RESEARCH ARTICLE

https://doi.org/10.17059/ekon.reg.2023-2-8
UCD code: 330.43
JEL Classification: D31, D33, D63

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DOES EDUCATION AFFECT INCOME INEQUALITY? A COMPARATIVE REVIEW OF FOURTEEN EUROPEAN COUNTRIES[1]

Abstract. For years, income inequality and its sources have remained the focus of attention of many researchers. The present article aims to expand and update the knowledge concerning the dimensions of household income inequality in European countries. The paper focuses on the association between the educational attainment and income inequality. It is hypothesised that the different level of income inequality observed in different countries can depend on the educational attainment of the society. Therefore, the main research objective of the article is to explain how the education level of the head of household affects income inequality in fourteen West-EU countries. The analysis also has two empirical aims: to assess the divergence in the mean incomes of the distinguished subgroups of households and to measure how much of the overall inequality can be attributed to the distance between these subgroups rather than to inequalities within them. To this end, the Generalised Entropy measures were applied, using the representative microdata derived from the EU Statistics on Income and Living Conditions (EU-SILC). The obtained results indicate that the education level has a significant impact on the income variability between households, with some differences between countries. The study also revealed that the higher proportion of people with the lowest level of education, the higher inter-group income differentiation. Moreover, the study demonstrates that most countries with a high proportion of well-educated people also show low levels of inequality at the bottom of the distribution. This suggests that income inequality could be controlled through the development of education.

Keywords: household, household income, income inequality, education, household head, decomposition, Generalised Entropy measures, West-EU countries, EU-SILC, microdata

Acknowledgments: *The article has been prepared as part of the research project: Income and Inequality of Income of European Households (Eurostat, No. 162/2018-EU-SILC) and is based on data from Eurostat, EU Statistics on Income and Living Conditions — EU-SILC CROSS-SECTIONAL UDB 2018 — version 2019-09. The responsibility for all conclusions drawn from the data lies entirely with the authors.*

For citation: Muszyńska, J. & Wędrowska, E. (2023). Does Education Affect Income Inequality? A Comparative Review of Fourteen European Countries. *Ekonomika regiona / Economy of regions, 19(2)*, 397-409. https://doi.org/10.17059/ekon.reg.2023-2-8

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ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

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Влияние уровня образования на неравенство доходов: сравнительный обзор четырнадцати стран Европы

Аннотация. На протяжении десятилетий проблема неравенства доходов и его причин остается в центре внимания исследователей. В данной статье проанализирована связь между неравенством доходов домохозяйств в странах Европы и уровнем образования. Выдвигается гипотеза, предполагающая, что неравенство доходов в разных странах может зависеть от уровня образования семьи. Основная цель данной статьи — объяснить, как уровень образования главы семьи влияет на неравенство доходов в четырнадцати странах Европейского союза. Основными задачами исследования было оценить расхождение в средних доходах выделенных подгрупп домохозяйств и исследовать влияние разницы между этими подгруппами на общее неравенство. Для расчета обобщенной энтропии были проанализированы репрезентативные микроданные, представленные в исследовании «Статистика доходов и условий жизни в ЕС» (EU-SILC). Полученные результаты свидетельствуют о существенном влиянии уровня образования на неравенство доходов домохозяйств с некоторыми различиями между странами. Исследование также выявило прямую зависимость между долей лиц с самым низким уровнем образования и межгрупповой дифференциацией доходов. Более того, низкий уровень неравенства на границе распределения характерен для большинства стран, в которых высока доля образованных людей. Соответственно, неравенство доходов можно контролировать, развивая систему образования.

Ключевые слова: домохозяйство, доход домохозяйства, неравенство доходов, образование, глава домохозяйства, декомпозиция, обобщенная энтропия, страны Запада, EU-SILC, микроданные

Благодарность: *Статья подготовлена в рамках исследовательского проекта: Доходы и неравенство доходов европейских домохозяйств (Евростат, № 162/2018-EU-SILC) и основана на данных Евростата, Статистика доходов и условий жизни в ЕС — EU-SILC CROSS-SECTIONAL UDB 2018 — версия 2019-09. Ответственность за выводы, сделанные на основе данных, полностью лежит на авторах.*

Для цитирования: Мушинска И., Вендровска Е. (2023). Влияние уровня образования на неравенство доходов: сравнительный обзор четырнадцати стран Европы. *Экономика региона, 19(2)*, С. 397-409. https://doi.org/10.17059/ekon.reg.2023-2-8

1. Introduction

For many decades, the desire to explore potential determinants and patterns of income inequality has in no way diminished. Even though economic theories suggest the existence of a wide range of such determinants, there is no unanimity as to which of them are the most relevant. It was Kuznets (1955) who put forward one of the most influential hypotheses in social sciences concerning the relationship between the level of inequality and the level of economic development. This hypothesis assumes that an increase in the level of economic development represents the structural changes occurring in the economy which directly affect inequalities. In the countries undergoing transition income inequalities will most probably increase in the initial stages of transition as a consequence of these changes; however, they will eventually stabilise, and then decrease. While further research on the causes of income inequality criticised the theory formulated by Kuznets (a review of such works was carried out by Korzeniewicz and Moran (2005)), it also added to the set of the variables that potentially shape inequality. Among others, Heshmati (2006) extended the list of the variables accounting for the level of inequality by including various demographic factors, factors representing the degree of openness of a country's economy, the rate of economic growth, inflation rate, indicators of poverty, corruption, and the education level of the society. In addition to the traditional causes of inequality, Cornia and Court (2001) point to its other roots, resulting from "excessively" liberal economic systems: the liberalisation and globalisation of trade and finance, technological changes, errors in the implementation of stabilisation programmes, changes in the labour market (increased flexibility of wages, reduced state regulation, reduction of minimum wages, abandonment of employment protection, reduction of employment in the public sector, weakening of the bargaining power of employees). In turn, Atkinson et al. (2011) see the main sources of inequality in the changes in taxation, which have reduced progressiveness, especially in the upper tail of the income distribution.

