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Do Poverty and Income Inequality Affect Public Debt?[1]

Abstract: The aim of this paper is to capture the impact of poverty and income inequality on public debt in European Union countries, providing for the dynamic nature of the response variable. To assess absolute poverty, a new overall deprivation indicator is suggested, a measure that makes it possible to distinguish between average deprivation and severe deprivation. To determine income inequality, the unevenness in the distribution of pre-fiscal income is considered, as this is the factor that is most likely to cause government redistributive spending. A dynamic panel data model (DPD model) is estimated using the bias-corrected LSDV estimator. The results indicate that neither poverty nor income inequality are statistically significant predictors of the public debt-to-GDP ratio. This is because countries that report higher absolute poverty or higher income inequality de facto spend less on social benefits, while countries with higher relative poverty do not have higher social spending than the rest of the sample.

Keywords: public debt-to-GDP ratio, deprivation indicator, pre-fiscal income, Gini coefficient, Kiviet estimator

JEL classification codes: C23, D31, E62, H63

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Introduction

Since the beginning of the 2000s, the average public debt-to-GDP ratio in the EU has increased by about 40%. The indicator has continued to follow a long-run upward trend that has been observed in most industrialized countries since the end of World War II.

Outstanding public debt is a major economic problem that can have long-term macroeconomic implications. It can weaken economic growth (by crowding out private investment), increase the inflation rate and the long-term interest rate, or distort the distribution of the tax burden across generations [Bernheim, 1987; Padoan *et al.*, 2012; Reinhart, Rogoff, 2010; Seater, 1993]. Therefore, understanding the factors that determine public debt is essential for stabilizing and reducing its level. The question to what extent public debt may not be harmful to the economy is beyond the scope of this paper, but some authors point out that, in the short term, government borrowing can help finance economic growth-enhancing investments (including attracting foreign capital through selling government bonds). For a comprehensive review of studies on the relationship between public debt and economic growth, see, for example, Siwińska [2015].

Clearly, public debt reflects accumulated previous budget deficits and the deficits represent the excess of total government expenditure over total government revenue. In the EU as a whole, total general government expenditure accounts for almost half of GDP, with social spending as its largest component. To be precise, about 65% of total general government spending is made up of social transfers, in cash or in kind, which, to some extent, redistribute the market income (social expenditures are devoted mainly to social protection, health, education and housing).

The goal of this paper is to investigate the impact of poverty and income inequality on public debt. A research problem that lies behind analyzing the causal relationship between these variables concerns a link between the existing level of poverty or income inequality and debt-financed social expenditures that are induced to deal effectively with the problems. To be precise, the hypothesis to be verified through empirical research is that countries with deeper poverty or higher income inequality are the most indebted ones, as they must have higher social spending. So far, a description of the theoretical relationships between poverty or income disparity and national debt can be found, for example, in the works of Persson and Tabellini [1991], Alesina and Rodrik [1994], and Battaglini and Coate [2008].

To meet the above aim, the public debt-to-GDP ratio is regressed on (1) poverty and income inequality measures, and on (2) social government spending, controlling for a lagged dependent variable, non-social government spending, total government revenue and the real GDP growth rate (while analyzing fiscal policy in economies that grow over time, it is beneficial to use the public debt-GDP ratio rather than the nominal or real public debt level [Bohn, 2005]. To quantify absolute poverty, a new overall deprivation indicator

is proposed. The indicator makes it possible to distinguish between average deprivation and severe deprivation. Income inequality is figured out as the unevenness in the distribution of pre-fiscal income, as this is the factor which most likely causes government redistributive spending (the primary income Gini coefficient is used). To take into account the dynamic nature of public debt, the dynamic panel data model (DPD model) is chosen. The model is estimated using the bias-corrected least-squares dummy variable estimator (the corrected LSDV estimator), which approximates the small sample bias of the LSDV. Overall, dynamic panel data models have become increasingly popular in economic analysis in recent decades, mostly due to increasingly easier access to macro- and micro-panel databases. They are used to model a wide range of economic phenomena, such as economic growth, employment, investment, consumption, demand, exports, and imports [Dańska-Borsiak, 2009; Goczek, 2012].

