The Impact of the 2011 Education Act on the Economic Growth of Hungary

By

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Abstract

This paper aims to research the relationship between the Hungarian economy and the education act implemented in Hungary in 2011. Specifically, this paper analyzes the relationship between Hungary's economic growth and one of the key elements of this policy, the adjustment of the upper limit of compulsory schooling from 18 to 16. In order to give a full-scale perspective, I studied the institutional background of the policy, in addition with the already existing research on the broad topic of economic growth and education. I further developed and adapted a methodology using difference-in-differences regression analysis as empirical strategy to answer the question of how the 2011 education act impacted the share of secondary school students on a municipality level and how did the same act affect economic growth, on a municipality level. Based on the study, I set up my conclusion and policy recommendation which suggest that the education act does have an impact on the economy, and it should be considered to re-establish the upper limit of compulsory schooling to 18 years of age.

Key words: growth, education, Roma

Declaration

I hereby declare that this thesis is the result of original research; it contains no material accepted for any other degree in any other institution and no material previously written accepted and/or published by another person, except where an appropriate acknowledgment is made in the form of bibliographical reference.

Signed: _____

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Acknowledgement

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Chapter 1

Introduction

In this paper I am going to research the relationship between school-leaving age (reduced by the 2011 education act) and economic growth of Hungarian municipalities. Further I am going to analyze if this relationship is different for municipalities with higher share of Roma population. The reason why it is important to investigate this relationship, is to provide a better understanding on the impact of the 2011 education act of Hungary.

In 2011, the Hungarian government amended the Hungarian Public Education Act. The aim of the Hungarian Public Education Act (as well as the amendment) was to create a public education system that promotes qualities enhancing the development of the individual as well as the society and the economy. However, it is not clear if this amendment successfully achieved these goals.

One of the key aspects changed in this policy was to reduce the upper age limit of compulsory schooling from 18 to 16. Based on this aspect, my main assumptions are that the share of secondary school students decreased, and it had an indirect effect on the growth of the Hungarian economy. In order to prove my points, I developed the following research questions: How did the average share of students studying in secondary education change before and after 2011 in every settlement and in settlements with high share of Roma population? And how did the average economic growth change before and after 2011 in every settlement and in settlements with high share of Roma population?

My hypotheses behind these questions, (although I acknowledge that the relationship can be negative or positive) firstly is that:

1. The average share of students studying in secondary education decreased in every settlement, and it decreased significantly more in settlements where the share of Roma population is high after the introduction of the 2011 Education Act.

2. The average economic growth decreased everywhere, and it decreased more in settlements with high Roma share after the introduction of the 2011 Education Act.

The reason why I additionally investigate the outcome variables in municipalities with high share of Roma population is because I assume that the 2011 policy had a more serious impact on the Hungarian Roma population than on the non-Roma Hungarian population. This perspective of my thesis aims to fill a gap in the literature, as research on the relationship between the 2011 education act, economic growth and Roma have not been done yet.

Having the intention to research my topic with an empirical approach, I studied similar empirical studies that analyzed the relationship between education and economic growth. In this thesis, I focus on Solow's (1957) production function, Romer's and Lucas's (1986, 1988) endogenous model, and Barro's (2001) study on the importance of the relationship between human capital and economic growth, as well as lot of others who added, or in some cases re-invented models and theories in relation to the field of growth and education.

Additionally, I studied methods used in these studies, and I came to a conclusion that each study has its own specificities. Keeping this in mind, in order to test my hypotheses, I developed two models examining the relationship between education and growth in Hungary. I choose difference-in-differences regression analysis as empirical strategy. My results are summarized and presented in two regression tables, which serves as evidence to my findings. My key finding points out that the share of secondary school students is decreasing after introducing the 2011 education act and it is decreasing even more in settlements with high Roma population (at a 5% threshold for high Roma population i.e., the Roma binary variable used to identify settlements with high Roma share, if the share of the Roma population was above 5% in 2011) after 2011. Furthermore, economic growth is decreasing from before 2011 to after 2011 in settlements with low Roma population and is decreasing even more in settlements with high Roma population (at a 5% threshold for high Roma population), however this relationship is

statistically is not significant. I also examined this relationship with a 1% threshold for high Roma population, but my result was mostly non-significant and non-representative.

Based on my results, I summarized the conclusions and offered a policy recommendation. But before that, in the next section I present the current knowledge on the topic.

Chapter 2

Institutional Background The 2011 Education Act in Hungary

In 2011, the Hungarian government amended the Hungarian Public Education Act (2011 Hungarian Public Education Act, 1. §(1)), which was originally introduced in 1993. Generally, the aim of the Hungarian Public Education Act is "*to create a public education system that promotes the harmonious spiritual, physical, intellectual development of children and young people, through the conscious development of their skills, abilities, knowledge, emotional and volitional qualities, and their education in accordance with their age characteristics, with a special goal to prevent social isolation and nurture talent with the tools of education"* (2011 Hungarian Public Education Act, 1.§(1)). Although, all the elements of the policy must have a considerable impact on the Hungarian education system and indirectly on the economy of Hungary, the main scope of this paper is discussing the effect of intervention on the compulsory education which reduced the upper age limit of compulsory schooling from 18 to 16.

The new law changed several details of the Hungarian education system including compulsory education.[1] First, it reduced the compulsory age of children starting kindergarten from 5 to 3 years old. Second, it reduced the upper age limit of compulsory education of children from 18 to 16. According to the new rules, compulsory schooling lasts until the end of the school year, in which a given student reaches the age of 16, which can be extended for those with special needs until the age of 23 (2011 Hungarian Public Education Act, 45. § (3)). It is important to note that for those students who started the 9th grade in the academic year 2011/12 or before, compulsory education remains unchanged until the end of that school year in which these students turn 18 (2011 Hungarian Public Education Act, 97. § (1)).

[1] The new public education act introduced other elements, such as the teacher career model, teacher's performance assessment, compulsory courses on religion and ethics, as well as the Klebersberg Kunó Institutional Maintenance Center (or KLIKK by the Hungarian acronym, which is a centralized directory delegating wages, schoolbooks and tools and other disciplinary measures for all state financed primary and secondary schools, with a few exception) (Torgyik and Nagy (2004), p. 79.) – these are outside the scope of this thesis, and are not discussed in detail.

As for the aim of the change in the compulsory schooling age, according to Nagy (2014) the legislator justified this change by saying that it was not necessary to keep those young people in school who would rather drop out from compulsory education, and it would be beneficial for those who would rather study since they would not be disturbed by the ones wanting to leave school. Moreover, those who left school at the age of 16 can rejoin the formal education system later through a program for adults called Bridge (a program aiming to reduce the number of those without professional qualification between the ages 18-24 (Torgyik and Nagy (2014), p 80.). This statement raised the voice of many, stating that it would just push out those from the educations system who are already in a vulnerable position (Erdélyi, 2016). This gave me the motivation to research more on the topic, on which research I elaborate in the next chapters.