The emergence of extensive and detailed sets of microdata in the second half of the 20th century enabled examination of the dimensions of inequality between people or households that directly result from the attributes of the people or households surveyed, such as gender, age, education, labour market status, region of residence, size and demographic structure of the household. Many studies on income inequality in modern societies assume an individual approach. However, according to some researchers, an analysis of inequalities in the incomes of particular people at the individual level is insufficient, or even artificial (VacasSoriano & Fernández-Macías, 2017, p. 38), as many people combine their incomes at the household level. Such pooling of incomes from different sources (market income, social transfers) can reduce inequalities due to the economies of scale. Households accumulate and redistribute the income of their members, generate the economies of scale and, to some extent, protect the members from temporary loss of income or other traumas. The family/household is an important "social security provider" and a significant redistributor of resources, consequently contributing to moderating inequality. This is why the redistributive role of the household is increasingly emphasised.

In line with these considerations, the article centres on the total disposable income of households, which includes all available sources of earned and unearned income. We focus on income inequality, particularly on equivalised household disposable income as the income concept that best approaches individuals' and households' standards of living (DiPrete, 2003). The distribution of this income depends on the composition and demographic structure of the household.

The article centres on the association between the educational attainment and income inequality. The paper aims to verify the hypothesis that the different level of income inequality observed in different countries can depend on the educational attainment of the society. Therefore, the main research objective of the article is to explain how the education level of the household head affects the level of income inequality in fourteen West-EU countries. On the one hand, European Union countries strive for integration on many levels to improve the quality of life of European citizens. On the other hand, they are characterised by many differences, e.g. regarding the level of inequality or the education of the society. Therefore, we want to investigate to what extent education contributes to shaping inequality in the fourteen countries forming the European Union before the accession of new members in 2004.

Our analysis also has two empirical aims: to assess the divergence in the mean incomes of the distinguished subgroups of households and to measure how much of the overall inequality can be attributed to the distance between these subgroups rather than to inequalities within them. In order to achieve the aims, we employ decomposition techniques of the Generalised Entropy measures. The study examines representative microdata obtained from the European Union Statistics on Income and Living Conditions (EU-SILC) survey.

The rest of the article is organised as follows: the next section presents the review of specialist literature. The third part details the sources of data and the research methodology. The results of the study are presented and analysed in section 4. These are followed by a discussion of the results, with conclusions ending the paper.

2. Literature Review

The literature on the subject points to education as one of the most crucial factors influencing income inequality. The idea of education as the basic factor determining income differences has a long history, dating back to the times of Adam Smith. Despite professing liberal views, he insisted on state co-financing of education. He believed that generally accessible education of children and the possibility for workers to occupy their minds are beneficial not only to individual people but also to the state. Quinn (2013) believes that the rationale here is paternalistic, yet liberal in the sense that the type of character that was to be formed by education was not passive and thoughtless, but was, rather, autonomous. Becker and Chiswick (1966), as well as Mincer (1970) claimed that by improving the level of skills (qualifications) education ensures an increase in personal and social income and reduces the dispersion of income distribution. However, Rodríguez-Pose and Tselios (2009) emphasise that an increase in the share of the population with tertiary education leads to an erosion of the value of education and, in the longer term, to a decrease in the wages of some workers with tertiary education.

The complexity and multidimensionality of the discussed issue mirror the often contradictory empirical results. Checchi (2000) stresses that facilitated access to tertiary education can increase earning opportunities of the poorest groups of the population, leading to a reduction of poverty and income inequality. Education is, therefore, considered not only an important factor of economic growth, but also one of the most powerful known instruments for reducing income inequal-

ity (Rodriguez-Pose & Tselios, 2009). The development of education is often perceived as a valuable tool for combating growing income inequalities in the medium term, and expenditure on education is justified as a very effective instrument for reducing income inequalities. The results of studies on the impact of government spending on education (as a share of gross domestic product (GDP)) on inequality for the 28 countries of the European Union between 2002 and 2015 reveal that a 1-percentage-point increase in government education expenditure leads to a reduction in the Gini coefficient by 0.024 deviation points in the following year (Jianu, 2018). However, despite these findings, the impact of education on income inequality is yet to be fully understood and may vary in developed and developing economies. Chevan and Stokes (2000) even refer to education as "the Pandora's box of income inequality", claiming that both low and high levels of education can foster income inequality. Based on data for 97 countries, Checchi (2001) demonstrated that an increase in government spending on education will lead to an increase in income inequality. The complexity of the issue of the effect of education on income inequality arises also from social stratification. It seems crucial which groups (with primary, secondary or tertiary education) are supported by additional education and qualifications. Shapiro (2006) stresses that in the areas inhabited by people with a higher level of education, the quality of life increases faster. Therefore, theses on reinforcing human capital usually concern the social groups most threatened by poverty and income inequality.

