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Socio-economic development, income inequality and redistribution

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Abstract

Tackling the issue of income equity through redistribution consists of a discussion about the extent and forms of redistribution. The study responds to the issue of income redistribution defined within the neoclassical welfare economy by addressing the research question concerning the relation of the selected areas of social policy (expenditure of social protection) and of socio-economic development (Human Development Index, Gini coefficient). The study uses a quantitative approach to the research question, statistically tests the relation between social protection expenditure and socio-economic development, and tests income inequality using the Pearson's correlation coefficient. The results show that social protection expenditure on health care and old age had a positive impact on socio-economic development, assessed through the Human Development index; only social protection expenditure on disability had a negative impact on socio-economic development. Also, social protection expenditure on health care, on the disabled and on old age had a mainly negative impact on income inequity, based on the Gini coefficient.

Keywords

Income inequality, social protection expenditure, socio-economic development, redistribution, welfare state.

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1. Introduction

The need for and extent of redistribution processes is one of the most discussed issues which has not only an economic and social dimension, but also a political one (Mikušová Meričková and Halásková, 2014a, 2014b). The extent of redistribution should be a compromise between equity versus efficiency (a trade-off compromise according to the theory of welfare economics) (Bailey, 1995; Cullis and Jones, 1992). Finding an optimal level of redistribution is a complex issue as it is a welfare-state concept, and therefore needs to be defined by each economy with respect to national customs, traditions and specificities. The welfare state is based on the idea that a country has a certain range of redistribution processes, defined by the amount of public expenditure on social protection, in order to set equal opportunities at the beginning of one's life and to use social policy to create an environment of adequate welfare (Adnet and Hardy, 2005; Diamond and Lodge, 2013; Farnsworth and Irving, 2011; León, 2012; Ochrana and Nekola, 2009; Pestieau, 2006; Sinn, 1995).

In connection with the practical perspective of this issue, there has been a focus on redistribution processes and the amount of public social expenditure (Adema et al., 2011; Goudswaard and Caminada, 2010; Immervoll and Richardson, 2011; Pestieau, 2006; Wang et al., 2012), redistribution with respect to income inequality (Immervoll and Richardson, 2011; Korpi and Palme 1998; Niehues, 2010) and income redistribution in relation to social and economic development (Alesina and Rodrik, 1994; Cingano, 2014; Mikušová Meričková and Halásková, 2014a, 2014b; Perotti, 1996; Pisu, 2012).

As a follow-up study of existing research Mikušová Meričková and Halásková (2014a, 2014b), this study aims to evaluate, based on a theoretical and empirical approach, the level of redistribution processes given the amount of expenditure on social protection, in connection with income inequality and socio-economic development in selected European countries. What is defined in line with the aim is the object of research: the correlation between social and economic policy from a narrow perspective.

The first part of the study deals with welfare-state regimes in relation to redistribution. In the empirical part, the object of statistical testing is the research question about the existence of a relation between the amount of selected social protection expenditure according to function (expenditure on the sickness/health-care, on the disabled and on the old age) on the one hand, and the achieved level of socio-economic development and quantified Human Development Index (HDI) and the level of distribution of available incomes, evaluated using Gini coefficient, on the other hand. Expenditures on social protection by selected functions have been chosen with a particular focus placed on material living standards and health, which are features defining the quality of life from the viewpoint of human resources.

2. Welfare state concept

Attempts to reduce income and social inequalities have a history in Europe. In each country, the development of redistribution was different. In the course of the 20th century, models of social protection, varying in their range of redistribution processes, developed in Europe (Adnet and Hardy, 2005). Esping-Andersen's categories draw on Weber's methodological approach in constructing holistic *ideal-types*. These are reflected upon in the profile of public expenditure and welfare outcomes across social protection regimes (Adnet and Hardy 2005; Brennan et al., 2012; Diamond and Lodge, 2013; Farnsworth and Irving, 2011; Pestieau, 2006; Sinn, 1995). Nordic (social democratic) welfare states are predicated on social investment strategies that promote higher employment and growth, ensuring a *cradle-to-grave* provision of child care and social care for the elderly. Income redistribution reaches a high level, which corresponds with high public expenditure in social areas. Implementation of this model can be found mainly in Sweden, Finland, Denmark, Norway and, partially, in the Netherlands. Continental (conservative) welfare states maintain contributory social insurance systems that offer high levels of protection to *insiders*, while continuing to regulate employment and the labour market. Redistribution processes are based on an insurance principle, when the source of public expenditure in the social area is public insurance. This model is implemented in, for instance, France, Germany, Austria and, at this juncture, also in Switzerland. Anglo-Saxon (liberal) *welfare states* have

undergone a transition, adopting elements of the social investment approach. Nonetheless, welfare-benefit levels remain relatively low, there is a significant reliance on targeting and means-testing, and a considerable proportion of state services have been privatised. The range of redistribution processes and public expenditure on social areas is lower, compared with other models. Within Europe, this social model is implemented mainly in Great Britain and Ireland.

3. Material and methodology

The study uses the analytic classification comparison and abstraction in selected theoretical approaches to develop a theoretical-methodological framework for the research solution–concerning the relation between redistribution and socio-economic development, income inequality. This relation is statically tested; the study uses a quantitative approach to the research question. The outcomes of comparative analysis are concluded by methods of synthesis and partial induction. The research has a secondary character, uses the Eurostat statistics data (due to data availability for the 2005–2012 period). The data was gained by the constructive method, and processed by statistical methods described below.

