

Income Inequality by Highest Attained Education in the Czech Republic

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Abstract

Income distribution strongly affects the value of risk-of poverty, what could explain small values of poverty rate in the Czech Republic. Therefore it is important to examine the level of income inequality in society and find out the socio-economic characteristics of people affecting the overall income inequality. The factor showing the biggest influence on the income level is education, so it is meaningful to examine the relationship between income inequality and poverty rate of each group of people by their highest attained education. One appropriate approach is quantification of each group's contribution to the overall income differentiation by decomposition of some income inequality indicators. This decomposition enables also to identify the reason the value of each contribution according to various aspects, such as the group size or total volume of groups incomes. The development of overall income inequality in the last year is a necessary condition for the prediction in the future, so the trends of time series of some inequality indicators were analyzed. The whole analysis enables to complete a view on income level and its inequality in the society, which are important indicators measuring the living standards of people.

Keywords

Income inequality, poverty rate, highest attained education, Theil index

JEL code

I00, I24

INTRODUCTION

Income is one of the appropriate indicators for evaluating of living standards of people, which provides the information about the economic well-being of individuals. It is an important component by assessing the overall quality of life of people, so it is important to examine the distribution of income and its degree of differentiation in the society. Is it possible to observe an impact of the level of education on the income situation of people? It is necessary to identify the dependence, how does the factor of education influence the overall income distribution and then the contributions of groups according to level of education to overall income inequality could be measured.

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This paper is based on the assumption that there exists a directly proportional relationship between the level of poverty rate and income inequality. The main objective of this research is to find the differences between the level of income inequality among individual groups of people. The classification criterion of people was variable called “highest attained education” because of its clear influence on income level of people in society.

First, we find out the values of poverty rate and income inequality within each group. Then, we provide an analysis of income inequality value for all groups together. Like this, we can identify, which groups of people contribute to income inequality the most and which as the least of all. It is also possible to get the information about between-groups contribution to the overall income inequality. Finally, we can observe the situation within the groups over time.

1 MAIN PUBLICATION IN THE FIELD

Many articles in academic literature deal with poverty, income inequality, material deprivation etc. but there are many ways how inspect these matters. At first it can be viewed from a global perspective, as described Martin Ravallion in his article about globalization and poverty (2003). Poverty is usually understood as a level of living and can be perceived absolutely or relatively. According to (Ravallion, 2003) absolute poverty means a certain level of purchasing power. Each country shows a different absolute poverty line because their different purchasing power. In this case we talk about relative poverty, which depends on each area.

The poor people are those, whose consumption is below a given level of need. This poverty line is typically determined relatively to mean income, so the poverty rate depends on income distribution in society. The statement of Ravallion (2003) “How much more is held by rich people than by poor people” shows disparities in level of living, which is called inequality. Inequality can be also understood absolutely or relatively. Absolute inequality is given by absolute differences in level of living. On the other hand: “Relative inequality depends on the ratios of individual incomes to the overall mean.” (Ravallion, 2003).

The measurement of poverty rate is derived from income distribution, so the poverty rate shows similar behavior as income inequality indicators. “The poverty measure can be hardly considered as sufficient statistics for judging the quality of people lives,” (Ravallion, 2003). The poverty rate reflects more the income distribution in society, so it makes sense to identify the reason why the number of people living below given poverty line in the Czech Republic is measured by values of income inequality indicators.

The other article (Sirovátka & Mareš, 2006) focuses directly on poverty in the Czech Republic. The poverty rate indicates the percentage of people living below 60 per cent of the national income median. The data published on the Eurostat (2014) website show that the Czech Republic still achieves the lowest rate in Europe.

According to (Sirovátka & Mareš, 2006) it could be attributed to by relatively low national income median resulting in lower purchasing power, and a narrow income distribution. They claim that in the Czech Republic many people are between the 60 per cent and 70 per cent of threshold. This fact is also contributed to by former egalitarian character of the Czech social structure, where the redistribution of income is applied. The level of income distribution is presented by Eurostat (2014) and income inequality is, on average, higher in Europe than in the Czech Republic, which also proves income equality there.

According to (Marek, 2011) this lower value of the Gini index is caused by smaller amount of redistribution in the Czech Republic. In addition, this index is maintained for the last 10 years still at an approximately constant level. Also no significant differences are observed in accordance to sex or age. Different level of income inequality shows regional classification, where Gini index of Prague is comparable with values of other countries in European Union.

