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Analysis of poverty and income inequality in the Czech Republic

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Department of Economics
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DIPLOMA THESIS ASSIGNMENT

Příbramský Marek

Economics and Management

Thesis title
Analysis of poverty and income inequality in the Czech Republic

Objectives of thesis

The objective of the diploma thesis is to analyse the impacts of selelected socioeconomic drivers on income distribution and its development in the Czech Republic. The analysis will mainly focus on education as an important factor affecting income inequality. Based on the quantitative assessment, the main hypothesis of positive education's impact on income distribution will be verified in the conclusion.

Methodology

The thesis consists of theoretical and empirical part. In the theoretical part, fundamental terms regarding the concept of income inequality will be explained and the descriptive analysis of the phenomenon will be provided.

The empirical part will focus on quantitative assessment of income inequality in the Czech Republic. Main sources of data will be provided by the Czech Statistical Office. Econometric methods will be used to prove the relationship between education and income inequality and to reject or verify the hypothesis set by the author based on thourough literature review.

Schedule for processing

February - April 2013: Compilation of literature sources
May - September 2013: Elaboration of the theoretical backround of the diploma thesis
October - January 2013: Elaboration of the practical part of the diploma thesis
February - March 2013: Final arrangements and completion of the diploma thesis

The proposed extent of the thesis

60 - 80 pages

Keywords

Education, Income distribution, Analysis, Inequality, Economic development, Poverty, Czech Republic

Recommended information sources

BERTOLA, Giuseppe, Reto FOELLMI a Josef ZWEIMÜLLER. Income distribution in macroeconomic models. Princeton, N.J.: Princeton University Press, c2006, xviii, 421 p. ISBN 978-069-1121-710.

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Prague September 16, 2013

Declaration

I hereby declare that I have worked on my diploma thesis titled "Analysis of poverty and income inequality in the Czech Republic" is my own, under guidance of my supervisor. I have used only academic literature and information resources mentioned in overview in the end of the diploma thesis. As author of diploma thesis, I further declare that I have not breached copyright of third parties when working on the diploma thesis.

In Prague on ……………   Signature ……………

Acknowledgment

Analysis of poverty and income inequality in the Czech Republic

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Analýza chudoby a příjmové nerovnosti v České republice

Abstract

The thesis examines income inequality in the Czech Republic and relationship of other factors to this phenomenon. Associated economic terms and other factors such as poverty, economic inequality, economic development, globalisation or education are further studied in the literature review. Those factors are described for the Czech Republic and also compared with other countries. They are then subsequently quantified and evaluated by description analysis.Second part of the thesis examines the chosen factors more closely and includes them into econometric model. By linear regression analysis, influence of those factors on income inequality in the Czech Republic is calculated and quantified. Following evaluation of the results and their interpretation which show a significant influence of chosen factors on income inequality and therefore meet the assumptions are presented at the end of the thesis.

Keywords

Abstrakt

Diplomová práce zkoumádůchodovou nerovnost v České republice a vztah dalších faktorů k tomuto jevu. Související ekonomické pojmy a další faktory jako chudoba, ekonomická nerovnost, globalizace nebo vzdělání jsou dále studovány v literární rešerši. Tyto faktory jsou potom popsány pro Českou republiku a také porovnány s ostatními zeměmi. Dále jsou kvantifikovány a zhodnoceny v deskriptivní analýze. Druhá část práce se zabývá zvolenými faktory více podrobně a zahrnuje je do ekonometrického modelu. Pomocí lineárně regresní analýzy (konkrétně metody nejmenších čtverců) je kvantifikován a vypočítán vliv těchto faktorů na důchodovou nerovnost v České republice. Následující vyhodnocení výsledků a jejich interpretace, které prokazují významný vliv zvolených faktorů na důchodovou nerovnost a tím tedy potvrzují předpoklady jsou představeny na konci práce.

Klíčová slova

České republika, distribuce důchodů, příjmová nerovnost, chudoba, vzdělání, ekonomický růst, globalizace, analýza

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1. Introduction

Inequality means difference or disproportion in any point of view. There have always been inequalities among people because every person is original and has his/her unique attributes, appearance, surrounding environment etc. That's why the economic inequality has always existed among ourselves since the beginning of humanity.

Talking about income inequality which is a significant subset of economic inequality, a lot of things have been told, written or discussed about this issue as it has been here during the entire human history. In ancient and medieval times, people were divided into classes with different power and wealth. In some countries the society was polarized into aristocracy and rulling class and the poor but elsewhere, there was also a certain middle class. At the start of industrial revolution and capitalism, differences between rich owners and poor workers drastically increased and the topic of income distribution started to be widely discussed. Some philosophers and economists suggested models which were extremely egalitarian such as socialism while other pointed out that there will always be differences among people and a certain extent of inequality is beneficial for the society.

Apart from various opinions and views on income inequality, the thing which have been also widely discussed and questioned in modern age are its causes. What factors influence income inequality and by what extent? Many opinions on this issue from respected studies are presented also in this thesis.

Czech Republic with its history full of reversals and unexpected events was a socialist country where income inequality was held at minimal level by force until 1989.After the revolution and start of a new regime, country opened itself to outer world as never before and a huge amount of new possibilities on economic, social or cultural level have come. A lot of aspects in daily life of a citizen but also in national economy have changed and country began to live in capitalism. New freedom at the market brought not only positive things and new possibilities but also some problems.Income inequality has logically rose as it was extremely low due to prior regime. This thesis is focused on the analysis of this phenomenon in the Czech Republic and also on factors which influence it considering tertiary education as one of the main of those factors.

2. Main goals and methodology:

The diploma thesis anyses income inequality in the Czech Republic. Main goal is to identify, desribe, analyze and evalute the most significant determinants of income inequality in the Czech Republic and respond the research questions.

The partial goals of the diploma thesis are following:

1. To define main indicators which influence and determine income inequality in general.
2. To answer the question whether tertiary education has been a significant factor which affected income inequality in the Czech Republic in the period of 1993 – 2010.
3. To quantify and evaluate the statistical significance of the relationship between chosen factors which are tertiary education, GNI, globalisation, taxes and income inequality in the Czech Republic.

The thesisis divided into literature review which provides theoretical background for the later stages of the thesis and the practical part which quantifies the relationship of factors described in the literature review. At the beginning, the literature review describes definitions of poverty and income inequality and methods of measurementof this phenomena. Economic inequality in today's world is subsequently described in detail. Factors causing economic inequality and education as one of the most singnificant factors are in following chapters. Optional level of inequality and some examples and comparison with education in relationship with income inequality are put at the end of literature review.

The second part of the thesis is focused on descriptive analysis and quantification of chosen factors for the Czech Republic and comparing it also to other countries. The factors are then incorporated into the econometric model and tested by ordinary least square method in linear regression model in Gretl program. This method minimizes the sum of squared distances between the observed responses in the data set and the responses predicted by the linear approximation. Variables are tested for their significance and meeting the assumptions of their influence and its intensity on the income inequality in the Czech Republic and subsequently evaluated and interpreted. The chosen data set consists of 6 explanatory variables (2 variables

representing tertiary education, 3 variables from other socioeconomic areas + 1 intercept term) and dependent variable of income inequality.

The period of 18 observations (1993 – 2010) was selected because of its actuality and also because before 1990 during the communist era, there was a totally different regime and different standarts and values in social end economic areas, so the chosen data set captures the modern era of the Czech Republic except the last 3 years which were difficult to capture and there were a lot of contradictions in observed results.

To verify the relevance of calculated results, statistical tests are subsequently conducted. Correlation matrix tested multicollinearity (correlation among exogenous variables in the model), Durbin-Watson and Breusch-Godfrey tests verified autocorrelation of residuals, KPSS model tested stationarity of data and White's test verified heteroskedasticity (i.e. if the standard errors are biased). Those tests brought desired results and confirmed correctness of the model. The end of practical part captures interpretation of the results together with brief discussion and comparison with the results of other authors.

3. Literature review

3.1 Definition and means of poverty and income inequality

"Poverty devastates families, communities and nations. It causes instability and political unrest and fuels conflict."(Annan, 2012)

Concerning the economic and material point of view, the meaning of the word "poverty" should be explained at first. The World Bank Organization's definition (which should serve the purpose well) is following:*"Poverty is hunger. Poverty is lack of shelter. Poverty is being sick and not being able to see a doctor. Poverty is not having access to school and not knowing how to read. Poverty is not having a job, is fear for the future, living one day at a time.*

Poverty has many faces, changing from place to place and across time, and has been described in many ways. Most often, poverty is a situation people want to escape. So poverty is a call to action -- for the poor and the wealthy alike -- a call to change the world so that many more may have enough to eat, adequate shelter, access to education and health, protection from violence, and a voice in what happens in their communities."(WBO, 2012)

The world map of poverty is depicted in the Figure 1 bellow.

Figure 1: Extension of poverty in today's world

Comments:
Indicator: Poverty headcount ratio at $1.25 a day (PPP) (% of population)
Year: 2012

no data | 0 - 20.0 | 20.0 - 40.0 | 40.0 - 60.0 | 60.0 - 80.0 | 80.0 - 100
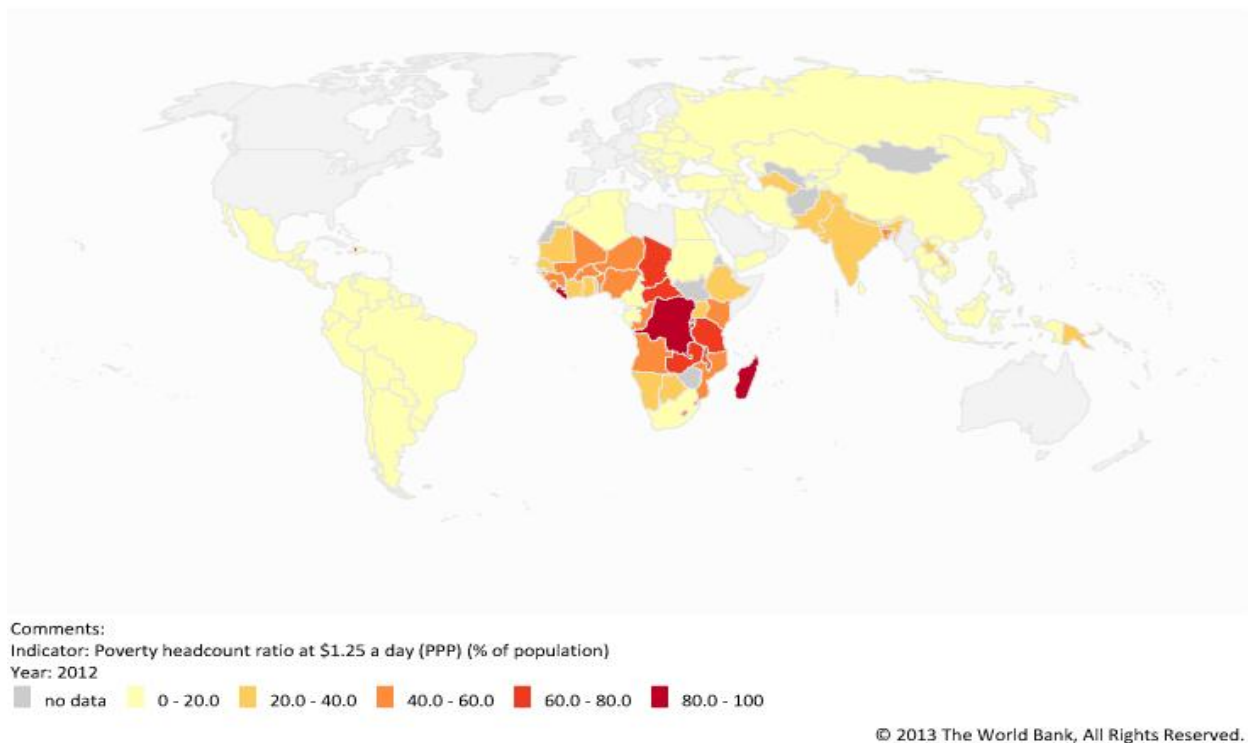
While the mentioned definition of poverty describes rather absolute poverty which is a lack of sources to satisfy the basis needs, there is another important term called „relative poverty". This term is better known as economic inequality.[1] In the figure above, we can see which countries nowadays suffer by poverty the most.

Economic inequality (also described as the gap between rich and poor, incomeinequality, wealth disparity, orwealth and income differences) is the difference between individuals or populations in the distribution of their assets,wealth, or income. The term typically refers to inequality among individuals and groups within a society, but can also refer to inequality among countries. The issue of economic inequality involves equity, equality of outcome, equality of opportunity, and life expectancy. So for example while there is almost no economic inequality among Somalia citizens (i.e. they are not relatively poor compared with each other), most of them live in grave poverty as they can barely satisfy their basic needs for life. On the other side there is surely economic inequality among the people in Luxembourg but practically none of its citizens live in poverty, because it is such a developed country that even the less propertied citizens live quite well.[2] The opinion that big social differences have become a global and also even local obscatle of social-economic and human development has been recently widely accepted in global discussion.[3]

Another important term, income distribution describes us how are the incomes distributed amongs people and social groups and it has always been a central concern of economic theory and economic policies. Either factor income distribution (which is distribution of income between the main factors of production, land, labour and capital) or distribution of income across individuals and households, both have been the topics of many discussions and disputes throughout the entire history because they are closely related to a lot of other important aspects of the social and economic environment.[4]

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[1] MANKIW (2012)
[2] FLETCHER (2013)
[3] HRUBEC (2008)
[4] BERTOLA (2006)

3.2　Methods of measurement of income distribution

There are many methods how to measure income inequality. Apart from most popular of them – Gini Coefficient, two alternatives will be also introduced which are Robin Hood Index and Theil Index. Despite the fact that none of the methods is perfect and every one of them has some disadvantages, I find Gini Coefficient as the most proper and I decided to work with this methods further in my researches.

3.2.1　Gini Coefficient and Lorenz Curve

The most common method which is most fequently applied for measuring the income inequality is **Gini coefficient**. It measures the extent to which the distribution of income among individuals or households within a state's economy devitates from a perfectly equal distribution (which means that everyone has exact the same amount of income). This indicator is measured in percent while 0% means perfect equality and 100% (i.e. 1) reflects perfect inequality (which means that one person has all the income). The disadvantage of Gini coefficient is that it captures total inequality but fails to tell us where exactly the inequality happens along the distribution. Values of Gini coefficient in comparative statistics are usually divided into pre-tax and post-tax while prex-tax values show us income a real income distribution of working adults and post-tax values adjust those figures according to the particular country's tax law.[5]

Figure 2: Depiction of Lorenz Curve and Gini Coefficient
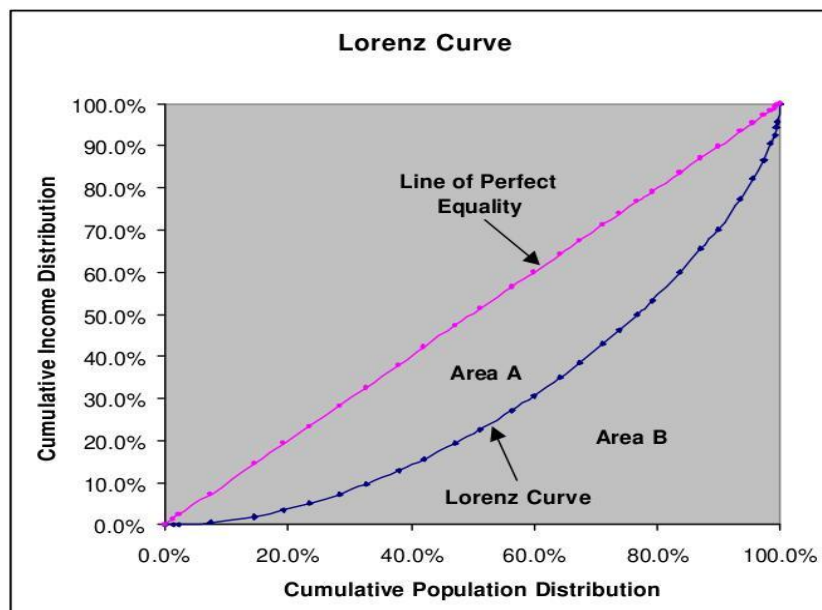
[5] BERTOLA (2006)

Lorenz curve is another important and widely used method how to measure the income inequality and is in fact closely related to Gini coefficient. Lorenz curve displays the relationship between cumulative distribution of total income and the cumulative proportion of people who receive the income while Gini coefficient is the area between the line of perfect equality and the observed Lorenz curve, as a percentage of the area between the line of perfect equality and the line of perfect inequality. On the picture bellow, we can see the chart of Lorenz curve which is represented by the blue line while the pink line represents the perfect equality (which is only therotetical because there will always be some inequality regarding people's income). The value of Gini coefficient in this chart is displayed as the Area A which shows deviation of the real distribution (represented by Lorenz curve) and perfect equality (represented by the pink line).The higher the Gini coefficient is the bigger is the total inequality. Therefore the formula for fits value is following[67]:

$$\text{GINI} = \frac{A}{A + B} \tag{1}$$

In some cases, this equation can be applied to calculate the Gini coefficient without direct reference to the Lorenz curve. For example (taking *y* to mean the income or wealth of a person or household since each person can be assigned his or her own y_i):[8]

$$G = \frac{2\sum_{i=1}^{n} i y_i}{n \sum_{i=1}^{n} y_i} - \frac{n+1}{n} \tag{2}$$

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[6] BERTOLA (2006)
[7] BIRDSALL (2000)
[8] BERTOLA (2006)

3.2.2 Robin Hood Index

Also known as Hoover index or Schutz index is a measure of income metrics. It is equal to the portion of the total community income that would have to be be redistributed (i.e. taken from the richer part of the population and given to the poorer part) for there to be income uniformity (i.e. everybody woud have same income). During the calculation we at first order all the households according to their incomes from the richest to the poorest. Afterwards we divide this data into 10 same sized groups. Then summarize percentage parts of the groups (but we count in only those whose proportion is bigger than 10%). From this number, we deduct *n* multiple 10% where *n* is the number of groups counted in the previous calculation. The result number tells us what part of all incomes in the country is needed to be redistributed in order to reach total egalitarianism where everybody has the same income.[9]

3.2.3 Theil Index

Another significant indicator measuring economic inequality. Apart from inequality it also measures redundancy, lack of diversity and non-randomness. It however doesn't have a straightforward representation and lacks the appealing interpretation of the Gini coefficient. It works with weighted geometric means of particular income groups. In case of zero inequality (=total equality), the value of Theil index is 0.In case of total inequality where one person has all the incomes, Theil index equals ln(n).[10]

$$T_T = T_{\alpha=1} = \frac{1}{N} \sum_{i=1}^{N} \left(\frac{x_i}{x} \cdot \ln \frac{x_i}{x} \right)$$

(3)

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[9] MANKIW (2012)
[10] BERTOLA (2006)

3.3 Economic inequality in today's world

Economic inequality within countries between their citizens but also among those countries on international level has recently become a growing trend in many countries in all over the world. Opinions differ about the utility of inequality and its efects. Some studies consider it benefical for state's economy while others consider it a severe problem which causes many other troubles. It varies between societies, historical periods, economic structures and political systems and also for sure, between individuals' abilities and skills to create wealth. Other important factors which surely influence the economic inequality and income distribution are also labor market situation, technological changes, policy reforms and taxes (which is related to state's policy), discrimination (gender, racial, nationality) level of education etc.[11]