According to the European System of Integrated Social Protection Statistics ESSPROS (2012), expenditure on social protection is divided into four categories. The first one is expenditures on social benefits, which are resources in the form of cash, products or services. The second category relates to administrative expenses, connected with the system of providing social protection. The third and fourth categories deal with transfers into other systems and various expenditures. According ESSPROS (2012) social protection is defined as encompassing all interventions from public or private bodies intended to relieve households and individuals of the burden of a defined set of risks or needs, defined through eight functions of social protection: sickness/health care, disability, old age, survivors, family/children, unemployment, housing, and social exclusion not classified elsewhere.

This paper focuses on key areas of social policy, and in connection to redistribution processes, three categories of expenditure are observed. These are categories of expenditure on social protection by function (social protection expenditure on sickness/health care, disability, old age) have been selected on the basis of these functions with regard to the selected group, in which at least a minimal extent of social protection in these areas (for citizens with the lowest income) is supposed also in countries with a liberal approach to social policy.

What is being statistically tested is the research issue of the existence of the relation between the amount of selected social protection expenditure by function (expenditure on the sickness/health-care, on the disabled and on old age) on the one hand, and the achieved level of socio-economic development and quantified Human Development Index (HDI) and the level of division of available incomes, calculated using Gini coefficient, on the other hand.

The object of the quantitative analysis is a set of seventeen European countries comprising: Belgium-BE, Czech Republic-CZ, Denmark-DK, Estonia-EE, Greece-EL, France-FR, Italy-IT, Latvia-LV, Luxembourg-LU, Hungary-HU, Netherlands-NL, Poland-PL, Romania-RO, Slovakia-SK, Sweden-SE, United Kingdom-UK, Switzerland-CH. The sample was deliberately selected in order to ensure its heterogeneity from the viewpoint of observed indicators/variables influencing the statistical testing. These countries vary in their level of redistribution policy (according to the welfare state and a different level of expenditure on social protection) and their level of socio-economic development.

Testing of the relation between social protection expenditure by function on the one hand and socio-economic development and income inequality on the other, was carried out using the method of the Pearson correlation coefficient. From the perspective of a standardised method of statistical testing of the dependence of variables (e.g. Spearman's rank correlation coefficient, where no linearity of the expected relationship or the common distribution of two variables can be supposed, Kendall's coefficient of concordance, based on data related to metric or ordinary evaluation of n objects ($i = 1, 2, …, n$) according to two criteria X and Y) (Levin et al., 2013; Lynch, 2013) and the character of available data, the method using the Pearson's correlation coefficient appears the most appropriate.

This method is used to measure the strength of *linear* correlation between two random variables. Values range within the interval <–1, 1>, when the positive or negative value indicates the direction of correlation (positive in the case of correlation, negative in the case of anticorrelation) and its absolute value, the strength of correlation. The more the absolute value approaches 1 (or –1 for that matter), the stronger the correlation is. One of the most frequently used calculations of correlation analysis appropriate for a given type of data is the Pearson's correlation coefficient. The estimate of a pair correlation coefficient is defined as the estimate of covariance x and y divided by the multiplication of estimates of their standard deviations, i.e.

$$r_{yx} = \frac{\text{cov}_{xx}}{s_x s_y}, \tag{1}$$

where cov$_{xy}$ is the covariance between x and y and can be calculated as the average of the multiplication of deviations, i.e. it is a *common* measure of variability (covariance) for two features (x and y). The equation is based upon covariance, which is the level of mixed variability of variables x and y.

$$\text{cov}_{xy} = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)\left(y_i - \bar{y}\right) = \overline{xy} - \bar{x}\cdot\bar{y}. \qquad (2)$$

To express the strength of the correlation, the coefficient of determination (r^2) was used, which is the squared value of the coefficient of correlation (*r*), expressed in per cent. The coefficient of determination also states the extent of suitability of a model. It shows the part of *y* variability which can be explained by the model (Lynch, 2013).

The calculations in the following part are the output of the SPSS Statistics 21.0 software.

4. Results and discussion

Based on an analysis carried out in the period 2005–2012: 1) the results of the income redistribution that was reached and of the socio-economic development and income inequality in selected European countries are presented; 2) using the Pearson's correlation coefficient and the coefficient of determination, the results of the range of expenditure on social protection with respect to socio-economic development, quantified with the Human Development Index, and with respect to income inequality, expressed by the Gini coefficient, are presented.

4.1 Level of income redistribution in the selected European countries

What is first assessed is the level of income redistribution according to social protection expenditure, by three functions (sickness/health care, disability, old age). The level of income redistribution in selected European countries in the years 2005–2012 is provided in the following tables with the individual categories of social protection expenditure. More closely, key areas of social policy are targeted. What is observed in connection with redistribution processes are three categories of social protection expenditure spending by function (social protection expenditure on sickness/health care, disability, and old age). These have been selected based on these functions with regard to the selected group, where at least a minimal extent of social protection in these areas (for citizens with the lowest income) is supposed also in countries with a liberal approach to social policy.