Dependence of income situation on education is described by (Finardi, Fischer, Mazouch, 2012). Significant differences in income level are observed especially by different study fields. Values of private

rate of return on human capital vary considerably between various study fields. Whatever, in the Czech Republic this rate in general is higher than the OECD average, what is caused by tuition fees. This is reason, why the influence of education on income distribution in society is important to observe.

2 DATA AND METHODOLOGY

In order to examine the standard of living, we need to know the income situation of the population. Such information is available in EU-SILC survey (European Statistics on Income and Living Conditions), the most famous research, which collects data about households and persons living in the household. In this paper all computations are based on the data from research EU-SILC 2013 (ČSÚ-sk, 2014). These facts reflect income distribution for reference year 2012, for which these data were collected and officially presented on the Czech Statistical Office website (ČSÚ-ep, 2014).

This survey observes actually available income in each of households, which is called equalized disposable income. It is also appropriate to consider the average households income per consumption unit, which reflects the diversity of the economic structure of the household. According to (Jílek & Moravová, 2007): “The scale of consumption units for individuals is defined as relative volume of consumption (income) of various types of people, based on the consumption (income) of the selected type of person.” The design of these consumables (equivalent) units reflects savings from the cost of items of mass consumption realized multi-households. For comparison of household incomes in the EU-SILC survey, the average income per modified consumption unit is used, because this most reflects the size and demographic composition of the household (Schechtman & Yitzhaki, 2007). For the first member whole one unit is considered, but other adults in households are weighted only by half a unit and for child under 13 years weight of 0.3 is used.

This equalized disposable income per consumption unit in household is allocated to each member of households. Then, the income situation can be compared between groups of people in society according to their social-economic characteristics.

For comparison of income distribution in society the classification of people by factor education representing the level of highest attained education was used. For our purposes, a detailed division was grouped into larger units in accordance with the classification of ISCED, and subsequently formed the groups:

- Primary = People with attained education of first or second grade of elementary school,
- Lower secondary = People with lower secondary education without leaving exam,
- Higher secondary = People with secondary education with graduation, or post-secondary courses,
- Tertiary = People with tertiary education (bachelor's, master's and doctoral graduates), including higher vocational schools.

Completely omitted is a group of children under 18 years and actively studying people under 26 years. They have not yet any own income and therefore their income is derived entirely from the earnings of their parents, or more precisely, it is budgeted to them from the total household income by the number of its economic consumer units. Therefore, their inclusion in the analysis of incomes by groups of education would not be relevant.

Between these education groups of people it is possible to observe differences in income distribution, income level and also income differentiation. It is appropriate to detect the level of income inequality in each of education groups and between these groups.

The growth of income inequality in society can be monitored by changes in the characteristics of variability and many income inequality indicators. Most commonly used measure of the concentration is the Gini coefficient with its graphical representation called Lorenz curve (Moravová & al., 2000). The more this curve deviates from the axis of the quadrant downwards the higher is degree of inequality in society.

Gini coefficient is the numerical representation which takes values from 0 to 1 and also higher values indicating larger income inequality. Extremes would be an absolute inequality ($G = 1$ – all incomes are held by one person) at the rate of 100% concentration (Moravová et al, 2000).

The rate of income inequality can also be described using the coefficient of income inequality (Jílek & Moravová, 2007). It measures proportion of the volume of income received by people in the top quintile and volume of income of people in the bottom quintile. The top (the fifth) quintile includes 20% of those with the highest income of ordered set of people by the size of income per modified consumption unit. The ratio of these values is noted as S80/S20 (Income quintile share ratio). The greater is the value of this coefficient, the larger income inequality exists. It indicates how many times larger income receives one-fifth of households with the highest incomes on average compared to a fifth of households with the lowest incomes (ČSÚ-mv, 2014).

Commonly used methods for assessing income inequality are taken from paper of Hesmati (2004) and several of these methods are also applied in this work.

The degree of income inequality in society can also be determined by using the Theil index of inconsistency. The formula of Theil index is presented by (Moravová et al, 1996):

$$T = \sum_{i=1}^k \left(- \frac{x_i}{\sum_{i=1}^k x_i} \cdot \ln \frac{\bar{x}_i}{\bar{x}} \right), \quad (1)$$

where x_i presents total income of group i , \bar{x}_i means average income in group i , \bar{x} is average income in society and k represents the number of groups.

