



Relationship of Social Protection Expenditures and Socio-economic Indicators: A Panel Data Analysis of the EU Countries

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ABSTRACT

Systems of social protection and approaches in tackling social risks differ by the degree of redistribution and by its generosity. The current issue in developed countries is finding the optimal relationship between economic and social policy. Therefore, the selected areas of social policy and economic development from a narrow perspective are subjected to the research investigation. To address the issue, the paper aims to analyse the association between social protection expenditures and the selected socio-economic indicators. In line with the aim, four hypotheses have been verified. H1: There is a positive relationship between social protection expenditures and indicators of socio-economic development. H2: There is a positive relationship between social protection expenditures and indicators of unemployment. H3: There is a negative relationship between social protection expenditures and indicators of income inequality. H4: There is a negative relationship between social protection expenditures and indicators of poverty. The panel data regression for the sample of the 27 EU countries in the period 2007-2015 was applied to test the hypotheses. The results of the final fixed effect model with robust coefficients revealed a positive relationship between Human development index and unemployment rate on the one side and social protection expenditures on the other. On the contrary, a negative relationship was identified between social protection expenditures on the one side and poverty rate for the elderly 65+ and income inequality (measured through Gini coefficient) on the other. These findings confirm the fact that the amount of social protection spending is reflected in the socio-economic development of the EU countries.

INTRODUCTION

The extent and consequences of social and economic phenomena with their mutual interaction drive the search for an optimal relationship between economic and social policy. The interrelation of both policies is more intense when the societal development achieves a higher level (Spick-

er, 2014). The idea behind welfare state is a range of redistribution processes, defined by the volume of public social protection of the population. The aim is to balance the chances in one's life and to use social policy to create conditions to ensure welfare commensurate with the potential of the society (Sinn, 1995; Korpi and Palme, 1998; Pestieau, 2006). Each welfare state type, as Diamond and Lodge (2013, p. 5) explain, is "a reflection of a particular set of political forces and philosophies, which is reflected in contemporary social policy and institutional regimes". The Nordic and Continental European models essentially converge in terms of expenditure, but social democratic regimes are service-intensive, while private welfare provision is low". The social protection system can be defined by its degree of redistribution and by its generosity (Pestieau, 2006). According to Forster and Whiteford (2009, p. 35), "the redistributive impact of alternative systems of social protection differs and in assessing these impacts it is important to distinguish between targeting, progressivity, and redistribution".

A number of studies is devoted to social protection, redistribution, and assessment of social protection expenditures with different perspectives and methods (Goudswaard and Caminada, 2010). Another group of scholarly papers is related to selected areas of economic and social development (Pestieau, 2006; Furceri and Zdzienicka, 2012; Alper and Demiral, 2016); related to income inequality (Afonzo et al., 2008; Niehues, 2010; Anderson et al., 2016; Sanchez and Perez-Corral, 2018); and last but not least related to poverty reduction (Caminada and Goudswaard, 2012; Notten and Guio, 2016 or Mieziene and Krutuliene, 2019).

Therefore, the purpose of this paper is to present a more complex view on social protection expenditures based on previous research efforts. Furthermore, the aim is to evaluate the long-term relationship between social protection expenditures and socio-economic indicators in the EU countries from 2007 to 2015, using panel data. The subjected to research investigation are selected areas of social policy and economic development in a narrow perspective. Quantitative research of the existence and nature of this relationship implies the selection of instruments associated with socio-economic indicators. The paper is focused on 1) indicators of socio-economic development (GDP per capita, Human development index); 2) indicators of unemployment (unemployment rate, long-term unemployment rate); 3) indicators of income inequality (Gini coefficient of equalised disposable income, Income quintile share ratio); and 4) indicators of poverty (at-risk of poverty rate, at risk of poverty or social exclusion rate for the elderly 65+, Impact of social transfers on poverty reduction).

The regression model included indicators from all four groups in order to verify the following relationships in the sample of the 27 EU countries, specifically:

H1: There is a positive correlation between social protection expenditures and indicators of socio-economic development.

