreases with odds of 0.838. Households with a university educated head were estimated to be 1.771 times more likely to have a student in university than just in secondary school. In the context of the overall model the socioeconomic backgrounds of Czech students do influence their entry to university.

## SLID Variables

Dependent variable "high school or university" was the indicator variable separating households containing only students in high school and households with at least one student in university. The motivation for this analysis is exactly the same as for the Czech EU-SILC with the only difference being the term *high school* instead of *secondary school*. By the ISCED classification secondary school and high school are considered to be the same level (Eurostat, 2016). Using similar methodology to the analysis of the Czech data; explanatory variables used in this analysis were included to determine factors that influence the likelihood that a household contains at least one university student.

1. The variable "income per capita" was expressed as thirty-thousand CAD. This thirty thousand CAD represents the approximate difference between the lower and upper quartiles of the income per capita of the Canadian households. All households with zero reported income and one person were removed from the analysis. Any household with one person in this analysis would be the student and therefore economically inactive. Households with zero reported income were also removed due to the high probability of this being misreported.
2. The material deprivation is outlined as the number of items the household can't afford from the following list of ten items: to eat fresh fruit and vegetables every day; able to get dental care if needed; eat meat, fish, or a vegetarian equivalent at least every other day; able to replace or repair damaged appliances such as a vacuum or a toaster; have appropriate clothes for job interviews or other special occasions; able to get around your community, either by having a car or by taking the bus or an equivalent mode of transport; able to have friends or family over for a meal at least once a month; dwelling free of pests and insects such as mice, bedbugs, or cockroaches; able to buy some small gifts for family or friends at least once a year; or have a hobby or leisure activity (Statistics Canada, 2011).
3. The educational background of the other members of the household was included in the analysis in the form of a variable indicating if a member of the household that wasn't identified as the student in the analysis had completed tertiary education. In other words, whether or not the student is living with someone who has completed tertiary education.
4. The province of residence was included in the set of explanatory variables.
5. A variable indicating if someone in the household had received social assistance within the reference year was also examined for potential influence on students.

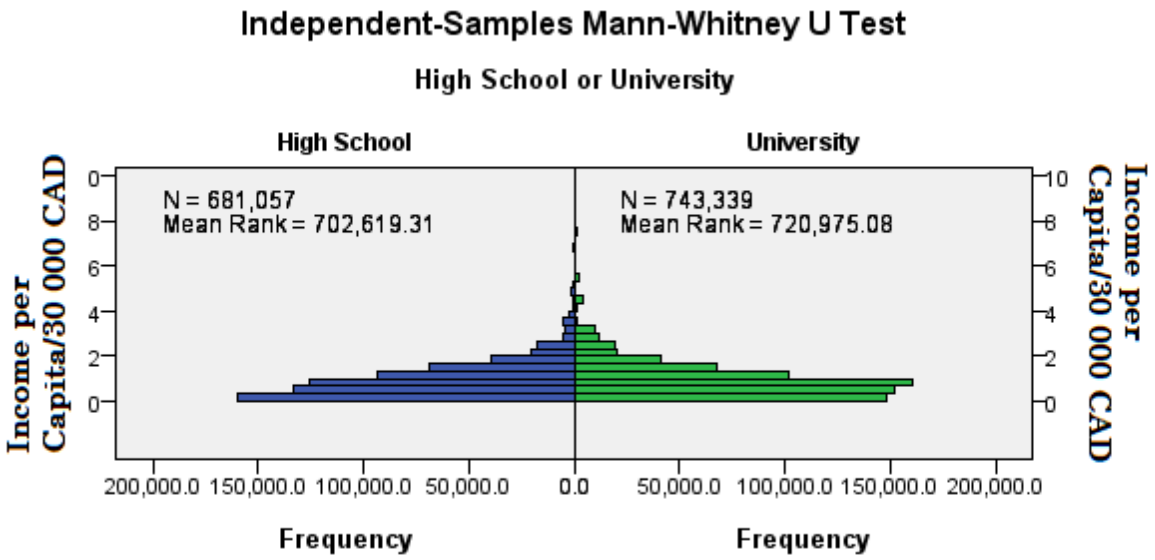
## SLID Mann-Whitney U Tests

Mann-Whitney U tests with $\alpha = 0.05$ significance were conducted on some of the explanatory variables of the Canadian SLID dataset to verify differences in the means of the ranked values. The null hypothesis of this test is that the mean of their ranks is the same.