Figure 3: Economic inequality in today's world according to Gini coefficient (2006)

Color	Gini coefficient				
■	< 0,25	■	0,35 - 0,39	■	0,55 - 0,59
■	0,25 - 0,29	■	0,40 - 0,44	■	> 0,60
■	0,30 - 0,34	■	0,45 - 0,49	■	NA
		■	0,50 - 0,54		
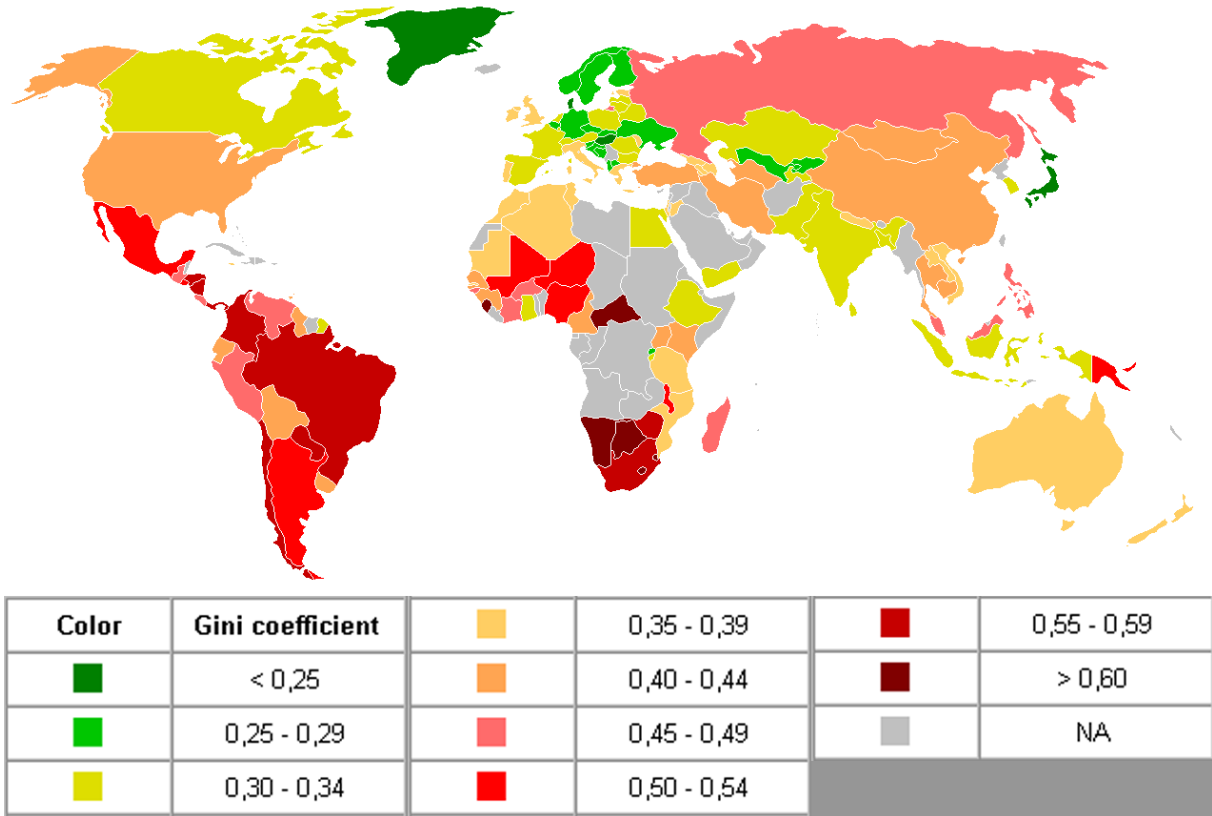
Source: The World Factbook (CIA Library)

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[11] BERTOLA (2006)

From the map above we can see which countries have the highest economic inequality according to Gini coefficient. Apart from developing and poor countries, there is also a significant economic enequality in several developed countries, most notably in the USA.

The World Bank divided 215 countries into four categories according to income levels:
- Rich countries (average income in 2010 was $33,232) e.g. Canada, Poland etc.
- Upper-middle income countries (average income in 2010 was $8,731) e.g. Brazil
- Lower-middle-income countries (average income in 2010 was $33,232) e.g. Nigeria
- Poor countries (average income in 2010 was $1,099) e.g. Cambodia, Kenya[12]

To able measure world income inequality, we have to considerseveral viewpoints. We can calculate:
- **The income gap between rich and poor countries** which is average income of rich countries and they are compared with the average income of poor countries and his is tracked over time
- **The overall world wealth and income inequality**
- **The income inequality of each country and their comparison**
- **The income inequality within a country**

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[12] MANKIW (2012)

3.3.1 The income gap between rich and poor countries

Has the gap between rich and poor countries increased? The answer is not so clear and a bit complicated. Income per capita among rich countries has always been higher than income per capita in countries from other three groups. However, mainly as a result of the rise in incomes in China and India, the two middle-income groups of countries (which belong China and India in) began to get richer more swiftly. This phenomenon can be seen in the Figure 4 bellow. Notice how the red and green lines begin to trend upwards in the 2000s.

Figure 4: Comparison of countries' incomes considering four major groups
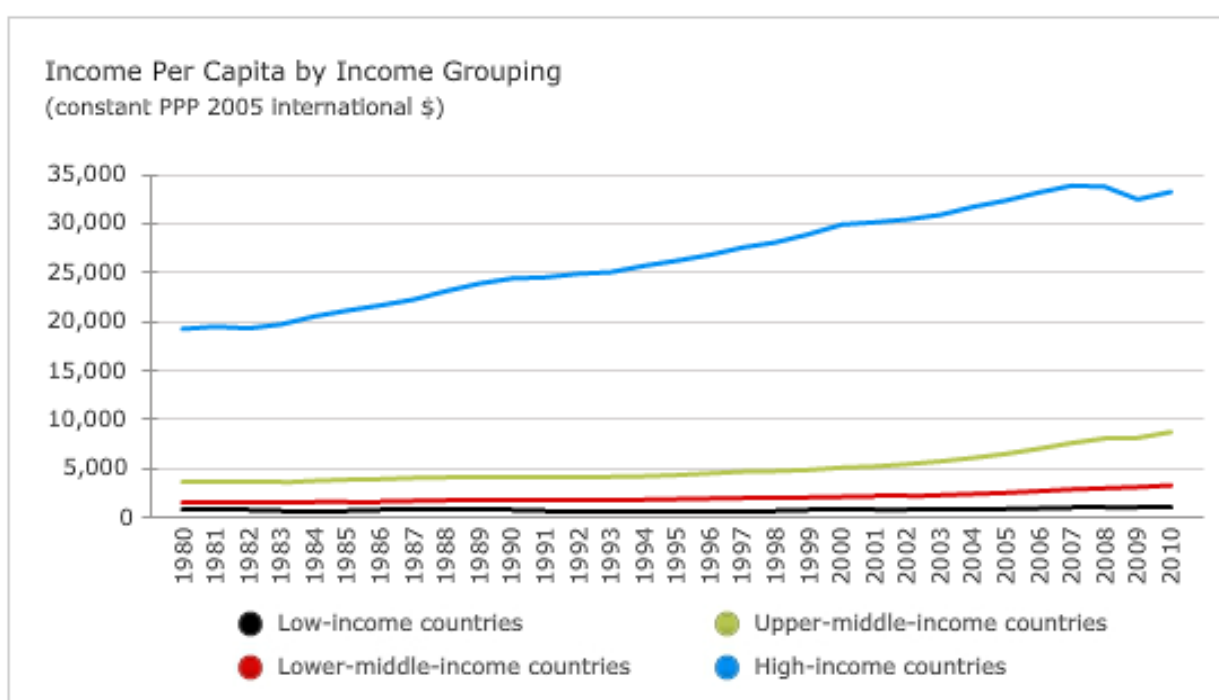
Source: The conference board of Canada (2013)

China, recently re-classified by the World Bank as an upper-middle-income country, is the reason for per capita incomes in this grouping rising by an average of 5.9 per cent per year between 2000 and 2010. India, a lower-middle-income country, is the main reason for per capita incomes rising by an average of 5.1 per cent per year in that decade. By contrast, average per capita incomes grew by 3.7 per cent per year in low-income countries between 2000 and 2010, and by only 0.5 per cent per year in high-income countries.
The answer to the second question—whether the gap has been growing—is both yes and no. It grew in the 1980s, the 1990s, and the first part of the 2000s, but declined slightly between 2007 and 2010. For example, the gap between income per capita in high-income countries and

low-income countries increased from $18,500 in 1980 to $32,900 in 2007, before falling slightly to $32,100 in 2010. High-income countries are also significantly richer than middle-income countries. In 2010, the average income per person in a high-income country was $29,950 more than the average income of a person in a lower-middle-income country and $24,500 more than the average income of a person in an upper-middle-income country.[13]

3.3.2 The overall world wealth and income inequality

Now let's take a look on inequality not from country but from individuals point of view. There have been many researches conducted to measure differences in individuals wealth and incomes. Most recent studies have shown that differences in individual persons globally have developed into immense extension. Top 0.5% of richest people owns more than one third of total global wealth. On the other side, more than bottom two thirds of poorest people which are mostly from third world countries own only 4.2% of global wealth. [14]

Figure 5: Economic inequality among individuals (2010)
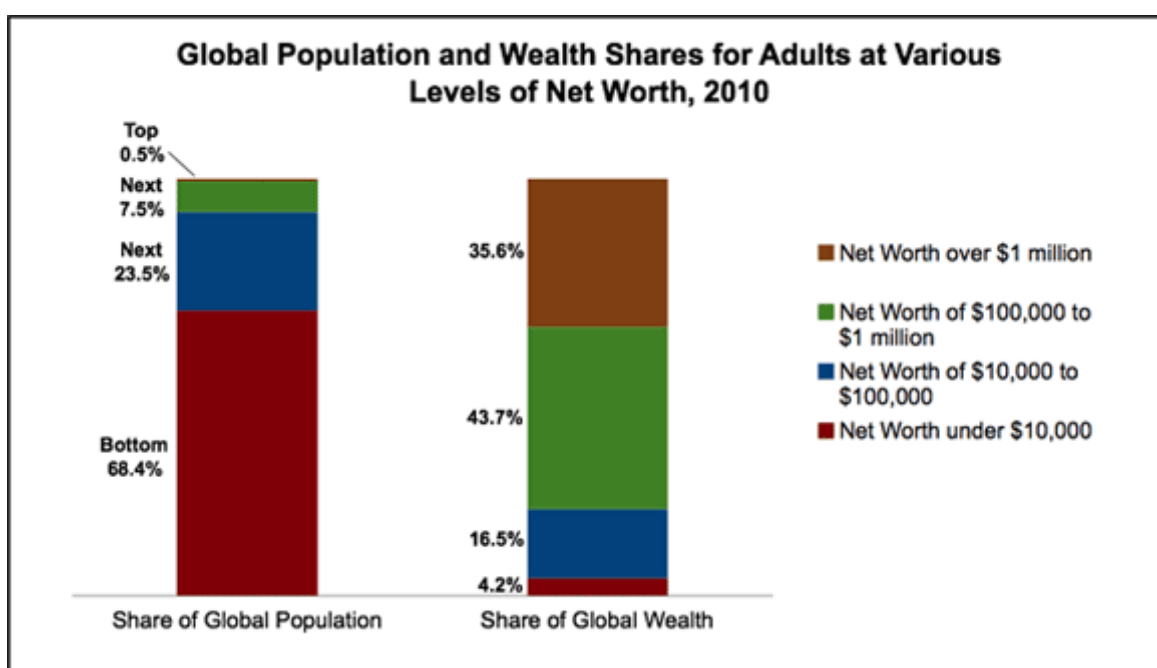
Source: Program on inequality and common good (2012)

Moreover, according to *Forbes* magazine, which summed the fortunes of the world's billionares, the world's 1210 current billionares hold a combined wealth that equals over half

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[13] THE CONFERENCE BOARD OF CANADA (2013)
[14] PROGRAM ON INEQUALITY AND COMMON GOOD (2012)

the total wealth of the 3.01 billion adults around the world who hold under 10 000 in net worth (see the chart bellow) and this difference increases every year as more and more wealth is concentrated in the hands of the richest people on this planet.[15]

Figure 6: Differences between absolutely the richest and the poorest people in the world
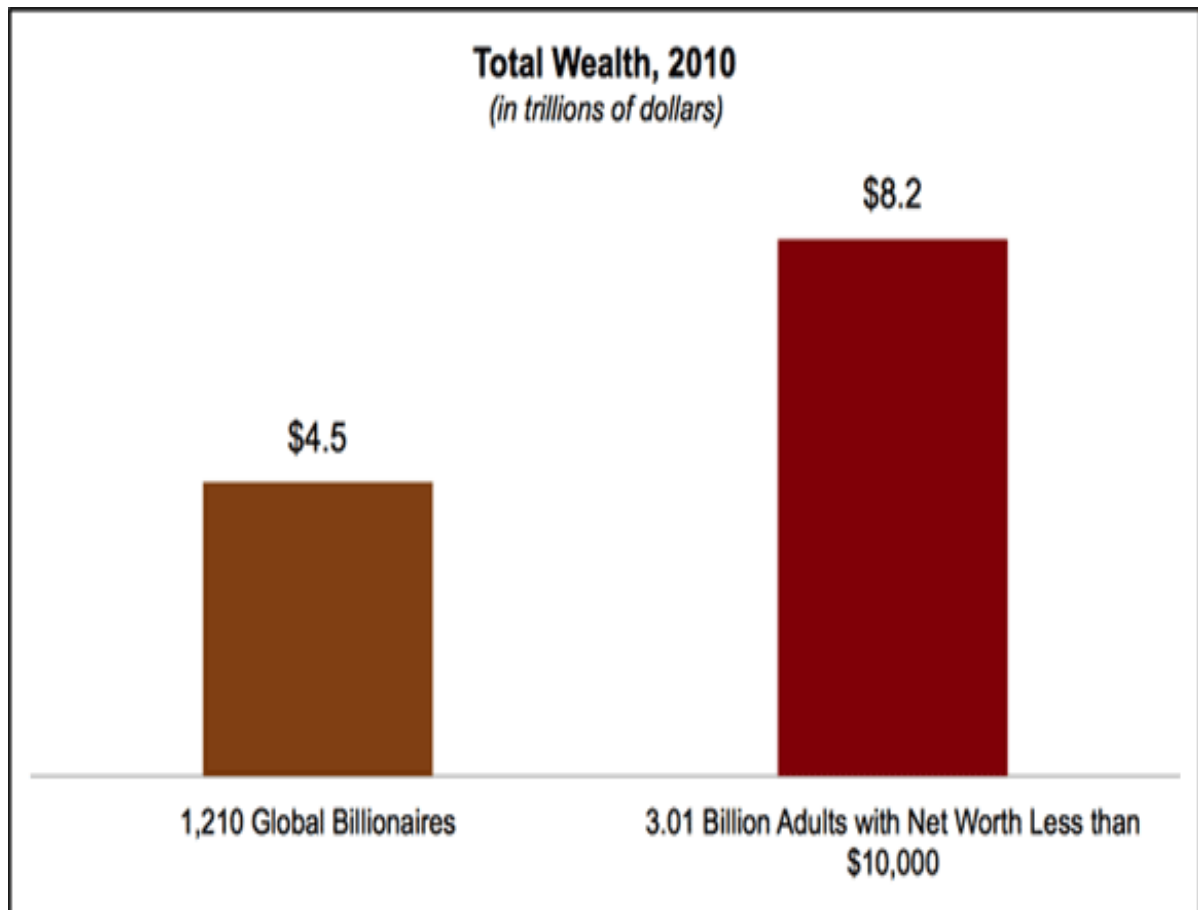
Source: Program on inequality and common good (2012)

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[15] INEQUALITY.ORG (2012)

3.3.3 The income inequality among countries and their comparison[16]

In this calculation, we take all countries in the world, measure their income per capita and calculate the income inequality among them. This calculation does not regard countries' population but compares solely their average incomes per capita. Therefore this is a measure of inequality among countries in the world , not inequality among all people in the world. Generally, if the Gini coefficient rises, it means that richer countries are doing better than poorer countries. In the chart bellow we can see historical development of income inequality among all countries since 1960.

Figure 7: World inequality among countries
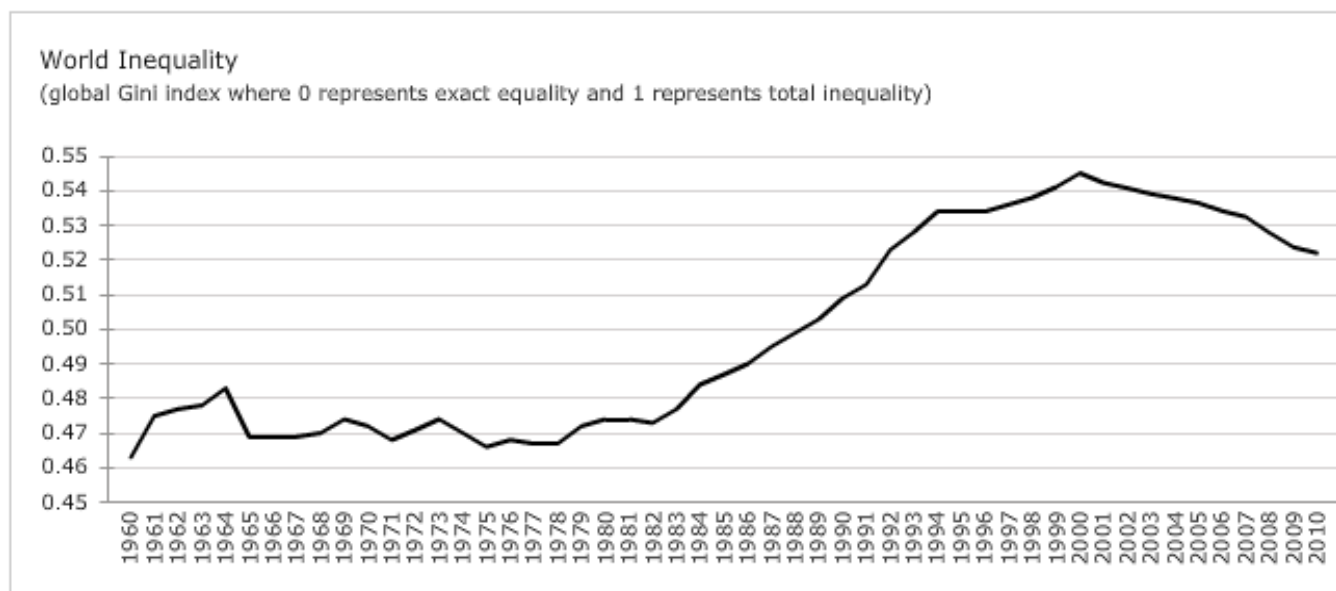
Source:The conference board of Canada (2013)

As the income inequality almost didn't changed from 1960 to 1980, it started to grow rapidly during 80's which signalled growing income inequality among countries. It was especially by poor performance of Post Soviet, Latin American and African countries during 1980's and partly 1990's. After the new millenium, inequality has been declining due to increased growth of mentioned regions of South America, African and Post Soviet Europe. Despite of 2000's

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[16] THE CONFERENCE BOARD OF CANADA (2013)

inequality fall, the Gini coefficient in 2010 remained higher than in 1970's. The explanations for this fact are two: market forces and institutional forces.