H2: There is a positive relationship between social protection expenditures and indicators of unemployment.

H3: There is a negative relationship between social protection expenditures and indicators of income inequality.

H4: There is a negative relationship between social protection expenditures and indicators of poverty.

1. LITERATURE REVIEW

The Human Development Index (HDI) is, according to authors Ravallion (2012) or Burns and DeVille (2017), the best known indicator of long-term social and economic development of individual countries. The Human Development Index (HDI) is a summary measure of the average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. It represents a geometric mean of normalised indices for each of the three dimensions (Human Development Report, 2016). Numerous authors such as

Costantini and Monni (2008) or Diniz and Sequeira (2012); consider the Human Development Index a more complex indicator of socio-economic development than income per capita or GDP. According to Mikusova, Merickova and Halaskova (2014b) it combines HDI information on economic growth (GDP per capita in the latest methodology of calculation of national income per capita), level of education (literacy in adult population), and state of health (life expectancy). The relationship between *social protection expenditures and Human development Index* was studied in many papers (e.g. Pestieau, 2006; Halaskova and Mikusova Merickova, 2017). As mentioned in Halaskova and Mikusova, Merickova (2017) the relationship between the selected expenditures of social protection according to function (expenditures on sickness/health-care, on the disabled and on the elderly people) on the one hand, and the achieved level of socio-economic development quantified Human-Development Index (HDI) on the other was evaluated on a sample of 17 European countries in the period 2005-2012.

The relationships between *social protection expenditures and economic growth* were the subject of many research papers. Furceri and Zdzienicka (2012) assessed effects of social spending on economic activity, with a panel of OECD countries from 1980 to 2005. Their results show that social spending has expansionary effects on GDP. More specifically, sub-categories of social spending devoted to health and unemployment benefits have the greatest effects. Alper and Demiral (2016) investigated the effects of governments' social expenditure proxies, namely education, health and social spending on economic growth performances, represented by the changes in gross domestic product (GDP) per capita. Using the feasible generalised least squares (FGLS) estimators based on a balanced panel dataset covering 2002-2013 periods of 18 OECD countries, authors conclude that social expenditures in all three dimensions significantly contribute to economic growth. As Tkacheva et al. (2017) believe that active social support for the population adversely affects the efficiency of the economy, which results in increased unemployment. Some theoretical and practical studies demonstrate that economic behaviour of the working population is determined solely by full rationality. Authors analysed the dependence of GDP of the EU countries on public expenditures on social benefits and unemployment rate for the period of 2005 - 2015.

Most of the studies are focused on the *effect of social protection expenditures on income inequality* from different perspectives. Ferrarini and Nelson (2003) stress that only a limited number of studies have attempted to identify the connection to income inequality, the negative correlation between social expenditures and income inequality was identified in most countries. Pestieau (2006) applied correlation and regression analysis of the relationship between social expenditures and income inequality evaluated by use of Gini coefficient, in 15 OECD countries in the period 1994-2000. The results suggested a negative impact of social expenditures on income inequality. Afonzo et al. (2008) applied a different perspective in studying the impact of public spending, education, and institutions on income distribution in advanced economies and the efficiency of public spending in redistributing income for a set of 26 OECD countries by using a DEA (Data Envelopment Analysis) nonparametric approach. The results concluded that public policies significantly affect income distribution, notably via social spending, and indirectly via high quality education (human capital) and via economic institutions. In addition, also research by Sanchez and Perez-Corral (2018) or Ulu (2018) examined the relationship between government social expenditure and income inequality.