The distributions of income per capita were compared between households with only high school students and households with at least one university student. Figure 3 shows the distributions between the two groups and the results of the Mann-Whitney U test conducted. The null hypothesis of the Mann-Whitney U test, that is that the ranked means are the same, is rejected

Figure 3

*SLID Income per Capita*



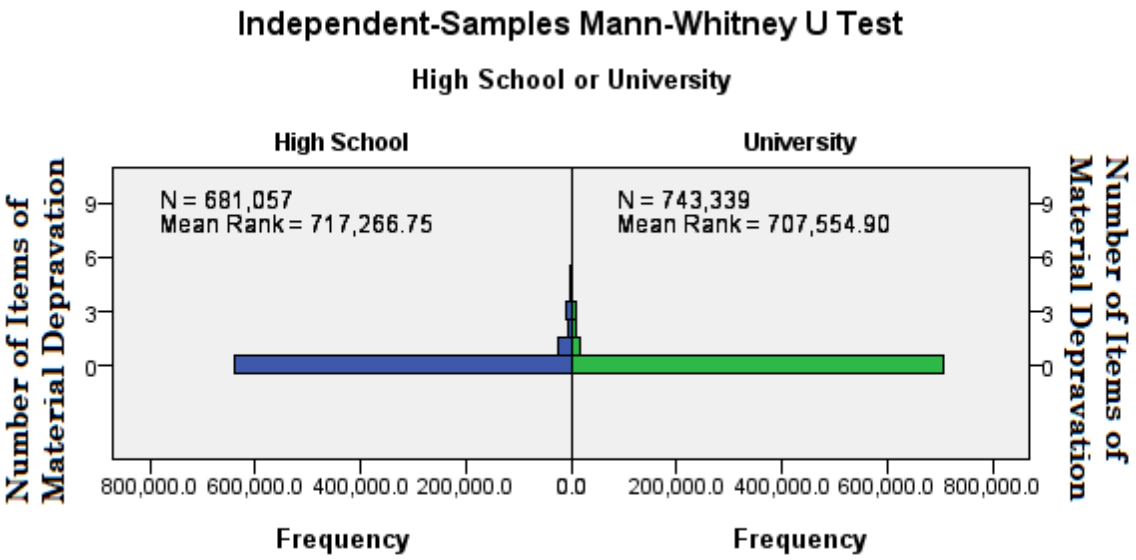

| | |
|---|---|
| **Total N** | 1,424,396 |
| **Mann-Whitney U** | 259,652,086,915.000 |
| **Wilcoxon W** | 535,928,893,045.000 |
| **Test Statistic** | 259,652,086,915.000 |
| **Standard Error** | 245,136,854.787 |
| **Standardized Test Statistic** | 26.614 |
| **Asymptotic Sig. (2-sided test)** | .000 |

when comparing these two distributions. With the mean income per capita for households with only a high school student at 28,512 and 29,775 for households with a university student.

The distributions of the material deprivation between the two groups can be seen in Figure 4. In both cases most of the households are without any kind of material deprivation. It appears, however, that households with only high school students have a slightly higher level of material deprivation than households with at least one university student. This observation is validated based on the results of the Mann-Whitney U test also found in Figure 4; the null hypothesis is rejected in favour of the alternative hypothesis, that is the ranked means are significantly different.