Fields (1980) analysed the case of developing countries, with regards to which he studied the relationship between education and income inequality. The results he obtained suggested that an increase in the level of education in society reduces inequality and poverty. The results obtained by Checchi (2001) also confirmed a negative relationship between education and income inequality. In contrast, the research conducted by Rodríguez-Pose and Tselios (2009) for 102 EU regions indicated a positive relationship between endowment with human capital and income inequality. Medgyesi (2014), in turn, revealed that there are significant income inequalities between groups of households with different education levels achieved by the head of household. His results indicate that the impact of educational differences on income disparities is usually relatively high in the EU-12 and relatively low in most EU-15 countries. Similar conclusions for the Visegrad Group were obtained in a study carried out by Muszyńska and Wędrowska (2018). The results for developing Asian countries presented in the work by Arshed et al. (2019) indicate that large-scale popularisation of primary education will reduce the level of inequality in a country. However, an increase in the number of people with tertiary education will reduce income inequality only in the short term. The consequences of such increase on a large scale will broaden income inequality in the long term.

3. Research Methodology

The study described in the paper is a part of the project "Income and inequality of income of European households" (RPP 162/2018-EU-SILC), and employs data from the EU-SILC survey conducted by Eurostat. In our analysis we used microdata extracted from the cross-sectional database of the EU-SILC 2018.

When using the EU-SILC data, two important limitations should be kept in mind. Firstly, the sampling design varies among countries, as the income data can be derived from administrative sources, or directly from the household survey, which causes limitations in comparability (Kranzinger, 2020, p. 648). Furthermore, low and high income households can be under-represented in the survey data due to the fact that often people refuse to provide any information about their income or understate it. As a result, the measures of income inequality can be underestimated.

Our study covered fourteen West-EU countries: Austria, Belgium, Denmark, Germany, Greece, Spain, Finland, France, Ireland, Italy, Luxemburg, the Netherlands, Portugal and Sweden. Due to data deficiencies, the United Kingdom was excluded from the analysis.

The study provides knowledge on measures of inequality estimated on the basis of equivalised household disposable income per household member. Total household disposable income was calculated as a sum of gross personal income components for all household members and gross income components at the household level reduced by taxes, social insurance contributions and inter-household cash transfers paid. To account for differences in the size and composition of households, the household disposable income was adjusted using the OECD-modified equivalence scale. The scale we adopted is widely spread across Europe and used by the Statistical Office of the European Union (Eurostat). The OECD-modified scale assigns a weight of 1.0 to the head of household, 0.5 to every household member aged 14 or more and 0.3 to each child aged less than 14. Summing up the individual weights gives

the household specific equivalence factor. In our study, the household disposable income was divided by the equivalised household size and then an equivalised value was assigned to each household member.

In the study, we used information regarding the incomes achieved by 341,678 individuals. Depending on the country, the sample size ranged from 10,431 (Luxemburg) to 54,806 observations (Greece). Detailed information on the sample sizes is presented in Table 1. All inequality indices reported in the paper were estimated using the personal cross-sectional weights and, therefore, correspond to the extrapolation of the measures to the entire population.

In order to achieve the aim of the study, we employ the Generalised Entropy measures (GE). Their selection was justified not only by the fact that they meet the four main axioms that any "reliable" measure of inequality should meet, but also by their property of being additively decomposable (Bourguignon, 1979; Shorrocks, 1980; Shorrocks, 1984). The decomposition property allows the total inequality within a population to be broken down into the inequality existing within the subgroups distinguished based on a specific population characteristic, and the inequality existing between the subgroups. In this way, the nature of the causes of income inequality can be ascertained. In other words, it is possible to assess the contribution of a set of factors, such as, for instance, household-specific attributes, to overall inequality. The importance of each single factor in explaining income inequality can be denoted as a ratio of the inequality between subgroups to overall inequality.

The *GE* class of measures is presented by the formula:

$$GE(\alpha)=\frac{1}{n(\alpha^2-\alpha)}\sum_{i=1}^{n}\left[\left(\frac{y_i}{\bar{y}}\right)^{\alpha}-1\right],\ \alpha\neq 0;\alpha\neq 1, \quad (1)$$

where y_i is the equivalised disposable income of household i, $\bar{y}$ is the mean income of a population, and n is the number of households in the population. The parameter α indexes the members of the class and represents the weight given to the distances between incomes in different parts of the income distribution. $GE(\alpha)$ is more sensitive to changes in the lower tail of the distribution for low parameter values ($\alpha < 1$), and more sensitive to changes that affect the upper tail for high parameter values ($\alpha < 1$) (Cowell, 2006, p. 351); (Jenkins, 2009, p. 394). However, in empirical work, the value of parameter a is typically limited to [–1, 2] because, otherwise, estimates may be distorted by a small amount of very low or very high incomes (Jenkins, 2009, p. 394). Following Jenkins' suggestions, we limited our estimation to the values of parameter $\alpha \geq -1$ and $\alpha \leq 2$, and calculated four *GE* measures for $\alpha = 1, 0, 1, 2$.