The advantage of this index is the possibility of its decomposition into subgroups (Moravová et al, 1996). This feature enables the extended use of Theil index according to (Ferreira, 2000) for examining the differences between income distributions of different groups of people. The decomposition of this index into groups can be based on measuring the income volumes and number of people in each group. If all groups showed the same population share as the income share, the overall index would be equal to 0 and it would be absolute equality. The index takes values in the interval $(0, \ln(k))$, where the value of $\ln(k)$ means, that one person owns all income (Jílek & Moravová, 2007).

The following calculation formula of Theil index is appropriate for this purpose. It consists of two parts, the first is the sum of contributions of each group to the overall income inequality and the second indicates the contribution of income inequality between groups (Novotný, 2007). The formula is presented by (Ferreira, 2000):

$$T = \sum_{i=1}^k w_i T_i + \sum_{i=1}^k w_i \ln \frac{w_i}{n_i}, \quad (2)$$

where T_i is within-group Theil index, w_i represents income share and n_i means population share.

The Theil index value thus depends both on within-group variability and on between-group variability of income and not least on group size by volume incomes occurring. This index has the ability to decompose its value between multiple summands as the only one of its kind, thanks to the properties of logarithms therein used (Ferreira, 2000).

3 INCOME INEQUALITY BY LEVEL OF EDUCATION

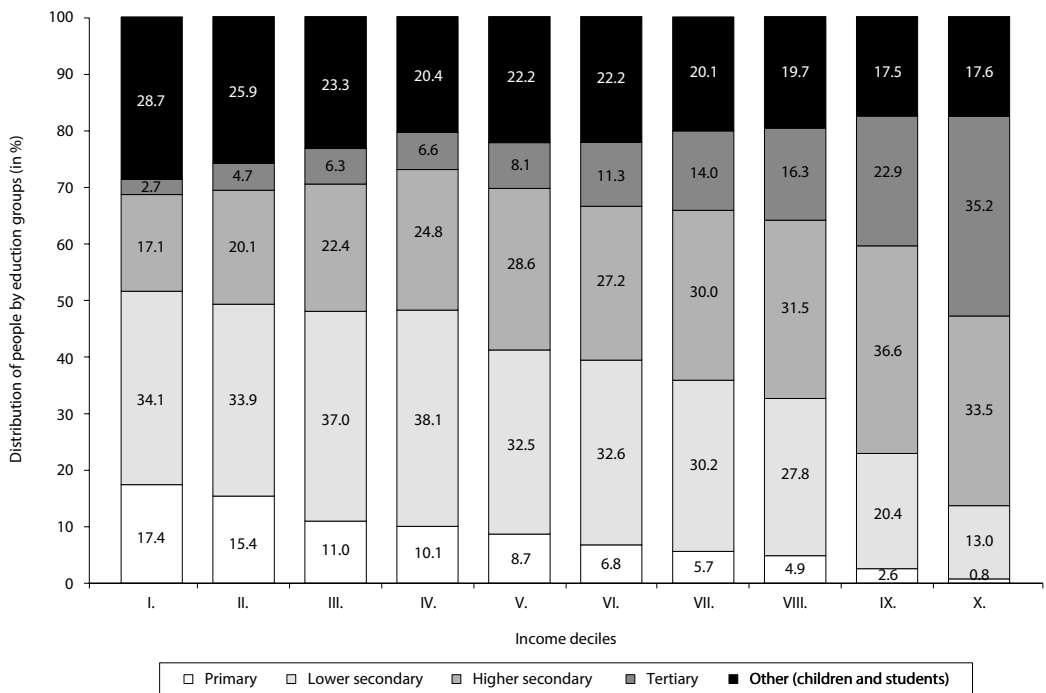
3.1 Income distribution within each group by level of education

Income level and income inequality within each of education groups is the first step in observing the differences between people according to their highest attained education. The above mentioned classification of people into the education groups was used in this analysis. The reasons for choosing the four education groups and omitting a group of children under 18 years and active studying people under 26 years have been explained above. The total equalized disposable income per consumption unit was recalculated for such an adjusted population.