Chapter 3

Literature review

In what follows, I summarize the main results of Solow and Swan (1956), Romer and Lucas (1986, 1988), regarding the relationship between education and economic growth. The reason why I start with these studies is because they had established the core theories of this field, thereby it is covered in almost every study that I have come across so far.

The first core theories belong to Solow and Swan (1956) that is why I start with their neo-classical (exogenous) growth model followed by Lucas' and Romer's endogenous growth framework. In 1956, Robert Solow and Trevor Swan introduced the idea to describe the growth of national income with three main factors: (i) the stock of physical capital that consisted of machines and buildings or any tools that were used to produce goods or service, (ii) the size of labor force, and (iii) a residual component for all other aspects of economy, mainly capturing the technical progress, of which increasing levels of education were one of the key contributors. Their assumption was that the increase in human capital (or any other specific factor of production) will produce a proportional increase in output only if these factors are combined. They also assumed constant returns to scale, perfect competition, and complete information about the market without externalities (Dimand, Spencer 2020).

The Solow-Swan model of the aggregate production function is : $Y= f (Kt, At Lt, t)$, in which Y denotes the Gross Domestic Product (GDP), K denotes the aggregate capital stock, L denotes the size of the labor force, time is denoted by t and labor-augmented technology (or knowledge) is denoted by A. Solow and Swan assume that both labor and technology levels exogenously grow, at a rate of g (Acemoglu (2009)). In sum, the theory posits that the accumulation of capital, appearing as savings or consumption, contributes to economic growth and that the connection between labor force and capital determines the output of the economy. It is also indirectly influenced through labor, meaning that technology (or knowledge) assumed to augment labor productivity and increases output (Sredojević, Bošković, Cvetanović 2014).

Additionally, in the Solow-Swan framework, it is considered that the impact of a small change in the stock of a factor of production (such as a change in production per worker) is equal to its share in the national income; for instance, a 1 percentage point increase in capital causes a third of a percentage point increase in output because the share of capital of national income is approximately the same. The share of labor of growth is the other 2/3, which is why human capital is so important. If the number of workers increases (and the total number of years spent with education is not changed) its effect on growth would be smaller than a proportionally equal growth in the stock of physical capital. However, if there is an equal proportional increase in the stock of human capital (years of education per person), then the effect on growth would double. (Dickens, Sawhill, Tebbs, 2006 p.3.).

Besides the exogenous growth model of Solow and Swan, the endogenous-growth model also gained popularity among economists. Lucas and Romer (1987) created a model in which the importance of human capital in growth is larger. The endogenous model (which was initially developed by Romer, Lucas later further developed it) has increasing returns to scale which increases all factors of production proportionally, resulting in bigger proportional increase in economic growth (Romer, 1986). Romer and Lucas (1986, 1988) assumes that technological change is the result of individuals who are responsive to economic incentives; thus, if an economic factor affects these individuals' efforts, it can potentially have a positive or negative effect on the long-term prospects of the economy. Based on this assumption, the 2011 Education act could have initiated a technological change resulting in a positive or negative long-term impact on Hungary's economic growth.

Furthermore, one of the key theoretical developments in Romer's and Lucas's development was the re-discovery of the "AK" growth model (Solow's production model). The model considers an exogenous productivity parameter, A, and an exogenous, constant investment rate, K. Then, the main equation of the model is $Yt = AKt$ and $Kt = sYt - \delta Kt$, (where A: exogenous

and constant productivity parameter; s: exogenous and constant investment rate; K:physical capital, in Romer 's understanding(1986) K:knowledge; for Lucas (1988) K:human capital) (Jones, 2019).When these elements are considered together the following equation becomes the result: $gY \equiv Yt/Yt = sA - \delta$ (Jones, 2019). The growth rate of the economy is determined by the fundamental parameters of the economic environment. In this example, a permanent increase in the investment rate will permanently increase the growth rate of the economy (Jones, 2019). Departing from the assumption of constant returns to scale, endogenous growth theories (like Romer's and Lucas's) suggest that human capital that is incorporated as an input in the production function, explicitly models individual educational investment choices allowing human capital to have additional effects on the growth rate (Sianesi, Van Reenen, 2003).

Moving on, these theoretical frameworks brought into existence a sequence of empirical research. Some of them involved the former neo-classical model or its extended version, some others used the endogenous model. For instance, Sianesi and Van Reenen (2003) starts with a theoretical framework explaining those educational externalities which require a macro-level modelling perspective (Sianesi, Van Reenen, 2003). One of these externalities is focusing on the benefits of human capital accumulation. The researchers claim that the benefits of human capital accumulation might impact others besides individuals per se (Sianesi, Van Reenen, 2003). These externalities can be observed, for example in a way that a skilled worker can contribute to technical progress or knowledge accumulation, arising from investments in human capital, in their work environment. Besides, external social impacts are also important to note, Sianesi and Van Reenen (2003) state that investments in human capital have an indirect impact on the economy. For that matter, they point out that a higher educated population has been associated with more advanced public health and parenting, a cleaner and well-maintained environment, low crime rates, better social relations, and healthier political and community

participation, which all adds to a country's economic growth. However, they also clarify that proving these mechanisms is complicated (Sianesi, Van Reenen, 2003).

Another major representative of the field worth mentioning in detail is Barro. He wrote an essential study on the topic, especially investigating the effect of government policies on economic growth, which makes it very relevant in my research as my research also analyzes a government policy. Barro (2001) was focusing on the long-term economic growth of a country, based on the difference between prosperity and poverty levels depending on the country's growth rate (Barro, 2001). His paper investigates the importance of human capital in determining economic growth, where human capital refers to all the things that a person can bring to a business or organization (education, health, social aspects, and business acumen) (Barro, 2001).

Specifically, Barro (2001) uses a framework that mixes the neo-classical model with extensions that emphasize relevance of government policies and institutions and the accumulation of human capital. He found that there are huge differences in growth outcome based the amount of education a person has versus the quality of that education (Barro, 2001). According to the study, the endogenous-growth models are used to understand why advanced economies can continue to grow in the long run despite the workings of diminishing returns in the accumulation of physical and human capital. At the same time, the neo-classical framework can be used to understand relative growth rates across countries (Barro, 2001).