In a number of countries, health care is directly linked to social insurance through applied insurance schemes, which ensure both payment of health-care expenses and payment of sick leave. According to

Gavurová and Šoltés (2014) and Pestieau (2006), a general phenomenon of health insurance in all advanced countries is the fact that public expenditure on health care grows faster than the economy. If public expenditure on health care grows faster than GDP, expenditure on social security, expenditure of the insured and expenditure of the payers of health insurance grows as well.

Social protection expenditure by the sickness/health-care function covers, according to ESSPROS (2012): *cash benefits that replace completely or partially the loss of earnings during temporary inability to work due to sickness or injury, and medical care provided in the framework of social protection to maintain, restore or improve the health of the people protected. The scope of cash benefits in this function is rather limited. Cash benefits that replace loss of earnings during temporary inability to work in the case of pregnancy or disability are recorded under the family/children or disability functions. Benefits provided by employers in the form of continued payment of wages and salaries during sickness are taken into account*.

In the set of selected countries, the highest social protection expenditures on sickness/health-care function as % of GDP were observed in the Netherlands, United Kingdom, France, Belgium (Table 1). In years 2005–2012, a growing tendency to spend on social protection by sickness/health-care function can be observed, mainly in the Netherlands (increase of 3.3% of GDP) and Belgium (by 1.1% of GDP), i.e. in countries with an obligatory health insurance scheme for citizens, and in Great Britain (increase of 1.5% of GDP), where the system of NHS is used–health care is paid by the state from taxes, without insurance funds. Among the countries with a relatively high rate of expenditure on social protection–sickness/health care–in years 2005–2012 was France, whose health-care type of financing and outpatient care derives from the insurance system, but also here the system of a national health service is implemented. By contrast, the most significant decline in expenditure on social protection by sickness/health-care function over the evaluated period was observed in Hungary (decrease by 1.4% of GDP), and a slight decrease in spending (by 0.3–0.4% of GDP) took place in Latvia, Greece and Sweden.

According to ESSPROS (2012) social protection expenditure according to the disability function covers benefits that *provide an income to persons below standard retirement age as established in the reference scheme whose ability to work and earn is impaired beyond a minimum level laid down by legislation by a physical or mental disability; provide rehabilitation services specifically required by disabilities and provide goods and services other than medical care to*

disabled people. Benefits in the disability function represent *cash benefits* (i.e. disability pension, early retirement benefit due to a reduced capacity to work, care allowance, economic integration of the handicapped and other cash benefits) and *benefits in kind*, such as accommodation, assistance in carrying out daily tasks, rehabilitation and other benefits in kind.

European countries vary in their per cent rate of social protection expenditure on disability. In the years 2005–2012, the highest expenditure on social protection through the disability function (as % of GDP) was reached in Scandinavian countries of Denmark and Sweden, and also in Switzerland, as opposed to Latvia, Romania and Greece. For the range of social protection expenditure by the disability function as % of GDP, see Table 2. The pension system, as one of the main parts of social protection, constitutes a system which concentrates the biggest economic potential regardless of the system of financing (pay-as-you go, or capitalisation). Pension systems determine the standard of living of a significant part of the population, and consequently its consumption, and have an impact on economy. They are influenced by economic stability or instability of a country, but also by other factors, such as employment or population

Table 1 Expenditure on social protection by function–sickness/health care (% of GDP)

Country	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	7.4	7.1	7.2	7.6	8.3	8.2	8.3	8.5
Czech Republic	6.3	6.0	5.9	5.8	6.4	6.3	6.3	6.4
Denmark	6.1	6.1	6.3	6.5	7.3	7.0	6.9	6.9
Estonia	4.0	3.7	4.0	4.8	5.3	4.8	4.4	4.3
Greece	6.7	6.9	6.8	7.4	8.0	8.2	7.5	6.4
France	8.8	8.7	8.6	8.6	9.2	9.3	9.2	9.2
Italy	6.7	6.8	6.6	6.9	7.3	7.3	7.0	7.0
Latvia	3.4	3.8	3.4	3.7	3.9	3.7	3.2	3.0
Luxembourg	5.5	5.1	4.9	5.3	6.1	5.8	5.6	5.8
Hungary	6.5	6.4	5.7	5.7	5.8	5.8	5.6	5.1
Netherlands	8.0	8.8	8.6	9.4	10.4	10.7	10.9	11.3
Poland	3.8	3.8	3.9	4.5	4.7	4.5	4.3	4.2
Romania	3.8	3.3	3.5	3.5	4.2	4.4	4.1	4.1
Slovakia	4.8	4.8	4.7	5.1	5.8	5.5	5.4	5.5
Sweden	7.9	7.8	7.5	7.5	7.9	7.4	7.5	7.6
United Kingdom	7.8	7.9	7.7	7.8	8.7	8.4	9.0	9.3
Switzerland	6.8	6.5	6.4	6.4	7.1	6.7	6.8	7.2

Source: Eurostat (2015b)

Table 2 Expenditure on social protection by function–disability (% of GDP)