Numerous studies are devoted to *poverty rate and poverty reduction* in relation to *social expenditures* and their effects. The impact of social expenditures on income poverty and material deprivation in four EU countries was studied by Notten and Guio (2016), while Cantillon and Van Mechelen (2013) conducted research on reducing poverty through social transfers, and Avram (2016) examined the efficiency of social expenditures in reducing poverty rates in the EU countries. Moreover, available studies indicate a strong negative correlation between poverty and social expenditures in the EU countries. It means that the countries' at-risk-of-poverty rate tends to erode with increasing social expenditures (Pestieau, 2006 or Caminada and Goudswaard 2012). Pes-

tieau (2006) evaluated the relationship between poverty rate and social spending on the example of 15 of OECD countries from 1994 to 2000. According to this research, social transfers exert a clear-cut effect on poverty and there is a strong negative correlation between the two variables. The results revealed that larger social expenditures correspond to lower poverty levels and that the impact of social transfers on poverty rate has not changed over time. Halaskova (2018, p. 129) says that “Caminada and Goudswaard (2012) analysed the relationship between gross total social expenditures and poverty rates across 28 countries (15 of the EU countries and 13 non-EU countries) in 2003-2007 with the use of regression analysis. The authors conclude that there is a strong negative relationship between the level of gross public social expenditures and poverty. Countries with higher gross public social expenditure ratios tend to have lower poverty rates than countries with lower expenditure ratios. Furthermore, the results have also proved that the correlation is less strong in the EU countries compared to non-EU countries”. Other the studies e.g. Mieziene, Krutuliene (2019) have demonstrated that the impact of government spending on poverty may vary according to the sector of spending, how well it is targeted, and the way of financing.

2. MATERIAL AND METHODS

2.1 Data

To fulfil the aim of the paper, the object of the quantitative analysis is a set of the EU 27 countries, comprising: Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (EL), Spain (ES), (France (FR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Luxembourg (LU), Hungary (HU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE), United Kingdom (UK). The data were collected from available Eurostat sources, and all indicators were assessed for the 2007 - 2015 period due to data availability. However, Croatia was excluded from the analysis due to the limited availability of the required data for this period.

Expenditures on social protection were selected as a dependent variable which represents a significant part of public spending. *Social protection expenditures* (SPEXP) are the outlay for social protection interventions. They consist mainly of: social benefits, or transfers in cash or in kind, to households and individuals with the aim to relieve them of the burden of a defined set of risks or needs; administration costs, or costs of managing or administering the social protection scheme; and other miscellaneous expenditures by social protection schemes, i.e. payment of property income and other (Eurostat, 2017 - Social Protection Statistics – background). The European system of integrated social protection statistics - ESSPROS defines social protection 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, social exclusion not elsewhere classified” (European union, 2016 – ESSPROS. Manual and User Guidelines).

Before the data analysis, the stationarity test of the dependent variable SPEXP had been carried out using the Dickey-Fuller Test to check for stochastic trends. The zero test hypothesis is determined by the fact that the data in the time series, i.e. the panel data in our case, do not exhibit stationarity, i.e. no unit root is present. If proved, this fact would have to be taken into account by calculating the first difference. Subsequently, Figure 1 shows that the average SPEXP values, including confidence intervals, remained very similar from 2009 onwards.