Barro (2001) employed an extended neoclassical growth model framework [Dy=F (y, y*)], in which Dy is the growth rate per capita output and inversely related to its level of development for a given value of y*, y is the level of development, and y* is the long run (target level) of per capita output. According to this model, if a government policy is effective, it will initially cause an increase in the growth rate and then eventually lead to an increase in the level of output. If technological progress continues to rise at a rate consistent with the long-run rate of

technological progress, then the growth rate will eventually return to its original value (Barro, 2001). In the study, he looked at reports from 100 countries during the 1960s-2000 period and found that growth rates varied depending on how government policies were implemented. The study also found that other factors such as economic conditions and social unrest influenced growth rates. The countries presented were at different levels of economic development (Barro, 2001).

Barro (2001) looked at average growth rates and average ratios of investment to GDP over 3 decades from 1965-1995 in 5-year periods, using regression analysis to estimate the growth of a certain population. The regression system includes an education variable which is shown to have significant explanatory power for economic growth (Barro, 2001). The study uncovered a design of conditional convergence meaning that the development rate of per capita GDP is contrarily related to the original level of per capita GDP, holding fixed measures of government approaches and institutions, initial stocks of human capital, and the type of national population (Barro, 2001).

In addition, he found development to be positively related to the level of average years of schooling of males at the secondary and higher education levels, since laborers with this educational level would be complementary with modern technology, playing a vital part in the distribution of technology within the improvement process. He found that economic growth is not significantly related to primary level male schooling, but since it may be a requirement for secondary education, it would probably affect economic growth (Barro, 2001).

Furthermore, Barro (2001) also implemented measures on the quality of schooling. The data on internationally comparable examinations in science mathematics and reading were used. He concluded that Science has a very strong positive correlation with economic growth. He argued that the identification of economic growth was at a higher convergence rate in richer nations. He also observed greater impacts from international openness and term of trade changes in

countries with less wealth and negative effects from government consumption again in poor countries (Barro, 2001).

These perspectives and result were very important in establishing my hypotheses and in implementing my model. Barro (2001) posits growth development differently for rich and poor countries and claims that secondary schooling has an impact on growth in relatively poor countries, but not in rich countries. This made me put Hungary within the scope of Barro's study. Hungary is a country on the peripheries and the 2011 Education Act modified the rules of secondary schooling. It is a relatively poor compared to Western countries however, it is relatively richer than others. Also, there is a huge difference in development within the country, (which again proves that this study could serve as a crucial example for modeling my research questions), rural areas especially on the East are very much underdeveloped compared to the capital city for example. In sum, I considered this study to be strong influence on my research strategy.

Education has been found an important contributor to growth by others, too. Dickens, Sawhill and Tebb (2006) summarized the impact of investments in early childhood education. They aimed to answer the question; why would it be necessary to have a highly educated labor force and how would this highly educated labor force contribute to economic growth? (Dickens, Sawhill, Tebbs, 2006). The argued that a relatively more educated individual is more flexible and able to adapt to new situations, furthermore individuals with better or more years of education can master skills and new work exercises easily compared to their not that much educated peers (Dickens, Sawhill, Tebbs, 2006). The assumption also suggests that such individuals can use a wider varied of technologies in a more sophisticated manner so they will need less management which results in creative work and better productivity. This can further create a chain of benefits for a firm; for example, a company with such workers is more

adaptable to changes enhanced by competition and by demand which can infuse a spillover effect improving the whole economy (Dickens, Sawhill, Tebbs, 2006).

In their paper, Dickens, Sawhill, Tebbs (2006) constructs a model analyzing educational policies through which growth effects can be computed. As an example, the researchers brought under review a preschool program that considers majority of the population with an amended six months of education and ran a policy stimulation test. They reached to the following results: their model estimated additional growth in GDP in 2080 of more than USD 2 trillion 2005 which concludes an approximate 3.5 % growth (Dickens, Sawhill, Tebbs, 2006). They have also conducted the cost of the program and other early childhood program expenditures of the government and they estimated that revenues will be in a positive balance approximately in 2050 and paying off itself more than 2x by 2080. Nonetheless, they conclude that these are promising results, still the benefits are on the long-term, while the cost of the program is the opposite (short-term expenditure) which could discourage investing in this form of human capital (Dickens, Sawhill, Tebbs, 2006).

There are other studies that focused on important details overlooked in the previous studies. For example, Jorgenson and Strioh (2000) found that education contributed 13% more in output per worker and 8.7% more to overall growth between 1959 and 1998. Uzawa (1965) also claimed in his theory that education increases labor productivity. In Uzawa's perspective, a country with twice as much human capital as workers might generate the same quantity of goods with just half as many people. A one percent increase in the stock of human capital per worker in Uzawa's model results in a percentage point rise in the effective supply of labor, which has an impact on production equivalent to the labor share of income (Uzawa, 1965).

Continuing with another pioneer of the topic, Papageorgious (2011) wrote a paper on the traditional cross-country growth accounting approach (exogenous model) which was suggested for change in this research. The study continues the work of Benhabib and Spiegel (1994) by

empirically examining different structural hypotheses in which human capital contributes to economic growth in two ways: first, by producing goods and services; second, by promoting technological innovation and imitation. The paper's most significant novelty is its use of alternative structural specifications to pinpoint how primary and post-primary education affects economic growth (Papageorgious, 2011). Before discussing Papageorgious (2011), I first summarize the approach by Benhabib and Spiegel (1994), who analyzed how human capital and the level of education within the labor force impact an economy's output and expansion.

Again, not surprisingly Benhabib and Spiegel (1994) initial focus happened to be on the exogenous and endogenous theories with some additional adjustments reviewing other variables such as income inequality, factor accumulation and political stability. Benhabib and Spiegel (1994), mainly used the growth accounting model (which is same as the neo-classical or exogenous model) and a further developed Cobb-Douglas function. The findings from their initial set of regressions are relatively underwhelming: Human capital accumulation fails to play a substantial role in determining economic growth when one runs the specification predicted by a typical Cobb-Douglas production function that includes it as a factor, and even plays a role with a negative point estimate (Benhabib and Spiegel 1994).

They got better results when they incorporated a model in which human capital affects the rise in total factor productivity. In this paradigm, there were two ways that human capital influenced growth. First, as demonstrated by Romer (1986), the level of human capital has a direct impact on the rate of domestic technical innovation. Second, according to Nelson and Phelps, there is another factor influencing the rate of adoption of foreign technology, which is the human capital stock (Nelson, Phelps 1966). The importance of this new model in terms of its empirical ramifications is that it now takes into account the level of human capital stocks rather than their growth rates in determining the growth of per capita income (Benhabib and Spiegel 1994). Treating human capital in this way, it implies that human capital should be included in growth

rates in growth accounting regressions. However, this argument is not supported by the empirical data provided in their research. BS included two additional ways that human capital might contribute to economic growth: both as a magnet for recruiting physical capital and as an indicator of the size of a nation's Solow residual (Benhabib and Spiegel 1994). The empirical proof from the combined cross-country data supports these notions to some extent (Benhabib, Spiegel, 1994).