The main finding of this study is that neither poverty nor income inequality are statistically significant predictors of public debt, but there is a strong, significant link between social expenditure and the response variable. This is because countries that register higher absolute poverty or higher income inequality de facto spend less on social benefits, and the degree of relative poverty has no effect on the social spending level. For absolute poverty, the conclusion is the same regardless of whether the overall deprivation indicator emphasizes average deprivation or grave deprivation.

Review of prior research

Although the literature on public debt is substantial, papers that deal with interactions between sovereign debt and poverty or income inequality are much more limited in number. Theoretical links between income inequality and public debt can be found, for example, in Persson and Tabellini [1991], and Alesina and Rodrik [1994]. The authors explain how high income inequality generates political pressure on governments to finance redistributive spending. If total revenues collected by the governments are too low to cover the expected redistributive expenditure, budgetary deficits are generated, and, in the long term, a run-up in public debt occurs. A political economy theory of fiscal policy is presented by Battaglini and Coate [2008], who describe how the policy choices that are made by public authorities can increase revenues via taxation or by public borrowing (in the model, public revenues can be used to finance public goods or social cash transfers).

Milanovic [2000] examines the problem of interaction between income inequality and income redistribution, describing a political mechanism through which a greater income discrepancy results in greater income redistribution, but with no references to the issue of debt-financed social expenditure. He focuses on the median-voter hypothesis, showing empirically that countries with higher inequality of factor income redistribute more to the least well-off persons.

Among a large group of publications that concern the optimal level of public debt, some works account for the presence of income (wealth) inequality. For example, Röhrs and Winter [2011] proposed a growth model with incomplete markets and households facing uninsurable income shocks, providing for consistency with the skewed wealth and earnings distribution in the United States. They found that the government should not issue public debt in the long run, but ought to hold assets instead and buy private bonds (the reason is that a large proportion of the population has almost no wealth). Similarly, calibrating an incomplete-markets overlapping-generations model to the US income and wealth distribution, Vogel [2014] showed that the government should hold negative debt, and the optimal debt level depends on the adjustment policy, varying by up to 70% of GDP. As regards the effect of public debt on the distribution of welfare, the greatest gains from a low level of national debt would be experienced by agents in the middle of the income scale.

Azzimonti *et al*. [2012] directly investigate how income inequality alters national debt, proposing a multi-country model with incomplete markets and endogenous government borrowing. The model shows that governments choose higher levels of public debt if financial markets become internationally integrated and income inequality rises. Income inequality is associated with greater uninsurable risks that result in higher demand for safe assets and a lower interest rate, and consequently higher government borrowing. The quantitative analysis supports theoretical reasoning by revealing that, in 16 OECD counties, national debt growth was associated with an increased income discrepancy from 1973 to 2005, as measured by the share of total income earned by the top 1% of the population. The authors regressed the growth rate of real government debt on the change in the index of capital mobility, the log-change in the top 1% of income shares, the ratio of public debt to the GDP in the previous year, the log-change in the GDP, and a set of other control variables.

Jabłoński [2013] presented theoretical arguments for the relationships between growing income inequality and increasing public debt in capitalist economies. He also demonstrated that a rise in income inequality led to an increase in public debt in OECD countries in 1995–2010. The empirical study was based on an econometric model of public debt similar to that proposed by Azzimonti *et al*., with the difference that the reported income inequality referred to both the upper and lower parts of income distribution. Although both of these papers rely on dynamic panel data modeling to consider the fact that national debt is influenced by its own past values (realizations), neither introduces poverty or public spending as an explanatory variable.

The rest of this paper is laid out as follows. Section 3 explains the DPD model of the public debt-to-GDP ratio and the estimation methodology applied. Section 4 characterizes the empirical sample used. Section 5 reports the regression results. Section 6 concludes.

Model specification and methodology

The following model aims to identify the impact of poverty and income inequality on public debt (subscripts i and t refer to the country and time period respectively):

$$PD_{i,t} = \alpha_1 PD_{i,t-1} + \alpha_2 IN_{i,t} + \alpha_3 NSE_{i,t} + \alpha_4 TR_{i,t} + \alpha_5 GDPrate_{i,t} + \gamma_i + \delta_t + \epsilon_{i,t} \quad (1)$$

where *PD* is the public debt-to-GDP ratio, *IN* represents a poverty or income inequality measure, *NSE* stands for non-social government expenditure, *TR* measures total government revenue (all predictors are expressed as a share of *GDP*), *GDPrate* denotes real *GDP* growth rate, γ_i and δ_t are country-specific and time-specific effects respectively, and ϵ_i is the idiosyncratic error term. Introducing the lagged dependent variable $PD_{i,t-1}$ as a right-hand-side variable allows for a partial adjustment mechanism in the underlying process (and helps ensure consistent estimates of the coefficients of other regressors).