Figure 4

*SLID Degree of Material Deprivation*




| | |
|---|---|
| **Total N** | 1,424,396 |
| **Mann-Whitney U** | 249,676,345,107.500 |
| **Wilcoxon W** | 525,953,151,237.500 |
| **Test Statistic** | 249,676,345,107.500 |
| **Standard Error** | 97,633,231.863 |
| **Standardized Test Statistic** | -35.354 |
| **Asymptotic Sig. (2-sided test)** | .000 |

## SLID Logistic Regression

Binary logistic regression models were constructed to examine the significance and effects of included Canadian variables. Regression models were constructed with one or two explanatory variables to evaluate their potential for inclusion in a larger complex overall model and will not be mentioned further. The matrix of the Pearson correlations of the included variables can be found in Table 3. This was examined to prevent the possibility of collinearity within the model estimations.

Table 3

*SLID Pearson Correlations of Explanatory Variables*

| | | Income per Capita/30 000 CAD | Number of Items, Material Depravation | Tertiary Education of Household Member | Province of Residence | Family Member Received Social Assistance |
|---|---|---|---|---|---|---|
| Income per Capita/30 000 CAD | Pearson Correlation | 1 | -0.124** | 0.264** | 0.083** | 0.172** |
| | Sig. (2-tailed) | | 0.000 | 0 | 0.000 | 0.000 |
| | N | 1424398 | 1424398 | 1424398 | 1424398 | 1424398 |
| Number of Items, Material Depravation | Pearson Correlation | -0.124** | 1 | -0.072** | -0.029** | -0.168** |
| | Sig. (2-tailed) | 0.000 | | 0.000 | 0.000 | 0.000 |
| | N | 1424398 | 1424398 | 1424398 | 1424398 | 1424398 |
| Tertiary Education of Household Member | Pearson Correlation | 0.264** | -0.072** | 1 | 0.067** | 0.086** |
| | Sig. (2-tailed) | 0 | 0.000 | | 0.000 | 0.000 |
| | N | 1424398 | 1424398 | 1424398 | 1424398 | 1424398 |
| Province of Residence | Pearson Correlation | 0.083** | -0.029** | 0.067** | 1 | 0.003** |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | | 0.000 |
| | N | 1424398 | 1424398 | 1424398 | 1424398 | 1424398 |
| Family Member Received Social Assistance | Pearson Correlation | 0.172** | -0.168** | 0.086** | 0.003** | 1 |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.000 | |
| | N | 1424398 | 1424398 | 1424398 | 1424398 | 1424398 |

** Correlation is significant at the 0.01 level (2-tailed)

Table 4

*Canadian Binary Logistic Regression*

| | High School or University | |
|---|---|---|
| | Odds Ratio: | 95% Confidence Interval: |
| Income per capita | 1.026*** | (1.021, 1.031) |
| Material Deprivation | 0.916*** | (0.909, 0.922) |
| Tertiary Education of Household Member | 1.040*** | (1.033, 1.048) |
| Province of Residence | 1.001*** | (1.001, 1.001) |
| Family Member Social Assistance | 0.908*** | (0.895, 0.921) |
| Constant | 1.211*** | |

*Note*. * p-value <0.1; **p-value <0.05; ***p-value <0.01

All previously significant explanatory variables were encompassed in the overall model. Table 4 contains parameter estimates, significance levels, and confidence intervals of the estimates. The set of all explanatory variables were significant at the $\alpha = 0.05$ level. With an increase in thirty thousand CAD per capita the odds of a household having a university student are increased by 1.026. Moreover, the odds of a household having a university student decrease with increasing

material deprivation and if someone in the household had received social assistance with odds of 0.916 and 0.908 respectively. Households containing a member who has already completed tertiary education are more likely to contain a student studying in university. The province of residence is significant however uninformative. The construction of this model suggests that socioeconomic factors also influence Canadian students' entry into university.