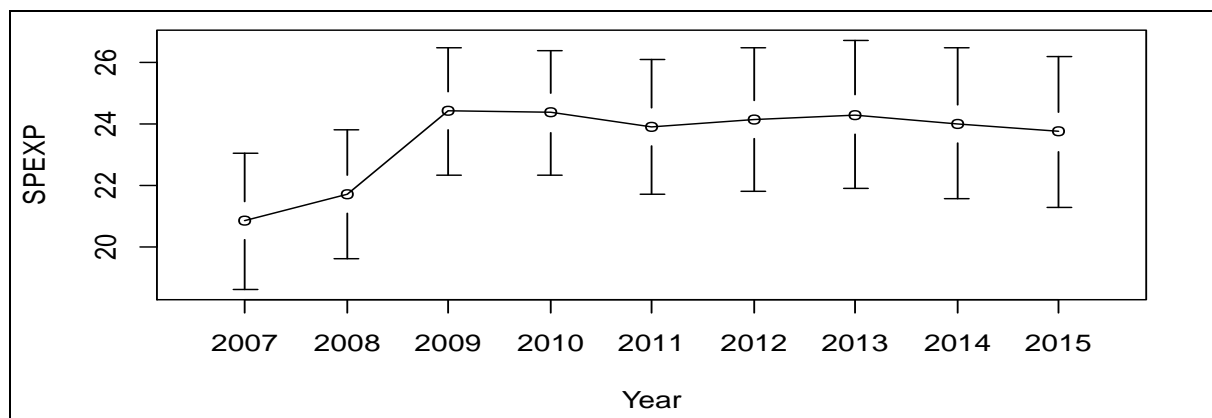


Figure 1. Group Means and Confidence Intervals for Social protection expenditures (SPEXP) in the EU 27 countries 2007-2015

Source: Own results based on Eurostat (2018)

The nine indicators of social and economic development were selected as independent variables. Available data from Human Development Report (2016) were received for Human development index. The Eurostat Statistics (2018) database was exploited to obtain the next eight independent variables. The list and description of the selected socio-economic indicators treated as independent variables is presented in Table 1.

Table 1. Description of the selected socio-economic indicators

<i>Indicator</i>	<i>Abbr.</i>	<i>Description</i>
GDP per capita	GDPCAP	Real GDP per capita is calculated as the ratio of real GDP to the average population of a specific year. It is often used as an indicator of how well off a country is, since it is a measure of average real income in that country. However, it is not a complete measure of economic welfare. For example, GDP does not include most unpaid household work. Neither does GDP take account of negative effects of economic activity, like environmental degradation.
Human Development Index	HDI	HDI is a statistic composite index of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development. A country scores higher HDI when the lifespan is higher, the education level is higher, and the GDP per capita is higher. (HDI between 0 and 1)
Unemployment rate	UNEM	Unemployment rates represent unemployed persons as a percentage of the labour force. The labour force is the total number of people employed and unemployed. Unemployed persons comprise persons aged 15 to 74 who were: a. without work during the reference week, b. currently available for work, i.e. were available for paid employment or self-employment before the end of the two weeks following the reference week, c. actively seeking work, i.e. had taken specific steps in the four-week period ending with the reference week to seek paid employment or self-employment or who found a job to start later, i.e. within a period of, at most, three months. (UNEM in percentage)
Long-term unemployment rate	LTUNEM	It is the number of persons unemployed for 12 months or longer as a percentage of the labour force (i.e. economically active population), based on the International Labour Office (ILO) definition. (LTUNEM in percentage)
Gini coefficient of equalised disposable income	GINI	The Gini coefficient is defined as the relationship of cumulative shares of the population arranged according to the level of equalised disposable income, to the cumulative share of the equalised total disposable income received by them. (Gini coefficient scale from 0 to 100)
The income quintile share ratio (S80/S20 ratio)	S80/S20	It is a measure of the inequality of income distribution. It is calculated as the ratio of total income received by the 20% of the population with the highest income (the top quintile) to that received by the 20% of the population with the lowest income (the bottom quintile).

The at-risk-of-poverty rate	ARPOR	Is the share of people with an equivalised disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income after social transfers. This indicator does not measure wealth or poverty, however, low-income residents in comparison to other residents in that country, which does not necessarily imply a low standard of living. (ARPOR in percentage)
At risk of poverty or social exclusion rate for elderly 65+	ARPOR 65+	The sum of the elderly (65+) who are: at risk of poverty or severely materially deprived or living in (quasi-)jobless households (i.e. with very low work intensity) as a share of the total population in the same age group. (ARPOR65+ in percentage)
Impact of social transfers on poverty reduction	PORED	Reduction in percentage of the risk-of-poverty rate, due to social transfers (calculated comparing at-risk-of-poverty rates before social transfers with those after transfers; pensions are not considered as social transfers in these calculations). The indicator is based on the EU-SILC (in percentage).

Source: Eurostat (2018), Human Development Report (2016)

Subsequently, the independent variables were subjected to the correlation analysis applying Pearson's correlation test. The results are presented in Table 2.