In formula (1) the denominator $n(\alpha^2 - \alpha)$ is equal to zero for $\alpha = 0$ and $\alpha = 1$. For this reason, the values of $GE(\alpha)$, in both cases, are obtained using the de l'Hôpital rule, and can be described by formulas (2) and (3):

$$GE(0)=-\frac{1}{n}\sum_{i=1}^{n}\ln\left(\frac{y_i}{\bar{y}}\right), \quad (2)$$

$$GE(1)=\frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}\ln\frac{y_i}{\bar{y}}. \quad (3)$$

$GE(\alpha)$ for $\alpha = 1$ is the Theil index T, while $GE(\alpha)$ for $\alpha = 0$ is referred to as the mean logarithmic deviation or the Theil index L.

As it has already been mentioned, one of the reasons behind selecting the *GE* measures was their property of additive decomposition. According to Bourguignon (1979), an additively decomposable measure of inequality is a measure that permits the total inequality within a population to be broken down into a weighted average of the inequality existing within subgroups of the population and the inequality existing between them.

Formally, the additively decomposable measure $I(y)$ can be defined as follows (Shorrocks, 1984):

$$I(y)=I(y_1,\ldots,y_K)=\sum_{j=1}^{K}w_j\cdot I(y_j)+I_B(y_1,\ldots,y_K), \quad (4)$$

where $y_1, \ldots, y_K$ represents any partition of the distribution y into K subgroups. When the decomposition is additive, the coefficients $w_j\left(\sum_{j=1}^{K}w_j=1\right)$ and the between-group term $I_B(y_1, \ldots, y_K)$ depend only on the average values for subgroups and population sizes. The first sum in formula (4) is the within-group component, which describes the part of overall inequality which arises from the inequality within subgroups. The within-group term is a weighted average of group inequalities, where the weights depend on the population and income shares. The second term $I_B(y_1, \ldots, y_K)$ is the between-group component, which measures the extent of the inequality arising from the differences in the group mean income. The between-group term represents the level of inequality that would be observed if the income achieved by each person was replaced by the mean income of the respective subgroup.

In the case of the GE measures, total inequality $GE(\alpha)$ can be presented as a sum of the inequality within groups $GE_W(\alpha)$ and the inequality between groups $GE_B(\alpha)$, where the first is the weighted sum of the inequalities within each subgroup:

$$GE(\alpha) = GE_W(\alpha) + GE_B(\alpha). \quad (5)$$

The decomposition formula for the *GE* measures is presented below (Paulus, 2004, pp. 220–221):

$$GE(\alpha) = \sum_{k=1}^{K} v_k \lambda_k^{\alpha} GE_k(\alpha) + \frac{1}{\alpha(\alpha-1)} \sum_{k=1}^{K} v_k \left[\lambda_k^{\alpha} - 1\right], \quad \alpha \neq 0; \alpha \neq 1, \quad (6)$$

where K is the number of subgroups, v_k — the share of population of the subgroup k in total population k, and λ_k — the ratio of the average income in the subgroup k to overall average income.

Specifically, for $\alpha = 0$ and $\alpha = 1$:

$$GE(0) = \sum_{k=1}^{K} v_k GE_k(0) + \sum_{k=1}^{K} v_k \ln\left(\frac{1}{\lambda_k}\right), \quad (7)$$

$$GE(1) = \sum_{k=1}^{K} v_k \lambda_k GE_k(1) + \sum_{k=1}^{K} v_k \lambda_k \ln \lambda_k. \quad (8)$$

The method we applied represents the so-called a priori approach, according to which the decomposition method is based on theoretical axioms, and it is sometimes criticised as being purely descriptive rather than analytical. Indeed, the subgroup decomposition method we employed does not document causal relationships, but only describes the association between the population characteristics and the level of income inequality. However, since we focus on the contribution of the household characteristics to overall inequality, the method we applied is adequate (sufficient) to achieve the aim of our study. From our point of view, the primary limitation of the decomposition technique is that it only assesses the individual effect of each feature on overall inequality. This method does not allow for capturing the interaction among different attributes (Chongvilaivan & Kim, 2016, p. 86).

Analysing income inequality in our study, we focused on the education level of the head of household. The head of household was defined on the basis of income. The member of a household who has made the largest contribution to the income of the household was perceived as the head of household.

When creating subgroups of households, we considered the following four education levels:

— primary,
— lower secondary,
— upper secondary and post-secondary,
— tertiary.

4. Results

As it was already stated, in order achieve the empirical aim of the study, we estimated the *GE* measures for $\alpha = -1; 0; 1$ and 2. The decomposition analysis was based primarily on the Theil *L* and *T* indices, and a ratio of the inequality between subgroups to overall inequality indicated the importance of a variable in explaining income inequality. *GE*(–1) and *GE*(2) were employed to assess inequalities at the lower and upper tails of the distribution respectively, i. e. in the group of the poorest households and in the group of the richest ones. Table 1 presents the values of the *GE* measures in the examined countries.