## Discussion

As a form of human capital, higher education attainment has a positive influence on earning potential in the labour market (OECD, 2010). With this in mind, it would be imperative to identify what influences such decisions to be made. Parental income and parental education influence the entrance into university (Belley et al., 2011; Chevalier et al., 2013; Frenette, 2007). There have been mixed results regarding the influence of tuition on university attendance (Bastien et al., 2014; Canton & De Jong, 2005; Hemelt & Marcotte, 2008).

Within both sets of data, conclusions are drawn that the socioeconomic statuses of the households do influence entry into university in both countries.

### The Czech Republic

When examining the results from the EU-SILC data, the income per capita, material deprivation, and the education level of the head of the family are all significant in influencing the entry to university. These findings validate the results obtained in other research (Belley et al., 2011; Chevalier et al., 2013; Frenette, 2007; Savas, 2016). The results show that households within this sample with higher socioeconomic statuses are more likely to contain a university student. As there is a relationship between educational attainment and earning potential found by Finnie and Frenette (2003) in the labour market, one could argue that the explanatory variables used in this analysis should be highly correlated and redundant. This is not the case, as shown in Table 1. Social selectivity is present in the Czech Republic and households with lower socioeconomic means are the most at risk for exclusion from university.

### Canada

The results from the Canadian SLID dataset also seem to weakly further validate other results (Belley et al., 2011; Chevalier et al., 2013; Frenette, 2007; Savas, 2016). The income per capita, material deprivation, tertiary education of a household member, and if a member of the household received social assistance are all statistically significant in influencing entry into university. These results, in all cases, indicate that households with higher socioeconomic statuses are more likely to contain a student in university in Canada. Like the Czech explanatory variables, a correlation matrix was constructed to examine the Pearson correlations. As can be seen from Table 3, although the correlations are significant, they are weak, warranting the inclusion of all the explanatory variables in the model. The estimated odds ratios from this model are quite small, notably when looking at income per capita. The estimated odds ratio of 1.026, although significant, indicates that the income does not have a large influence on the entry to university. One could argue that these estimates are only significant due to the large number of observations in the data (Lin et al., 2013).

## Comparing Results

The most comparable variables of the two sets of explanatory variables are the income per capita and the material deprivation of the household. The material deprivation lists contain different elements but both serve to quantify household deprivation levels. Both of these significant variables indicate that households that have higher income are more likely to have a university student. When making a direct comparison of the estimated odds ratios, it shows the magnitude of the changes is a lot higher in the Czech Republic than in Canada, suggesting that the entry into university in Canada is much less restricted than in the Czech Republic. Figure 5 and Figure 6 show the differences in income per capita per person between households with only secondary/high school students and households with at least one university student for the Czech Republic and for Canada.

Figure 5 shows an obvious discrepancy in the income per capita between the two groups. Extreme observations have been removed from Figure 5 to focus on the main portion of the sample. This visualization of the data reinforces the regression parameter estimates of the income per capita variable. When comparing Figure 5 and Figure 6, it is quite noticeable that the differences between secondary and university for the income per capita variable are quite a bit larger for the Czech households than the boxplots for the Canadian data.

Figure 6 shows that the Canadian income per capita between high school and university households are very similar. This is reflected in the estimated odds ratio of 1.026; stating that an