Table 2. Correlation matrix of the socio-economic indicators in the EU 27 countries 2007-2015

	GDPCAP	ARPOR65	ARPOR	GINI	S80/S20	PORED	LTUNEM	UNEM
ARPOR65	-.585***							
ARPOR	-.404***	.684***						
GINI	-.380***	.602***	.891***					
S80/S20	-.430***	.633***	.932***	.967***				
PORED	.543***	-.636***	-.830***	-.752***	-.787***			
LTUNEM	-.353***	.045	.359***	.350***	.398***	-.350***		
UNEM	-.307***	.055	.400***	.403***	.441***	-.310***	.913***	
HDI	.743***	-.719***	-.505***	-.471***	-.512***	.606***	-.234***	-.185***

Source: Own compilation based on Eurostat (2018). *** indicates the significance level at 0.01 level.

After evaluation, proxy variables for individual socio-economic indicators were selected due to the high degree of collinearity. Their selection was set so that their mutual correlation value did not exceed 0.800. This is normally considered an indicator of strong data correlation. For this reason, the following variables have been selected as independent variables, namely 1) HDI as proxy variable of social and economic welfare; 2) UNEM as proxy variable for unemployed persons as a percentage of the labour force; 3) GINI as proxy variable for a measure of inequality of income distribution; and 4) ARPOR65 as proxy variable for people at risk of poverty or social exclusion. Thus, all proxy variables measure socio-economic indicators in the context of the degree of disadvantage of EU citizens.

2.2 Methods

Time-invariant country specific unobserved heterogeneity through *fixed effects model* of our balanced panel was used to accomplish the main objective of the paper, which is the interpretation of the impact of independent variables that vary over time on SPEXP. Hence, the fixed effects model took the form:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \quad (1)$$

where

Y_{it} = the dependent variable where i = entity (i.e. the EU 27 countries in our case) and t = time (i.e. panel data within nine consecutive years from 2007 to 2015 in our case);

X_{it} = independent variable,

β_1 = the coefficient estimate for independent variables,

α_i = the intercept for each entity, i.e. n entity-specific intercepts,

u_{it} = the error term.

In our case, the fixed effect model was tested using a fixed effect estimator, applied within transformation. Subsequently, the fixed effects equation of our model took the form:

$$\text{SPEXP}_{(\text{EU27},2007-2015)} = \beta_1 \text{HDI}_{(\text{EU27},2007-2015)} + \alpha_{\text{HDI}} + \beta_2 \text{UNEM}_{(\text{EU27},2007-2015)} + \alpha_{\text{UNEM}} + \beta_3 \text{GINI}_{(\text{EU27},2007-2015)} + \alpha_{\text{GINI}} + \beta_4 \text{ARPOR65}_{(\text{EU27},2007-2015)} + \alpha_{\text{ARPOR65}} + u_{(\text{EU27},2007-2015)} \quad (2)$$

In order to confirm the suitability of using the fixed effect model, the following tests were carried out to compare the quality of each model, such as pooled OLS, fixed effect model and random effect model, according to differences between coefficients estimates, i.e. 1) Lagrange multiplier test for pooled OLS vs. random effects model; 2) Chow test for pooled OLS model vs. fixed effect model; 3) Hausman test for fixed effects vs. random effects model. In addition, heteroscedasticity was controlled for fixed effects and random effect model employing Breusch-Pagan test, serial correlation was controlled using Breusch-Godfrey test for panel data, and cross-sectional dependency using Pesaran's CD test for correlation of residuals across the EU countries. Following the violation of the fixed effects and the random effects model assumptions, these robust alternatives of tests were used 1) owing to a cross-sectional dependency violation, by adopting an alternative Pesaran's CD test hypothesis, robust Hausman test was used in favour of a fixed vs. random effect model, i.e. its auxiliary-regression-based version, see Wooldridge (2010, Sec. 10.7.3) exploiting the White's (1984) robust variance-covariance matrix of the coefficients of a fitted model (Baltagi, 2005); and 2) due to violation of homoscedasticity and serial correlation (quasi-) t Wald tests of estimated coefficients using the variance covariance matrix of the coefficients was applied to robustly estimate the coefficients of the resulting model.