The level of income inequality in all examined countries can be considered moderate. Income

Table 1

Income inequality in the studied countries

Country	Sample size	*GE*(–1)	*GE*(0)	*GE*(1)	*GE*(2)
AT	12 613	0.2637	0.1234	0.1209	0.1463
BE	13 450	0.1436	0.1075	0.1108	0.1506
DE	25 025	0.3770	0.1570	0.1900	0.4772
DK	11 701	0.2256	0.1357	0.1592	0.3044
EL	54 806	0.2253	0.1711	0.1897	0.3706
ES	33 301	0.3180	0.1914	0.1784	0.2117
FI	23 794	0.1218	0.1109	0.1219	0.1678
FR	24 406	0.1390	0.1305	0.1637	0.7126
IE	12 404	0.1787	0.1534	0.1691	0.2828
IT	45 085	0.3012	0.1909	0.1861	0.2542
LU	10 431	0.3284	0.1817	0.1821	0.2467
NL	27 149	0.2139	0.1283	0.1343	0.1959
PT	33 285	0.2061	0.1679	0.1738	0.2227
SE	14 228	0.1848	0.1236	0.1276	0.1876

Source: Authors' own calculation using EU-SILC data.

Table 2

Summary statistics of equivalised household disposable income in the studied countries

Country	Summary statistics	Levels of education			
		primary	lower secondary	upper secondary and post-secondary	tertiary
AT	income share	0.0041	0.0871	0.4727	0.4361
	relative mean	0.6255	0.7195	0.9331	1.1921
BE	income share	0.0801	0.1019	0.2841	0.5339
	relative mean	0.6344	0.7334	0.9022	1.2225
DE	income share	0.0051	0.0376	0.4154	0.5419
	relative mean	0.6128	0.6395	0.8468	1.2251
DK	income share	0.0395	0.0893	0.4013	0.4699
	relative mean	0.7253	0.8668	0.9256	1.1490
EL	income share	0.1661	0.0724	0.3638	0.3977
	relative mean	0.7315	0.7958	0.9338	1.3604
ES	income share	0.1342	0.1913	0.1978	0.4767
	relative mean	0.6748	0.8015	0.9420	1.3526
FI	income share		0.1355	0.3936	0.4709
	relative mean		0.7747	0.8950	1.2220
FR	income share	0.0960	0.1025	0.3643	0.4372
	relative mean	0.7693	0.8773	0.8841	1.2625
IE	income share	0.0774	0.0943	0.2072	0.6211
	relative mean	0.6652	0.7623	0.8381	1.2115
IT	income share	0.1047	0.2439	0.3880	0.2634
	relative mean	0.7459	0.8128	1.0235	1.4594
LU	income share	0.1109	0.1033	0.3344	0.4514
	relative mean	0.6927	0.7757	0.9128	1.3262
NL	income share	0.0382	0.1133	0.3305	0.5180
	relative mean	0.7129	0.8023	0.8840	1.2010
PT	income share	0.2722	0.1726	0.2099	0.3453
	relative mean	0.7272	0.8923	1.0071	1.5429
SE	income share	0.0495	0.0986	0.4688	0.3831
	relative mean	0.6633	0.7971	1.0069	1.1399

Source: Authors' own calculation using EU-SILC data.

disparities were the lowest in Belgium and they were only slightly higher in the Nordic countries: Finland and Sweden. The highest income inequality was observed in the Mediterranean region, Luxemburg, and Germany.

In the group of the poorest households, high income inequality was recorded in Germany, Luxemburg, Spain and Italy, while low-income disparities were observed in Finland, France and Belgium. At the other end of the distribution, i. e. among the richest households, high inequality in disposable income was noted in France, Germany and Greece.

As expected, we observed a positive correlation between the education level and the average income of the groups distinguished on the basis of education (Table 2). The most considerable disproportions in the average income of the people from the groups characterised by the highest and lowest levels of education occurred in the Mediterranean countries, Germany, Belgium, and Luxembourg, where the level of the average income of the households whose head was a person with higher education was approximately twice as high as the average income of the households headed by a person with primary education. The least definite differences in average income due to differences in education levels were observed in the Nordic countries, the Netherlands, Ireland, and France.

There were substantial differences in income distribution among the groups distinguished on the basis of education between the countries surveyed. More than half of income was distributed among the members of the households with the highest level of education in Ireland (62.1 %), Germany (54.2 %), Belgium (53.4 %) and the Netherlands (51.8 %). On the other hand, the lowest share of income for this subgroup was observed in Italy (26.3 %) and Portugal (34.5 %).

We also noticed that the level of inequality within the groups distinguished on the basis of

Table 3

Intra- and inter-group inequality of equivalised household disposable income in the studied countries