Figure 5

*EU-SILC Income per Capita Boxplots*

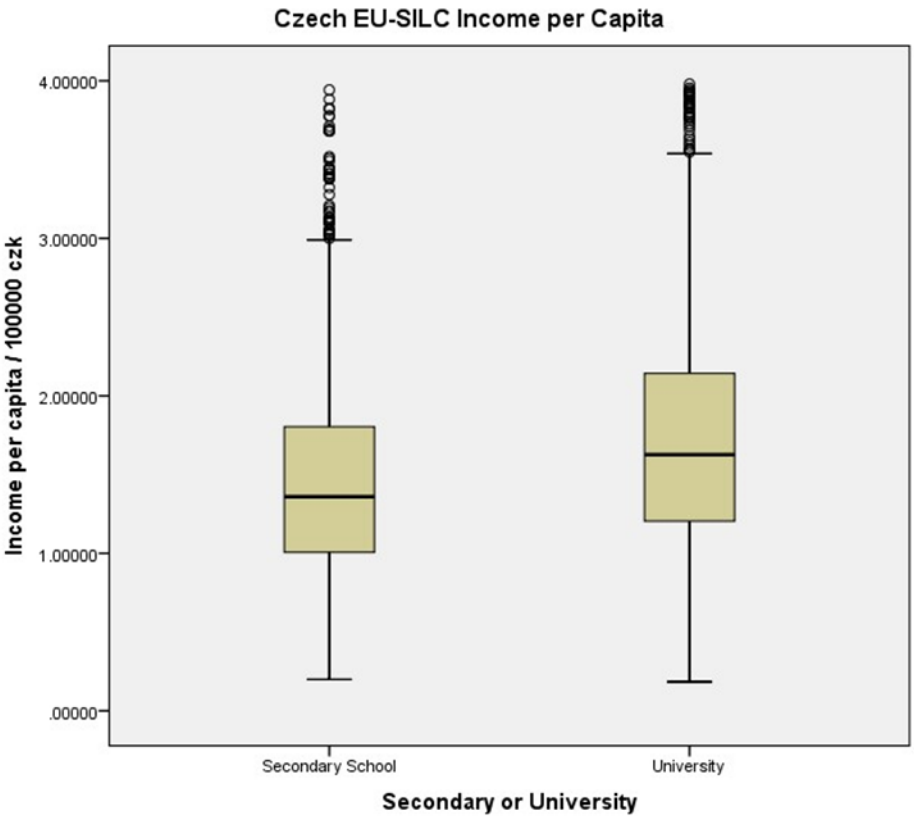
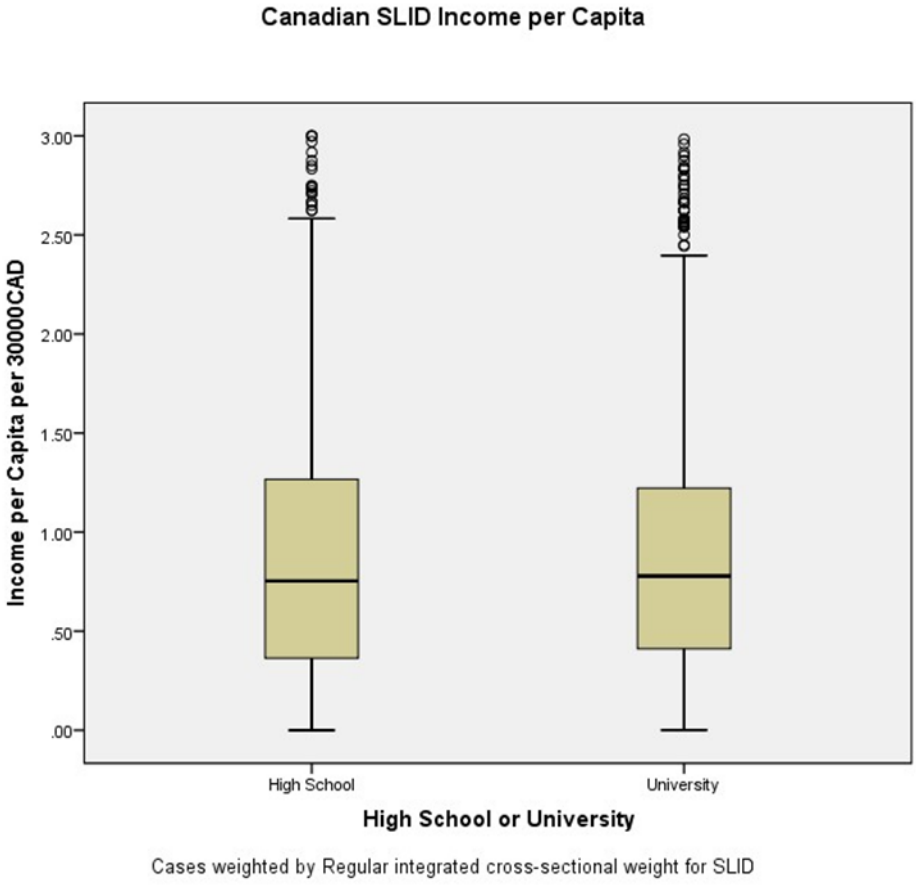