According to the main regression estimates of Papageorgioius (2011), the relative contributions of human capital to the uptake of technology and the production of financial commodities may differ by country. Primary education makes a significant contribution to output production, but its contribution to R&D is modest, especially in poor nations. In contrast, post-primary education which presented opposite effects (Papageorgious, 2011). Regression coefficient estimates support the hypothesis for the idea that human capital plays two roles in economic progress. When human capital is incorporated into the creation of finished goods as well as technology, the resulting specifications outperform their equivalents in the literature (Papageorgious, 2011). The most crucial conclusion is that post-primary education mostly contributes to the acceptance and innovation of technology, whereas basic education primarily contributes to the production of final output (Papageorgious, 2011).

Many other researchers have analyzed the causal relationship between growth and education, with mostly based on cross-national, longitudinal data of growth and education. Since these studies comparing the data of different countries, defining the key variables happened to be complicated as different form of education and economic systems resulted in different outcomes.

An exception to the previous studies is by Marques-Ramos and Mourelle (2018) who have established a model which investigates the relationship between economic growth and education, first at a country level, additionally at a regional level. Another fact that makes this

paper very interesting and relevant for my project is that meanwhile the previously discussed papers assume a linear relationship, Marques-Ramos and Mourelle considers a non-linear empirical analysis as well. They measure economic growth with GDP in this paper as well, whereas education is measured by enrollment rations at a tertiary and secondary level. In addition, they define a variable of labor force with secondary and tertiary levels of education, and they also included other proxies for physical capital and a public government expenditures on education (Marques-Ramos, Mourelle, 2019).

According to their regression estimates, there is a positive relationship between education and growth. Additionally, Marques-Ramos, Mourelle's, (2019) non-linear measures revealed that secondary education (when used as an independent variable) showed a somewhat different effect regarding the significance of secondary education compared to tertiary education. In the non-linear model, secondary education at a regional level shows a relatively greater growth (Marques-Ramos, Mourelle, 2019) which in some ways promising for my research as well. In my study I also aim to examine a country level data with regional fixed effect variables and the impact of a policy intervention affecting mainly secondary education.

But before I would turn to the details of my data there are a set of conclusions made based on the already existing literature. The empirical literature of most of the existing studies uses a variety of education measures. The majority of proxies relate to indicators of formal education, such as literacy rates, enrolment rates, and years of education. These might have brought significant result, however there are minor flaws in most of the approaches which limits the validity of these research.

Benos and Zotou (2014) suggest that instead of measuring the effects of education by proxying the quantity of education, researchers would get a more accurate result (when researching the contribution of education to economic growth) if measurements would rather focus on the quality of education (Benos, Zotou, 2014). Additionally, they also suggest that depending on

the study, several output metrics, such as real GDP, GDP per worker, GDP per worker age group, or GDP per capita, are used to create economic growth variables. It seems to be not just the most common but the most reasonable ways of measuring growth (Benos, Zotou, 2014).

In sum, most of the existing literature suggests that there is a wide interest in researching the topic on economic growth in relation to education, or more precisely if it worth to invest in education in order to achieve a higher rate of outputs. The short answer is yes, however the road to this answer is way more complicated. Setting up a universal research method that applies to every country, and every educational system or policy intervention is probably impossible. Even, just finding same variable to use in an adaptation of a model is hardly ever manageable, which makes is extremely hard to replicated one good research model.

Although I also faced these obstacles when constructing my model, my research tried to draw from its predecessors. It needed to be adjusted and adapted to certain conditions specific to Hungary and the research method applied. To provide a better perspective, besides reviewing the core literature I also looked at research in scope of the 2011 Education Act in Hungary that is discussed in the next section.

Chapter 4

The effects of the 2011 Education Act in Hungary so far

As I mentioned before, this part of the paper summarizes the already existing studies on the impact of the 2011 Education Act in Hungary. Although, the reform did create a great echo among social science scholars, it did not generate a considerable interest on empirical research.

On the one hand, experts immediately started to form an opinion which suggest that reducing compulsory schooling from 18 to 16, negatively impact mostly unprivileged students. These students often come from lower-middle income families which also quite often means Roma students included in this category as well, (this assumption is not scientifically supported). For instance, Hermann (2018) analyzed the impact of reducing the compulsory schooling on drop-out rates, analyzing a four-year cohort from 2010-2013. Specifically, he examined how the ration of those students who drop out of public education have changed and how did the proportion of students without secondary education changed in the previously mentioned school cohorts (Hermann, 2018). Herman (2018) concluded that the data suggest that the compulsory school age reduction increased the proportion of drop out young people, especially in the 16-18 age group. However, this does not seem to be accompanied by a significant decrease in the proportion of those who obtained a secondary education. Following the reform, it turns out that school dropouts under 18 would leave public education even before the introduction of the reform before reaching the age limit of 18. This suggests that the higher compulsory schooling age alone is not sufficient to reduce early school leaving (Hermann, 2018).

Velkey and Fekete (2020) studied the effect of the new education system on how the changes of the past decade have affected young people living in backward rural areas. Their investigations have clearly demonstrated that the danger of the issue of low-educated individuals, living in backward rural territories away from the labor market has only been resolved to a minimal extent by the introduction of the 2011 education act. Permanent

unemployment and temporary public employment are still maintaining addictions and lack of perspective that destroy individuals, families, and communities. Velkey's analysis shows that, as a result of the changes of recent years, Hungary has developed a very strongly differentiated network of primary school institutions hiding serious inequalities. He further argues that for the vast majority of young people who start from a disadvantaged family situation, the level of secondary school education that is available based on their academic results remains at the vocational school level (Velkey, Fekete 2020).

Besides the studies of domestic actor, in 2015 the OECD prepared an Education Policy Outlook with the aim to analyze the and compare education policies throughout OECD countries (Peterka et.al, 2015, OECD). The analysis focuses on 6 policy levers when providing a constructive examination of education policies. From a student relevant perspective, the key points under investigation are: 1) if the policy promotes equity and quality and 2) if the policy augments preparedness for the future. Institution-wise it analyses if the policy enhances quality through 3) school improvement and 4) evaluation and assessment, while on a systematic level the question is if the system is managed in a way to improve the education system through 5) governance and 6) funding (Peterka et.al, 2015, OECD).