Country	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	2.0	1.9	1.8	1.9	2.1	2.1	2.2	2.3
Czech Republic	1.4	1.5	1.4	1.4	1.5	1.5	1.5	1.4
Denmark	4.2	4.2	3.8	3.7	4.1	4.2	4.1	4.1
Estonia	1.2	1.1	1.1	1.5	1.9	1.9	1.8	1.8
Greece	1.2	1.1	1.2	1.2	1.3	1.3	1.4	1.3
France	1.8	1.9	1.8	1.8	2.0	2.0	2.0	2.1
Italy	1.5	1.5	1.5	1.6	1.7	1.7	1.6	1.7
Latvia	0.9	0.9	0.7	0.9	1.3	1.3	1.3	1.2
Luxembourg	2.8	2.6	2.3	2.4	2.7	2.6	2.6	2.6
Hungary	2.1	2.2	2.1	2.1	2.1	1.9	1.7	1.6
Netherlands	2.5	2.4	2.4	2.4	2.5	2.5	2.4	2.3
Poland	2.1	1.9	1.7	1.6	1.5	1.6	1.5	1.5
Romania	1.1	1.1	1.3	1.4	1.6	1.6	1.5	1.3
Slovakia	1.3	1.3	1.3	1.4	1.5	1.6	1.6	1.6
Sweden	4.6	4.5	4.4	4.4	4.6.	4.1	3.9	3.9
United Kingdom	2.3	2.4	1.9	2.0	2.1	2.1	2.0	1.9
Switzerland	3.1	2.9	2.8	2.6	2.7	2.6	2.5	2.5

Source: Eurostat (2015b)

development. Their financing is part of public finances, which influences their quality and sustainability (Mikušová Meričková and Halásková 2014a; Pestieau, 2006; Saraceno, 2008).

Basic regimes of social policies (socio-democratic, conservative, liberal model) in the respective countries show a different rate of social protection expenditure on old age expressed as % of GDP (Table 3). Social protection expenditure by the old age function according to ESSPROS (2012) covers *benefits that provide a replacement income when the aged person retires from the labour market; guarantee a certain income when a person has reached a prescribed age and provide goods or services specifically required by the personal or social circumstances of the elderly.* A part of social protection expenditure provided by the old-age function are *cash benefits*, which include old-age pension, anticipated old-age pension, partial pension, care allowance, other cash benefits, and *benefits in kind*: accommodation, assistance in carrying out daily tasks and other benefits in kind. The European population is the oldest in the world, which results in an increase in social protection expenditure by old age, where the main part is the old-age pension.

In years 2005–2015, the highest rate of expenditure on social protection by old-age function (as % of GDP) in the set of selected countries was observed in Greece, Italy (countries with the south-European model), Denmark and Sweden, (countries with the social-democratic model), and France (continental model). In the last years of this period, a relatively high rate of expenditure on social protection according to old-age function (as % of GDP) was observed also in the United Kingdom (Table 3). Conversely, among the countries with the lowest rate of expenditure on social protection

by old-age function (as % of GDP) in the years 2005–2012 were found in Estonia, Latvia and Romania, which are countries with the lowest total expenditure on social protection.

The character and amount of public expenditure also markedly influences the range of public social expenditure, depending on the share of public sector, tax burden and redistribution (Adema et al., 2011; Goudswaard and Caminada, 2010; Halásková and Halásek, 2015; Ivančík, 2012; Mikušová Meričková and Halásková, 2014a; van Kersbergen and Hemerijck, 2012; Wang et al., 2012). The amount of social protection expenditure (on sickness/health care, disability and old age) in the selected European countries provides a basic outline of the tendencies of this expenditure, which differ according to concepts adopted in areas of social protection, the health-care system and the pension system. The range of such expenditures in the individual countries is influenced by the economic situation, fiscal rules and demographic development.

4.2 Level of socio-economic development and income inequality in the selected European countries

The level of socio-economic development is quantified by means of the Human Development Index (HDI), which is the most known indicator of the long-term social and economic development of individual countries. Numerous authors–Costantini and Monni (2008), Diniz and Sequeira (2012), Mankiw (2010), and Ranis (2004) –consider the Human Development Index (HDI) a more complex indicator of socio-economic development than income per capita or GDP.

Table 3 Expenditure on social protection by function–old-age (% of GDP)

Country	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	8.4	8.4	8.2	8.7	9.5	9.2	9.5	9.6
Czech Republic	6.8	6.8	6.9	7.3	8.3	8.5	8.9	9.3
Denmark	11.0	10.8	12.6	12.7	14.0	13.8	14.2	14.4
Estonia	5.3	5.3	5.1	6.2	7.9	7.8	6.9	6.7
Greece	11.5	10.4	10.5	10.8	11.3	11.9	12.7	15.4
France	11.1	11.1	11.2	11.5	12.4	12.5	12.6	12.9
Italy	12.8	13.0	13.1	13.6	14.5	14.8	14.9	15.3
Latvia	5.7	5.5	4.8	5.4	7.6	9.1	7.9	7.5
Luxembourg	5.6	5.4	5.2	5.6	6.5	6.2	6.3	6.7
Hungary	7.8	8.0	8.4	8.8	9.1	9.1	9.3	9.9
Netherlands	9.7	9.5	9.6	9.7	10.4	10.7	10.8	11.3
Poland	9.3	9.4	8.8	9.0	9.9	9.3	9.0	8.7
Romania	5.3	5.2	5.5	6.5	6.5	8.1	7.9	7.6
Slovakia	6.2	6.1	5.9	5.8	6.8	6.8	6.8	7.0
Sweden	11.5	11.1	11.1	11.4	12.6	12.2	11.9	12.4
United Kingdom	10.6	10.4	10.5	10.9	12.2	12.1	12.2	12.7
Switzerland	10.0	9.8	9.7	9.6	10.3	10.3	10.4	10.7

Source: Eurostat (2015b)

This index combines information on economic growth (GDP per capita in the latest methodology of calculation of national income per capita), level of education (literacy in the adult population), state of health (life expectancy). The indicator of economic development is supplemented with indicators of social development, reflecting on the level of education and provision of health care (Mikušová Meričková and Halásková, 2014b).