The first step to achieving the main aim of the paper and its partial hypotheses was to calculate the pooled OLS model using the variables contained in Equation 2. The use of the OLS regression model pooled assumption that in its general expression

$$y_{it} = \beta x_{it} + \alpha_i + \varepsilon_{it} \quad (3)$$

x is not correlated with both error components, namely α_i and ε_{it} . Thus, two assumptions emerge, i.e. neither entity-specific time-constant unobserved heterogeneity (random effects) nor time-varying unobserved heterogeneity (fixed effects) are present. The second step was to calculate the random effect model for its comparison with the pooled OLS model and fixed effect model. Breusch-Pagan test showed 1) heteroscedasticity in the random effect model (BP = 11.659, df = 4, p-value < 0.05); 2) serial correlation using Breusch-Godfrey test (chisq = 58.47, df = 1, p-value < 0.001); 3) and the cross-sectional dependency proved by Pesaran CD's test (a = 21.316, p-value < 0.001). The third step was to calculate the model's fixed effects for its comparison with the pooled OLS model and random effect model. Application of Breusch-Pagan test revealed 1) heteroscedasticity in the random effect model (BP = 11.659, df = 4, p-value < 0.05); 2) serial correlation using Breusch-Godfrey test (chisq = 38.788, df = 1, p-value < 0.001); 3) and the cross-sectional dependency proved by Pesaran CD's test (z = 21.61, p-value < 0.001). A subsequent series of tests performed testing pooled the OLS versus random effect model and fixed effect model. Lagrange Multiplier Test - Honda's uniformly most powerful test for balanced panels (Baltagi, 2005) was applied to test the pooled OLS model vs. random effect model. The result shows that variances across the EU 27 countries are not zero (normal = 26.29, p-value < 0.001). Hence, the null hypothesis was rejected and it was concluded that the random effect is appropriate. Chow test to

evaluate the pooled OLS model vs. fixed effect model was employed. The test proved that the fixed effect model has to be preferred to the pooled OLS model as the test accepted rejection of the null hypothesis that the coefficients for all years are jointly equal to zero ($F = 80.013$, $df1 = 26$, $df2 = 212$, $p\text{-value} < 0.001$), i.e. the individual effects are presented. Respecting the given results of all these previous tests, a robust version of Hausman test was utilised where null hypothesis assumed that the random effect model did not suffer from the violation of the Gauss-Markov theorem and therefore not ending up with biased and inconsistent parameter estimates, i.e. the individual effects are uncorrelated with the other regressors (Park, 2011). The robust Hausman test suggested preferring the fixed effect model to random effect model as the null hypothesis had been rejected ($\text{chisq} = 22.604$, $df = 4$, $p\text{-value} < 0.001$).

3. RESULTS AND DISCUSSION

The resulting fixed effect model exhibits a coefficient of determination: 0.495. The adjusted coefficient of determination, taking into account the use of multiple independent variables in the model, reached the value of 0.423. Thus, the model presented by us can be interpreted in such a way that the amount of variance dependent variable (SPEXP) is explained by the amount of variance of independent variables from 42.3%. The prerequisite for evaluating the individual estimations of coefficients is the F-statistic, when all the coefficients in the model are different from zero (F-test: 51.8531 on 4 and 212 DF, $p\text{-value}: < 0,001$). Their results are shown in Table 3.

Table 3. Estimation of coefficients in the fixed effect model for Social protection expenditure in the EU 27 countries 2007-2015

Variable	Coeff. Estimate	Standard Error	t-Value	P-Value
HDI	21.828949	9.883642	2.2086	0.02827 **
UNEM	0.334838	0.034114	9.8153	< 2e-16 ***
GINI	-0.135201	0.079388	-1.7030	0.09003 *
ARPOR65	-0.039394	0.022691	-1.7361	0.08400 *

Source: Own compilation based on Eurostat (2018). * indicates significance level at 0.10 level, ** indicates significance level at 0.05 level, *** indicates significance level at 0.01 level.