Country	$GE(\alpha)$	Levels of education				
		primary	lower secondary	upper secondary and post-secondary	tertiary	Between-group component (%)
AT	$GE(-1)$	0.3201	0.1796	0.1858	0.3750	5.40
	$GE(0)$	0.1303	0.1061	0.0896	0.1383	11.10
	$GE(1)$	0.0899	0.0968	0.0839	0.1355	11.02
	$GE(2)$	0.0822	0.1040	0.0925	0.1648	8.95
BE	$GE(-1)$	0.0667	0.1168	0.1306	0.1087	17.87
	$GE(0)$	0.0607	0.0814	0.0789	0.0910	22.55
	$GE(1)$	0.0600	0.0803	0.0734	0.0993	21.02
	$GE(2)$	0.0635	0.0932	0.0774	0.1478	15.02
DE	$GE(-1)$	0.0696	0.1415	0.1726	0.6651	6.09
	$GE(0)$	0.0647	0.1158	0.1165	0.1592	14.09
	$GE(1)$	0.0638	0.1192	0.1245	0.2064	11.39
	$GE(2)$	0.0667	0.1486	0.1896	0.5803	4.49
DK	$GE(-1)$	0.0634	0.1781	0.1123	0.3869	4.20
	$GE(0)$	0.0680	0.1747	0.1022	0.1479	6.82
	$GE(1)$	0.0852	0.2625	0.1168	0.1632	5.71
	$GE(2)$	0.1308	0.8925	0.2031	0.2736	2.95
EL	$GE(-1)$	0.1503	0.2094	0.1989	0.2015	12.63
	$GE(0)$	0.1158	0.1485	0.1436	0.1604	16.66
	$GE(1)$	0.1128	0.1711	0.1550	0.1841	15.29
	$GE(2)$	0.1504	0.4611	0.3261	0.3421	8.08
ES	$GE(-1)$	0.2897	0.2463	0.2886	0.2208	11.90
	$GE(0)$	0.1496	0.1561	0.1663	0.1487	19.34
	$GE(1)$	0.1325	0.1483	0.1457	0.1393	20.65
	$GE(2)$	0.1446	0.1876	0.1590	0.1591	17.62
FI	$GE(-1)$		0.0906	0.0993	0.1143	13.72
	$GE(0)$		0.0796	0.0863	0.1098	15.02
	$GE(1)$		0.0833	0.0889	0.1249	13.73
	$GE(2)$		0.1021	0.1088	0.1767	10.09
FR	$GE(-1)$	0.0948	0.1703	0.0935	0.1462	12.66
	$GE(0)$	0.0888	0.1616	0.0858	0.1375	13.65
	$GE(1)$	0.0950	0.1966	0.0904	0.1923	11.09
	$GE(2)$	0.1176	0.3399	0.1109	1.1383	2.62
IE	$GE(-1)$	0.0939	0.1299	0.1246	0.1835	15.56
	$GE(0)$	0.0889	0.1098	0.1050	0.1516	17.25
	$GE(1)$	0.0990	0.1112	0.1049	0.1678	15.09
	$GE(2)$	0.1296	0.1279	0.1209	0.2948	8.81
IT	$GE(-1)$	0.2544	0.2699	0.2617	0.2507	8.53
	$GE(0)$	0.1312	0.1708	0.1671	0.1749	13.78
	$GE(1)$	0.1198	0.1549	0.1595	0.1767	14.70
	$GE(2)$	0.1375	0.1790	0.2261	0.2322	11.38
LU	$GE(-1)$	0.1307	0.1888	0.4402	0.2304	6.61
	$GE(0)$	0.1117	0.1366	0.1598	0.1644	17.07
	$GE(1)$	0.1116	0.1315	0.1535	0.1635	17.01
	$GE(2)$	0.1280	0.1517	0.2317	0.2043	12.74

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Country	$GE(\alpha)$	Levels of education				
		primary	lower secondary	upper secondary and post-secondary	tertiary	Between-group component (%)
NL	$GE(-1)$	0.0965	0.0956	0.2596	0.1812	7.65
	$GE(0)$	0.0676	0.0793	0.1099	0.1304	12.57
	$GE(1)$	0.0666	0.0838	0.1063	0.1379	11.93
	$GE(2)$	0.0733	0.1123	0.1479	0.2021	8.19
PT	$GE(-1)$	0.1456	0.1403	0.1585	0.1802	20.27
	$GE(0)$	0.1233	0.1135	0.1318	0.1320	25.49
	$GE(1)$	0.1281	0.1139	0.1385	0.1313	25.79
	$GE(2)$	0.1670	0.1372	0.1797	0.1548	21.57
SE	$GE(-1)$	0.0926	0.1642	0.1386	0.2188	7.18
	$GE(0)$	0.0853	0.1105	0.1074	0.1189	9.91
	$GE(1)$	0.0930	0.0990	0.1139	0.1250	8.95
	$GE(2)$	0.1237	0.1021	0.1683	0.1947	5.73

Source: Authors' own calculation using EU-SILC data.

education showed some regularity in most countries (except Spain, France and Portugal). Those households where the head had a university degree were characterised by the highest income inequality (Table 3).

The discrepancy between the income structure and the population structure is illustrated by the decomposition of the measures of inequality. There was a considerable variation between the countries surveyed in terms of the contribution of the education level of the head of household to overall inequality (Table 3). In Portugal, Belgium and Spain, the share of the inequality between subgroups in total inequality represented more than 20 % of the overall inequality measured by the $GE(0)$ and $GE(1)$ measures, while in Denmark and Sweden it was less than 10 %.

5. Discussion

High income inequality observed in the Southern countries and Ireland can still be attributed to the Great Recession due to a larger impact of the crisis on the European periphery. Especially in the Mediterranean countries, this negative impact on income levels was extended over time (VacasSoriano & Fernández-Macías, 2017, p. 56). The level of inequality in the studied countries is also affected by the unequal growth rate of household income in various parts of the distribution. According to the European Commission, the slow growth rate among the poorest households had the greatest impact on overall inequality in the years after the crisis. This phenomenon had a particularly strong effect in Portugal, and also in Italy and Germany (European Commission, 2017).