The HDI reaches values in an interval of 0 to 1. The most advanced countries approach the value of 1. HDI classifications according to the Human Development Report (2014) are based on HDI fixed cut-off points, which are derived from the quartiles of distributions of component indicators. The cut-off points are HDI of less than 0.550 for low human development, 0.550–0.699 for medium human development, 0.700–0.799 for high human development, and 0.800 or greater for very high human development

The majority of selected countries (Table 4) reached an HDI level of very high human development, despite marked differences between them. European countries with the highest human development level–Switzerland, the Netherlands, and Denmark–reached an HDI level above 0.900, while countries such as Latvia reached an HDI of 0.786–0.808, and Hungary, reached an HDI level just slightly above 0.800. From the selected set of European countries, the lowest HDI was observed in Romania, HDI 0.750–0.782, which is a level of high human development. Regarding the level of economic advancement and HDI, marked differences are observed mainly in the comparison of European countries with the least developed

economies, where HDI reaches a level of medium or low human development (Majerová, 2014).

According to the Human Development Report (2014), *three standard ways of measuring income inequality are used: the ratio of the top and the bottom quintiles, the Palma ratio, which is the ratio of income of the top 10 per cent and the bottom 40 per cent, and the Gini coefficient.* Income inequality for the selected sample of countries is expressed on the basis of the Gini coefficient, where the 0 value represents equal incomes for everyone, whilst 100 represents a full-scale income inequality. In connection with a specific character of social policy and redistribution processes, tendencies to reduce income inequalities appear in numerous European countries, most notably in Poland, the UK and Switzerland. By contrast, in some countries, such as Denmark, France or Romania, income inequality increased over the period 2005–2012.

Notable differences in income inequality values are evident in the set of the selected countries (Table 5). In the course of the observed years, Latvia and Greece belonged to the countries with the highest income inequality, with the Gini coefficient reaching above 34 in 2012. Marked income inequalities were also observed in Romania, Great Britain, Estonia, Italy or Poland, with the Gini coefficient above the EU28 average (30.4). By contrast, among countries with the lowest income inequality (the Gini coefficient ranged from 24.0 to 25.5) are found the Netherlands, Slovakia, the Czech Republic and Sweden. Specifically in the Czech Republic and Slovakia, the Gini coefficient was decreasing, which results in balanced salaries.

Numerous papers tackle income inequality in relation to economic growth, when the extent of income

Table 4 Level of socio-economic development quantified by the Human Development Index

Country	2005	2008	2010	2012
Belgium	0.865	0.873	0.877	0.880
Czech Republic	0.845	0.856	0.858	0.861
Denmark	0.891	0.896	0.898	0.900
Estonia	0.821	0.832	0.830	0.839
Greece	0.853	0.858	0.856	0.854
France	0.867	0.875	0.879	0.884
Italy	0.858	0.868	0.869	0.872
Latvia	0.786	0.813	0.809	0.808
Luxembourg	0.876	0.882	0.869	0.880
Hungary	0.805	0.814	0.817	0.817
Netherlands	0.888	0.901	0.904	0.915
Poland	0.803	0.817	0.826	0.833
Romania	0.750	0.781	0.779	0.782
Slovakia	0.803	0.824	0.826	0.829
Sweden	0.887	0.891	0.895	0.897
United Kingdom	0.888	0.890	0.895	0.890
Switzerland	0.901	0.903	0.915	0.916

Source: Human Development Report (2014)

inequality is also influenced by the phase of the economic cycle (Alesina and Rodrik, 1994; Cingano, 2014; Perotti, 1996; Pisu 2012) or when the attention is paid to income distribution, inequality and poverty on a practical level (Förster, 2000; Korpi and Palme, 1998).

4.3 Correlation between expenditure on social protection by function and socio-economic development in the selected European countries

The present analysis focuses on whether there exists any linear relation between social protection expenditure (according to the selected functions: sickness/health care, disability, old-age) and the level of socio-economic development (quantified by the HDI), and whether there exists a mutual influence between these indicators. Correlation is observed by means of the Pearson's correlation coefficient (r) and the coefficient of determination (r^2). Results of the Pearson's correlation coefficient and the coefficient of determination for the set of selected countries in the years 2005–2012 are presented in Table 6.

Based on the Pearson's correlation coefficient (r), a direct linear correlation was observed in most countries between social protection expenditure on sickness/health care and the HDI, of which a strong, statistically significant correlation ($p < 0.05$) was found in the Netherlands in 2005–2012, with the Pearson's correlation coefficient $r = 0.955$, and the coefficient of determination $r^2 = 0.912$, i.e. 91.2%; in Denmark, with $r = 0.946$ and $r^2 = 0.895$, i.e. 89.5%; in Belgium, with $r = 0.939$ and $r^2 = 0.882$, i.e. 88.2%; and Slovakia, with $r = 0.904$ and $r^2 = 0.817$, i.e. 81.7%. What applies as a result is that the higher the social protection

expenditure on sickness/health care is, the higher the HDI is in these countries. As the coefficient of determination shows, social protection expenditure on sickness/health care and the HDI in the Netherlands were 91.2% mutually influenced and 8.8% influenced by other factors; in Denmark, these factors were 89.5% mutually influenced and were 10.5% influenced by other factors; in Belgium, mutually, 88.2% and by other factors, 11.8%; and in Slovakia, mutually 81.7% and by other factors, 18.3%.