Nonetheless, the resulting model is burdened with a violation of assumptions for consistent coefficient estimates. Therefore, a model with corresponding parameter estimates based on their robust counterparts using the "arellano" method for fixed effects models and type HAC3 giving less weight to influential observations is presented in Table 4.

Table 4. Robust estimation of coefficients in the fixed effect model for Social protection expenditure in the EU 27 countries 2007-2015

Variable	Coeff. Estimate	Standard Error	t Value	P-Value
HDI	21.828949	15.384169	1.4189	0.1574
UNEM	0.334838	0.068276	4.9042	1.865e-06 ***
GINI	-0.135201	0.105964	-1.2759	0.2034
ARPOR65	-0.039394	0.035520	-1.1091	0.2687

Source: Own compilation based on Eurostat (2018). *** indicates significance level at 0.01 level.

Table 4 shows that the only significant factor influencing SPEXP values is the registered unemployment rate (UNEP, $p < 0.001$). For the other factors, the obtained data did not provide sufficient evidence of their significance. Consequently, the interpretation of this coefficient estimate in the fixed effect model indicates how much SPEXP changes overtime, on average per country, when UNEP increases by one unit taking all other variables constant, namely by 0.334838 in that case. In this regard, SPEXP is expected to increase by 21.828949 units on average in the model, if one-unit increase occurs in HDI. This represents the highest value in the model, however, with an insignificant relationship between both variables encumbered with a large standard error. For the other two independent variables, namely ARPOR65 and GINI, there is a change to SPEXP overtime, on average negative per country. Thus, SPEXP is expected to decrease by -0.039394 and -0.135201 respectively.

On the other hand, all hypotheses 1-4 were confirmed from the perspective of the individual signs of the coefficients within the independent variables, i.e. H1: there is a positive relationship between SPEXP and the socio-economic development represented by HDI; H2: SPEXP increases in relation to the amount of UNEM; H3: there is a negative relationship between SPEXP and GINI, i.e. higher amount of expenditure on social protection mitigates income inequality; H4: there is a negative relationship between the SPEXP and the poverty rate (ARPOR65) with the same explanation as for H3. Nevertheless, it must be reiterated that a sufficient significant effect on SPEXP was revealed only in the case of UNEM.

The evaluation of socio-economic indicators and social protection expenditures accomplished in this research is consistent with findings in Pestieau (2006); Mikusova Merickova and Halaskova (2014a; 2014b) or Halaskova and Mikusova Merickova (2017) with a positive correlation between the *social protection expenditures and socio-economic development* quantified Human-Development Index. Furthermore, Mikusova Merickova and Halaskova (2014a or 2014b) came to the conclusion that there is a positive correlation between social protection expenditures on family and old age and socio-economic development. Halaskova and Mikusova Merickova (2017) suggested that social protection expenditures on health care and old age had a positive impact on socio-economic development; only social protection expenditure on disability had a negative impact on socio-economic development evaluated by Human development index.

Findings of this paper are consistent with former studies, such as Niehues (2010); Anderson et al. (2016); Halaskova and Mikusova Merickova (2017) or Sanchez and Perez-Corral (2018) where a negative relationship between *social expenditures and income inequality* was identified. Moreover, Niehues (2010) analysed whether more generous social spending policies lead to lesser income inequality or not in the EU 15 member states until 2004 and EU 25 member states from 2005. This research reflected the fact that the structure of benefits, particularly unemployment benefits and public pensions is responsible for the inequality reducing impact. Additionally, Halaskova and Mikusova Merickova (2017) assessed the correlation between social protection expenditure by selected function and income inequality for a set 17 European countries in the period 2005-2012. Results of this study revealed that social protection expenditures on health care, on the disabled and on old age had a mainly negative impact on income inequality, based on the Gini coefficient. Furthermore, study by Anderson et al. (2016) realised a meta-regression analysis exploring the effects of government spending on income inequality, with a particular focus on low- and middle-income countries. The results concluded the presence of a moderate negative relationship between government spending and income inequality, which is strongest for social welfare and other social spending, with using the Gini coefficient. Nevertheless, a range of other factors affects both the size and direction of the estimated relationship between government spending and income inequality. Moreover, the results of study by Sanchez and Perez-Corral (2018), who analysed the relationship between public social expenditures and income inequality in the EU 28 countries, showed a negative correlation between public social expenditures as a whole and income inequality.