The distribution of people into income deciles by their level of education is observable in Figure 1. People with the lowest (primary) education can be found most often in the lowest income groups

(I to III. decile). These people represent 17.4% of all people in the first decile. With higher income their share in groups is declining. In the highest income group (X. decile) they represent only 0.8%. Most often these are women aged over 50, who are either working or retired and live in multiple-member households. A similar trend can be seen among people with lower secondary education without leaving exam. Their share also falls with growing income. The opposite situation occurs by representation of people with upper secondary education with leaving exam or the highest (tertiary) education, which includes graduates from universities and higher vocational schools. In the first decile, the proportion of people with such education represents only 2.7% and with increasing income their representation in groups grows. Particularly, women aged 25 to 49 years living in numerous families, are in the first decile. Mostly they work as self-employed or are otherwise inactive persons. The highest influence has tertiary education on placements in the highest decile. The proportion of tertiary educated people is here just 35.2%, which means more than 10 times higher representation than in the first decile.

Figure 1 Distribution of people into income deciles by education groups (in %) in 2012



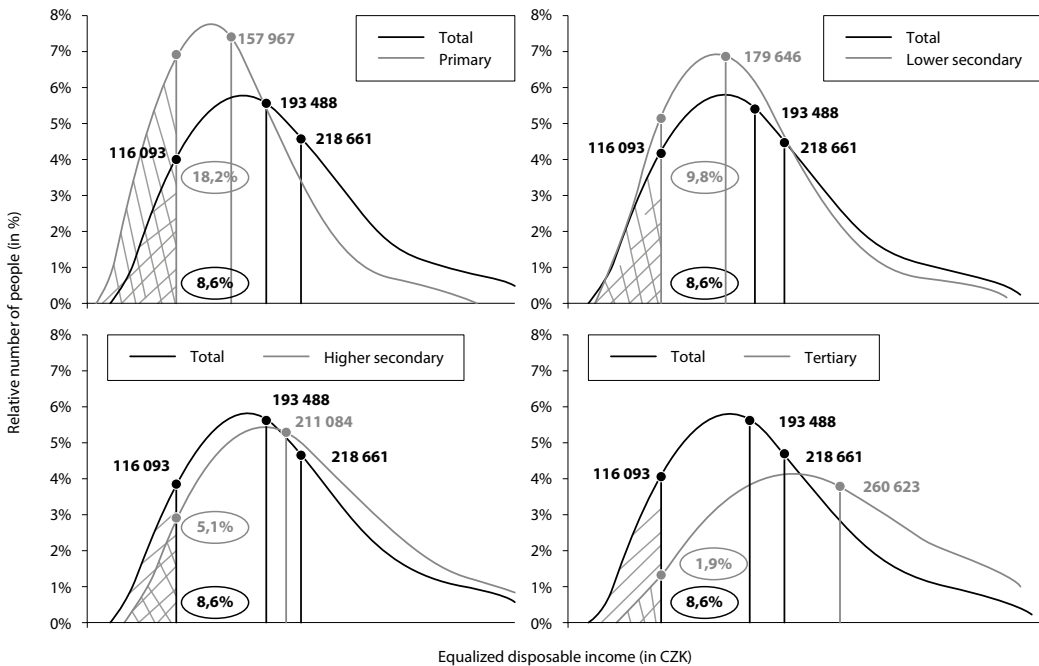
Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

The distribution of people by income in total and subsequently also distribution in different groups by highest attained education shows Figure 2. The bold black line indicates the distribution of income among the total, where the average income for year 2012 CZK 218 661/year and median with obviously lower value of CZK 193 488/year. Other curves describe the situation in groups. In the second graph just their median income is used for transparency.

There is an obvious crosshatched area with people at risk of poverty, indicating those whose income is below the poverty line, which is defined as 60% of the median of equalized disposable income.

In this case it means the value of CZK 116 093/year. The poverty rate, or, more precisely, the percentage of people at risk of poverty against all persons, is 8.6%. The color areas are plotted for the groups, where the lowest level of poverty can be found among people with tertiary education with a value of just 1.9%, which is mainly due to their high income. Half of these people take more (median is CZK 260 623) than the average income of all members in society. Other extreme is the group of people with primary education, which are threatened with 18.2% of income poverty. This indicates their already low average and median income (CZK 157 967), both are also even less than the total median. Average income of secondary educated people is very close to the overall median and their poverty risk is about 9.8%.