Through the examination of the Hungarian education system in 2015 (that implies the 2011 Education Act has been already in effect), Peterka et al. (2015) pointed out on several key issues considering the previously mention factors. The country lags behind in developing basic skills of student, and also failed to diminish the effect of socioeconomic background on education achievements especially among those from disadvantaged backgrounds. It also goes together with the lack of quality and inclusive education. In addition, the Hungarian education system faces challenges preparing student for the needs of the labor market. There is a shortage of teacher, especially in certain regions and subjects, so the policy analysis advises policymakers to make attract younger teaching workforce with adequate pedagogical practices.

The report also advises to reform the public funding for education and to achieve a balance in decision-making at different levels of governance (Peterka et.al, 2015, OECD).

In sum, the above-described studies are investigating the impact of the 2011 Education act from a more sociological point of view. There seem to be a gap in literature on empirical studies studying the relationship between the 2011 Education Act and the economic growth of Hungary, that is why my rationale is to study and analyze this relationship. In the next section, the practical elements of investigating this relationship are presented in the form of an empirical research model.

Chapter 5

Methodology

5.1. Research method

Following the literature review, it became clear that the neo-classical production function serves as a starting point for studies conducting empirical research on economic growth and education. Similarly, my research tried to obtain a model in which setting the available data could fit in. After considering the specificities of the data I worked with, essentially the model that I developed had to have its own specificities as well.

Nonetheless, before going into the detail of the research model, it is important to clarify the hypotheses of this research. The focus of the statements of the thesis are: 1) Hypothesis: The average share of students studying in secondary education decreased in every settlement, and it decreased significantly more in settlements where the share of Roma population is high after the introduction of the 2011 education act; 2) Hypothesis: The average economic growth decreased everywhere, and it decreased more in settlements with high Roma share after the introduction of the 2011 education act.

In order to answer my research question and to test my hypotheses, I needed a time-series panel data on Hungarian settlements before and after 2011, to assess the relationship between economic growth, education and ethnicity. My chosen method is difference-in-differences (diff-in-diffs) regression analysis. In a difference-in-differences regression model, it is crucial that I observe my variables before and after an intervention such as the 2011 education policy, which in this case allows us to analyze the growth rate of the Hungarian economy before and after 2011. In my empirical strategy, I compare the average change in the outcome variable from the pre- to the post-intervention period, between municipalities that are presumably more affected (such as municipalities with high Roma share) and municipalities which are presumably less affected (such as municipalities with low Roma share) (Bekes, Kezdi, 2021, p. 625).

In this specific research I use diff-in-diffs analysis to compare first, the average change of the share of students in secondary education, and then the economic growth in percentages in municipalities with high Roma share and in municipalities with low Roma share. I observe the outcome variables for same units before and after the intervention both in municipalities with high Roma share and in municipalities with low Roma share.

To ensure the validity of my diff-in-diffs strategy it is a must to include the Parallel (or Common) Trends Assumption. The Parallel Trends Assumption implies that in the absence of intervention, outcomes would have been constant over time, in the treatment and in the control groups (Angrist, Pischke, 2008 p. 173). In my study it would mean that in the case of no education act, the share of students in secondary school and economic growth would have changed the same way in the municipalities with low and high Roma share. If the Common Trends Assumption is true, the difference-in-differences strategy gives proper estimate of average treatment effect on the treated (ATET) (Bekes, Kezdi, 2021, p.624).

In this case the Parallel Trends Assumption would posit that without the 2011 Education Act the average share of secondary schoolers would change the same way after 2011 as it changed before the 2011 period in municipalities with a high share of Roma population as in municipalities with a low share of the Roma population. It would also mean that without the 2011 education act the average log growth would change the same way after 2011 as it changed before 2011 in municipalities with a high share of Roma population.

The model is given by a difference-in-differences empirical strategy with the following 2 regression models:

1. MODEL: sh-secondary_*jt* = a0 + a1*post2011_*t* + a2*sh-Roma-high_*j* + a3*(post2011_*t* * sh-Roma-high_*j*) + a4*C_*jt* + u_*jt*;
2. MODEL: ln_growth_jt = b0 + b1*post2011_*t* + b2*sh-Roma-high_*j* + b3*(post2011_*t* * sh-Roma-high_*j*) + b4*C_*jt* + e_*jt*;

In both of the models the unit of observation is a municipality in a given year. Furthermore, j indexes municipality and t indexes time, and the coefficients a3 and b3 on the interaction variables measure to what extent the relationship between the education act and the outcome variables differ for municipalities with high Roma share and for municipalities with low Roma share: sh-secondary_jt denotes the share of individuals in the secondary education in a given municipality j in a given year t; post2011_t denotes a binary/dummy variable, which is 1 for years after 2011 and 0 before; sh-Roma-high_j denotes a binary/dummy variable, which is 1 for municipalities with a high Roma share and 0 otherwise (this was constructed with a threshold above 5 and also with 1%); C_jt is a vector of control variables, such as, for instance, average income in the municipality, average level of education, average level of job-seekers, and county (denoted mkod2018 in the dataset)/ municipality type (denoted teltip8 in the dataset) fixed effect. I also included the time variable (ev) as to control for trends in the share of students attending all kinds of secondary education. Additionally, in the regressions I have excluded those observations of share of students in secondary education where the share of students was above 100 % in other to avoid distortions.

I use a panel dataset for municipalities across years, of which sources I describe next.

5.2. Description of data

The data that I used to implement my models are secondary data sources for years 1999-2021 (the database that I use is from 1990 but in the model, I included values from 1999). I was granted access, as a thesis writer of the MTA KRTK (Hungarian Academy of Science - Economic and Regional Science Research Center), to the Territorial Statistical Database System (T-STAR) data, administered by the Institute of Economics of the Hungarian Academy of Sciences (KRTK-MTA), and being the property of the Hungarian Central Statistical Office (KSH).

T-STAR is a longitudinal dataset for the 3164 Hungarian settlements, for years 1990-2021. It is the richest source of information for Hungarian municipalities containing all the data collected or received by the KSH every year since 1990. A part of the data from the 1990 and 2001 censuses were processed at the settlement level, as well as the so-called territorial number system of the National Statistical Office, were integrated into T-STAR. The database includes every single settlement that has existed in Hungary's administrative system for even just one day since January 1, 1990. As a result, the vast majority of fields do not continuously contain data and there is a lack of data in the records of settlements that do not exist independently in a given year.

Although there is some missing information in the database, it contains plenty of variables, each of them a dataset itself such as data on demography, unemployment, education, municipal budget, healthcare, business organizations, data on administration of justice, industry, trade transport and communication, public administration etc.

To answer my research question, it was additionally necessary to find a variable on the share of various ethnicities, as well as other education control variables. Since the T-star did not include data on the Roma population in Hungary, I use the 2011 census that contains the number of individuals that identify themselves as Roma, as well as people with different levels of education.