When assessing income inequality in various parts of the distribution, income structure should be taken into consideration. According to the International Labour Organisation (ILO), in Europe, wages account for approximately 70 % of household income, on average, with some substantial variations between countries. However, sources of income at both the top and the bottom of the income distribution are more diverse than in the middle, where households rely mostly on wages (International Labour Organisation, 2015, p. 35). In the case of the poorest 10 % of households, wages represent the smallest source of household income. In Italy, wages account for more than 30 % of household income, in France approximately 25 %, while in Germany less than 10 % (International Labour Organisation, 2015, p. 36). In Italy and France, the richest 10 % of households draw a large share of their household income from sources of income other than wages, particularly from self-employment proceeds and capital gains (International Labour Organisation, 2015, p. 38). In our study, a similar situation was observed also in Germany.

In the lower end of the distribution, the level of household income inequality is shaped by low wages, unemployment benefits and social transfers, while in the right tail, inequality is determined by considerable incomes of highly qualified employees, such as managers, engineers, or lawyers, as well as by self-employment proceeds and capital gains. This pattern can, in fact, be observed in almost all countries examined in our study.

Our results show a paramount role of education in shaping inequality. In Ireland, Finland and Sweden, which boast the highest educational attainment among the countries surveyed, the income differences between the households with the highest and lowest levels of education ob-

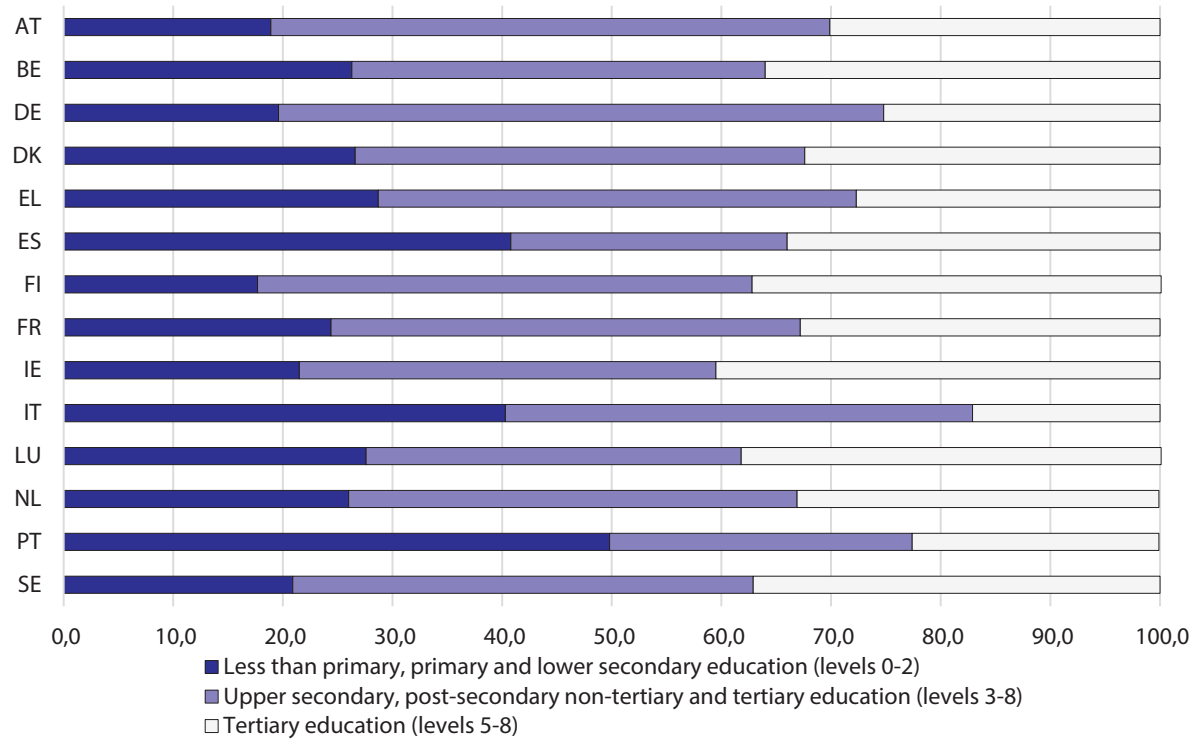

Fig. 1. *Population by educational attainment level in the studied countries, 2018 (source: Authors' own elaboration using Eurostat data)*

tained by the head of household, respectively, were smaller than in the countries where the share of people with higher education is lower (Fig. 1). In Portugal and Spain, on the other hand, where the inter-group income variations were the most pronounced, there was the highest proportion of people with the lowest level of education. The conclusions we reached are in line with the works of DeGregorio and Lee (2003) and Heshmati (2006), who claim that higher educational attainment contributes to equalisation of income distribution. In the countries with a large supply of educated labour, there may be more competition for positions requiring advanced qualifications, and the "educational advantage" may disappear. This leads to narrowing the income gap between educated and uneducated people. At the same time, however, we observed that higher income in the groups of households headed by a person with higher education is coupled with higher income inequality (except for Spain, France, and Portugal).