Market forces, mainly technical change (which have been always skill biased) and increased globalization , have always created a rising demand for highly skilled labour. As developed countries nowadays import more low-skilled-intensive goods mostly from developing countries and export more skills-intensive goods, jobs in low-skilled industries in developing countries are lost in those developed countries (where are they demanded). This fact causes that even if there are skilled workers in developing countries, they usually go to developed countries where their high skill is demanded.

Institutional forces, as an alternative explanation represent the factors like stagnating minimal wages (which have not been growing appriately according to inflation rate), declines in uniozation , deregulation and national policies favoring interests of wealthy people and those factors contributed to increase of inequality generally. Supporters of this theory state that the market economy is a social construct which is created to serve people so we can't blame inequality on market forces but rather instutional forces which are responsible for its functioning.[17]

The next calculation shows the world Gini coefficient but this time, it is concerning countries' population size. This means that countries with large populations have a larger impact on the Gini coefficient than do countries with smaller populations. The chart bellow compares the population-weightened Gini coefficient (red line) with the unweightened one from the previous chart (black line).

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[17] THE CONFERENCE BOARD OF CANADA (2013)

Figure 8: World inequality among countries concerning their population sizes

World Inequality
(global Gini index where 0 represents exact equality and 1 represents total inequality)

● Population weighted   ● Population unweighted
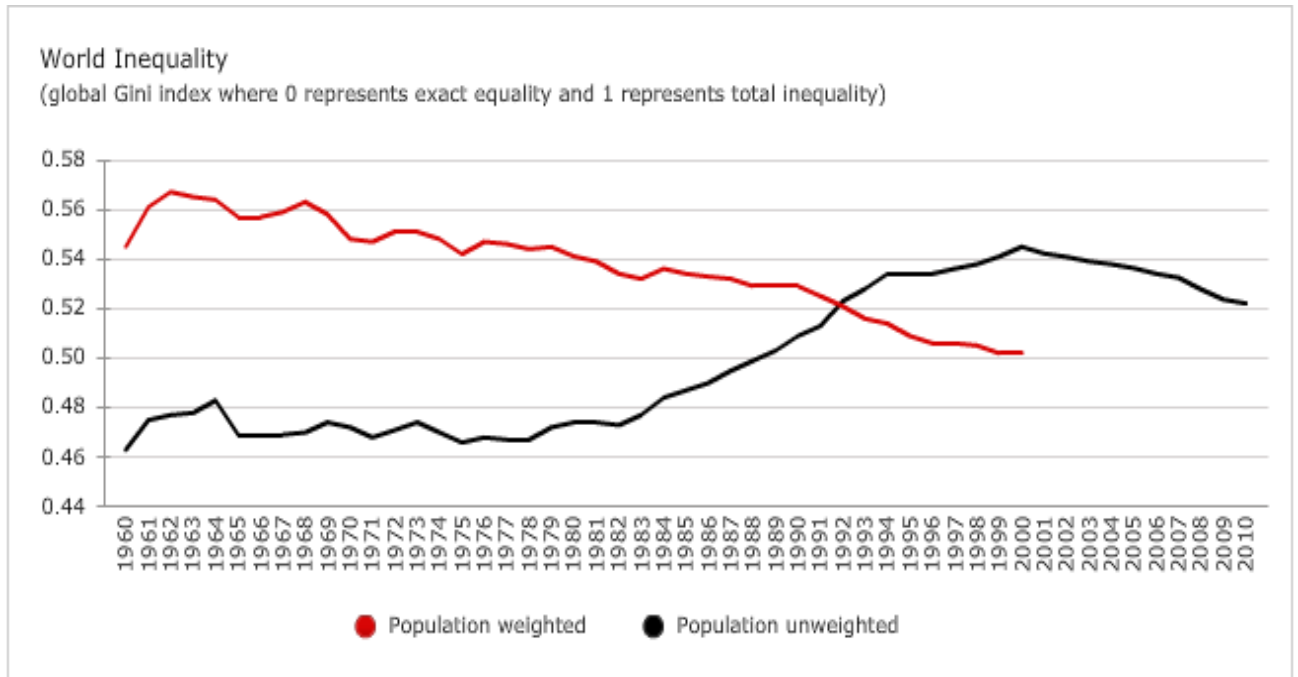
Source: The conference board of Canada (2013)

This weighted world Gini index declines almost consistently from 1962 onward. This is mainly due to the phenomenal economic growth in China and India relative to richer countries. Because China and India together account for over one-third of the world's population, these two countries have a very strong impact on the population-weighted Gini results. But if China and India are removed from the calculation, the population-weighted Gini index trends upward after 1982 (as does the unweighted Gini index), meaning that overall income inequality is increasing in the rest of the world.[18][19]

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[18] THE CONFERENCE BOARD OF CANADA (2013)

[19] OECD StatExtracts: Inequality and Poverty (2013)

3.3.4 The income inequality within a country

Income inequality within a country, i.e. among the particular classes of its inhabitans has always been here. At the end of 19th century, the modern era of capitalism has started and it was also infamous for its unequality. Enterpreneurs and investors accumulated wealth and focused huge incomes while there were masses of factory or field workers who could barely live on. *" The rising gap between rich and poor (and the fear of socialist revolution) spawned a wave of reforms, from Theodore Roosevelt's trust-busting to Lloyd George's People's Budget. Governments promoted competition, introduced progressive taxation and wove the first threads of a social safety net. The aim of this new "Progressive era", as it was known in America, was to make society fairer without reducing its entrepreneurial vim."*
(THE ECONOMIST, 2013)

The forces of globalisation and technical innovations in the contemporary age have narrowed inequality globally, as poorer countries catch up with richer ones. On the other side, income gaps within many coutries have widened. More than 60% of the world's people live in countries where income disparities have risen since1980, often to a startling degree. A typical example is the situation in USA. The share of national incime going to the top 0.01% has risen from just over 1% in 1980 to almost 5% now – an even bigger slice than top 0.01% got in the Gilded Age at the end of 19th century. As a slight measure of inequality might be good for an economy (it incite people to work hard and take risks and rewards the talented ones who drive the economic progress) economic inequality in a high measure is contraproductive and bad for growth. For example in China credit is siphoned to state-owned enterprises and well connected insiders; the elite also gain from a string of monopolies while the majority of "common people" there live in relative poverty. Social mobility in America, i.e. the mobility among classes is lower than in most European countries. Many countries, including Britain, Canada, China, India and even egalitarian Sweden, have seen a rise in the share of national income taken by the top 1%. The numbers of the ultra-wealthy have soared around the globe. According to *Forbes* magazine's rich list, America has some 421 billionaires, Russia 96, China 95 and India 48. The world's richest man is a Mexican (Carlos Slim, worth some $69 billion). The world's largest new house belongs to an Indian. Mukesh Ambani's 27-storey skyscraper in Mumbai occupies 400,000 square feet, making it 1,300 times bigger than the average shack in the slums that surround it.The level of inequality differs widely around the world. Emerging economies are more unequal than rich ones. The widening of income gaps is

a reversal of the pattern in much of the 20th century, when inequality narrowed in many countries. That narrowing seemed so inevitable that Simon Kuznets, a Belarusian-born Harvard economist, in 1955 famously described the relationship between inequality and prosperity as an upside-down U. According to the "Kuznets curve", inequality rises in the early stages of industrialisation as people leave the land, become more productive and earn more in factories. Once industrialisation is complete and better-educated citizens demand redistribution from their government, it declines again.[20][21]

Figure 8: The Kuznets curve describing social inequality development
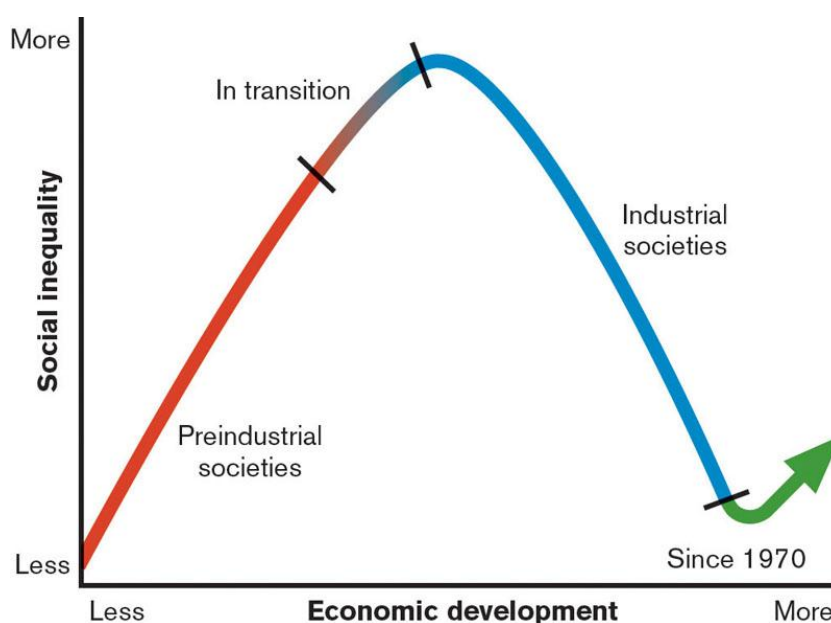
Source: W.W. Norton Company

Until 1980 this prediction appeared to have been vindicated. But the past 30 years have put paid to the Kuznets curve, at least in advanced economies. These days the inverted U has turned into something closer to an italicised *N*, with the final stroke pointing menacingly upwards. This means that post modern societies have tend to have increasing income inequality again and differences between particular social classes are on a rising trend.[22]

Growing income inequality within most of the OECD countries in past 30 years was confirmed in various censes. Gini coefficient stood an average of 0.29 in OECD countries in

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[20] THE ECONOMIST (2013)
[21] MANKIW (2012)
[22] THE ECONOMIST (2013)

the mid-1980s but by the late 2000s, it had increased by almost 10% to 0.316. It rose in 17 out of 22 OECD countries for which long-term data have been available. In some countries such as Germany, New Zealand, Sweden or USA, it has increased by more than 4 percentage points. Income inequality followed different patterns across the OECD countries. It started to increase in early 1980s in UK, USA and Israel. Since the late 1980s, the increase in income inequality became more widespread. Since the 2000s, income inequality has been rising not only in traditionaly high-inequality countries like USA but also for egalitarian countries with, so far low inequality like Germany, Sweden, Denmark where inequality grew more than anywhere else in the 2000s. The 2008 OECD report *Growing Unequal?* highlighted those changes in inequality and summed causes such as ageing population, changes on labour market and decreasing effectivity of stabilizating mechanisms such as income taxes and cash transfers.[23]

Figure 9: Income inequality increased in most OECD countries
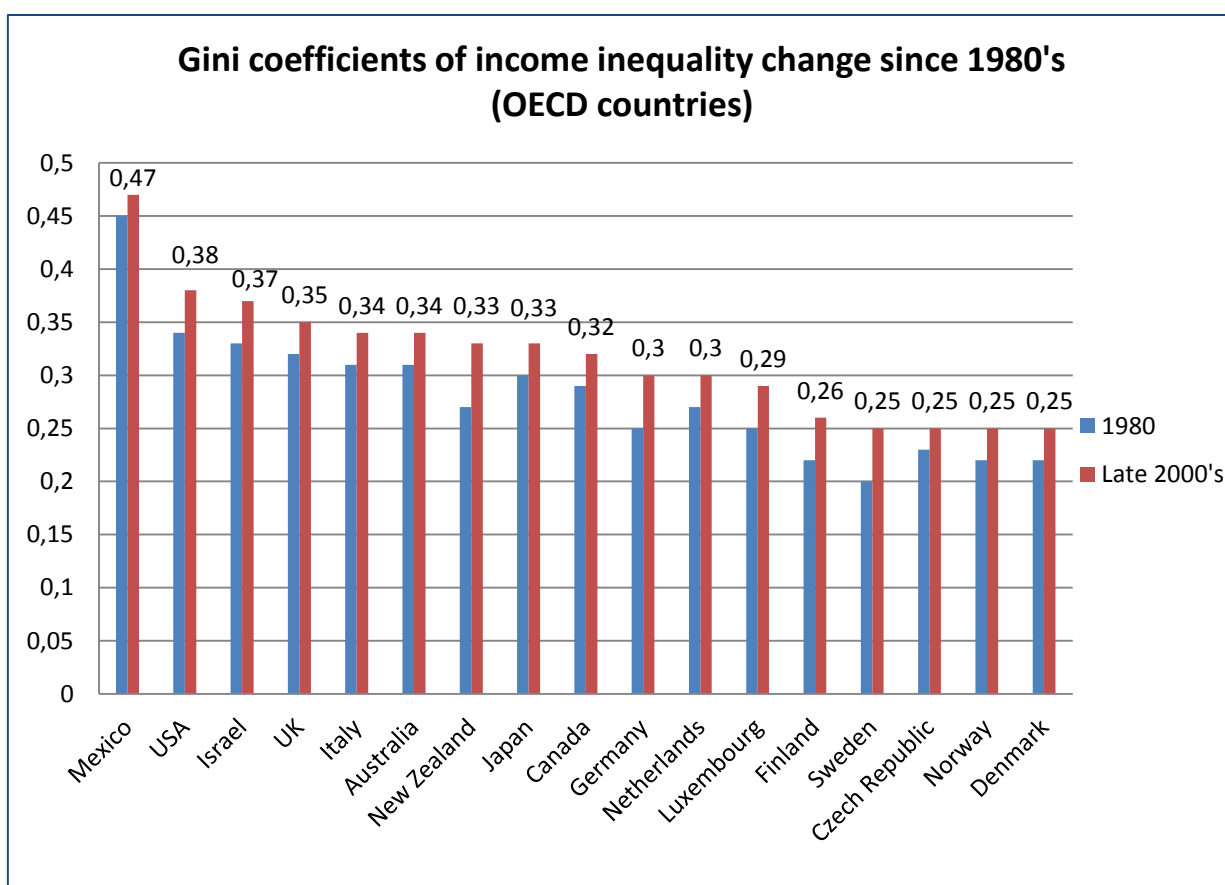
Source: OECD Database on Household Income Distribution and Poverty

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[23] OECD (2011)

3.4 Factors causing economic inequality

There are many reasons for economic inequality within states and societies. For example, recent growth in overall income inequality in developed countries has been driven mostly by increasing salaries inequality but beside of this, there are other factors which are thought to impact inequality. A fundamental factor of economic inequality is surely a difference in skills and talents of every individual or so called **"natural inequality**."Every individual is born with a certain talents which are somehow developed during his/her life and it is logical that the ones who are more capable rather tend to earn higher incomes. It is not only their mental or physical skills are better but also by the fact that they can manage and use their incomes more effectively. Apart from this factor, there are also external factors mentioned bellow.

An mportant factor influencing the economic inequality is**the determination of wages and salaries** on labour market. Different types of work have different supply and demand plus there is imperfect competition and opportunities to acquire needed education or skills is therefore are also unequal. In capitalist system, salaries and wages are not controlled by organizations, or government but rather by the market.A job where there are many workers willing to work for a large amount of time is highly supplied and if requires just a little work (low demand) will always result in a low wage for that job. On the other side if there is a job where there are just a few capable or willing workers (low supply) and large need for the positions (high demand), it will result in high wages for that job which byl be driven up by the competition between employers for those employees. Thanks to this fact, the wages are polarized and there could exist vast differences in wages between certain job positions. This of course means a lot potential work which could be done by governments to correct these imperfections and market failures. Market should be also tempered to make sure it works for the benefit of as much citizens as it could do.

Tax systemplays also a big part in the economic inequality and income distribution. A progressive tax makes the tax rate increase as the taxable base amount increases. The level of top tax rate will have a direct impact on the level of inequality within a society, either increasing it or decreasing it, provided that income does not change as a result of the change in tax regime. Logically, a steeper progressive tax results in a more equal distribution of income across the citizens of particular country. That's why there are two important Gini indexes – the one before taxation and another one after taxation, comparing those two

indicators, we can see the real effect of particular taxation. Countries with the policy of free market and right wing governmental programmes tend to impose low taxes which have logically lower effect on income inequality (for example UK, New Zealand or Singapore). On the other hand, left wing governments impose high and progressive taxes which results in more frequent redistribution of income and assets and this lower the differences in income, therefore income inequality (a good example of this is Belgium or Scandinavian countries).

Figure 10: Influence of taxation on income inequality in some OECD countries
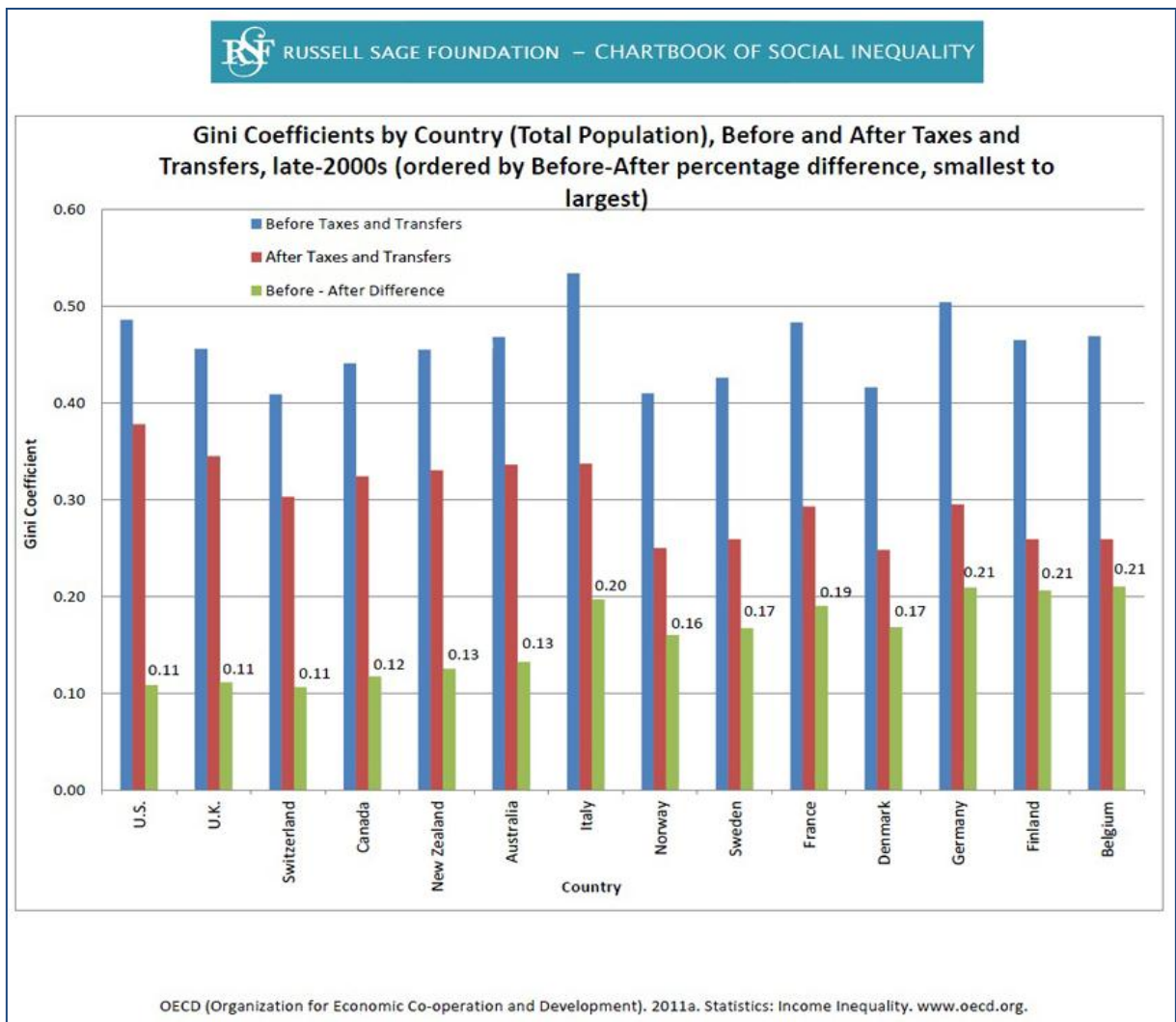
In many countries (even in the developedones), there is a significant**gender** income gap which favors males on the labour market. There are several factors which contribute to this gap. One of them is discrimination an beliefs that women are not as productive as men (which is partly true in considering some of the professions due to different physical proportions). Moreover, women are more likely to slow their career by pregnancy and staying with children

during the maternity leave. Some studies also state that women consider factors other than payment when looking for work and might be less willing to travel or relocate. For example, in all OECD countries median wages for men are higher than those for women. The average difference is more than 15% and exceeds 20% in several countries. Male median earnings are more than 20% higher than those of women in Korea, Japan, Germany, Switzerland, Canada and the United States. These are median earnings in full-time jobs and so are not affected by widespread preference for part-time work by women (though men tend to work longer hours than women. At the other end of the scale, the gender gap is less than 12% in New Zealand, Belgium, Poland, Greece and France. In the chart bellow (which is focused on median earnings), we can however see that in most of the cases, the gap between genders' salaries has decreased during last decade which is a positive development for those who support the idea of gender equality. Czech Republic gender income gap which was more than 20% at the beginning of the new millenium has recently dropped to approximately18% which is still higher than OECD average which was approximately 16% in 2010. Apart from gender discrimination, there are also other closely related attributes which are causing income inequality such as race, ethnic group etc.