5.3. Measurement of key variables

5.3.1. Generating economic growth variable

To construct the economic growth variable, I use the tax data in T-STAR that includes a variable of gross added value. Specifically, I first adjust the variable by inflation, for which the consumer price index (CPI) information, for years 1999-2021 stems from (source: https://www.ksh.hu/stadat_files/ara/hu/ara0036.html). Second, I divided the gross added value (GAV) variable with the deflator for each year and multiplied by 100, to adjust it with inflation.

In the regression models I define ln_growth_jt as ln(GAVdefl_jt/lag_GAVdefl_jt). The reason why I did this is because the current level of my growth variable is heavily determined by its past level and in this case, not including the lagged version of the variable could lead to omitted variable bias and results that might come out to be unreliable. Besides, the histogram of lagged growth variable showed a normal distribution like bell curve which made it even more evident to use this version in my measurements.

5.3.2. Education variable

In Hungary, secondary education can happen in several forms. These includes vocational schools where one can study a certain profession like hairdressing, cook, mechanic etc., however, does not receive a high school diploma at the end of the studies. Another type is a vocational high school in which frameworks one can get both vocational training and high-school diploma. Additional there is a secondary educational institution for those with special needs, either providing with high school degree or a certain type of vocation. Last but not least there is a high school system which gives a high school diploma in 6- or 8-years settings.

T-STAR contains the number of students in each secondary educational institutions from 1999-2021 in each year. After collecting these variables, I created a secondary school student share variable by dividing the number of students in secondary school, in a given municipality in a given year, with the population number, multiplying by hundred to get the percentage share of the population for each type of secondary school framework. Following this, I have combined these variables into one variable named as sh-secondary_jt.

5.3.3. Roma dummy variable

In order to test the hypotheses in the above models I created a variable sh-Roma-high_j (from a Roma population share variable measured in percentage, generated from the 2011 Census: roma_pop_share_perc) denoting a binary variable, which is 1 for municipalities with a high Roma share and 0 otherwise. The threshold regressions implemented has been established at 5 %. The reason behind is that the share of Roma population at a municipality does not reflect

the real share of Roma population and in many cases this number is either 0 or missing and never reaches above 50 percent (there is only 1 settlement where a 50% share is reported). Thereby my hindsight assumption is that settlements or municipalities reporting at least a 5 % share of Roma inhabitants, in reality it should be much larger than that.

In addition, given the assumption that the share of Roma population sample is not representative of the real population, I also ran a set of regressions with the same models, however for the second time the Roma dummy variable threshold was established at 1 % i.e., 1 for municipalities with a Roma population share above 1% and 0 for municipalities with a Roma population below 1 %. This variable is called sh_Roma2-high_*j*.

5.3.4 Other variables

With the intention to examine if there are underlying effects that influence the outcome variable, I included a few control variables such as jobseekers share (jobseek_control, form T-Star database, unemployment dataset), municipality income (lagged version of income_mun_control, created from T-Star database, municipality revenues and expenditures dataset), and in some cases the year variable to control for trend within the regression model. The share of jobseekers control variable is created from the number of jobseekers in each year divided by the population and multiplied by 100 in order to get a percentage share. Whereas the municipality income variable is created summing up revenues and expenditures of municipalities in each year, which is then provided the annual income on a municipality level. It followed by taking the lag of this variable. I also included variables as fixed effects controlling for county (mkod2018) and settlement type (teltip8). I did all this in order to see how the estimates if key variables change upon including these variables.

5.4. Limitations

Usually, throughout empirical research one has to face several obstacles before getting to a valid result. It did not happen differently while constructing this research either. My main limitation was that the available data included missing values in a quite large number which in

general questions the validity and reliability of my research. In many cases I had to adjust and modify the source data in order to run the regressions due to these missing values. Another obstacle was to identify those variables in the database that could be identified as the variables in the models. To ensure that my model applies the correct variable I would need to be aware of the exact method of how the data was collected. Unfortunately, the data provider could not present the detailed description of the nature of the data, which could result in a selection bias on my sample. Considering this, it could also happen that my sample is not representative of the population.

Chapter 6

Results

6.1. Descriptive Statistics

I used data for Hungary to carry out an aggregate study at country level. In order to provide an overview of the chosen variables I display the brief descriptive statistics of the main variables used in the empirical analysis. Table 1. shows the average economic growth, the average share of secondary school students and the average share of Roma population living in each municipality before 2011. In this period the average log growth rate was around 0.08 % meanwhile the population share of students in secondary education for the same period was around 0.4 % and the average share of Roma inhabitants living in a municipality was around 5.3%.

Table 1.

Descriptive statistics of key variables before 2011

stats	ln_gro~t	sh_sec~t	roma_p~c
mean	.0825512	.3961907	5.274232
p50	.0605098	0	1.883326
sd	.7262853	2.16734	7.704861
variance	.5274903	4.697361	59.36488
min	-8.992726	0	0
max	7.565076	19.97144	50.2424
range	16.5578	19.97144	50.2424
N	23574	65098	65073

Note: Variables presented as follows: ln_growth, sh_secondary_jt, roma_pop_share_perc (Roma population percentage share)

In addition, Table 2. presents the average economic growth, the average share of secondary school students and the average share of Roma population living in each municipality after 2011. After the introduction of the Education Act, a slight (0.02 percentage point) decrease can be observed in the average economic growth, however there is a slight increase in the average share of students studying in secondary education, totaling to 0.67 percentage after 2011. The share of Roma population did not show any change as it is measured only for the year 2011.

Table 2.

Descriptive statistics of key variables after 2011

stats	ln_gro~t	sh_sec~t	roma_p~c
mean	.0623997	.6699317	5.248477
p50	.0604129	0	1.877133
sd	.6515082	2.495399	7.685871
variance	.4244629	6.227015	59.07261
min	-7.229476	0	0
max	9.14117	19.99472	50.2424
range	16.37065	19.99472	50.2424
N	10341	28151	28145

Note: Variables presented as follows: ln_growth, sh_secondary_jt, roma_pop_share_perc (Roma population percentage share)

Furthermore, Table 3. and Table 4. presents the distribution of the average share of secondary school students and the distribution of the average economic growth, before and after 2011 respectively. Table 3. shows that the share of those attending any kind of secondary school approximately after around 2012 (when the Education act came into effect) started to take up a decreasing trend. Table 4. shows that economic growth followed a varied trend before and after 2011.

Table 3.

Distribution of the average share of secondary school students, before and after 2011.

Év	mean(sh_sec~t)
1999	0
2000	0
2001	.7990712
2002	.7988307
2003	.8260671
2004	.824322
2005	.8260674
2006	.8690562
2007	.8516413
2008	.8440072
2009	.83481
2010	.8824567
2011	.8957847
2012	.9203904
2013	.9170072
2014	.8693708
2015	.8051678
2016	.6789981
2017	.6438753
2018	.6043067
2019	.6023725
2020	0

Note: “Év” is the year variable, sh_sec~t refers to the share of secondary school students at a municipality level.