Our results imply a growing income gap among people with higher education. This is particularly true in Germany, where the *GE*(–1) and *GE*(2) measures indicate strong income disparities in both the lower and upper tail of the distribution in the group of households headed by a person with tertiary education. Similar conclusions were drawn by Pfeffer (2018), whose results showed a growing disparity in the incomes of university graduates, particularly between cohorts born in the 1970s and 1980s, respectively. Rodríguez-Pose and Tselios (2009) argue that an increase in the education levels of the highly-educated tends to increase income inequality, as the imperfect competition for positions requiring advanced educational credentials raises the wages of educated people even more. The results of the decomposition indicate that the education level of the head of household was the factor causing the greatest income inequality between subgroups of households in Portugal, Belgium, Spain (the share of the inequality between subgroups in total inequality represented more than 20 % of the overall inequality measured by the *GE*(0) and *GE*(1) measures). It should be emphasised, however, that overall inequality is shaped to various degrees by heterogeneity between the groups categorised by different education levels, ranging from about 26 % for Portugal to 6–7 % for Denmark (Fig. 2).

6. Conclusions

This study investigated the impact of the education level on income inequality in fourteen West-EU countries by using microdata extracted from the cross-sectional database of the EU-SILC 2018. We made use of the additively decomposable nature of the Generalised Entropy measures to explore in what way the education level of the head of household is associated with the degree of income inequality.

The results of our study confirmed an association between the education level and the average income of the groups distinguished on this ba-

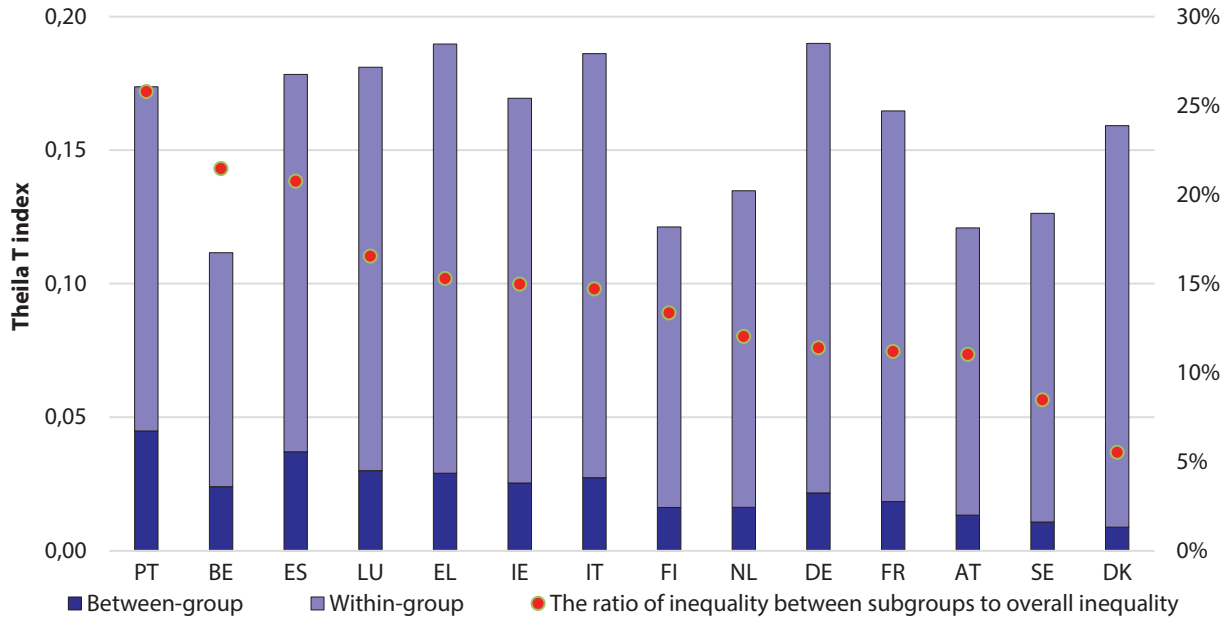

Fig. 2. *The Theil T index decomposition (source: Authors' own calculation using EU-SILC data)*

sis. The decomposition analysis showed that the contribution of the education level obtained by the head of household to overall inequality varied, ranging from 6 % in Denmark to approximately 26 % in Portugal. In most of the countries, which boast the highest educational attainment, the contribution of the differences in educational attainment was below its average. Belgium was the only exception, where the contribution was one of the highest. In turn, the highest proportion of people with the lowest education level was accompanied by the most pronounced inter-group income differentiation. Another important pattern, common to many of the countries covered in the study, was the highest level of inequality among the households where the head of household had a university degree.

Moreover, our study confirmed that in the lower tail of the income distribution, the level of household income inequality was formed by low wages, unemployment benefits and social transfers, while in the upper end, inequality was shaped by considerable incomes of highly qualified employees. The results obtained accentuate the importance of using multiple measures of inequality in order to examine income inequality in different part of the income distribution.

As shown in the literature review, an increase in the education level can cause both an increase and a decrease in inequality. The way education affects income inequality is due to social stratification. It seems crucial which groups (with primary, secondary or tertiary education) are supported by additional education and qualifications.

Our study reveals that most countries with a high proportion of well-educated people also show low levels of inequality at the bottom of the distribution. This suggests that education development would be a significant option to control the income inequality and should be considered as a means to improving income distribution.

In our opinion, it is important to improve the education level and qualifications of people with the lowest income in order to not only compensate for income inequalities, but also to contribute to the increase in the value of human capital and increase the equality of opportunity for future generations.

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Дата поступления рукописи: 15.06.2021.
Прошла рецензирование: 20.01.2022.
Принято решение о публикации: 24.03.2023.

Received: 15 Jun 2021.
Reviewed: 20 Jan 2022.
Accepted: 24 Mar 2023.