Based on the Pearson's correlation coefficient, *social protection expenditure on disability and the Human Development Index* proved anticorrelation in 8 countries, for which there was a strong, statistically significant anticorrelation ($p < 0.05$) in Poland, with $r = –0.933$ and $r^2 = 0.870$, i.e. 87%; and in Luxembourg, with $r = –0.905$ and $r^2 = 0.820$, i.e. 82%. In Sweden, a statistically significant anticorrelation was proved in social protection expenditure on disability and the Human Development Index ($p < 0.01$), with $r = –0.983$ and $r^2 = 0.966$, i.e. 96.6%. It therefore applies that the higher the social protection expenditure on disability is, the higher the HDI. The coefficient of determination showed that social protection expenditure on disability and the HDI were 87% mutually influenced in Poland, 82% in Luxembourg, and 96.6% in Sweden. Conversely, based on the Pearson's correlation coefficient anticorrelation was observed in 9 countries from the set between social protection expenditure on disability and HDI (see Table 6). A statistically significant correlation ($p < 0.05$) was proved in France, with $r = 0.891$ and $r^2 = 0.794$. Thus, the higher social protection expenditure on disability is, the higher the HDI. The determination coefficient proved that social

Table 5 Income inequality evaluated using to the Gini coefficient

Country	2005	2006	2007	2008	2009	2010	2011	2012
Belgium	28.0	27.8	26.3	27.5	26.4	26.6	26.3	26.5
Czech Republic	26.0	25.3	25.3	24.7	25.1	24.9	25.2	24.9
Denmark	23.9	23.7	25.2	25.1	26.9	26.9	27.8	28.1
Estonia	34.1	33.1	33.4	30.9	31.4	31.3	31.9	32.5
Greece	33.2	34.3	34.3	33.4	33.1	32.9	33.5	34.3
France	27.7	27.3	26.6	29.8	29.9	29.8	30.8	30.5
Italy	32.8	32.1	32.2	31.0	31.5	31.2	31.9	31.9
Latvia	36.2	38.9	35.4	37.5	37.5	35.9	35.1	35.7
Luxembourg	26.5	27.8	27.4	27.7	29.2	27.9	27.2	28.0
Hungary	27.6	33.3	25.6	25.2	24.7	24.1	26.8	26.9
Netherlands	26.9	26.4	27.6	27.6	27.2	25.5	25.8	25.4
Poland	35.6	33.3	32.2	32.0	31.4	31.1	31.1	30.9
Romania	31.0	33.0	37.8	36.0	34.9	33.3	33.2	33.2
Slovakia	26.2	28.1	24.5	23.7	24.8	25.9	25.7	25.3
Sweden	23.4	24.0	23.4	24.0	24.8	24.1	24.4	24.8
United Kingdom	34.6	32.5	32.6	33.9	32.4	32.9	33.0	31.3
Switzerland	–	–	30.4	31.1	30.7	29.6	29.7	28.8

Source: Eurostat (2015a)

protection expenditure on disability and the HDI were 79.4% mutually influenced and 20.6% accounted for other factors.

In 10 of the evaluated European countries, based on the Pearson's correlation coefficient (r), a strong correlation was proved between *social protection expenditure on old age and the HDI. A* strong statistically significant correlation ($p < 0.01$) was proved in Denmark, France, and Belgium, and a strong statistically significant correlation ($p < 0.05$) in Hungary, Italy and the Czech Republic. It therefore applies that the larger the amount of social protection expenditure on old age is, the higher the HDI. As can be derived from the coefficient of determination (r^2), social protection expenditure on old age and the HDI in Denmark were 99% mutually influenced and 1% influenced by other factors, in Belgium, 92.5% mutually and 6.5% by other factors, in France 92.2% mutually and 7.8% by other factors.

Expenditure on social protection by selected functions (on old age, on the family and on unemployment) in relation to HDI has been evaluated in previous research (Mikušová Meričková and Halásková, 2014a, 2014b). The results confirmed a strong direct linear correlation in the majority of the evaluated OECD countries between the amount of social protection expenditure on old age and the HDI

using the Pearson's correlation coefficient, similar to the present research.

Since the HDI is a complex index, its result of the correlation is methodologically limited regarding the observed social protection expenditure by functions (Mikušová Meričková and Halásková, 2014a, 2014b). Index distribution and testing correlations of its parts of social protection expenditure can be, according to the authors, a theme for further validation of the present results.

4.4 Correlation between expenditure on social protection by function and income inequality in the selected European countries

Also, based on the Pearson's correlation coefficient (r) and the coefficient of determination (r^2), an evaluation is provided regarding whether there exists a correlation between the amount of expenditure on social protection (based on selected functions: sickness/health care, disability, old age) and income inequality (expressed by the Gini coefficient). Results of the Pearson's correlation coefficient (r) and the coefficient of determination (r^2) for the set of selected countries in the years 2005–2012 are provided in Table 7.