Table 4.

Distribution of the average economic growth, before and after 2011

Note Év is the year variable, ln_gro~t refers to ln_growth at a municipality level.

Év	mean(ln_gro~t)
1999	
2000	.0896537
2001	.2162593
2002	.1145247
2003	.0819726
2004	.1300185
2005	-.0002969
2006	.1749399
2007	.0448569
2008	.2542613
2009	-.1444712
2010	.0069162
2011	.092056
2012	-.0520548
2013	.0219466
2014	.1509915
2015	.1254926
2016	
2017	
2018	
2019	
2020	

6.2. Regression Estimates from the Difference-in-Differences Models

As discussed before, I use a difference-in-differences regression model to test my hypotheses and research question of, how the average share of students studying in secondary education change before and after 2011 in settlements with high share of Roma population? And how did the average economic growth change before and after 2011 in settlements with high share of Roma population? This change can be either increasing, decreasing or neutral i.e., no change at all. I now describe my regression estimates; in all tables below, standard error estimates are robust to heteroscedasticity.

My first results are presented in Table 5. displaying the estimates of my first and second regression models (corresponding to testing the hypotheses) with the 5 % threshold on the Roma dummy variable. In this table I included four regressions and its estimates as follows: model 1 without control variables (but including the year variable to control for the trend in the outcome variable) and without fixed effects, model 1 with control variables and fixed effects, model 2 without control variables, and model 2 with control variables and fixed effects.

The coefficient estimate on the "post2011" variable indicates that the share of secondary school students decreased by, on average, 0.42 percentage points from before 2011 to after 2011 in municipalities in which the share of the Roma population is low (below 5 percent). The share of secondary school students decreased even more in municipalities in which the Roma share is high, by 0.05 percentage points, but this coefficient estimate on the interaction term is not significantly different from 0 (p-value is 0.135). The coefficient estimate on the "sh_Roma_high_jt" variable indicates that the share of secondary school students is significantly lower in municipalities in which the Roma share is high, by 0.16 percentage points, on average (significant at the usual significance levels).

Upon including control variables of the number of job seekers in the municipality and municipality income, as well as the type and county of the settlement, the coefficient estimate

on the "post2011" variable still indicates a decrease in the share of secondary school students (albeit that is not significant anymore), and the interaction coefficient turns significantly positive. The coefficient estimate on the "sh_Roma_high" variable still indicates that the share of secondary school students is significantly lower in municipalities in which the Roma share is high, by 0.22 percentage points, on average.

The results of estimating Model 2. are also presented in Table 5. The coefficient estimate on the "post2011" variable indicates that the growth rate from one year to another decreased by, on average, roughly 1.79 percent, from before 2011 to after 2011 in municipalities in which the share of the Roma population is low (below 5 percent); this coefficient estimate is significant at the 5 and 10 percent levels but is not significant at the 1 percent level. Given the point estimate on the interaction variable is not significant, the growth rate did not differentially change in municipalities in which the share of Roma population is high, from before to after 2011. The coefficient estimates on the "sh_Roma_high" variable indicates that the growth rate is lower in municipalities in which the Roma share is high, by 0.9 percent, but this coefficient estimate is not significant at the usual levels.

After including controls in the regression model, I found that the coefficient estimate on the "post2011" variable indicates that the growth rate from one year to another, decreased more on average by 2.27 percent. The interaction term is not statistically significant but shows a 1.81 percent increase in economic growth, on average, in municipalities in which the Roma share is high. Furthermore, the "sh_Roma_high" variable still indicates that the growth rate from one year to another decreased by 1.09 percent (not significant ant the usual significance levels).

Based on these estimates, the average share of students studying in secondary education substantially decreased in settlement where the share or Roma population is low significantly, and it decreased more in settlements where the share of Roma population is high, after the

introduction of the 2011 Education Act (although it is not significant). In sum, the statement of the first hypothesis partially holds, and my estimates supports this, however it is rejected regarding the examinations on settlements where the share of Roma population is high (at a 5% threshold). Although the interaction coefficient shows a slightly greater decrease in the share of students in secondary education in municipalities with high Roma population after 2011, it is not significant at the usual significance level. Furthermore, when I included the control variables, results show that in contrast to the results of the 1ST model without controls, that the average share of students studying in secondary education substantially decreased in every settlement but not significantly, however the interaction term showed a positive rate of increase and became significant. This means that I cannot fully reject or hold the first hypothesis at a 5% threshold for the Roma population variable.

Additionally, according to the 2nd model the average economic growth, year by year, decreased in settlements with low Roma population from before 2011 to after 2011 (significant at a 10% and 5% level but not at 1 % level) but no significant decrease or increase observable in settlements after 2011 with high Roma population. It is also observable that economic growth rate is substantially lower in settlements with high Roma population in general, however it is not significant. Based on this the 2nd hypothesis is not rejected to a certain aspect however it needs further research to be done.

Table 5.

MODEL 1: sh-secondary_jt = a0 + a1*post2011_t + a2*sh-Roma-high_j + a3*(post2011_t*sh-Roma-high_j) + a4*C_jt + u_jt and MODEL 2: ln_growth_jt = b0 + b1*post2011_t + b2*sh-Roma-high_j +b3*(post2011_t * sh-Roma-high_j) + b4*C_jt + e_jt with 5% threshold on the Roma population variable.

	(1) sh_seconda~t	(2) sh_seconda~t	(3) ln_growth_jt	(4) ln_growth_jt
post2011_t	-0.420***	-0.0391	-0.0186*	-0.0227*
	(-11.30)	(-0.98)	(-2.20)	(-2.35)
sh_Roma_hi~j	-0.161***	-0.230***	-0.0113	-0.0109
	(-10.05)	(-8.44)	(-1.04)	(-0.80)
time_roma_~t	-0.0489	0.174***	0.0142	0.0181
	(-1.49)	(5.05)	(0.83)	(1.01)
ev	0.0471***	-0.0100***		
	(34.57)	(-3.44)		
jobseek_co~l		0.0111***		-0.00204
		(5.01)		(-1.05)
ln_income_~l		0.142***		-0.00139
		(16.28)		(-0.39)

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Note: In this table I included four regressions and its estimates as follows: column (1): model 1 without control variables (but including the year variable to control for the trend in the outcome variable) and without fixed effects, column (2): model 1 with control variables and fixed effects (not presented in the table, but included in the regression model), column (3): model 2 without control variables, and column (4): model 2 with control variables and fixed effects (not presented in the table, but included in the regression model). It is all implemented with a 5% threshold on the Roma variable.