Absolute and relative poverty are quantified with the use of the material deprivation indicator and the at-risk-of-poverty rate respectively, whereas income inequality is evaluated by the Gini coefficient[2].

A new general deprivation indicator that is linear in the deprivation rates is proposed:

$$D = \frac{\sum_{j=1}^{n} w_j d_j}{\sum_{j=1}^{n} w_j} \quad (2)$$

where d_j is the deprivation rate related to a given number of deprivation items, w_j is the weight attached to a given deprivation rate ($w_j > 0$), j is the number of deprivation items, and n is the sum of the deprivation items. The deprivation rate shows the proportion of citizens who cannot afford some items considered to be necessary or at least desirable to lead an adequate life; the items may concern the diet, amenities, activities or, broadly speaking, any particular aspect of a lifestyle (a meal, a washing machine, a color TV, a phone, etc.). For example, d_1 represents the share of persons unable to pay for any one of the abovementioned deprivation items, and d_3 stands for the percentage of persons unable to pay for any three of such items.

The same or different weights can be attached to successive deprivation rates:

$$D_1 = \frac{\sum_{j=1}^{n} d_j}{n} \quad \text{and} \quad D_2 = \frac{\sum_{j=1}^{n} j d_j}{\sum_{j=1}^{n} j} = \frac{\sum_{j=1}^{n} j d_j}{n(n+1)/2}. \quad (3)$$

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2 Absolute poverty is defined in terms of the deficiency of material resources to guarantee a minimal standard of living, while relative poverty refers to a state of lacking means as compared to other members of a distinct population (country). Therefore, countries with the same relative poverty rates may differ significantly with respect to the absolute income of the poor.

If the same weights are assigned, the deprivation indicator is simply the arithmetic mean and minimizing it is equivalent to minimizing the sum of individual deprivation rates, with no regard to the way in which the rates are distributed. On the other hand, assigning higher weights to successive deprivation rates reflects giving importance to persons who cannot afford many or even all of the deprivation items, that is persons who are severely materially deprived (the higher the percentage of the least well-off citizens, the greater the overall deprivation indicator). In this case, to minimize the total deprivation indicator, it is necessary to minimize the income shortfall of the worst-off persons.

The at-risk-of-poverty rate indicates the share of people with an equivalized disposable income before social transfers, that is below the at-risk-of-poverty threshold calculated after social transfers. Pensions are excluded from social transfers and counted as original income, as they are understood as deferred income from work. In general, the indicator may be provided by different poverty thresholds, such as the given percentage of the national mean or median disposable income.

One income inequality measure is the Gini coefficient of pre-government income, that is household income from all kinds of work, pensions and private transfers (pensions are counted as original income). It is income before state-granted social transfers, hence the disproportion in its distribution may have an impact on the magnitude and structure of the transfers.

Poverty and income disparity may contribute to public debt, since the factors may generate social government expenditure that is intended to result in more egalitarian income distribution. In the main, social expenditure is understood as those public transfers that are related to the following general government functions: social protection, health, education, housing and community amenities, as well as recreation, culture and religion (social and non-social general government spending complement each other). Consequently, as the next step of the study, in the public debt regression (1), social government expenditure is substituted for poverty and income inequality measures.

Equation (1) is estimated using a bias-corrected LSDV estimator known as the Kiviet estimator [Kiviet, 1995]. This estimator is preferred in the case of dynamic panel data sets of small N, as compared to the LSDV, IV and GMM consistent estimators [Bruno, 2005]. The main limitation of this procedure is that it assumes strict exogeneity of the covariates and does not solve the reverse causality problem, but its advantage is that it can be applied to unbalanced panel-data models.