On the basis of the Pearson's correlation coefficient (r), a positive linear correlation between social protection expenditure on sickness/health care and the Gini coefficient was proved in seven countries from the

Table 6 Relation between expenditure on social protection by selected functions and the HDI in the years 2005–2012

	Social protection expenditure on sickness/health care and index HDI		Social protection expenditure on disability and index HDI		Social protection expenditure on old age and index HDI	
	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)
Belgium	0.939*	0.882	0.730	0.533	0.962**	0.925
Czech Republic	0.092	0.008	0.456	0.208	0.888*	0.789
Denmark	0.946*	0.895	−0.047	0.002	0.995**	0.990
Estonia	0.320	0.102	0.767	0.588	0.543	0.295
Greece	0.546	0.298	−0.299	0.089	−0.477	0.228
France	0.705	0.497	0.891*	0.794	0.960**	0.922
Italy	0.656	0.430	0.788	0.621	0.911*	0.830
Latvia	0.200	0.040	0.370	0.137	0.328	0.108
Luxembourg	0.000	0.000	−0.905*	0.820	0.291	0.085
Hungary	−0.861	0.741	−0.696	0.484	0.915*	0.837
Netherlands	0.955*	0.912	−0.743	0.552	0.864	0.746
Poland	0.585	0.342	−0.933*	0.870	−0.636	0.404
Romania	0.262	0.069	0.773	0.598	0.835	0.697
Slovakia	0.904*	0.817	0.862	0.743	0.491	0.241
Sweden	−0.715	0.511	−0.983**	0.966	0.839	0.704
United Kingdom	0.220	0.048	−0.217	0.047	0.503	0.253
Switzerland	0.568	0.323	−0.745	0.555	0.856	0.738

Note: * Correlation is significant at the 0.05 level (2-tailed), **Correlation is significant at the 0.01 level (2-tailed)

set. With respect to this, a strong, statistically significant correlation in the years 2005–2012 was confirmed in Denmark, with $r = 0.875$ ($p < 0.01$); France, with $r = 0.742$; and Latvia, with $r = 0.750$ ($p < 0.05$). It therefore applies that the higher the range of social protection expenditure on sickness/health care is, the higher the income inequality, expressed by the Gini coefficient, is. The coefficient of determination (r^2) showed that social protection expenditure on sickness/health care and the Gini coefficient were, in Denmark, 76.6% mutually influenced and 23.4% influenced by other factors; in France 55% mutually influenced and by other factors, 45%; and in Latvia 56.3% influenced mutually and 43.7% by other factors. Conversely, negative linear correlation was observed between the range of social protection expenditure on sickness/health care and the Gini coefficient in 10 countries. A statistically significant anticorrelation was proved in Estonia, with $r = -0.836$ ($p < 0.01$), and Greece, with $r = -0.766$ ($p < 0.01$). It applies that the higher the range of social protection expenditure on sickness/health care is, the lower the income inequality expressed by the Gini coefficient (see Table 7).

On the basis of the Pearson's correlation coefficient correlation between the *range of social protection expenditure on disability and the Gini coefficient* was proved in 9 countries. A strong, statistically significant correlation was proved in France, with $r = 0.877$ ($p < 0.01$), and Poland, with $r = 0.969$ ($p < 0.05$). It applies

that the higher the range of social protection expenditure on disability is, the higher the income inequality, expressed by the Gini coefficient, in these countries is. By contrast, anticorrelation of the amount of social protection expenditure on disability and the Gini coefficient was proved in 8 countries from the set. A strong, statistically significant anticorrelation was proved in Estonia, with $r = -0.746$ ($p < 0.05$). Thus, the higher the range of social protection expenditure on disability is, the lower income inequality, expressed by the Gini coefficient, is. As the coefficient of determination (r^2) showed, social protection expenditure on disability and the value of the Gini coefficient were 93.9% influenced mutually in Poland and 6.1% by other factors, in Estonia 55.6% mutually and 44.4% by other factors, in France, 50.8% mutually and 49.2% by other factors.

From the set of selected countries in the period 2005–2012, based on the Pearson's correlation coefficient, a strong, statistically significant correlation was proved between *social protection expenditure on old age and the Gini coefficient* ($p < 0.01$) in Denmark ($r = 0.976$), France ($r = 0.877$) and Sweden ($r = 0.819$; $p < 0.05$). It therefore applies that the higher the social-protection expenditure on old age is, the higher the income inequality, expressed by the Gini coefficient, in these countries is. This relates to the set manner of financing social protection in the Scandinavian

Table 7 Relation between expenditure on social protection by selected functions and the Gini coefficient in 2005–2012

	Social protection expenditure on sickness/health care and Gini coefficient		Social protection expenditure on disability and Gini coefficient		Social protection expenditure on old age and Gini coefficient	
	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)	Pearson's correlation coefficient (r)	Coefficient of determination (r^2)
Belgium	−0.635	0.403	−0.423	0.179	−0.602	0.362
Czech Republic	0.175	0.030	−0.135	0.018	−0.511	0.261
Denmark	0.875**	0.766	0.100	0.010	0.976**	0.953
Estonia	−.836**	0.699	−0.746*	0.556	−0.777*	0.604
Greece	−0.766*	0.587	−0.394	0.155	0.154	0.024
France	0.742*	0.550	0.713*	0.508	0.877**	0.769
Italy	−0.673	0.453	−0.665	0.442	−0.487	0.237
Latvia	0.750*	0.563	−0.207	0.043	−0.331	0.110
Luxembourg	0.530	0.281	0.003	0.000	0.505	0.255
Hungary	0.517	0.267	0.252	0.064	−0.482	0.232
Netherlands	−0.678	0.459	0.245	0.060	−0.776*	0.602
Poland	−0.699	0.489	0.969**	0.939	0.188	0.035
Romania	−0.309	0.095	0.298	0.089	−0.041	0.002
Slovakia	−0.255	0.065	−0.176	0.031	0.113	0.013
Sweden	0.035	0.001	−0.449	0.202	0.819*	0.671
United Kingdom	−0.635	0.403	0.388	0.150	−0.549	0.301
Switzerland	−0.576	0.332	0.600	0.360	−0.824*	0.679