Figure 2 Distribution of people according to equal. disposable income (CZK/year) by education groups



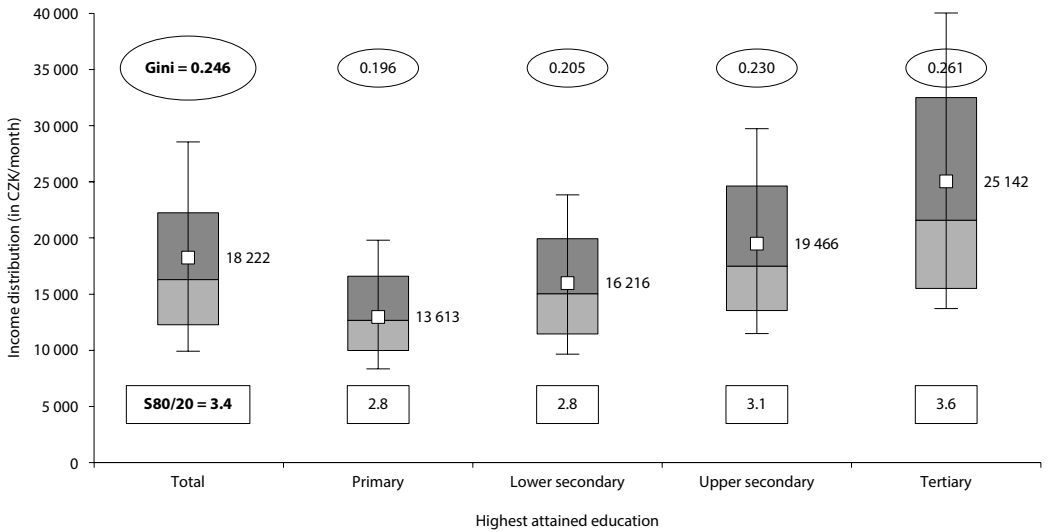
Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

The inequality of income distribution among each of groups by the highest attained education of people shows Figure 3, it is created by using the box-plots. The little white squares indicate the level of average month income in the group, which is always higher than the median.

There are also boxes with middle six deciles. The coefficient of income inequality can be obtained by using the ratio of the top quintile to the bottom quintile. It is in examined year 2012 at overall size of 3.4, which indicates that persons in the upper two deciles take 3.4 times more than those in the two lowest deciles. This indicator corresponds to further indicator of income inequality, which is the Gini coefficient, here at the level of 0.246. It expresses how much the current situation differs from the absolute equality of incomes. The higher the greater the inequality is. Graphical representation using the Lorenz curve is shown in the Figure 4.

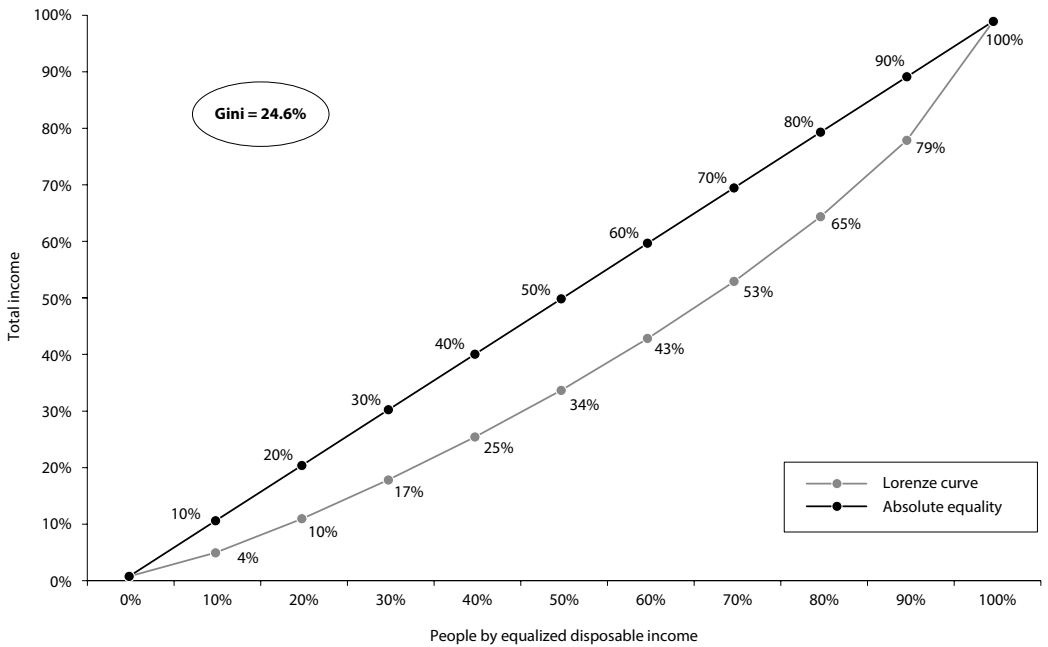
The Figure 3 shows that the higher level of education means the higher level of income and especially the higher level of inequality. Tertiary educated people have a great income range and Gini coefficient