The endogeneity of the lagged dependent variable to fixed effects in the composite error term inflates the coefficient on this variable in the OLS regression, but, due to a negative sign on the lagged composite error, the coefficient is biased downward in the FE regression. For this reason, it is expected that reasonable estimates of the coefficient lie between the value obtained by the OLS and FE methods [Bond, 2002; Roodman, 2009].

The empirical sample

The panel covers all EU countries in the period 1995–2015, and each member state is included in the sample depending on when it joined the EU. As the number of time periods is not the same for all countries, an unbalanced panel is dealt with, but, as already mentioned, the chosen estimator allows for such a panel.

The public debt-to-GDP ratio is reported in line with the definition set out in the Maastricht Treaty, according to which national debt is consolidated general government gross debt at nominal value, providing for currency and deposits, debt securities and loans (the general government sector comprises the central government, state government, local government, and social security funds)[3].

In the EU as a whole, the average public debt-to-GDP ratio was 54.45%. Twelve countries had a debt ratio above the reference value of 60% of GDP. Nevertheless, there was a high degree of heterogeneity among member states in public debt scaled by the size of the economy. Considering the within-country average, the ratio was 122.87% in Greece, 106.26% in Italy and 105.79% in Belgium. At the other end of the spectrum, the figure was 6.55% in Estonia, 12.33% in Luxemburg, and 21.90% in Latvia.

The data on the deprivation rates and the at-risk-of-poverty rate are taken from the Eurostat, but statistics are only available for the period from 2003 onward. Concerning the deprivation rates, Eurostat publishes a list of nine deprivation items: (1) mortgage or rent payments, (2) home that is adequately warm, (3) unexpected expenses, (4) a meal with meat, fish or a protein equivalent every second day, (5) a week's holiday away from home, (6) a car, (7) a washing machine, (8) a color TV, and (9) a phone. However, as regards the deprivation rate, which reflects the share of population that cannot afford all nine deprivation items, the number of missing values is large, so this variable is totally excluded. As regards the at-risk-of-poverty rate before social transfers, which serves as a right-hand variable in the model, it assumes a threshold that is set at 40% of the national median equivalized disposable income (setting a low income threshold helps capture the link between the scope of poverty and the level of social spending). Since pensions (old-age and survivors' benefits) are recognized as original income, the indicator examines the hypothetical non-existence of social transfers.

The deprivation indicator varies significantly among European countries, which applies to both D_1 (all individual deprivation rates have equal weights) and D_2 (higher weights are assigned to deprivation rates related to a higher number of deprivation items). D_1 reveals that deprivation is more severe

[3] The European Union's definition of public debt differs from the approach adopted by the International Monetary Fund, as the latter defines the concept as all general government liabilities that are debt instruments (debt instruments are made up of debt securities, loans, other accounts payable, special drawing rights, currency and deposits, insurance, pension and standardized guarantee schemes).

in countries such as Bulgaria, Romania and Cyprus than in Luxemburg, Sweden and the Netherlands. D_2 indicates that the overall deprivation rate was 8.40 in Bulgaria, 7.13 in Romania and 6.45 in Latvia, while standing at 1.06 in Sweden, 1.19 in Luxemburg and 1.50 in the Netherlands.

The at-risk-of-poverty rate was 22.64 in Ireland, 18.34 in the United Kingdom, and 17.56 in Denmark, while standing at 8.52 in Cyprus, 8.64 in the Czech Republic, and 9.26 in Slovakia. Of course, since the at-risk-of-poverty rate is a relative poverty measure, it does not compare the "material situation" of households across the countries but in relation to other households in a given country.

To compute the original income Gini coefficient, statistics from the EU Survey on Income and Living Conditions (EU-SILC) were used. The EU-SILC constitutes the largest harmonized database on representative samples of households in all member states, and it enables cross-country comparisons of the current income distribution. Unit data necessary to determine the Gini coefficient have only been available since 2004. The Gini coefficient given in this study refers to the distribution of households with respect to income per equivalent unit (a modified OECD equivalent scale was used).

The pre-fiscal income Gini coefficient was found to be the highest in Ireland, Portugal and the United Kingdom, at 42.90, 42.66 and 41.57 respectively. It was the lowest in Slovakia, the Czech Republic and Netherlands, at 29.35, 31.35 and 32.34 respectively.