Figure 11: Gender gap in median earningsof full-time employees in OECD countries in 2000, 2007, 2010
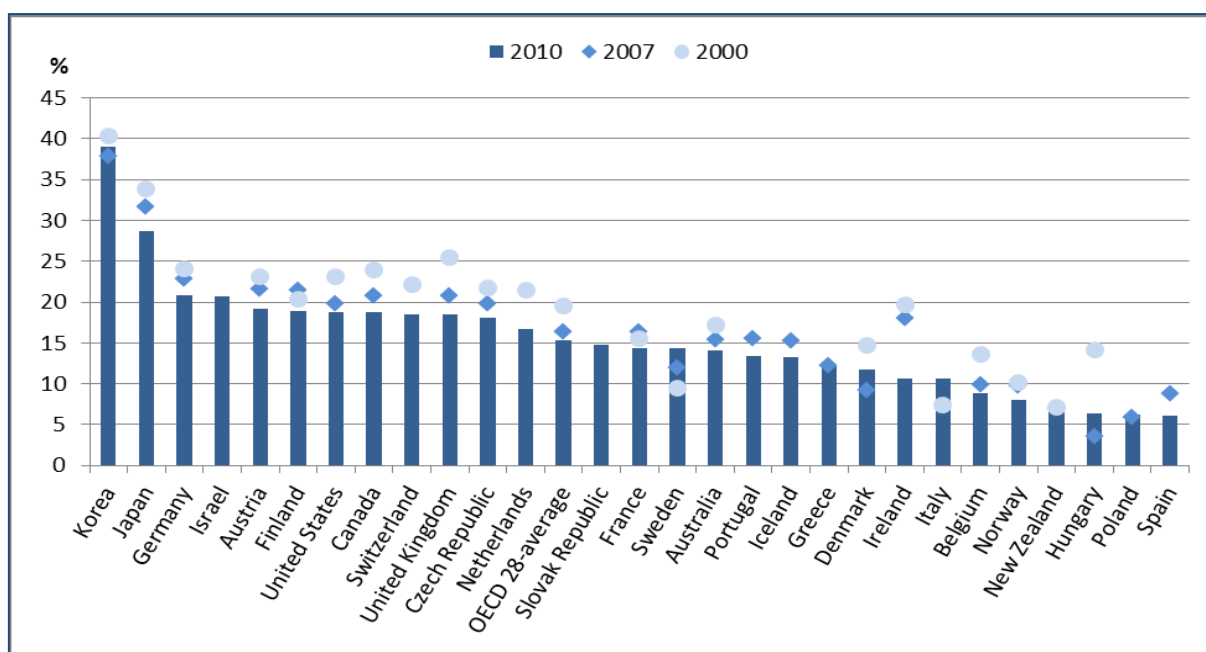
Source: OECD StatExtracts: Inequality and Poverty

Nepotism is also influential factor causing economic inequality in many countries. It is favoritism granted in politics and business to relatives and friends regardless of their skills and merit. Without appropriate qualifications and talents, some people are offered signficant positions or advance in their carreers and it is thanks to somebody from usually higher position who favors them. This occurs because of some personal relations between involved people (they are usually relatives, friends, lovers etc.)

Education and its accessibility have become especially during last decades a significant factor causing income inequality. Therefore, variation in individuals' access to education is a very important factor in the creation of inequality. Especially in an area where there is a high demand for workers, education creates high wages for those with it. A result for those who are unable to afford an education, or choose not to pursue optional education, is generally that they receive much lower wages. The implication of this is that a lack of education leads directly to lower incomes. From a historical point of view, there have been several significant periods or events which contributed to development and today's state of education. One of them was the mass high school education movement from 1910 to 1940, where there was a great increase in skilled workers, which led to a decrease in the price of skilled labor. A recent phenomenon in developed countries is such that the percentage representation of tertiary educated persons increased as the university education has been becoming more and more popular because people has started to see it as a promise of higher earnings and a good investition into future life. In many developed countries, a high proportion of the population (sometimes up to 50%), enter higher education at some period in their lives. Higher education is therefore very important to national economies mainly as a significant industry in its own right and also as a source of trained and educated people for the rest of the economy. Logically, college educated workers command a significant wage premium and are much less likely to become unemployed than less educated workers.[24]

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[24] MANKIW (2012)

3.5 Education and its significance nowadays

As I mentioned in the chapter above, education has become a one of the most decisive and most determinant factors for individuals income. It gives us not only a good feeling but also a better chance to succeed on the labour market. Education is also one of the best tools for fight with poverty. With the growing education level the incomes also increase and new technologies are implemented faster as well, therefore the economic growth increases as well. Available and good-quality education is one of the basic assumptions of positive economic, political and also social development. More educated people tend to obtain needed knowledge and skills and be rewarded better than less educated people. [25]

3.5.1 Division of education in the Czech Republic

Speaking of *formal education* which is based on the systems of schools and institutions it is generally divided into several categories. The first level is **preschooleducation** which is important because it provides a child the edge in competitive society and education climate. It also brings a child into social environment and contact with his/her peers which is essential for later stages of development. **Primary** (also known as elementary) **education** is conducted in different ways, depending on particular country. In general, it consist of the first eight or nine years of formal, structured education. Primaryeducation is compulsory in all developed countries and in the Czech Republic for example, it consists of 9 of formal education and lasts until the age of 15. In the most contemporary educational systems today, **secondary education** consist of the formal education that occurs during adolescent years. It is characterized as a transition from compulsory primary education for minors , to the optional and selective tertiary, or higher education for young adults. Depending on the system, schools for this period vary and specialize and they can be called high schools, gymnasiums, lyceums or middle schools. Secondary education in the Czech Republic for example, consists of usually of 4 years of studies (with some exceptions) which are ended by graduation or 3 years of studies which are concluded by special certificate examinations.[26]

Tertiary (also known as third-level or higher) educationis final stage of formal education and consists of studies in universities, academies and tertiary institutes. Recently, there has

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[25] PETRÍKOVIČOVÁ (2010)
[26] SMONOVÁ (2003)

been a great dispute in many countries about the access and availability to higher education for individuals from various social classes which will be engaged later in this thesis. Tertiary education is an educational level that follows a competition of a school providing secondary education (as mentioned above) and completion of a tertiary education program of study generally results in the awarding of academic defrees, diplomas or certificates. It includes teaching, research, exacting applied work and highly specialized studies. It is expected that graduates from this level of education become experts in their particular occupation and they will contribute the society on top level. However, in the recent situation often occurs that a lot of graduates are not able to find a job, especially in developed countries.[27]

The Figure 15 bellow graphically depicts schooling system in the Czech Republic.

Figure 15: Schooling system in the Czech Republic
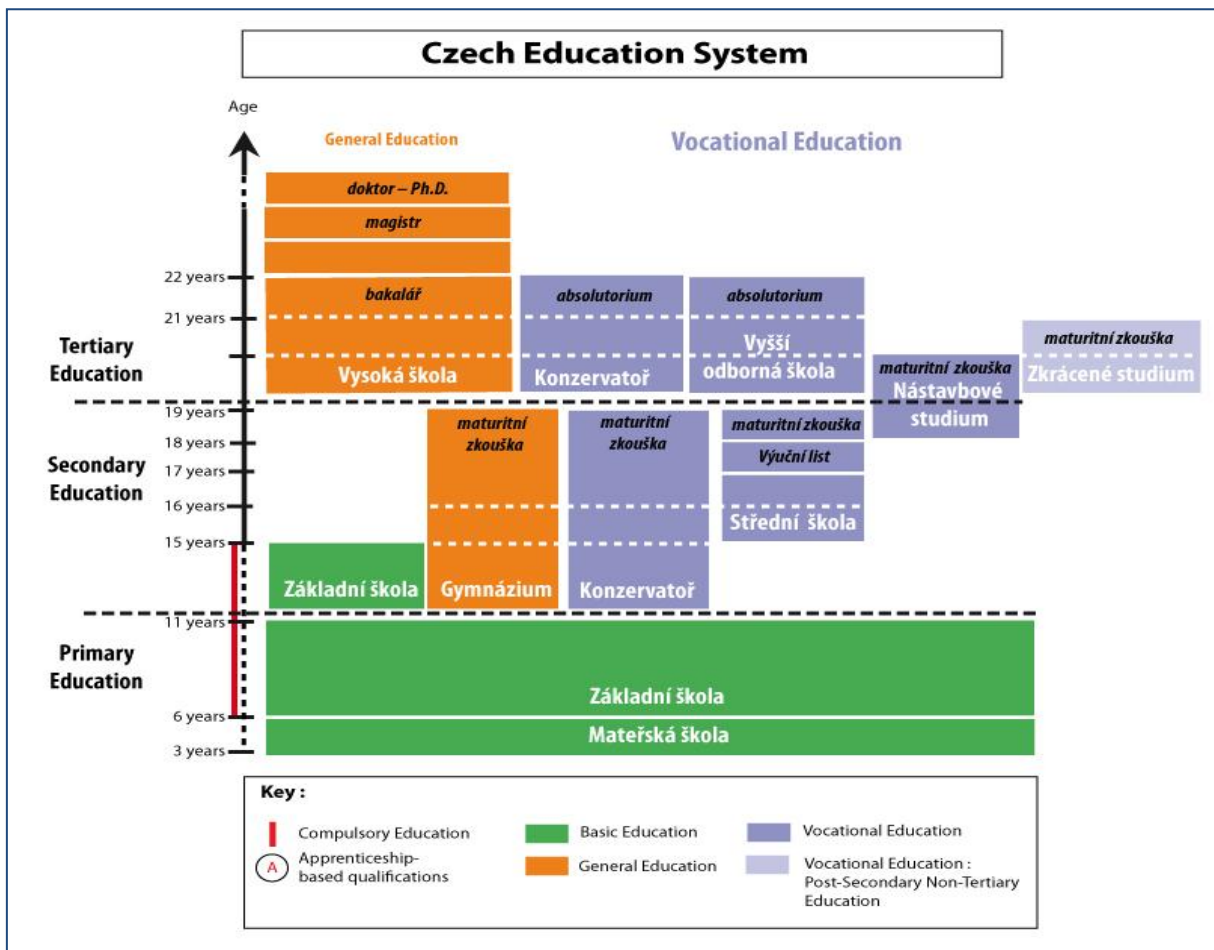
Source: Czech Statistical Office and Institute for Information on Education

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[27] PETRÍKOVIČOVÁ (2010)

The table 1 consists of glossary which explains some Czech terms in education and shows their English translated equivalent.

Table 1: Glossary of some significant terms in Czech education

Czech term	English equivalent
Mateřská škola	pre-primary education
Základní škola	primary and lower secondary school
Gymnázium:	mainstream secondary school
Konzervatoře	conservatoire – secondary and higher education in the field of arts
Střední škola	secondary school combining mainstream education, theoretical vocational classes and practical training
Vyšši odborná škola	higher vocational education
Vysoká škola	university or non-university higher education institutes
Maturitní zkouška	: final examination completing 4 years of upper secondary education, must be passed to go on to higher education
Absolutorium	final examination taken after completing higher technical education lasting 2 to 3½ years at a *vyšši odborna škola*, or 6 to 8 years at the *konzervatoř* (conservatoire).
Diplomovaný specialista	Title (specialist with a diploma) obtained on completing studies at a*vyšší odborná škola*

Bakalář	bachelor's degree validating 3 years of university studies
Magistr	master's degree validating 5 years of university studies

Source: Institute for Information on Education, own processing

One of the substantial differences between Czech system and other developed countries systems is age. Most of the students from developed countries finish their Bachelor and thereafter Master degree one or two years earlier than their Czech colleagues at the age of 20 or 21 respectivelly 22 or 23. Czech students usually finishe their Bachelor degree at the age of 22 and Master degree at the age of 24. This is due to fact the Czech elementary and high schools take more years. This set the Czech Republic graduates to a slight disadvantage as they are at best one or two years older than their other colleagues but with theoretically the same qualification. More differences and uniquenesses will be described in following chapters.[28]

3.5.2 Recent and future trends in higher education[29]

At the end of 20th century when advanced societies started to transform from industrial to knowledge and information societies, many changes have came up in various fields of economy end society. Having a knowledge is becoming a primary production factor in the international competition of locations. Alongside new fields of knowledge (e.g. nano- and bio-technology) and new social issues (globalisation, environment, employment, demographics, migration, democracy, gender mainstreaming), application-oriented research within existing industrial structures will remain an essential focus. Participation in tertiary education will increase further. New information technologies could open the doors to new knowledge for a wider audience, if the current social stratification of access and usage patterns could be overcome. The non-university sector of education and other providers of lifelong learning in continuous education will equally gain heightened importance. The following trends have been observed in higher education in recent years:

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[28] PETRÍKOVIČOVÁ (2010)
[29] WITTENBERG (2012)

Expansion - The share of highly-qualified persons is increasing. This is a world-wide trend not limited to economically advanced societies. Changing employment structures, increasing expectations of educational participation by the citizenry at large, and the academization of a growing number of professions, promote the expansion of higher education. Participation rates of over 50% for each age cohort in the tertiary sector, which are commonly recorded as the OECD average, are becoming a benchmark for all European countries.

Differentiation - Apart from providing scientific training in a given subject,study programmes must meet differentiated social requirements and convey technical skills which higher education has not offered so far. Concurrently, higher education institutions are to respond to the differentiating demand for higher education by offering course programmes beyond the mainstream.

Greater flexibility - The disappearance of traditional professional patterns and growing individualisation call for a multiplication of study options. Individual combinations of studies should be allowed; students should acquire self-organisation and self-upgrading skills.

Quality orientation - Expansion, differentiation, and greater flexibility presuppose and bring about novel approaches to quality assurance in higher education. The need to generate general social and political acceptance for higher education services, stakeholder expectations, supply-driven control of demand for higher education, the requirements of curricular development, as well as performance assessment of teaching-learning processes result in new forms of quality assurance, quality documentation, and evaluation being implemented.

Standardisation- The above mentioned developments are taking place in the context of the current European-wide introduction of modular and tiered study programmes that was prompted by the Bologna process which is a set of agreements between European countries designed to ensure comparability in the standards and quality of higher education qualifications.

Current study reforms are targeted at these global developments, relating specifically to the contents. The following areas of higher education are concerned:

Employability - means to ensure a stronger link between higher education and practice.

Internationalisation- strategies are designed to promote international mobility and convey intercultural skills.

Integrating sustainability - Societies which are geared to performance and growth need to be oriented towards sustainability in order to safeguard the very bases of their existence.

Living internationality - Internationality is taught in the context of globalisation, Europeanization and regionalisation.

Acting with a view to quality and competitiveness - Trends which are making themselves felt already today will be prolonged in a quest for quality and competitiveness.
There is a widespread consensus that higher education in the future will need forwards-looking teaching and learning approaches and techniques. Such forms of teaching and learning can be following:

- On an elementary, technical level, these are first and foremost new teaching and learning aids, such as the use of media (transparencies, posters, flipcharts) to visualise interrelations, and beamers including related software applications, electronic media for large-scaled projections and video conferencing, digital libraries for further learning in „classical" media such as books or magazines without the need for media conversion
- Exemplary learning by experience, i.e. forms of knowledge transmission which consist in effective guidance towards a self-reliant acquisition of knowledge and rational and critical handling of information using simulation and exercise studies in lecture, project work and project-oriented learning (POL) to replace structured ex-cathedra lecturing;[30][31]

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[30] STRAKOVA(2010)
[31] WITTENBERG (2012)

3.6   The optimal level of inequality

As mentioned in previous chapters there have been many disputes what level of inequality is the best for the welfare of state. Some economists think of economic inequality as a natural part of every system and consider it beneficial. Others deem it harmful for the state and prefer egalitarianism. It is very difficult to say what exact level of inequality is the best for state. We certainly cannot simply say whether it, in its very nature, is simply good or bad, but we could try to estimate its impact on the development of an economy.[32]

3.6.1 Extreme egalitarianism

Egalitarianism is state when everybody has the same and can't have more. It is not very useful for economy. Some political schools and parties (extreme left wing, Communists) strive for extreme egalitarianism and consider it as the best form of functional state. But this demotivates people to differ, to increase their human capital and to work for better results. This implies that people are being systematically dinscouraged from higher productivity (so called incentive trap) and it is also associated with free rider problem (which means that everybody wants to be better off but refuses to be active in accomplishing that goal wait for somebody else finishes their work). The operating costs of resources redistribution increase as does corruption, because to maintain same income for everybody is done by huge redistribution which is ideal condition for the rise of corruption. Those factors are very negative for economic growth and also growth potential of the country. On the other side, the low classes of the society are the best off they could ever been and they don't need to worry about anything – everybody has his guarantees. We know even from the Czech history in20th century, that forcible extreme egalitarianism and huge redistribution doesn't work well.[33]

3.6.2 Extreme inequality

Extreme inequalityis state when most of the factors of production are owned by a very small group of people. Total inequality even means that everything is owned by one person (the value of Gini coefficient in this case would be 1) but it is unrealistic and not seen in real world (unlike extreme inequality which exists). The increased feeling of inequity of the people in low classes generates social tensions and a very bad climate in the society which could lead to

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[32] OECD (2011)
[33] MANKIW (2012)

riots, political instability and other unwanted events. Extreme inequality could exacerbate the inequaity and feeling of injustice into much more serious hatred.[34]

Furthermore, inequality is often considered to be related to crime as it is meant to partially originate in the envy of the poorer classes. Based on the data from urban countries, there has been observed a strong correlation between high inequality and violent crime (Kelly, 2000). The report also suggests that crime is motivated not only by material needs but also by envy which has grown into hatred. Poor classes are even demotivated to invest in their education and capital and resign from effort to struggle with their destiny when higher class seems to be too far or out of reach .[35]

3.6.3 What is the optimal level of inequality?

The main question is: What is the optimal level of inequality that positively stimulates growth but at the same time does not evoke social problems? Public policies managed by government should find this desirable level of inequality. This level is theoretically pictured bellow in an Equality-Growth chart. Optimal Gini-coefficient (which indicates the measure of inequality) is at the peak of the curve.