Figure 3 Differentiation of equalized disposable income per month by group of education in 2012



Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

Figure 4 Lorenz curve of inequality of equalized disposable income in 2012



Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

in their group is at the level of 0.261. The richest fifth of them takes 3.6 times more incomes than the poorest fifth. Large differences in their income levels are given by their greater chances on the labor market, where tertiary educated people can easily evaluate the price of their work themselves. More aspects, than only wage or salary, are taken in consideration when choosing the work, because they can make decisions based on more opportunities.

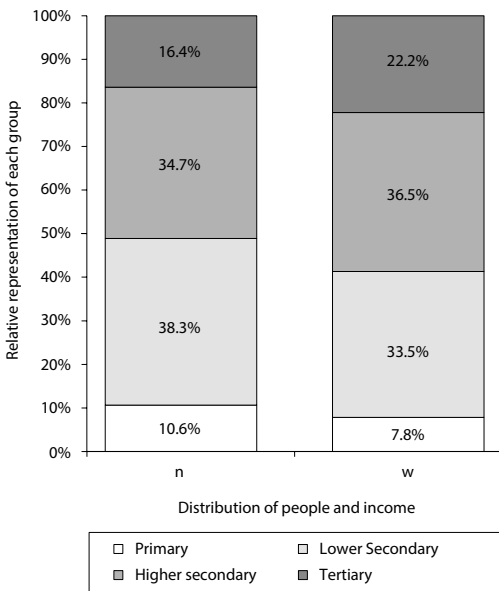
3.2 Decomposition of Theil index into groups by education

So far, analysis of income inequality was carried out in each group separately, which is useful for getting an idea of the differences between groups. However, to get the information about the contributions of the groups to overall income inequality is not enough. It offers analysis using Theil index, which allows us to perform the decomposition of income inequality in selected groups. We get not only an overview of how much a particular group contributes, but also about the influence of level of disparity between selected groups to overall inequality. Therefore we can see, how the between-groups variability participates in the total.

This index is based on comparison of the proportion of the number of persons in one group with the share of total incomes within this group. Does the amount of income correspond to the size of the group in there? The detection of just this inconsistency is then an obvious proof of income inequalities between persons in total, which are only classified into groups according to certain criteria.

The Figure 5 shows the differences between income and people distribution in each group of education for the year 2013. The two groups of people with primary and secondary education represent smaller volume of income than their frequency. Conversely, the population includes approximately 16% of people with tertiary education, by which we find more than 22% of total income volume.

Figure 5 Distribution of the group size (n) and total incomes (w) into groups by education in 2012