Figure 6

*SLID Income per Capita Boxplots*




increase of thirty thousand CAD per person in the household only slightly increases the odds of the household having a university student. Outliers were removed from Figure 6 to focus on the main part of the survey population.

When examining all of the parameter estimates from the models, the existence of social selectivity appears to be more present in the Czech Republic with regards to entry to university. The odds estimates are larger in the Czech model than in the Canadian model for all of the explanatory variables. As Canada charges tuition for public education, one would expect social selectivity would be more present than in the Czech Republic (Bastien et al., 2014; Hemelt & Marcotte, 2008; Hübner, 2012). Contrary to expectation, it seems that, although social selectivity appears to exist in Canada, the magnitude of the selectivity is much larger in the Czech Republic.

## Financial Aid

The existence of financial aid policies allows for students from lower socioeconomic backgrounds to enter university (Canton & De Jong, 2005). Based on this analysis, the financial aid policies are more successful in reducing social selectivity in Canada. All students may apply for student grants

and loans funded by their province of residence and the federal government (Government of Canada, 2020) On the contrary, in the Czech Republic the only financial aid is only aimed at the poorest part of population and in 2017 only supported 0.7% of all students at university level (MŠMT, 2020). Also, this support is very limited, as it only covers around 43% of the average expenditure of a typical Czech student (Fischer et al., 2016). In the 2013–2014 academic year the Canadian federal government spent 5.1 billion CAD on "Human Capital Formation" including scholarships, grants, and financial aid to post-secondary students (PBO, 2016). Matěj et al. (2003) argued that a slow growth of educational opportunities in the post communist Czech Republic has contributed to the higher apparent presence of social selectivity. The public system in the Czech Republic isn't able to support all students in need (Fischer et al., 2016). A possible solution for this could be private loans issued by banks, similar to the ones issued by major banks in Canada. In 2020, only three of the fifty banks operating in the Czech Republic offer students loans and the maximum loan amount of three hundred-thousand CZK which covers about three years of the student's living and study costs for those studying at the bachelor level (Fischer et al., 2016; Student Finance, 2016). The socioeconomic background of the students in both nations has a significant, albeit differing, influence on their entry to university. It appears that even without tuition, there are not enough resources available to Czech students to help them overcome lower socioeconomic backgrounds.

Making a direct comparison between the two nations' investments in education a clear source of disparity emerges. In 2019 the estimated gross domestic product in purchasing power parity (GDP in PPP) per capita in Canada was 49031.4 USD and 40314.2 USD in the Czech Republic (The World Bank, 2020). Total expenditure on educational institutions as percentage of GDP (in 2017) was 5.9% in Canada and only 3.6% in the Czech Republic (OECD, 2020b). Focusing on tertiary education only, the percentage of GDP expenditure in Canada was 2.3% and 0.9% in the Czech Republic (OECD, 2020b). There is also a difference in Total expenditure on educational institutions per full-time equivalent student on tertiary level of education. In 2019 in Canada expenditure in PPP was 24,671 USD and it was less than half that in the Czech Republic at 11,484 USD (OECD, 2020c). Even without charging tuition, the Czech Republic is apparently not providing sufficient support to help students from lower socioeconomic backgrounds enter tertiary education.