Figure 12: Equality and growth: a nonlinear relationship
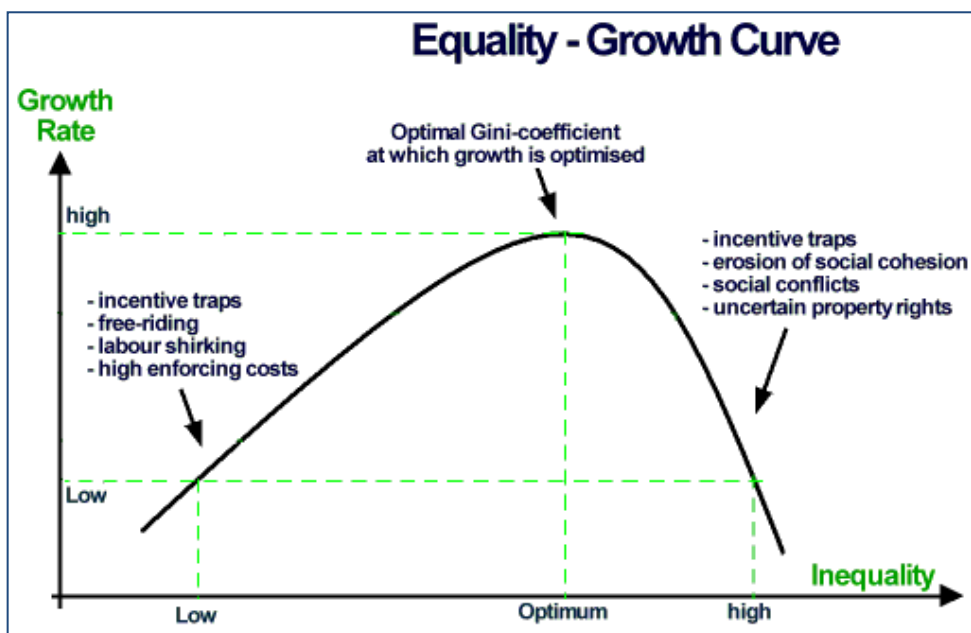
Source: Work and wealth for all organization

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[34] KELLY (2000)
[35] MANKIW(2012)

Same as about Laffer-curve, it is impossible to express exactly the value. According to various economists, desired level can be covered within an intervel of the Gini coefficient from 0.25 which is the value for Nordic countries or the Czech Republic, to 0.4 which is the value of USA.[36]

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[36] KELLY (2000)

3.7 Education and its realtionship wih economic inequality

Education is a symbolic capital which an individual gains during his/her life. After gradution from highschool, the necessity continual education accompanies us during the rest of our carrer life. We educate ourselves in order to improve our human capital and skills and our price on the labour market. With the acquisition of new knowledge and skills, our position in the society becomes stronger and our potentional for better social status is higher. Economic and social inequalities have always existed within all societies throughout the entire human history. Those inequalities are but influenced by several variables or factors. Concerning postmodern euroatlantic society (which are all developed countries) the significance of education as a factor influencing economic inequality has grown in recent years.[37,38]

As mentioned above, education is one of the keys to higher social status, demand for individuals skills and better job position. The government should try to make education available and accessible for as many citizens as it could be. But there are always going to be some obstacles which will impede people from certain groups to access this education. Mainly speaking about tertiary education which is the most problematic in terms of access as it is also most financially expensive, we should also consider earlier stages such as elementery and high schools where the children are divided into elite and non-elite groups and classes. These facts are not only related to different level of inteligence, skills and talents of each child but also with the family background which is one of the most crucial factors defining the child's future study path. According to the survey called "What the public think about educational inequalities" (Straková, 2010) the development of educational inequality in the Czech Republic will be increasing in following years. Differences in performances of various schools have also been observed as well so there are prestigious schools and then other less prestigious schools which also contribute to division and sorting of people into social classes. Czech public believe that with enough skills and effort, practically anyone can get particular education but also admit that students with vinactive and uninterested or bad family background have lesser chance to be successful. In terms of tertiary education, family incomes and wealth are main decisive factors as not everyone can afford to pay costs related studying universities (not speaking of private universities which have high tuition fees and

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[37]PETRIKOVICOVA(2010)
[38] STRAKOVA (2010)

often are adjusted only for rich people). Recent surveys has shown that in the society there still partly prevails the opinion that family background and status are important to reach a high-class education. However, there are exceptions in ambitious individuals who reached (despite their origin and all obstacles) their dreamed education and became successfull. But as the reached education and skills distinguished them from the rest of the society with not such a good education, this evokes vicious circle of economic and social inequality based on different access and level of education.[39,40]

3.7.1 Education as a determinant of income inequality

According to OECD censuses in 2008 and 2011, education is one of the most decisive factors which fundamentally influence income distribution in society and could be a stimulus for growth or decline of income inequality. For better idea of the significance of this relationship, we can see it in the table bellow. This table shows what percentage share of inhabitans of the United States of America with particular educational attainment reaches particular salaries. From the inequality point of view, we can see a significant difference mainly between high school graduates and university graduates. While only 1.4% highschool gratuates reaches the top salary group, it is 10% from university graduates group with bachelor diploma.

Table 2: Relationship between educational attainment and year salary in the USA in 21.st century

Education	Share of people with salary bigger than:				
	$40 000	$50 000	$60 000	$75 000	$100 000
Elementary	4	2.3	1.4	0.4	0.4
Highschool (M)	8.5	5	2.8	1.3	0.6
Highschool (D)	19.3	11.7	7.2	3.5	1.4
Bachelor	48.6	37.9	29	19.3	10.6
Master	59.2	48.9	38.2	26.9	15
Proressional	70.3	64.3	58	48.1	38
Doctor	67.5	62.1	54.7	41.8	28

Source: United States Census Bureau (2013)

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[39] PETRÍKOVIČOVÁ (2010)
[40] VAN DIJK (2005)

Education as one of main determinants of income inequality has been studied several times. While it was confirmed that it has a significant influence on income inequality, opinions about direction of the relationship differ. Past empirical estimates of the effects of educational and economic variables have been contradictory or inconclusive in many cases and complex relationships have been neglected.

Most studies came to a conclusion that there is a **negative** relationship between income inequality and country's average or median educational attainment(De Gregorio, 2002; Park, 1996; Ram, 1984). But there were also some studies which have found a **positive** correlation between the two factors when wealth inequality is also included (Deininger and Squire, 1998). Checchi (2002) concluded in his research that when distribution of educational attainment was accounted for, the relationship between attainment and income inequality was actually U-shaped. Direct relationship between educational diversity (or unequality) and income inequality has also shown mixed results. Those results and figures full of disputes are then inconclusive about direction of the relationship and there is a need for further studies. What is but generally agreed by practically everybody is the fact that education attainment is one of the fundamental determinants of individuals rewards (as it's seen in table 2).

3.7.2 Role of globalization and its impact on education, other socioeconomic drivers and income inequality

As it was mentioned in chapter 3.5, globalization affect educational systems in most nations of the world. Changing policies in education may subsequently also influence societal factors such as income inequality. Along with changing education, globalisation also influences other socioeconomic drivers such as labour market. Over the past decades, OECD countries expecially went through significant structural changes, driven by their closer integration into global economy and to swift technological progress. Those changes brought higly skilled workers greater rewards than low-skilled ones and therefore affected the way earnings from work were ditributed. Thanks to rapid rise in this integration and labour market demanding higly skilled workers, technological progress which reduced a cost of manual workers on

European and Western market, the gap between higly skilled workers and low skilled and manual workers has increased since this process has started (in 1980s). [41]

In terms of education, globalisation has changed also a lot of things (especially since 1990s). Concerning generally increasing demands on workers in developed countries, education had to logically go the same direction – towards quality and high skill. That is one of the reasons why the cost of education in OECD countries have been continously rising which made especially higher education less accessible.[42] The chart bellow shows us a typical example of US rising education cost which went up a way faster then costs of other things. Since 1985, the college costs surged 500% in USA. It has generated a great demand for educational loans while threatening to make college unaffordable for domestic and international students and especially for students from non wealthy families.[43]

Figure 13: Rising costs of college education compared to cost of living and medical costs in USA
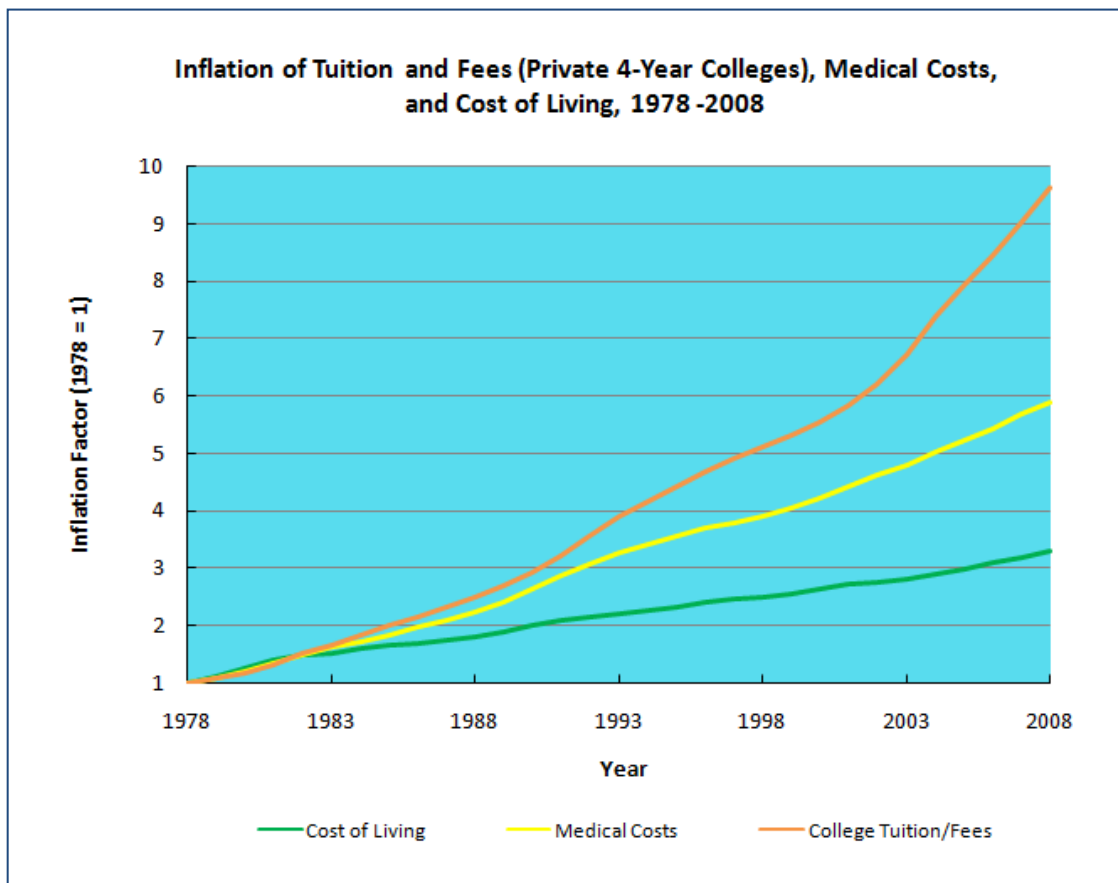
Source: OECD StatExtracts: Education

[41] OECD (2011)
[42]WITTENBERG (2012)
[43] JAMRISKO, KOLET (2013)

This rise in education costs has been of course worsening income inequality in the country by depriving those of less means of the schooling they need to advance. Students from lower income families are more likely to drop out of college to avoid debt or complications. This, together with the fact that the college fees are rising every year more and more all indirectly leads to favorism of students who can afford current fees without significant obstacles. Restricted acessibility of higher and especially college education only opens scissors of social inequality in the USA. Very similar situation has occured also in United Kingdom and some otherof the most developed OECD countries.[44]

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[44] JAMRISKO, KOLET (2013)

4. Practical part

4.1 Income inequality in the Czech Republic

The income inequality in the Czech Republic has been a stable phenomenon but from the international comparison's point of view, we classify it rather as egalitarian coutnry with rather equal income distribution. As we could see in figure 9 in chapter 2.3.4., The value of Gini coefficient for the Czech Republic is approximately 0.25 which is the same level as traditional egalitarian Nordic countries – Sweden, Norway, Denmark and Finland. Those countries together with the Czech Republic have had the lowest Gini coefficient values in the long-term.

Despite of those facts, income inequality in all OECD countries (with solitary exceptions of Turkey and Greece) increased during last three decades. Czech Republic (as other Post-Soviet Countries) has gone through fundamental transformation after the Velvet Revolution at the end of 1989. Communist party which was the only government party from 1948 to 1989 had a crucial influence on the Czech Republic's economy and on the income distribution as well.

Income inequality in the country that time was very low due to strongly left-wing policies imposed by government. After 1989, the country underwent a mass transformation from economic and social point of view as it changed from central planned system managed by totalitarian Communist party to free market economy and democratic government. These changes meant a lot also for income inequality point of view.

In the chart bellow, we can see the development of tha Gini coefficient value for the Czech Republice since the transformation after the Velvet Revolution until 2012. We can generally observe that income inequality according to this indicator has increased, not only because of release of artificial boundaries set by Communist party before 1989 but also because of other influences such as globalisation, changes in labour market etc. [45]

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[45] OECD (2012)

Figure 14: Gini coefficient (after taxes and transfer payments)development since transformation

Development of Gini coefficient in the Czech Republic since transformation in 1989
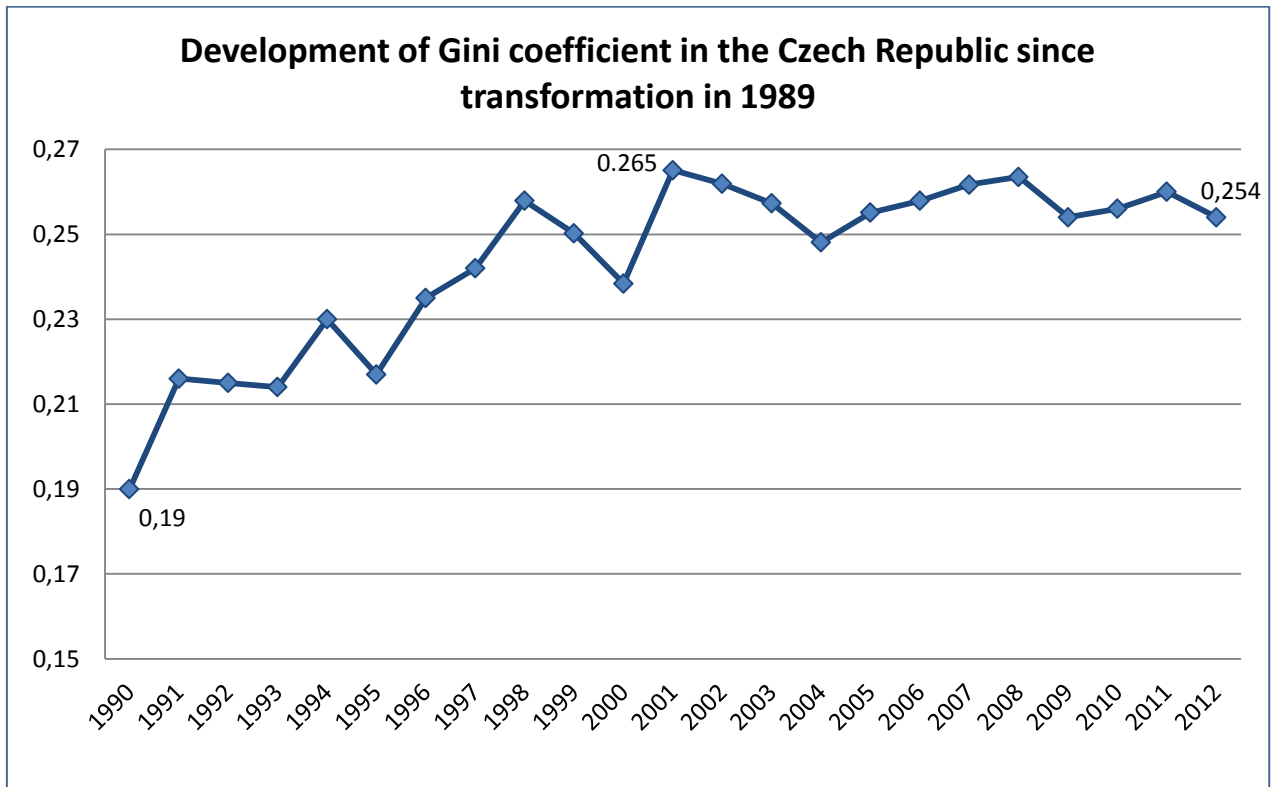
Source: OECD StatExtracts: Inequality and Poverty, Own processing (2012)

In the chart itself, we can observe that Gini coefficient increased rapidly from the beinning of 1990's from value 0.19 to approximately 0.25 in early 2000's whil it reached its peak in year 2001. Since 2000's it maintained high values around 0.25 and we could also see a slight fall in 2009 due to economics crisis while the last researched value for 2012 was 0.254.