In the second round of regression are presented in Table 6. displaying the estimates of the first and second regression models but this time with the 1 % threshold on the Roma dummy variable. Again, I included four regressions in the table and its estimates as follows: model 1 without control variables (but including the year variable to control for the trend in the outcome variable) and without fixed effects, model 1 with control variables and fixed effects, model 2 without control variables, and model 2 with control variables and fixed effects.

The coefficient estimate on the "post2011" variable indicates that the share of secondary school students decreased by, on average, 0.56 percentage points from before 2011 to after 2011 in

municipalities in which the share of the Roma population is low (below 1 percent). Table 6. also presents that the share of secondary school students in municipalities in which the Roma share is high, is greater by 0.22 percentage points, and this coefficient estimate on the interaction term is significant (at usual significance level). The coefficient estimate on the "sh_Roma_high_jt" variable indicates that the share of secondary school students is positive and significant in municipalities in which the Roma share is high, by 0.27 percentage points, on average (significant at the usual significance levels).

When I included the control variables: the number of job seekers in the municipality, municipality income, and the type and county of the settlement, the coefficient estimate on the "post2011" variable still indicates a decrease in the share of secondary school students (again, it is not significant anymore), and the interaction coefficient turns negative but not statistically significant anymore. The coefficient estimates on the "sh_Roma_high" variable still indicates that the share of secondary school students is significantly positive in municipalities in which the Roma share is high, by 0.22 percentage points, on average.

Model 2. with a 1 % threshold on the Roma variable are also presented in Table 6. The coefficient estimate on the "post2011" variable indicates that the growth rate from one year to another decreased by, on average, roughly 2.28 percent, from before 2011 to after 2011 in municipalities in which the share of the Roma population is low (below 1 percent); this coefficient estimate is significant at the 10 percent levels but is not significant at the 5 and 1 percent level. The growth rate did not significantly change in municipalities in which the share of Roma population is high, from before to after 2011. The coefficient estimates on the "sh_Roma_high" variable indicates that the growth rate is lower in municipalities in which the Roma share is high, by 1.9 percent, but this coefficient estimate is only significant at the 10 percent level. When I included the controls in the regression model, I found that the coefficient estimate on the "post2011" variable indicates that the growth rate from one year to another,

decreased more on average by 2.73 percent at a 10 percent significance level (but not on a 5% and 1% significance level). The interaction term is not statistically significant but shows a 1.7 percent increase in economic growth, on average, in municipalities in which the Roma share is high. Furthermore, the "sh_Roma_high" variable still indicates that the growth rate from one year to another decreased by 1.04 percent (not significant ant the usual significance levels).

In general, with the 1 % threshold for the Roma variable regression setting, I reject both of my hypotheses as my result were mostly not significant. Even those coefficients showed unrealistic result which have been proven before in other studies or with the 5 % threshold for the Roma variable regression settings. For example, the share of secondary school students in municipalities with high Roma population being greater than in those with low Roma population (before and after 2011) seems to be non-representative.

Table 6.

MODEL 1: sh-secondary_jt = a0 + a1*post2011_t + a2*sh-Roma2-high_j + a3*(post2011_t*sh-Roma-high_j) + a4*C_jt + u_jt and 2. MODEL: ln_growth_jt = b0 + b1*post2011_t + b2*sh-Roma2-high_j + b3*(post2011_t * sh-Roma-high_j) + b4*C_jt + e_jt with 1% threshold on the Roma population variable.

	(1) sh_seconda~t	(2) sh_seconda~t	(3) ln_growth_jt	(4) ln_growth_jt
post2011_t	-0.561***	-0.00687	-0.0228*	-0.0273*
	(-16.97)	(-0.17)	(-2.02)	(-2.22)
sh_Roma2_h~j	0.269***	0.0958***	-0.0190*	-0.0104
	(16.64)	(3.35)	(-1.98)	(-0.90)
time_roma2~t	0.217***	-0.0314	0.0145	0.0171
	(6.73)	(-0.92)	(0.97)	(1.10)
ev	0.0472***	-0.00931**		
	(34.67)	(-3.20)		
jobseek_co~l		-0.00147		-0.00210
		(-0.69)		(-1.13)
ln_income_~l		0.143***		-0.00141
		(16.31)		(-0.40)

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Note: In this table I included four regressions and its estimates as follows: column (1): model 1 without control variables (but including the year variable to control for the trend in the outcome variable) and without fixed effects, column (2): model 1 with control variables and fixed effects (not presented in the table, but included in the regression model), column (3): model 2 without control variables, and column (4): model 2 with control variables and fixed effects (not presented in the table, but included in the regression model). It is all implemented with a 1% threshold on the Roma variable.

Chapter 7

Conclusion and Policy implications

To conclude, after reviewing the literature on the relationship between economic growth and education and the background of the 2011 Education Act of Hungary, it made me realized that this topic requires a thorough analysis. Having dealt with previous research on the topic, Solow, Romer and Lucas and Barro served as the pioneers of the field. Based on these experts' theories and experience I constructed a difference-in-differences research model examining panel data with the aim to generate reliable and valid research findings, which answer my hypotheses.

My achievements with this approach were partially successful. With the help of my empirical strategy, I found that, my estimates partially and in certain conditions (e.g., with 5 % threshold for the Roma variable) support my hypotheses although not in every aspect. The outcome variables (share of secondary school students and growth) did have a decreasing rate in both of my models, however upon including the control variables the relationship lost its significance in some cases or presented an increasing rate of change. Again, I found partial evidence supporting the hypothesis claiming that the 2011 Education act had a more serious economic and schooling impact in settlement with high Roma population. Moreover, I could not find reliably result with the 1 % threshold for the Roma variable regression setting, however it would be worth to further review this model, maybe with different settings.

The study was facing mainly limitations in its method. The measurements for economic growth might not be representative of the population due to the fact that the nature of data collection is unknown. With more research it could be certainly made more precise and reliably. Another major limitation was to identify settlements with high and low Roma population. People in Hungary would rather avoid identifying themselves as Roma due to the negative stereotypes attached to this community (although it not discussed in this paper), thereby it is hard to represent the community in its real numbers, in any research.

I do realize that my research needs to be improved, however it is a good starting point to investigate the above-described relationship. Although, in itself, it is not enough to serve as evidence to change the upper limit of compulsory schooling age back to 18, however my recommendation is to re-establish this upper age limit as, in certain settings economic growth decrease in the long-term significantly (after the implementation of the 2011 Education Act).

This research brings the attention to a neglected source of economic development in Hungary, which is through a long-term, good quality education. The research proves that economic wealth and the level of education of the society are in a considerable relationship even in such a small country as Hungary.

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Source of data used

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