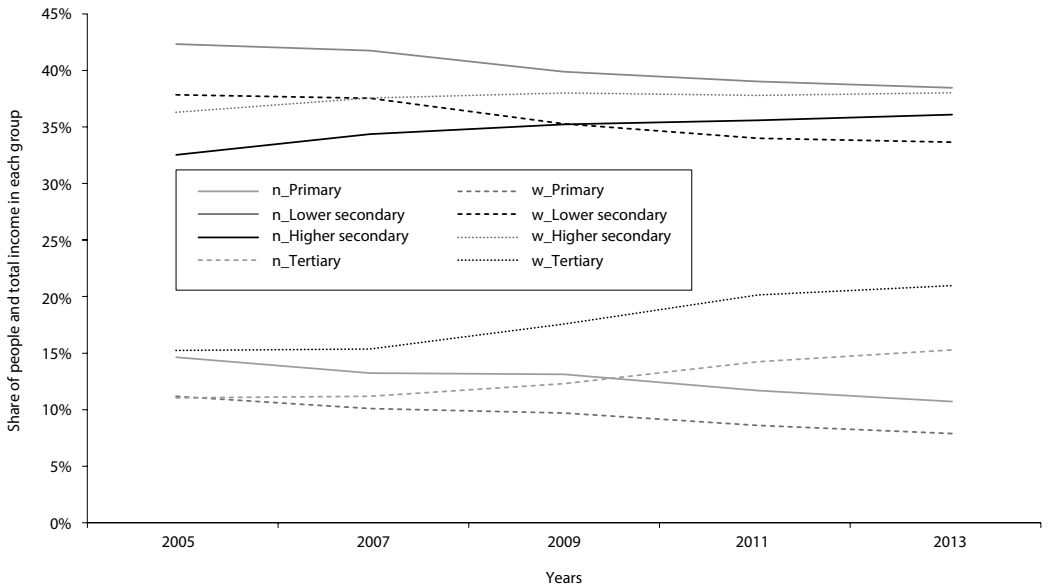


Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

This finding is supported also by analysis of some previous years in Figure 6. Here we can see that the two first mentioned groups have a solid line indicating the relative proportion of people placed above than the dotted line expressing the share of total income attributable to the group. By the other two groups, the opposite is true. We can also observe the trends of changing of representation in these groups. The only obvious trend is the faster growth of incomes among the people with tertiary education than their number and, on the other hand, the convergence of proportion of the people with upper secondary education with their relative incomes. Otherwise, the two curves more or less correspond to each other.

This information is an important basis for the calculation of the Theil index. Its numerical expression has in itself almost no explanatory power, the follow size of the contributions of each group to the total value of income inconsistency are important. Contributions of each group to this index in relative expression are shown in Figure 7. The group of people with higher secondary education contributes to the total income inequality the most due to their one-third representation

Figure 6 Development of group size (n) and total income (w) into groups by education between 2005–2013

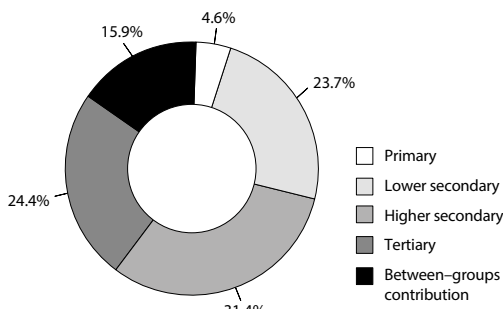


Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

in society. Second highest value presents the group of people with tertiary education despite their small representation amounting to 16.4%. It is because of larger proportion of total equalized income, of which they dispose, and because of their huge income inequality within the group. This is the reason, why their contribution is even higher than that of persons with lower education, whose representation in the society is more than twice bigger than that of persons with tertiary education.

Between-group contribution with level of 15.9% occupies the fourth position between all contributions, which means that its value is not that significant. Income inequality within education groups indicates higher contributions than inequality between these groups.

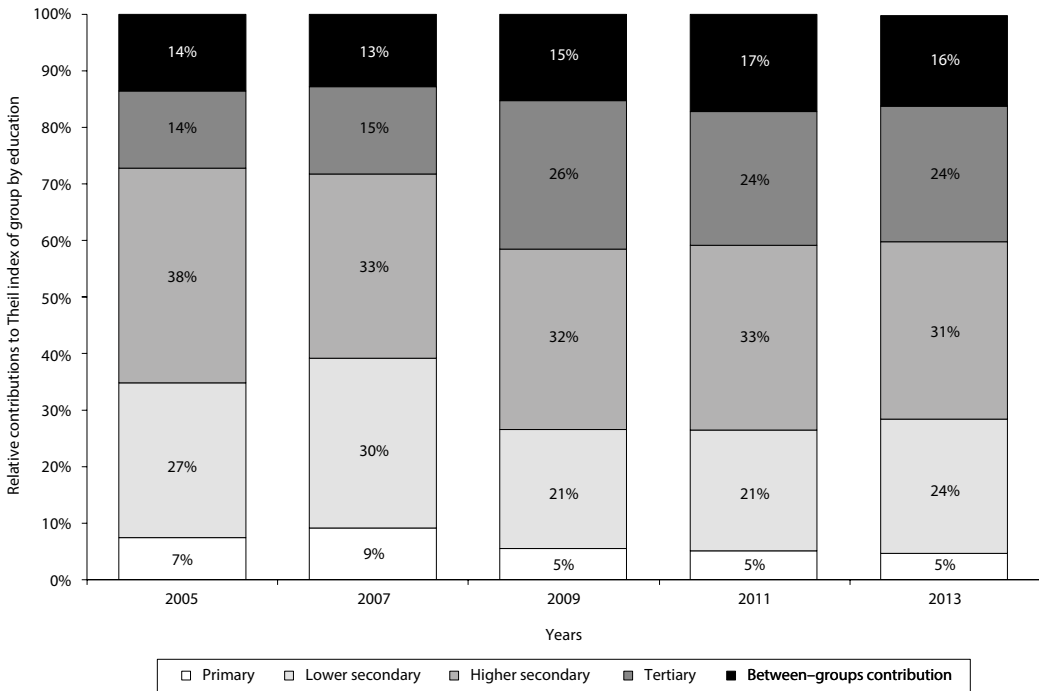
Figure 7 Contributions of education groups to Theil index in 2012