4.2 Education in the Czech Republic

4.2.1 Profitability of educational attainment in the Czech Republic

Great influence of educational attainment was mentioned in literature review. Speaking mainly of tertiary and university education, its influence and significance on incomes and economic distribution were being repressed during the entire Communist era until 1989. Rapid increase in the education's demand after 1989 is caused (apart from other factors) by big changes in economic profitability of mainly especially education. Analysises which were undertook by Jiří Večerník have showed us that the influence of eduational attainment on individuals incomes increased by 100% between years 1988 and 1996. Comparing university education to lower forms of education, profitability of the first mentioned was 18% in 1988, 42% in 1996 and even 46% in 2002.[46]

Growing singificance of education and its profitability could be also observed from statistics from OECD database. Relative earning of tertiary educated person compared to non-tertiary educated in the Czech Republic was 183% in 2006. Those changes in education's profitability logically support increase of aspirations and ambitions. In the spring of 1989 before the fall of Communist regime, only 17% of pupils in 8th grades at elementary schools expressed they would like to reach university educaiton. In 2003, it was already 50% of 9th grade pupils.[47]

Figure 16 bellow depicts relative earnings of tertiary educated people in OECD countries. We can see that after Hungary, the Czech Republic with its relative earning 183% (of average salary) is the country with the highest profitability of education. That means that going to college pays off more than in other countries in the Czech Republic. Apart from this indicator the chart also shows the relative earning of people without upper secondary education (i.e. highschool education in the Czech Republic). The figure for this indicator is 74% of average salary which is relatively good.[48][49]

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[46] ISEA (2005)
[47] OECD (2009)
[48] MATĚJŮ (2005)
[49] OECD (2009)

Figure 16: Earnings by educational attainment in OECD countries (2006)

Relative earnings by educational attainment

ISCED 3/4 = 100

Legend:
- Below upper secondary
- Tertiary

Countries (x-axis): Hungary, Czech Republic, Portugal (2005), United States, Poland, Ireland (2004), Italy (2004), Germany, United Kingdom, Austria, Switzerland, Finland (2004), France, Netherlands (2002), Luxembourg (2002), Korea (2003), Canada (2005), Belgium (2005), Spain (2004), Australia (2005), Norway (2005), Sweden (2005), Denmark (2005), New Zealand

Source: OECD iLibrary(2006)

4.2.2 Enrolment of university students in the Czech Republic

As mentioned previously in the chapter 3.3, the significance of education since 1990's in the Czech Republic has been growing. Increased profitability of mainly tertiary education has evoked strong aspirations and subsequently demands in more people which has resulted in growing number of students in tertiary education as well. More and more high school students applies for universities every year and there has been a long term excess of demand over supply. This means despite of the costs which must be invested into tertiary education, including commuting, dormitory fees, tuition fees (at private universities), and all other fees plus opportunity costs of the time spent at the universities, young people in the Czech Republic still deem university education as a good profitable investment. The number of students enrolled at universities has increased dramatically since 1990's as we can see in the table bellow as well as the number of private schools which is a new trend which came from western developed countries. Concretely, the number of public universities has grown only

from 23 to 26 since 1990 to 2013 but the number of private schools has grown from 8 in 2001 to 44 in 2013. That gives us a total number of 72 universities in the Czech Republic nowadays.

Following chart depicts the development of number of students at the universities in the Czech Republic since 1990.Despite the higher number of private schools. The majority of the students is still in the public schools as we can see in the Figure 17 as well. So although there is a new trend of private schools, public schools play a dominant role in tertiary education.

Figure 17: Developemnt of the number of university students in the Czech Republic
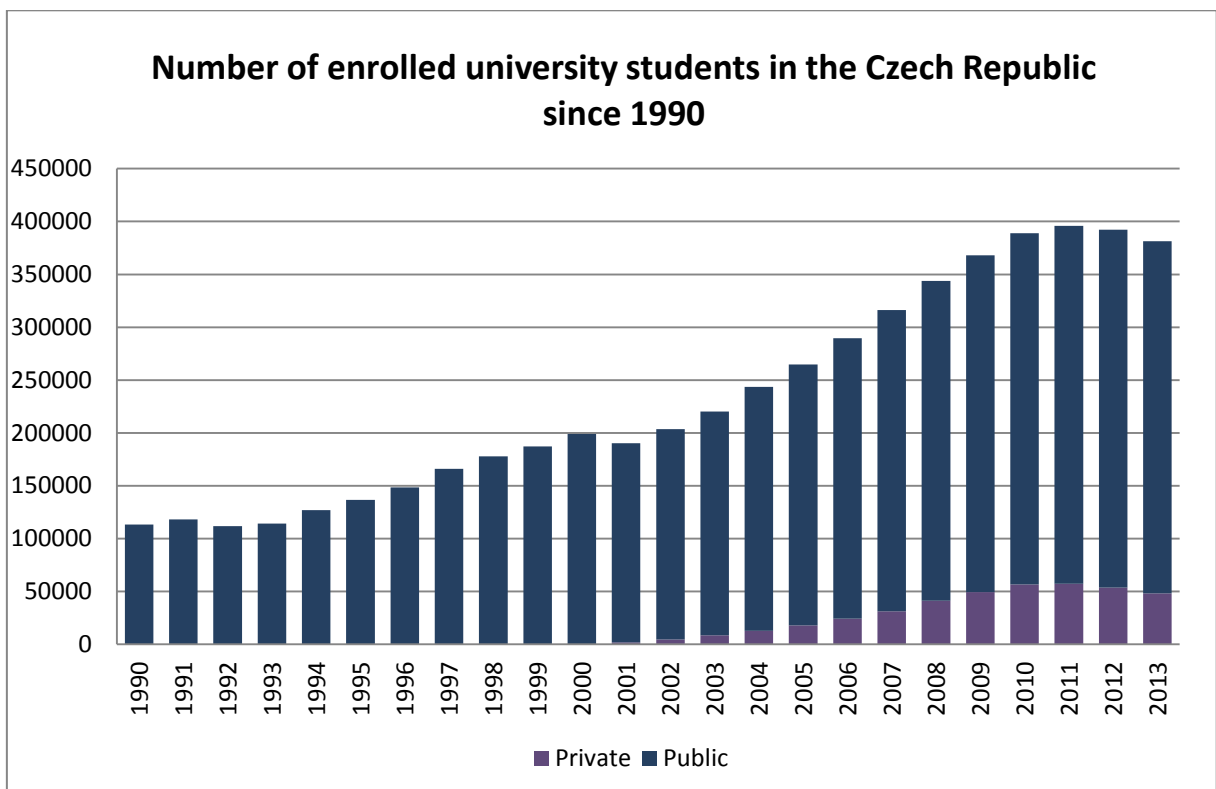
Soruce: Czech Statistical Office, Own processing (2013)

We could see that since 2011 when the university enrolment reached its peak of 338 660 students in total, the number slightly went down. The slight downfall in demand of university education was caused by several factors. Due to membership in European Union and rising globalization, the labour market has become a highly competitive place. Demands on applicants are much higher than in previous decade. Thus the number of tertiary educated people (from adult population) rose from 11% (in total count of 780 000) in 2000 to 18%%

(in total count of approximately 1 300 000) in 2013. The trend of rising enrloment especially since 2000's has logically then logicaly increased the total number of tertiary educated people. The development of the number of tertiary educated people is seen in the chart bellow. [50]

Figure 18: Developemnt of the number of tertiary educated people in the Czech Republic since 1990
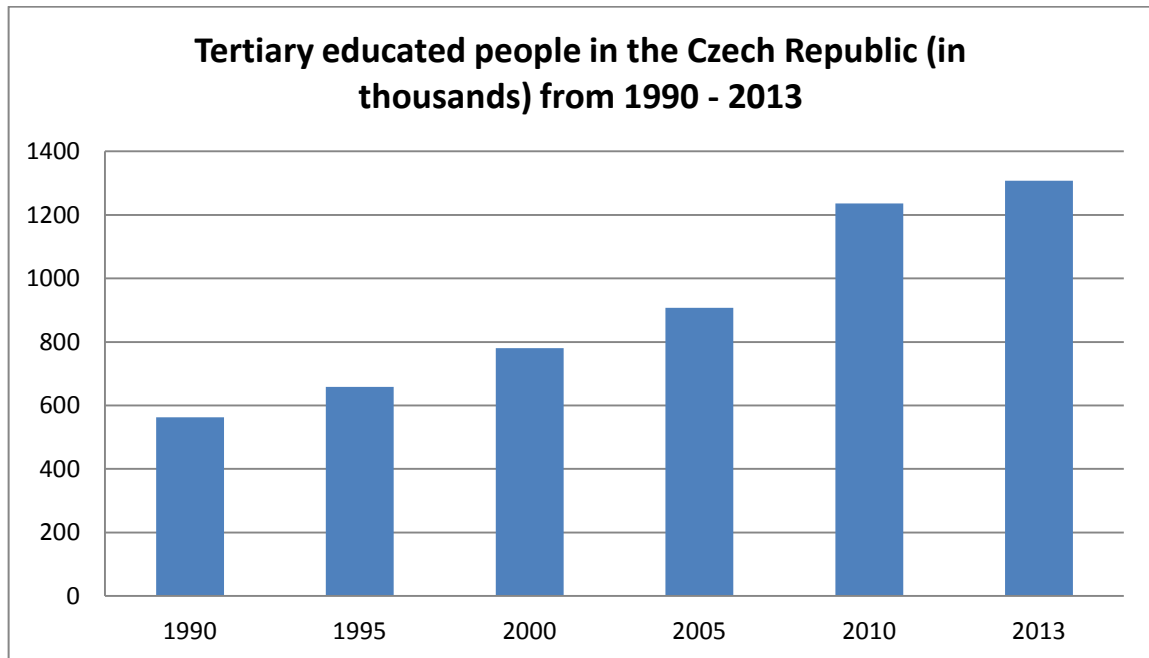
Source: Czech Statistical Office, own processing (2013)

As we can see, the number of tertiary educated in 2013 (which is more than 1.3 million) means that it has increased by almost 50% since 1995. This increase means that people with university degrees nowadays are not that special and unique on labour market as it was in past. Together with higher competition and recent crisis, Czech graduates at the moment accept worse job positions with lower salaries than 15 years ago. Another fact is that universities in the Czech Republic teach mostly only theoretical knowledge but today's companies require practise skills which are not taught at the universities. In 2013, every 5th university graduate was unemployed.[51] This problem of Czech education together with other important ones will be included in the following chapteer.

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[50] CZSO (2013)
[51] MATĚJŮ (2013)

4.2.3 Unequal acessibility in the Czech tertiary education

Acessibility and unequal access to education has been a widely discussed topic in new millenium. In ideal situation, education should be accessible by the same rate to every citizen of the coutnry so the ones who are most talented and hard-working would gain from it. As I mentioned in theoretical part, there are but some obstacles which impede to access some individuals to especially education. Not speaking of increasing number of enrolled students, there are some factors such as a social origion, family background or disposable income which cause that some individuals (regardless of their talents, skills or will) have lower chance to reach their desired education, i.e. their are disadvantaged compared to others. Expert analysis of unequal access to tertiary education in the Czech Republic (2009) brought us some interesting information.This analysis examined statistical data about the Czech Republic and constructed index which measured inequality in the access to tertiary education for individuals in the Czech Republic based on family background and financial possibilities.The analysis which calculated so called index of inequality (in tertiary education) was based on 4 determinants:

- Occupation of father
- Occupation of mother
- Educational attainment of father
- Educational attainment of mother

The results of the survey showed that since 1950's the inequality decreased as in other European countries but family background and status is still an influental determinant for individuals chances to reach his/her chosen educational attainment. It also showed that 54% of university graduates between years 1990 – 2007 have come from a top quartal (Q4) of families with the highest social status. Approximately 23% of gratuates then comes from second highest quartal (Q3), 14% of graduates from the second lowest quartal (Q2) and only 9% of graduates from tertiary education in the Czech Republic have come from the bottom quartal (Q1). So despite the announced downfall of access inequalities in the new millenium, it is obvious that there are still inequalities on this count.

Considering particular sectors in tertiary education, the survey showed that the biggest inequalities in access to education were in master and doctor programmes. In master programmes, 60% of graduates comes from upper quartal of highest status families and only 8% of graduetes from the bottom quartal of the lowest status families. This was caused by the fact that ordinary families with average or bellow-average incomes are not always capable to financially support their children 5 (or even more) years during their master studies.

Figure 19: Tertiary sector graduates in the Czech Republic between the years 1990 – 2007 according to family status
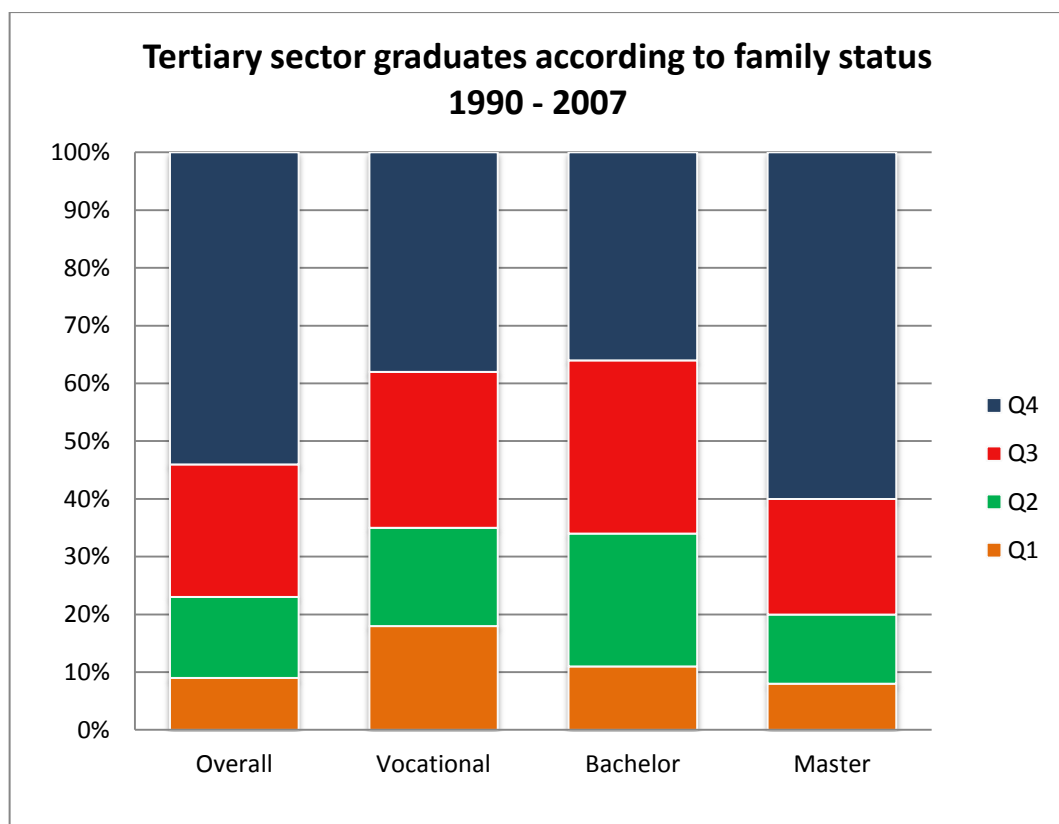
Source: Czech Statistical Office, own processing

The describe survey data are summed in the chart above. We can see there obviously is a significant inequal access to tertiary education especially at master level but the chances of various social classes are a lot higher in order to accquire vocational or bachelor education.[52][53]

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[52] KOUCKÝ, BARTUŠEK (2009)
[53] CZSO (2009)

Despite those results, we have to realise that tertiary education in the Czech Republic is still one of the cheapest in developed countries as there are no fees at public universities (or very small fees) which are still dominant. Private universisites as a new rising trend in the Czech Republic are much more expensive but according to recent surves, their quality and prestige hasn't still reached the level of public universities and just a small part of enrolled students study there (in 2013 it was just 48 thousand enrolled students out of the total number of 382 thousand)[54]

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[54] CZSO (2013)

4.2.4 Public expenditures on tertiary education

Financing of tertiary education is sometimes very different in various countries. Tertiary sectors in many countries has undergone a great quantitative development which brings certain consequences and requirements for desired volume if financial means in order to maintain system's functionality. Public expenditures on tertiary education are understood as a part which is spent in tertiary education of a share of total public expenditures.

Total public expedinture on education in the Czech Republic in 2010 was 4.7% of GDP which is bellow OECD average which was 5.4%.[55] Total expenditures into education in 2010 were 124 billion Czech crowns which was approximately 12% of total expenditures (which were over 1 trillion crowns. From those 12% which were transformed into education, 2.7% was for the tertiary education. The table bellow depicts the development of public spending on tertiary education as a share of total expenditures in the Czech Republic. We could see that after slight fall in late 1990's and early 2000's the trend of government spending into this sector rose again.

Figure 20: Public spending on tertiary education in the Czech Republic since 1990
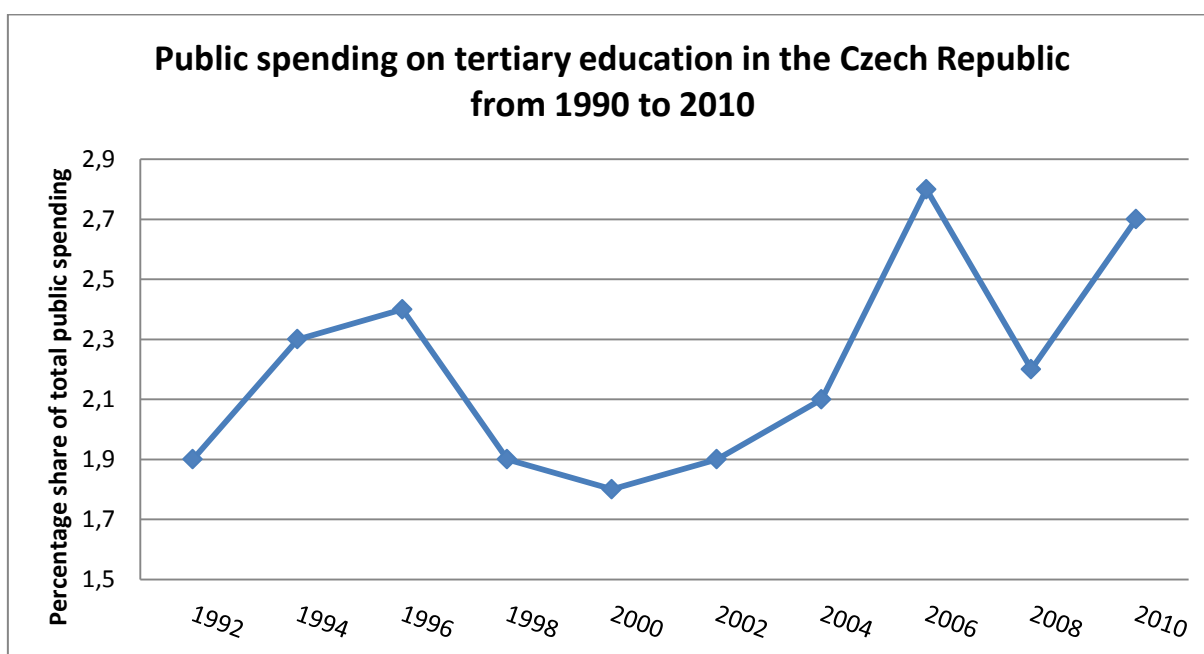
Source: Czech Statistical Office, Own processing

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[55] CZSO (2012)

Universities and educational institutes are financed mainly from the Ministery of Education Youth and Sports but also from Ministery of Defence and Armed Forces, development funds etc. While the percentage amount of invested funds into tertiary education is comparable with OECD average, it should be considered that most of the developed countries have a tradition where a big part of tertiary education is financed from private sources (e.g. by students themselves through tuition fees) while in the Czech Republic, public schools are usually free from the fees.

4.3   Other important drivers influencing income inequality

Apart from education, there are other socioeconomic drivers which influence the income inequality. Czech Republic is a developed OECD country in the middle of the Europe and another factors which are surely influencing the income inequality are globalisation, taxation and gross national income.

4.3.1 Globalization

The role of globalization is described in chapter 3.7.2. We know that also thanks to globalisation which became very intense especially after the Second World War, the world of developed countries has (apart from a very few exceptions) experienced an increase in income inequality. The Czech Republic experienced a big boom in globalisation especially after the Velvet Revolution at the end of 1989 when the totalitarian government was removed and the country opened itself to (until that moment) new markets, countries and their culturesand other opportunities.[56]

There were many theories how to quantify the process of globalisation. To quantify this process in the Czech Republic, the KOF Index of Globalisation isapplied. This index consists of three dimensions:

- Economic globalisation

- Political globalisation

- Social globalisation

The economic part is characterized as long distance flows of goods, capital and services and also as information and preceptions that accompany market exchanges. Political globalisation concists of diffusion of government policies and social globalisation could be expressed as the spread of ideas, information, images and people.