Social expenditure is made up mostly of old-age benefits, healthcare benefits, family-related benefits, disability benefits and unemployment benefits plus housing and social exclusion not covered elsewhere (this last category includes both benefits in cash and in-kind). They are public outlays that may directly result in income redistribution, at both the individual and household levels. On average, social expenditure corresponded to 21.75% of GDP: the most was spent by Denmark, France and Sweden, while the least was spent by Romania, Latvia and Estonia.

Table 1 presents cross-country panel summary statistics.

Table 1. Cross-country panel summary statistics

	Obs	Mean	Std. Dev.	Min	Max
PD	574	54.4510	31.8723	3.7	180.1
D_1	319	6.5157	1.9558	2.9	10.4333
D_2	319	3.5040	1.8428	0.8722	10.2944
At-risk-of-poverty rate	404	13.5933	3.6228	6.9	29.6
Gini coefficient	265	36.7383	3.5842	26.443	44.8071
NSE	510	23.4121	3.5261	12.9	42.47
TR	588	42.0350	6.4760	27.56	58.35
Real GDP growth rate	543	2.5610	3.6041	–14.80	26.3
SE	510	21.7471	5.3058	10.3	32.2

Regression results

Table 2A reports the outcome of estimating equation (1), and Table 2B shows that coefficients on the lagged dependent variable are within the OLS-LSDV range, which is the necessary requirement for the DPD estimate of the true parameter.

Table 2A. DPD model of public debt-to-GDP ratio, European Union countries, 2003–2015

	(1)	(2)	(3)	(4)
D_1	2.3257			
	(1.5918)			
D_2		2.6710		
		(1.6350)		
At-risk-of-poverty rate			0.6758	
			(0.6075)	
Gini coefficient				0.5820
				(0.5663)
NSE	0.8480**	0.8565**	0.8372**	0.8514**
	(0.3477)	(0.3453)	(0.5105)	(0.3638)
TR	–0.6657	–0.8040	–0.3436	–0.7584
	(0.5632)	(0.5663)	(0.5994)	(0.5778)
Real GDP growth rate	–0.8779***	–0.9303***	–0.8065***	–0.7923**
	(0.2921)	(0.2933)	(0.2967)	(0.3130)
L. dependent variable	0.7739 ***	0. 7839***	0. 8223***	0.7929***
	(0.0555)	(0.0549)	(0.0681)	(0.0578)
Number of observations	291	291	364	265
Number of countries	28	28	28	28
Wooldridge test (Prob > chi2)	0.8167	0.8115	0.7820	0.7689

Notes: Bias correction initialized by Blundell and Bond estimator (with no intercept). Bootstrapped standard errors are in parenthesis (they are calculated using 250 replications). Wooldridge test is a test for serial correlation in panel data model (H_0: no first-order autocorrelation). Year dummies are included in every specification but not reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations.

Table 2B. Estimated parameters on lagged dependent variable

	(1)	(2)	(3)	(4)
OLS estimator	0.9554 (0.0000)***	0.9507 (0.0000)***	0.9468 (0.0000)***	0.9389 (0.0000)***
corrected LSDV estimator	0.7739 (0.0000)***	0.7839 (0.0000)***	0.8223 (0.0000)***	0.7929 (0.0000)***
LSDV estimator	0.5608 (0.0000)***	0.5777 (0.0000)***	0.6732 (0.0000)***	0.5843 (0.0000)***

Notes: p-values in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations.

The coefficients attached to deprivation indicators D_1 and D_2, as well as the at-risk-of-poverty rate are statistically not significant, thus neither of those regressors has explanatory power while explaining the public debt-to-GDP ratio. It should be stressed that this result is valid even in the case of D_2, so even if it is assumed that severe deprivation contributes more to the overall deprivation level. No statistically significant link between the pre-fiscal income Gini coefficient and the response variable is detected either, and this income inequality measure takes into account the entire income distribution, including both the low and high ends of the distribution [Pyatt, 1976; Svedberg, 2004; Wiśniewski, 1992].

The above outcome is different from the result obtained by Azzimonti *et al.* [2012], who regressed the growth rate of real government debt on changes in the income inequality index, ending up with a positive and statistically significant coefficient on the predictor. But it has to be remembered that the income inequality index used by those authors was actually the concentration of income earned by the richest 1 percent of income earners, and this index is far from being able to summarize the entire income distribution.