Source: Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

A significant increase of the contribution of people with tertiary education is evident if we focus on the development of these relative shares over the years in Figure 8, compared to a decline of contributions of persons with lower secondary education. No clear trend in the development of between group variability could be observed, its value rather fluctuates between years. However, there is an obvious increase of income inequality in 2009. The contribution of between-group inequality and contribution of persons with tertiary education increased at the expense of three lowest income groups. From this year, income inequality has not been increasing as fast as until the 2013, a moderate leveling of income has been recorded.

Figure 8 Development of contributions of education groups to Theil index between the years 2005–2013



Source: Own calculations and creation in MS Excel using data from EU-SILC 2013

Based on the trends of income inequality observable in the last year we can create some opinions about the future development. Further increase of the number of people with tertiary education can be expected, which can cause their higher contribution to the total inequality due to greater proportion in the population and their even higher volume of total incomes, that is predictable based on Figure 6. The change of income inequality within the group can show different development trends. On one side, this can be increasing because of more various work requirements of people, but on the other hand, it can decrease due to leveling of work opportunities. This is connected with between-group variability, which could be declining in importance. Greater number of people with tertiary education possibly causes certain reduction of the education factor significance, so the differences between persons with higher secondary and tertiary education would be mitigated and their chances on the labor market could be equalized. These are just assumptions of possible development of income inequality, that it will be dependent on many other factors and especially on the development of the economic situation in society.

4 DISCUSSION

Some possible limitation can occur by providing a decomposition of income inequality. First of all, we consider the influence of population share in each group, what has an impact on the value of contribution and so distorts the effect of income inequality level within each group, It would be appropriate to achieve the same group volume, but this is impossible because of their classification according to education level. Other disadvantage of Theil index subsists in the fact, that its value is affected by the number of groups k . The relative contributions of each group to the total degree of income inequality are dependent

on this. The variability of group averages increases with number of groups, so higher k means also higher between-groups contribution (Novotný, 2007).

The advantage of Theil index is the possibility of additional decomposition between subgroups and obtaining the within and between-groups inequality. Whatever, it is not limited by maximum values, so that interpretation of its size is very complicated. For measuring the income inequality just relative expression of group contributions are useful. According to European Commission (2010), Theil index presents a comprehensive, but complicated indicator of income inequality.

CONCLUSION

In this paper it was assumed, that income inequality affects the poverty rate, so detailed examination of income inequality was conducted. Thereafter, the large differences of level of income inequality between groups of people categorized by their highest attained education were detected. It is obvious, that the level of education has a significant impact on income inequality and the highest values of Gini coefficient are observed among persons with tertiary education.

The income inequality was confirmed by comparisons of each group size and income amount within this group. Among persons with tertiary education we find more than 22% of total equalized income amount while these persons represent only 16% of population. So this group makes the biggest contribution to overall income inequality. Conversely, persons with primary education do not have a significant influence on inequality.

By multiple comparisons, the within-group as well as the between-group contributes to overall income inequality were detected. The largest contribution to the Theil index occurs by the group of persons with higher secondary education, which is because of their most frequent representation in the population. Persons with tertiary education follow. They dispose of greater proportion of total income and show higher income inequality. Similarly, persons with lower secondary education contribute to income inequality more than those with primary education. It is because of their larger group size, despite their high income equality.

The between-group contribution represents almost 16%, so between-group variability has also certain impact to overall inequality. Over time, no significant trends in development of contributions of groups to overall income inequality are monitored.

It would be appropriate to produce also an analysis according to classification of people by their social status in society.

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