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[56] OECD (2011)

Each of the three introduced variables is transformed to a cartain index on a scale from zero to one hundred while the higher values mean greater globalisation. The weights of the data are then calculated and put into one complex figure which presents the index of globalisation.[57]

Figure 21: Development of the Index of Globalisation in the Czech Republic from 1993 to 2010
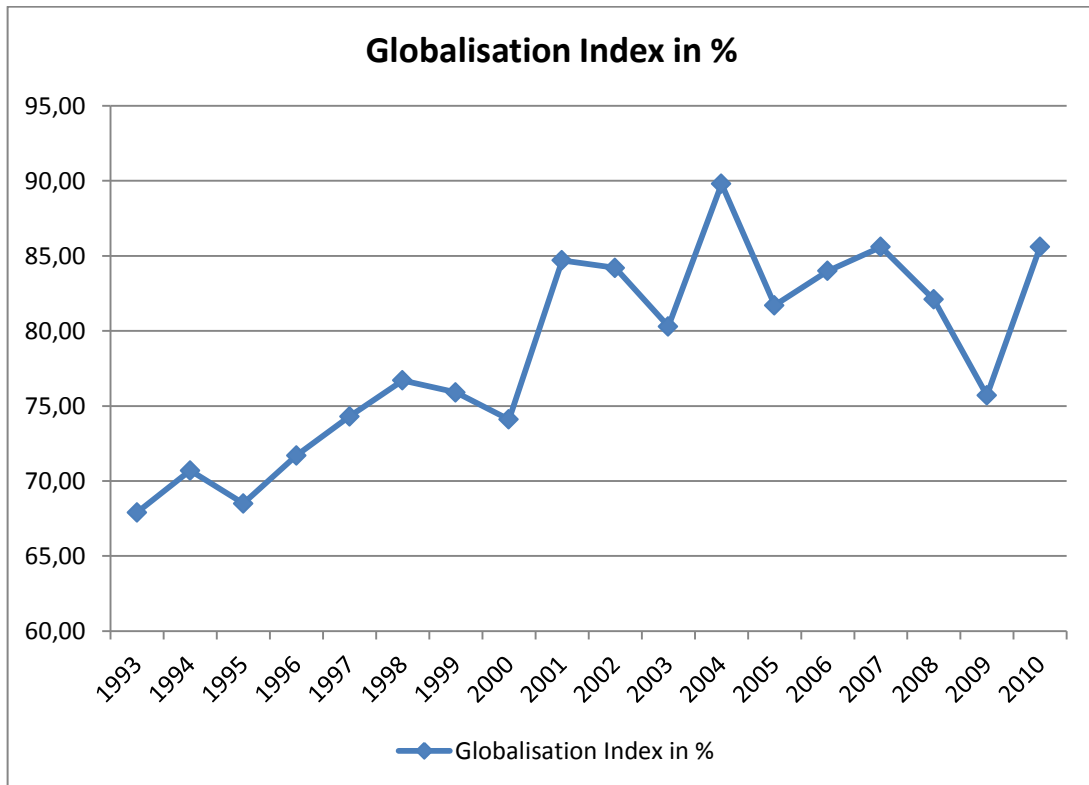
Source: EHT Zürich, Own processing

The figure 21 graphically describes the globalisation inde. We could see that since the beginning of 1990's the value of the index has a growing trend (apart from some exceptions like 2009 which was the year of crisis). Compared to other countries, the Czech Republic stands relatively high concerning globalisation. In 2010 the Czech Republic with its index of globalisation with value 86.87 was 12th most globalised country, closely behind such countries as Ireland, Canada, Denmark, Sweden, Belgium etc.

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[57] EHT Zürich (2013)

This signifies that our country is relatively open to outer world. Not only thanks to membership in such organizations as NATO (North Atlantic Treaty Organization), EU (European Union) or OECD (Organization for Economic Co-operation and Development) but also for its famous brands, well-known products and export policy, etc.

Because of significance of globalisation nowadays (especially in developed countries), its huge influence on social life, economy and other important mechanisms and based on the information from chapter 3.7.2.., it is assumed that globalisation has a **positive** impact on income inequality. It means the more the coutry is globalised (i.e. the higher the globalisation index is), the higher is the income inequality (i.e. Gini coefficient). It means, if the globalisation index increases, Gini coefficient should increase too.

4.3.2 Taxation

The role of tax system in the matter of influencing the income inequality is described in chapter 3.4. Some countries egalitarian countries such as Sweden tend to have higher redistribution than others and in those countries, the role of taxes is more singificant. The important thing to realize is but the fact that not only income and capital taxes are determining the income inequality, but there are also other types of taxes which determine real incomes of citizens such asi value-added tax or consumption tax. Czech Republichas one of the highest taxes in Europe and also among OECD countries.[58]

The tax wedge, which is the difference between labour costs to the emploeyer and the corresponding net take-home pay of the employee is also above OECD average. The figure 22 shows how the Czech Republic stands in tax wedge against other countries.

Figure 22: Tax wedge of the Czech Republic compared to other countries in 2011
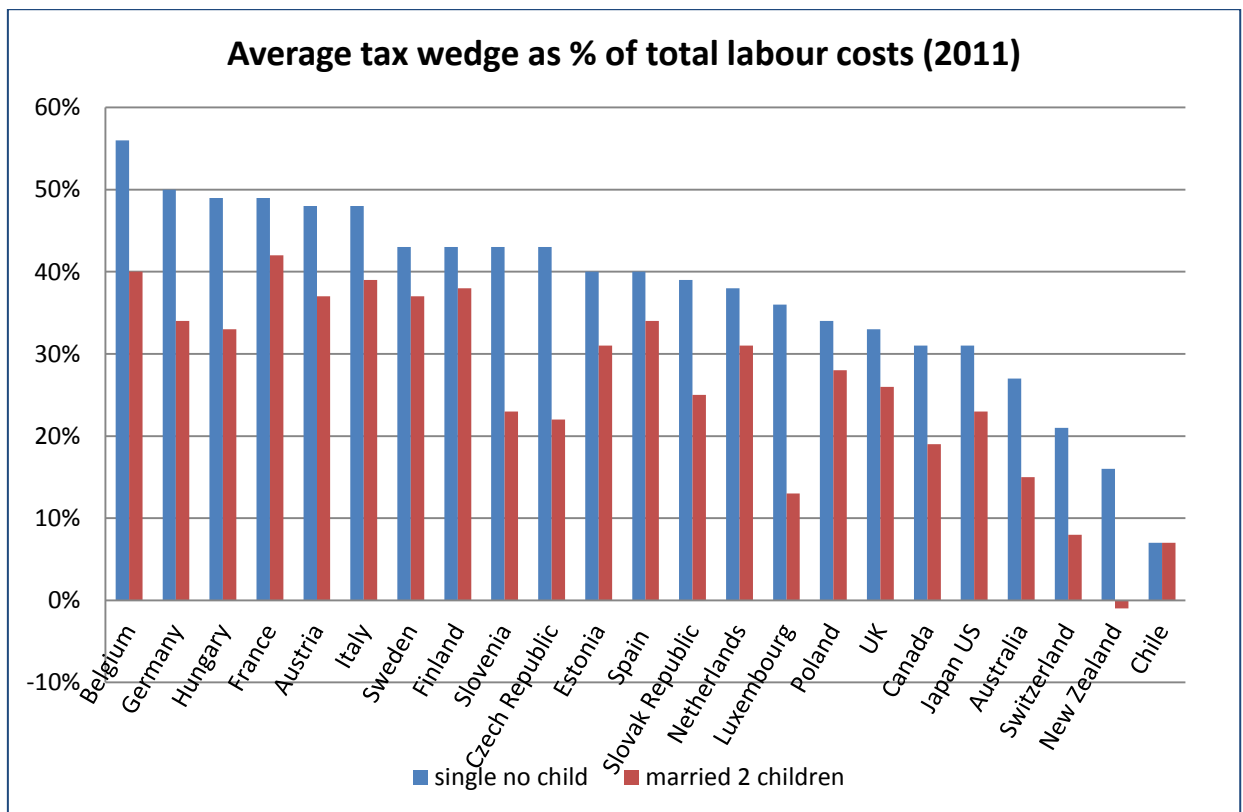
Source: Global Finance (2012), Own processing

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[58] BERTOLA (2006)

From the figure 22, we can see that the average taxe wedge in the Czech Republic is 43% for a single person with no children and 22% for a married person with 2 children. Even despite the fact the there is a flat income tax at the moment, we could see that through other deductions and tax reliefs, Czech Republic is quite supportive towards families whose tax wedfe is 21% lower compared to singles. On the other hand, there are countries which have a very small difference in tax wedge of children and non children households such as Spain or France. An unique example is New Zealand where the employer even gets subsidies on employees with children.

The tariff of value added tax in the Czech Republic is currently 21% for basic rate and 15% for reduced rate. Compared with EU contries, basic rate is average (the highest basic VAT tariff 27% is in Hungary and the lowest of 15% in Luxembourg). Reduced rate in the Czech Republi which is imposed on a specific goods such as food, water supplies, pharmaceutical products, transport etc. is with its 15% rate one of the highest in EU as there are values as 5, 8 or 9% other member states. Reduced rate used to be 5% before the economic recession in 2009 but due to restrictive economy drives it has been increased.[59]

The taxation in the country has with no doubt a huge influence on redistribution and logically on income inequality as well. That is the reason that it has been decided to work with this indicator as with on of those which determine income inequality in the Czech Republic. The average value of tax wedge or total taxation couldn't be simply measured as it is different for particular groups of citizens (eg. with children, without children, married with children etc.). Instead, the value for total tax revenue as % of GDP for every year was chosen as it is the best indicator which describes complex taxation in between invidual years.[60]

We assume that taxation has a **negative** influence on income inequality which means, the higher the taxes are, the lower the income inequality is. If the state collects more taxes, it has a higher amount to redistribute which supports so called trickle-down economics when the money taken from upper sorts of society trickles down to the needy.[61]

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[59] GLOBAL FINANCE (2012)
[60] PRAGUE DAILY MONITOR (2013)
[61] MANKIW (2012)

In figure 23, we could see the development of total tax revenues as % of GDP from year 1993 to 2010 compared with the development of Gini coefficient in the Czech Republic.

Figure 23: Gini Index in % and Tax revenues (as a % from GDP) in the Czech Republic since 1993 to 2010
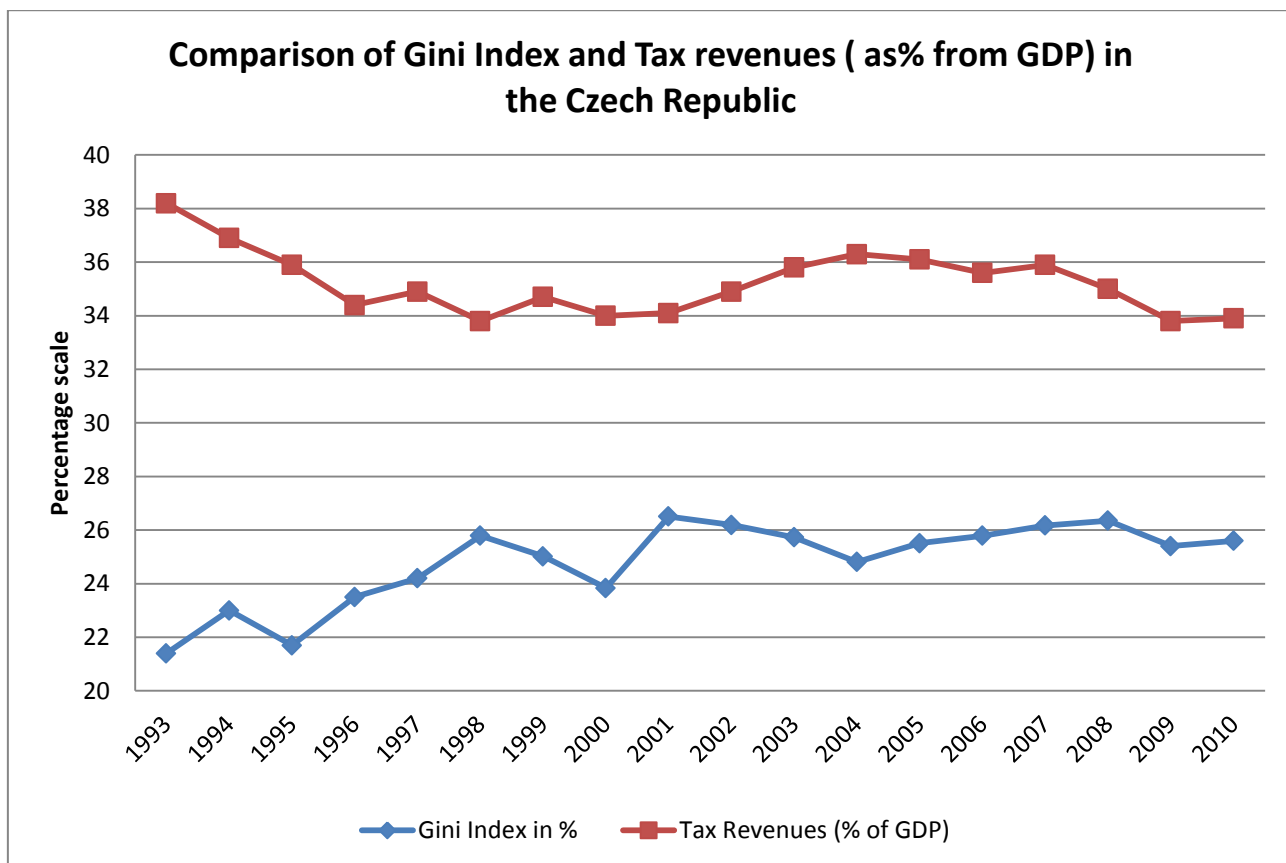
Source: World Bank, OECD StatExtracts: Inequality and Povert, Own processing

From the chart is obvious that the downfall of tax revenues in early 1990's is followed by a rise of Gini curve and the slight upgoing of tax revenues in early 2000's is again followed by the routing of Gini curve in opposite relationship. The often changes in tax revenues in the Czech Republic are caused by not only economic development and current situation but e.g. also by often changing of government policies which are run by governments which are in the office at the time. The problem is, that governments are usually changed every 4 years in a result of parliamentary elections.

4.3.3 Gross National Income

The Gross national income (GNI) is a total domestic and foreign output claimed by residents of a country, consisting of gross domestic product (GDP) plus factor incomesearned by foreign residents, minus income earned in the domestic economy by nonresidents. Basically it measures income received by a country both domestically and from overseas.

Many significant institutions including World Bank use GNI instead of GDP as a main indicator of economic development nowadays because it better describes the income which goes into particular country.[62]

In 1993, GNI of the Czech Republic was 35.6 billion US dollars and GNI per capita was 3446.4 US dollars. Since early 1990's it grew more than 5 times. In 2010, GNI of the Czech Republic was 183.6 billion of US dollars and GNI per capita was 17394.4 US dollars.[63]

Table 3 compares values of GNI in the Czech Republic with neirghbouring countries and China. We could see that since 1990, also Slovakia's GNI grew more than 5 times and GNI of Poland even more than 7 times. We have to consider that the indicator of total GNI shows us total production of the country so bigger countries with more inhabitants have also bigger GNI than some smaller countries with similar economic level.

Table 3:GNIof the Czech Republic and neighbours + China in billion US dollars
1990 - 2012

Year	Austria	Germany	Czech Republic	Slovakia	Poland	China
1990	163.6	1734.6	35.6	16.5	62.2	391.3
2000	188.8	1866.5	57.8	20.3	170.7	1183.8
2010	378	3376.5	183.6	86.1	451.8	5904.6

Source: World Macroeconomic Research, own processing

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[62] MANKIW (2012)
[63] KUSHNIR (2013)

Table 4 finally depicts an indicator which trully shows the economic level, no matter of the size of country. GNI per capita could be used to compare countries' economic level. We could see that while in 2010, Slovakia (with GNI per capita of 3766 dollars) reached approximately 67% of Czech Republic's level, in 2010 it was already 91% which was a big progress and Slovakia even exceeded Poland in GNI per capita.

Table 4: GNI per capitaof the Czech Republic and neighbours + China in US dollars   1990 - 2012

Year	Austria	Germany	Czech Republic	Slovakia	Poland	China
1990	21324.3	21511.3	3446.4	3122.4	1631	335.7
2000	23543.7	22349.4	5638.4	3766	4449.8	924.9
2010	44984.7	40671.9	17394.4	15845.8	11828.9	4341.8

Source: World Macroeconomic Research, own processing

GNI is a modern indicator of economic development and that is the reason it was chosen for this thesis as one of the determinants of the income inequality in the Czech Republic. Based on the information from chapter 3.3.4. it is assumed that the economic development has a negative influence on incime inequality. This could be also seen in Kuznet's curve picture from the same chapter – the trend in developed countries since 1970 confirms this assumption. This means that from a certain point of economic development (when the particular country reaches the status of developed country), further increase of the level of economic development leads to further increase of income inequality, therefore the main assumption is that economic development (in our case described through GNI) has a **positive** influence on income inequality.

4.4　Econometric analysis of income inequality

This chapter contains econometric analysis which is based on the theoretical background from the literature review and on the findings from the previous chapters of the practical part. The following chapterssum upsignificant indicators which were chosen and which are related to income inequality followed by contruction of the econometric model with interpretation and conclusion based on results.

4.4.1　Data collection

The one-equation econometric model is focused on the developmentof the **income inequality** **(y$_1$)** in the Czech Republic which is represented here by Gini coefficient. Beside the income inequality as the explained dependent variable, following explanatory variables were chosen as the most influental,significant and explaining determinants.

Number of tertiary educated people and **public expenditures on tertiary education** were chosen as two most influental representatives of tertiary education. Three more variables were chosen as significant determinants from economic and global sphere. **GNI per capita (PPP)** is based on purchasing power parity, which depicts the values in international dollars which have the same purchasing power over GNI as a U.S. dollar has in USA. **Globalization index** was adjusted to better fit in the model. To quantify taxation in the country in as most complex way it could be done, **Tax revenues (as % of GDP)** were chosen as another variable for the model. This indicator best describes complex taxation as every individual has a bit different tax burden (depending on his/her incomes, marital status, children etc.).

We therefore assume that the income inequality in the Czech Republic is affected mainly by five explanatory variables mentioned above. Based on the theories in chapter 4 and its subchapters, we assume the following relations of explanatory variables on explained one which are in the table 5.