Our results have confirmed a weak negative relationship between *social protection expenditures and poverty rate* for elderly 65+. If we focus on research into this issue having been carried out before, such as Caminada et al. (2012); Halaskova (2018); Mieziene and Krutuliene (2019), we can conclude that they reached similar conclusions. Halaskova (2018) analysed the relation between social expenditures in relation to poverty and social exclusion in the 28 European countries in the period 2007-2015. The results of correlation analysis showed a moderate negative correlation between social protection benefits (all functions) and income poverty and social exclusion. Halaskova (2018, p. 124) says that specifically, “the study by Caminada et al. (2012) was dedicated to the impact of social expenditures on poverty rate for the period 1985–2005, where demographic and macroeconomic differences across countries were considered. Results of this study verified a negative, but quite a strong relationship between the level of social expenditures and poverty rate”. Ageing and unemployment rates were found to have some explanatory power but without affecting the association between social transfers and poverty. The multivariate approach chosen in this paper verified the results of previous research agenda. Thereby, a positive relationship between social protection expenditures and unemployment rate in the EU 27 member states was identified.

Results of our research have also shown a positive relationship between *social protection expenditures and unemployment rate* in the EU 27 countries. Research conducted by Ding (2014) with using a panel data of 34 OECD countries from 1980 to 2010, confirmed that total welfare expenditures as a percentage of GDP proves a positive impact on unemployment outcomes (total unemployment, long-term unemployment and youth unemployment). Likewise, Cabelkova (2015) investigated the effect of social protection expenditures on the level of unemployment of the disabled in the EU. In addition, Chzhen (2017) confirmed the effect of social protection expenditures on unemployment and on the poverty risks of children in very low work intensity families.

Our findings are hereby consistent with previously published scholarly papers on social protection expenditures and socio-economic indicators. However, some differences could be perceived due to various aspects of expenditures (public expenditure, public social expenditure, social protection expenditure by selected functions), or due to diverse approaches of welfare state (*Social-democratic, Conservative and Liberal*). Research findings may also vary owing to different time-periods in prior research.

CONCLUSION

The aim of the paper was to analyse association between social protection expenditures and the selected socio-economic indicators in the years 2007-2015, using a regression analysis of panel data for the EU 27 countries. In our case, a fixed effect model was exploited for the analysis that proved the causal interpretation of the impact of independent variables that vary over time on social protection expenditures, however, in the case unemployment solely. The used regression model with a robust estimation of coefficients confirmed the predefined hypotheses H1-H2 with positive relationships of Human development index (HDI) and unemployment rate on social protection expenditures changes over time, on average per country. Moreover, hypotheses H3-H4 were confirmed, exhibiting negative relationships for poverty rate (measured by at risk of poverty or social exclusion rate for elderly 65+) and income inequality (expressed by Gini coefficient of equalised disposable income). Nevertheless, no independent variables in H1, H3 and H4 contribute to the amount variance of social protection expenditures significantly.

The consequences of the interaction of economic and social phenomena are discussed in many countries. In this context, one poses a question of a compromise between efficiency and equality, which is projected into the relationship between economic and social policy. Despite our results, the future research is proposed to be focused on the comparison of these results with Granger causality test ones as well as interaction effects of independent variables as fixed effects model could provide such analysis. Moreover, respecting the continuation of the divergence in

unemployment rate among the EU countries, least squares dummy variable model for fixed effect model is supposed to be applied using dummy variables for the EU countries or institutional regimes and vice versa as well as exploring its longitudinal effect, i.e. influence of the economic cycle on social protection expenditures.

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