Note: **Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

countries (mostly from general taxes). Every citizen has the right to a certain range of pension, and fully employed persons qualify for supplementary benefits. Based on the Pearson's correlation coefficient, a statistically significant anticorrelation was proved in Switzerland, the Netherlands and in Estonia, where the higher the amount of social protection expenditure on old age, the lower the income inequality, expressed by means of the Gini coefficient, is. The coefficient of determination (r^2) showed that social protection expenditure on old age and the value of the Gini coefficient were 95.3% mutually influenced in Denmark and 4.7% by other factors, in France there was 87.7% mutual influence and 12.3% from other factors.

The relation between social expenditure and income inequality was also dealt with by other authors (Afonzo et al., 2008; Ferrarini and Nelson, 2003; Immervoll and Richardson, 2011; Niehues, 2010; Pestieau, 2006). The negative impact of social expenditure on income inequality, evaluated using the Gini coefficient, and the use of correlation and regression analysis, was confirmed in 15 OECD countries (Pestieau, 2006), or by research carried out on a set of 22 OECD countries (Afonzo et al., 2008).

Ferrarini and Nelson (2003) show that only a limited number of studies have attempted to identify the link between specific social transfer programmes and income inequality in a comparative setting. Taking a closer look at the relation of social expenditure (on the sickness/ health care, on disability and on old age) according to different functions in connection to income inequality, a negative relation of social expenditure and income inequality was confirmed in most countries. Results of 15 EU countries, seen in Niehues (2010), showed that social expenditure on old age had a statistically significant negative impact on income inequality, as opposed to the relation between social expenditure on health and social expenditure on disability and income inequality, where a moderate positive correlation was observed.

Analyses of social expenditure of public and private character provide a different angle. According to Goudswaard and Caminada (2010), public social transfers are effectively targeted at low-income groups. Private social expenditures proved a negative and statistically significant relation to income redistribution. Countries with high private social expenditure thus have a low income redistribution. As regards total social expenditure, a positive and significant link to income redistribution can be observed, although the relation is more moderate compared to public social expenditure.

These finding show that not only various functions of social expenditure but also types of social expenditure (total, public, private) have a different impact on income inequality. A more detailed analysis of mutual relations, social expenditure by various functions and income-inequality indicators as well as socio-economic development may be used as themes for further research using regression analysis.

5. Conclusion

The issue of income inequality consists of a discussion about the extent and forms of redistribution. Tackling this issue has wide economic and political dimensions which are reflected in a compromise between effectiveness and equality (*trade-off*). The general theoretical view on the solution to this issue, presented by the neoclassical school of welfare economics, encounters numerous methodological problems (definition of the function of social welfare, interpersonal comparison of individual well-being) that hamper the attempts to find a proper response.

At the practical level, this compromise constitutes not only an implementation of social-policy instruments, but also of the achieved results of economic policy, with the aim of defining an optimal range and character of redistribution processes and mitigating income inequalities while keeping social rest. That is achievable by defining those areas of social protection where public expenditures make a positive influence on the quality of life in a society.

The empirical study reacts to this issue, providing a solution to the research question of the relation between the extent of selected types of social protection expenditures and the achieved level of socio-economic development. The existence of a relation between the selected amount of expenditure of social protection according to function (expenditure on sickness/health care, on the disabled and on elderly people) on the one hand, and the achieved level of socio-economic development and quantified Human Development Index (HDI) and the level of division of available incomes, evaluated using the Gini coefficient, on the other, was statistically tested on a sample of 17 European countries.

The results showed that in most European countries in question, expenditure on social protection (on sickness/health care and on old age) had a positive impact on the level of socio-economic development, evaluated by the Human Development Index. Social protection expenditure on disability, however, had a rather negative impact on the socio-economic development of the countries in question. Conversely, social protection expenditure on sickness/health care, disability and old age had a mostly negative impact on income inequality, evaluated through the Gini coefficient, in most countries. With the exception of

Denmark, Sweden (socio-democratic model of social policy) and France (conservative model of social policy), it was confirmed in most countries that the evaluated categories of social protection expenditure mitigate income inequality.

A high level of heterogeneity of selected countries with respect to the observed aspects proves a markedly different extent and nature of redistribution processes. The findings of the research should therefore be analysed more deeply through the redistribution theory of defined compromise *trade-off* between efficiency and equity. The compromise in each country depends on the character of the subparts and the models of social policy. From our perspective, these are systems of social security in case of illness, which are connected with financial and material benefits, models of health-care systems (Bismarck model, liberal model and the model of national health service), and concepts of the pension policy (presented by the liberal, socio-democratic and conservative model of social policy).

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