Table 5: Assumed relationships of selected exogenous variables on endogenous variable

Exogenous variable	Influence on income inequality
Number of tertiary educated people	Negative
Publiec expenditures on tert. education	Negative
Globalization index$_{adj}$	Positive
GNI per capita (PPP)	Positive
Tax revenues	Negative

Declaration of variables (+ units):

y_1	Income inequality (%)
x_0	Intercept term – unit vector
x_1	Number of tertiary educated people (thousands)
x_2	Public expenditures on tertiary education (%)
x_3	Globalization index$_{adj}$
x_4	GNI per capita,PPP (thousands)
x_5	Tax revenues (%)

Economic model: $\qquad y_{1=} f(x_1, x_2, x_3, x_4, x_5)$

Econometric model: $\qquad y_{1t} = \gamma_{10}x_{0t} + \gamma_{11}x_{1t} + \gamma_{12}x_{2t} + \gamma_{13}x_{3t} + \gamma_{14}x_{4t} + \gamma_{15}x_{5t} + u_{1t}$

The chosen data set in **Table 6** based on the data from previous chapters consists of one endogenous and 5 (+1 intercept) exogenous variables. To check the existence multicollinearity a correlation matrix bellow was constructed in **Table 7**.
As it could be seen from the results of correlation matrix, there is an unwanted relationship between x_1 and x_5(where correlation is higher than 0.8 which means multicollinearity. Despite high value of correlation coefficient between x_1 and x_5, both variables were significant, for which the multicollinearity problem was ignored in this case.

4.4.2 Quantification of the relationship between income inequality and its drivers

The resultas of the OLS model are displayed in Table 8.

Table 8: Outputs of OLS model

Model 3: OLS, using observations 1993-2010 (T = 18)
Dependent variable: IncomeInequality

	Coefficient	Std. Error	t-ratio	p-value	
Const	34.6548	6.49787	5.3333	0.00018	***
NumberOfTertEd	-0.00909836	0.00335247	-2.7139	0.01882	**
PublicExp	-1.5177	0.675918	-2.2454	0.04436	**
Globalisation	0.158036	0.0364489	4.3358	0.00097	***
GNIperCapita	0.480768	0.146722	3.2767	0.00662	***
TaxRevenues	-0.466785	0.161729	-2.8862	0.01367	**

Mean dependent var	24.80556	S.D. dependent var	1.556192
Sum squared resid	4.405121	S.E. of regression	0.605882
R-squared	0.893000	Adjusted R-squared	0.848417
F(5, 12)	20.02995	P-value(F)	0.000019
Log-likelihood	-12.87246	Akaike criterion	37.74492
Schwarz criterion	43.08715	Hannan-Quinn	38.48154
Rho	-0.231087	Durbin-Watson	2.423823

Source: author's calculation

We can see that all the assumptions from the table 5 were met and directions of the chosen variables are as it was expected. All explanatory variables are highly significant, which is a positive outcome. R^2 of value 0.85 means that 85% of the model explains the dependent variable, so the model fits the data very well. Before the evaluation and interpretation of the results, several significant statistical tests must be done to verify the correctness of the data.

4.4.3 Econometric verification

To verify the relevance of the model, several test are conducted in this chapter. Durbin Watson test is used to test **autocorrelation** of residuals. Based on the number of observation

and number of exogenous variables (excluding the intercept term) the gretl output for DW test is depicted in Scheme 1.

Scheme 1:

5% critical values for Durbin-Watson statistic, n = 18, k = 5

dL = 0.7098

dU = 2.0600
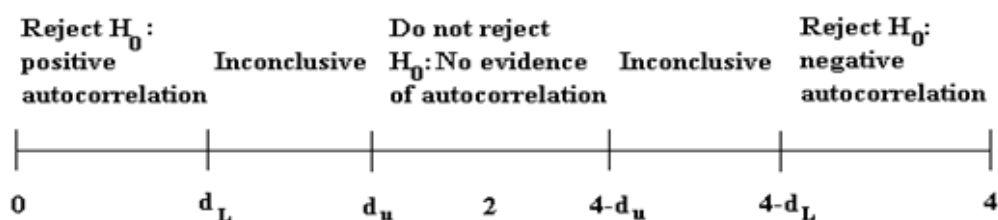
Source: ExpertsMind institution, author's calculation

The intervals which serve to identify the results are showed in the picture above. Durbin-Watson criterium for the model is 2.424. That means this criterium lies in the interval (4-d$_u$; 4-d$_l$) which is conretely the interval (1.94;3.29) in this case. Therefore the conclusion is that we cannot prove that there is an autocorrelation in this model. As DW test resulted as inconclusive, another test for autocorrelation- Breusch-Godfrey test is concluded. The output for this test from Gretl is following:

```
Breusch-Godfrey test for first-order autocorrelation
OLS, using observations 1993-2010 (T = 18)
Dependent variable: uhat

coefficient    std. error    t-ratio     p-value
  ---------------------------------------------------------
const-2.75912        7.14895        -0.3859      0.7069
  PublicExp         -0.158170      0.699203     -0.2262       0.8252
  TaxRevenues        0.0749632     0.180750      0.4147       0.6863
  NumberOfTertEd     0.00188755    0.00391431    0.4822       0.6391
  Globalisation     -0.000335411   0.0366119    -0.009161     0.9929
  GNIperCapita      -0.0645633     0.162414     -0.3975       0.6986
uhat_1               -0.332585      0.351651     -0.9458       0.3646

  Unadjusted R-squared = 0.075203

Test statistic: LMF = 0.894501,
with p-value = P(F(1,11) > 0.894501) = 0.365

Alternative statistic: TR^2 = 1.353652,
with p-value = P(Chi-square(1) > 1.35365) = 0.245
```

```
Ljung-Box Q' = 1.08272,
with p-value = P(Chi-square(1) > 1.08272) = 0.298
```

The p-value is 0.365 (i.e. it is higher than alfa 0.05). This means that we cannot reject the null hypothesis and therefore there is not any autocorrelation of residuals of the first order.

Another important factor in the model is the **stationarity** od data. Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test is used to test a null hypothesis that an observable time series is stationary around a deterministic trend:

```
KPSS test for IncomeInequality (including trend)

T = 18
Lag truncation parameter = 2
Test statistic = 0.160948

                  10%      5%      1%
Critical values: 0.125   0.150   0.205
Interpolated p-value 0.042
```

The results show that test statistic (p-value) is 0.16 which is bigger than 0.15 (5% level). So we cannot reject the null hypothesis and therefore the conclusion of the test is that our variables are stationary.

Heteroskedasticity can invalidate statistical tests of significance that assume that the modelling errors have a constant and finite variance and it could cause standard errors to be biased. To test the presence of this phenomena, White's test for heteroskedasticity is undertook with the following output:

```
White's test for heteroskedasticity
OLS, using observations 1993-2010 (T = 18)
Dependent variable: uhat^2

coefficient    std. error    t-ratio  p-value
  -----------------------------------------------------
const            85.3708       130.303       0.6552  0.5333
  PublicExp       3.24957        5.59897      0.5804  0.5798
  TaxRevenues    -5.22524        8.15857     ^-0.6405  0.5423
  NumberOfTertEd  0.0460499      0.0328749    1.401   0.2040
  Globalisation  -0.196678       0.770780    ^-0.2552  0.8059
  GNIperCapita   -1.20656        1.12464     -1.073   0.3189
sq_PublicExp     -0.577283       1.16956     -0.4936  0.6367
sq_TaxRevenues    0.0735490      0.115211     0.6384  0.5435
sq_NumberOfTertEd -2.10321e-05   1.52474e-05 -1.379   0.2102
sq_Globalisation  0.00141999     0.00631381   0.2249  0.8285
sq_GNIperCapita   0.0236833      0.0240736    0.9838  0.3580
```

```
Warning: data matrix close to singularity!

  Unadjusted R-squared = 0.423634

Test statistic: TR^2 = 7.625410,
with p-value = P(Chi-square(10) > 7.625410) = 0.665373
```

As we could see from the output, the p-value (0.665) is bigger than 0.05 so we cannot reject null hypothesis which confirms presence of**homoskedasticity**(which means no heteroskedasticity) in the model.

Because all the test resulted negative and there is no heteroskedasticity, autocorrelation or non-stationarity, we can proceed to evaluation and interpretation of the results.

```
Test statistic: TR^2 = 7.625410,
with p-value = P(Chi-square(10) > 7.625410) = 0.665373
```

4.4.4 Evalutation and interpretation of the results

An OLS analysis from chapter 4.4.2. provided desired results. The parameters for every explanatory variable were estimated in the single linear regression OLS model. Table 6 depicts estimated parameters.

Table 9: Estimated parameters for the OLS model

Variable		Parameter coefficient
Intercept term (Univet vector)	x_0	34.655
Number of tertiary educated people	x_1	-0.009
Public expenditures on tertiary education	x_2	-1.517
Globalization index$_{adj}$	x_3	0.158
GNI	x_4	0.481
Tax Revenue	x_5	-0.467

Source: author's calculation

Based on the esimated parameters, econometric equation for the model in its concrete form is following:

$$y_{1t} = 34.65x_{0t} - 0.009x_{1t} - 1.517x_{2t} + 0.158x_{3t} + 0.481x_{4t} - 0.467x_{5t} + u_{1t}$$

Intensity of the parameters is expressed by the parameter values. Direction by their signs. Intercept term (x_0) with its parameter value 34.655 presents a base for the model. Number of tertiary educated people (x_1) with parameter value -0.009 met our assumptions with negative relationship with income inequality but its intensity is very low. Public expenditures on tertiary education as another representative of tertiary education has on the other hand the highest intensity and also a negative direction (-1.517). Globalisation index (x_3) parameter value is 0.158. For GNI (x_4), the parameter value is 0.481 which is the highest from non education variables. Tax revenues (x_5) parameter has a negatie relationship and value -0.467.

As we mentioned in chapter 4.2.2., all variables in the model are significant so we can consider their intensity as trustworthy. Assumptions for parameter's direction (which are described in table 5) were also all met.

To fully compare the influence of each exogenous variable on income inequality, coefficient of elasticity for each variable is calculated bellow. In this case, elasticity is a measurement of how responsive every explanatory variable is to change the explained variable.Elasticity is a percentage change so all variables are comparable. **Table 10** shows elasticity of all exogenous variables to income inequality (which is endogenous variable in the model) for every observation and also a mean value for all the observations.To interpretthe results in general, it was decided to use the values of mean elasticity from all observations which are depicted in table 11.

Table 11: Mean elasticity value for exogenous variables

Variable coefficient	Value of elasticity
Ex_1	-0.320
Ex_2	-0.143
Ex_3	0.382
Ex_4	0.384
Ex_5	-0.660

Source: author's calculation

Final interpretation of variables' elasticities is presented bellow:

If the number of tertiary educated people increases by 1%, the income inequality will decrease by 0.311%.

If the public expenditures on tertiary education increase by 1%, the income inequality will decrease by 0.132%.

If the Globalizatino $index_{adj}$increase by 1%, the income inequality will increase by 0.370%.

If the Gross National Income increase by 1%, the income inequality will increase by 0.342%.

If the Tax revenues increase by 1%, the income inequality will decrease by 0.661%.

Final elasticity coefficients showed that strongest factor influencing income inequality are **taxes**. The more taxes are collected the more the state can redistribute or support those who struggle through various supporting programmes etc. Our research therefore confirmed results from an expert study"An Overview of Growing Income inequalities in OECD" that declared that taxes play a major role in reducing market-income inequality. This study also showed that taxes have become less effective in reducing income inequality since 1990's. In the table 10, we could see that elasticity coefficient of taxes has been declining during the observed period from 1993 – 2010 so this phenomenon also confirmed the results of OECD study. As taxes are still a most decisive factor influencing income inequality, it is a very complicated tool which causes many other effects to social and economic areas which could be unpleasant.

Globalisation and **GNI**(which represents the economic development of the country) have both similar elasticity coefficient slightly above 0.380. The same OECD study mentioned above examined the cause of rising income inequality in developed coutries since 1980's while globalisation and economic development were the main subjects of research. According to the study globalisation brings a change in determination of wages and incomes also offers companies and workforce to travel across the countries and conduct businesses internationally with less obstacles than in the past. This fact means that also requirements on workers have increased dramatically and companies nowadays have more people whom they can select which leaves those less skilled and educated in disadvantage more than ever before. Those fact cause that skilled people have high paid jobs and others who are not so good in the area end up with a salary which is often less then average. That is why according to this study, increase in globalisation brings also increase in income inequality. Our research confirmed this relationship by a significant coefficient with positive elasticity. Czech Republic as on of the most globalised coutries have been influenced by this phenomenon and rising globalisation since year 1993 had its on rise of income inequality as well. Growth of GNI representing economic development has had similar effects like globalisation - rise of specialization and requirements on labour market and increasing gap between skilled workforce and others.

Effects of education (especially **tertiary education**) on income inequality have been also discussed by many economists. There have been a lot of disputes about the direction and character of relationship between education and income inequality. As could be see in chapter

3.7.1. some economists as De Gregorio, Park or Ram found a negative relationship between educational attainment and income inequality. There were also others who found a positive relationship between the two factors (Deininger and Squire, Checchi), i.e. the higher is educational attainment in the coutnry, the higher is income inequality. The elasticity coefficients representing tertiary education in our model showed both as negative (-0.132 for public expenditures and -0.320 for number of tertiary educated people) so our model is in consensus with studies of De Gregorio, Park and Ram, i.e. that increase of factors representing tertiary education lowers the income inequality in the Czech Republic. Despite the lowest intensity, those coefficients are significant because the number of tertiary educated people have been constantly growing (unlike taxes which couldn't grow all the time). This number in the Czech Republic has been growing approximately 4% every year.Even public expenditures on tertiary education (which is bellow average among developed coutries) has a big potential to grow. Support and investment into tertiary education also helps those who areless skilled to increase their capital and become more competitive on labour market which also reduces the rise of income inequality (which is a negative effect of globalisation and economic development). Therefore, to sustain the level of gini coefficient about 0.25 which is considered as optimal (as mentioned in chapter 3.6.3.), the Czech Republic's government should try to make education more effective, accessible and allow more of its citizens to gain tertiary education. If more people are skilled and educated in their occupation, they will be capable and less of them will struggle finding a decent job.

5. Conclusion

The main objective of the thesis was to examine income inequality and its causes in the Czech Republic and answer the research questions relating parameters significance and education's position as one of the main determinants of income inequality. The literature review as a theoretical background highlighted and described many interesting facts and comparisons of income inequality and povertyfrom domestic but also international scene.Apart from those facts, it showed that income inequality especially in developed countries (where the Czech Republic belongs) has been growing since 1980's and nowadays it presents a significant problem in such countries as USA, United Kingdom or France.

Rising income inequality in developed countries in recent years has also brought several opinions about this phenomena while some of them were contradictory to each other. Czech Republic showed up as a country where the income inequality is very low and it is practically the same as in traditionally egalitarian countries such as Sweden, Denmark etc.

Concerning tertiary education, the literature review presented several interesting facts regarding the Czech Republic (such as rising accessibility or rising university enrolment) and also described several studies about this phenomena and its relationship with income inequality. Finally, the main factors from tertiary education and also from other spheres were identified to be later quantified and included into econometric calculations.

Variables from tertiary education enrolment, public expenditures and globalisation, tax revenues and GNI were all assumed to be significantly influencing the level of income inequality in the Czech Republic which was measured by Gini coefficient. The linear regression analysis which was conducted by ordinary least square method in Gretl program showed very welcomed results.All five factors resulted as significant explanatory variables which are determining income inequality. Because the other data tests on presented model brought also positive outcome which found no error in the model, its output could be considered as correct and trustworthy.

 Moreover, assumptions about relationships of particular factors and income inequality were all met as well. GNI and globalisation have a positive relationship with income inequality

while public expenditures, number of students and taxation have negative relationship with mentioned phenomenon. This means that if the government and other institutions support especially tertiary education and pursuit for its better accessibility, quality and expansion, more educated population will be also more equal. These facts are important to know as income inequality has been otherwise regulary growing in all developed countries during last decades also thanks to increasing globalisation and economic development.

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7. Supplements

Table 6: Data set for econometric model

Year	Income inequality (%) y_1	Unit Vector x_0	Number of tertiary educated people (Thousands) x_1	Public expenditures on tertiary education (%) x_2	Globalization index$_{adj}$ (%) x_3	GNI per capita (Thousands) x_4	Tax Revenues (%) x_5
1993	21.4	1.00	602.40	2.00	47.90	11.85	38.20
1994	23.0	1.00	630.50	2.30	50.70	12.44	36.90
1995	21.7	1.00	658.60	2.10	50.70	13.38	35.90
1996	23.5	1.00	698.50	2.30	51.70	14.15	34.40
1997	24.2	1.00	732.40	2.00	54.30	14.25	34.90
1998	25.8	1.00	740.50	1.90	56.70	14.26	33.80
1999	25.0	1.00	765.10	1.70	55.90	14.54	34.70
2000	23.8	1.00	780.40	1.80	54.10	15.28	34.00
2001	26.5	1.00	800.10	2.00	64.70	16.35	34.10
2002	26.2	1.00	839.40	1.90	64.20	16.92	34.90
2003	25.7	1.00	880.20	2.10	60.30	18.11	35.80
2004	24.8	1.00	889.60	2.10	59.80	19.11	36.30
2005	25.5	1.00	907.10	2.40	61.70	20.37	36.10
2006	25.8	1.00	959.40	2.80	64.00	22.04	35.60
2007	26.2	1.00	1023.20	2.40	65.60	23.60	35.90
2008	26.4	1.00	1140.50	2.20	62.10	24.67	35.00
2009	25.4	1.00	1187.10	2.30	55.70	23.94	33.80
2010	25.6	1.00	1236.30	2.70	70.70	23.40	33.90
mean	**24.8**	**1.00**	**860.74**	**2.17**	**58.38**	**17.70**	**35.23**

Source: Own processing

Table 7: Correlation matrix

	y1	x1	x2	x4	x5	x6
y1	1					
x1	0.665028	1				
x2	0.182134	0.552125	1			
x4	0.819567	0.638984	0.323353	1		
x5	0.684253	**0.860733**	0.612404	0.697425	1	
x6	-0.51799	-0.39932	0.093785	-0.20283	-0.249	1

Source: Own processing

Table 10: Elasticity of model exogenous variables to income inequality

year	y_{est}	Ex_1	Ex_2	Ex_3	Ex_4	Ex_5
1993	21.628	-0.251	-0.140	0.350	0.264	-0.825
1994	22.253	-0.255	-0.157	0.360	0.269	-0.774
1995	23.223	-0.255	-0.137	0.345	0.277	-0.722
1996	23.591	-0.275	-0.148	0.346	0.289	-0.681
1997	24.165	-0.273	-0.126	0.355	0.284	-0.674
1998	25.141	-0.265	-0.115	0.356	0.273	-0.628
1999	24.811	-0.278	-0.104	0.356	0.282	-0.653
2000	24.920	-0.282	-0.110	0.343	0.295	-0.637
2001	26.582	-0.271	-0.114	0.385	0.296	-0.599
2002	26.202	-0.288	-0.110	0.387	0.311	-0.622
2003	25.067	-0.316	-0.127	0.380	0.348	-0.667
2004	25.151	-0.318	-0.127	0.376	0.365	-0.674
2005	25.538	-0.320	-0.143	0.382	0.384	-0.660
2006	25.861	-0.334	-0.164	0.391	0.410	-0.643
2007	26.757	-0.344	-0.136	0.387	0.424	-0.627
2008	26.386	-0.389	-0.126	0.372	0.450	-0.619
2009	25.013	-0.427	-0.139	0.352	0.460	-0.631
2010	26.027	-0.428	-0.157	0.429	0.432	-0.608
mean	24.907	-0.311	-0.132	0.370	0.342	-0.661

Source: author's calculation