## Conclusions

An extensive amount of literature exists in examining influences on students' decisions regarding their studies. This literature has identified that family background, specifically the socioeconomic background, influences students' higher education decisions. Developments in this area were made due to this analysis conducted on data from the Czech Republic and Canada. This work provides important insight into the influences of social backgrounds on education in the Czech Republic. Furthermore, the comparison of these two nations provides unique information about the similarities and differences in these influences between countries with and without tuition.

The hypothesis that the entry to university is significantly influenced by the socioeconomic background of the students in the Czech Republic was strongly supported. The significance of key variables in the Canadian model suggests that social selectivity may still exist to a smaller degree. This social selectivity hinders the possible enrollment of many students from lower socioeconomic classes. This phenomenon of social exclusion seems to be more prevalent in the Czech Republic than in Canada. The overall magnitude of the odds ratio estimates for the Canadian data are far

smaller than the Czech estimates. Based on these findings, a hypothesis that the social selectivity in a tuition-free nation is less than that of a nation charging tuition for public university cannot be supported. Moreover, these results may be linked to the structure of the financial aid in place in Canada or the lack of opportunities to enter higher education in post-communist era Czech Republic (Matěj et al., 2003).

The idea of higher education being equally accessible to all who have the skill set and motivation to study is very important to this work. Education is a means for individuals to improve their own standard of living which is inherently critical for those who find themselves at the bottom of the socioeconomic ladder. Understanding the influences of students' backgrounds is an important step in developing competent methods of ensuring open access to higher education for all members of society. Social selectivity is prevalent in the entry to higher education in the Czech Republic and Canada.

This work is limited by the inability to show the direction in which the social selectivity appears to be going. In other words; this analysis would benefit from the inclusion of older data to see if improvements are being made. Results from other work suggest that things have become more egalitarian recently with regards to entry into higher education in Canada. Furthermore, no information about the specific labour market's educational demands and cultural educational demands of each country at the time of data collection is included in the analysis. This could provide some valuable additional context to why people are making their study decisions. The surveys analyzed were not directly designed for this research, and therefore could be missing additional explanatory variables of interest. As tuition fees are not constant across nations, it is necessary to consider the magnitude of these costs, and how much government funding is provided to education when applying these results to other nations. For example, public university tuition in the United States appears to be comparable to Canadian tuition rates however, private universities in the United States charge much higher tuition as outlined by the United States Government (2020) and this may impact the social selectivity problem more.

Further analysis into the post-treatment effects of social inclusion policies and projects could also be a direction in which to develop this research. As mentioned above, steps are being taken to create more social equality in higher education in both nations. Moreover, the identification of successful and unsuccessful attempts to develop this equality could be used to create more efficient ways of achieving this goal. With this in mind, more in-depth analysis of the influences of tuition seems to be in order.

Based on the comparison of the Czech Republic and Canada, tuition does not appear to be a large issue for Canadians from lower social classes. It appears that the financial aid policies in Canada are doing a better job than those in the Czech Republic. This may lead other nations to examine and adopt some of the successful elements of the Canadian system helping to solve this problem in many places.

This analysis does not provide enough empirical evidence to confirm or reject the influence of tuition outright. Another way to develop this work would be to include more countries or a wider time span. This would allow for further understanding of the effects of these socioeconomic variables in a broader context. Continued monitoring of the social selectivity and equality promotion projects in higher education is important in order to provide fair opportunities for people to improve their own socioeconomic status.

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## Notes

1 This analysis is based on the Czech Statistical Office Survey on Income and Living Conditions Survey (EU-SILC) (2009-2015). All computations, use and interpretation of these data are entirely that of the authors of this work.

2 This analysis is based on the Statistics Canada Public-Use Microdata File: Survey of Labour and Income Dynamics (SLID) (2011). All computations, use and interpretation of these data are entirely that of the authors of this work.

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