The estimated coefficients on all the remaining right-hand-side variables give the expected indications. The coefficient on non-social spending is positive, whereas the coefficient on the real GDP growth rate is negative, and the impact of the real GDP growth rate is strongly significant (at the 0.01 level). Hence, higher non-social spending forces governments to run further into public debt, but a higher real GDP growth rate causes public debt to be lower. The effect of total general government revenue turns out to be statistically not significant. In particular, the coefficient on the lagged dependent variable is positive and highly significant. The magnitude of this coefficient confirms that the current public debt is predominantly made up of the debt that has been accumulated over the years (the coefficient is below unity, which guarantees dynamic stability of the model).

To trace the link between poverty or income inequality, social spending and public debt, in equation (1), the poverty or income inequality measure is replaced by the social expenditure variable. The new regression output is given in Table 3A.

Social general government expenditure exerts a positive influence on the public debt-to-GDP ratio, and the effect is highly significant. The coefficient on this predictor implies that, on average, *ceteris paribus*, a 1 percentage point increase in social spending is expected to cause the dependent variable to rise by 1.41 percentage points. Therefore, countries with higher social spending tend to increase their national debt.

Not surprisingly, coefficients on all other right-hand-side variables have the same sign as earlier. Nevertheless, the coefficient on non-social spending becomes more significant, the coefficient on the real GDP growth rate becomes less significant, and the coefficient on total revenue gains its significance.

Table 3A. DPD model of public debt-to-GDP ratio, European Union countries, 1995–2015

	(1)	(2)
SE	1.4134***	1.1922***
	(0.3880)	(0.3961)
NSE	0.7720***	0.6040***
	(0.2153)	(0.2109)
Real GDP growth rate	–0.4126**	–0.4134**
	(0.2053)	(0.2149)
TR	–0.6668**	
	(0.2912)	
L. dependent variable	0. 8122***	0.8240***
	(0.0350)	(0.0347)
Number of observations	472	472
Number of countries	28	28
Wooldridge test (Prob > chi2)	0.8317	0.8314

Notes: Bias correction initialized by Blundell and Bond estimator (with no intercept). Bootstrapped standard errors are in parenthesis (they are calculated using 300 replications). Wooldridge test is a test for serial correlation in panel data model (H_0: no first-order autocorrelation). Year dummies are included in every specification but not reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations.

Table 3B. Estimated parameters on lagged dependent variable

	(1)	(2)
OLS estimator	0.9095 (0.0000)***	0.9408 (0.0000)***
corrected LSDV estimator	0.8122 (0.0000)***	0.8240 (0.0000)***
LSDV estimator	0.7115 (0.0000)***	0.7006 (0.0000)***

Notes: p-values in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Own calculations.

In the research sample, there is a correlation between total general government revenue and social spending expenditure (the Pearson correlation coefficient is 0.7), and that is why it is worth to follow the robustness of the significance of social spending. Column 2 in Table 3A gives the results when total revenue is excluded from the equation. The magnitude of the coefficient on social expenditure decreases, but it remains positive and strongly significant. The same outcome applies to the coefficient on non-social spending, and an almost unchanged result is observed with respect to all other covariates.

The next intuitive question worth asking is whether poverty and income disparity affect social expenditure. An initial look at the relationship between these variables is presented in Table 4.

Table 4. Poverty, income inequality, GDP per capita, and social spending-to-GDP ratio: countries divided according to the mean value of predictor

	D_1		D_2		At-risk-of-poverty		Gini coefficient		GDP per capita	
	low	high	low	high	low	high	low	high	low	high
	n=15	n=13	n=15	n=13	n=15	n=13	n=12	n=16	n=12	n=16
mean social spending/GDP	24.73	17.50	24.71	17.52	21.67	21.02	23.59	19.71	17.77	24.07
$(p > \|t\|)$	0.0000		0.0000		0.7386		0.0402		0.0003	

Notes: H_0: mean (group A) – mean (group B) = 0.
Source: Own calculations.

In the case of each predictor, its mean value makes it possible to divide the sample into two groups: countries with low and high levels of the variable. Based on a t-statistic, it is possible to verify the null hypothesis that a mean of the social spending-to-GDP ratio in each group is the same (0.05 significance level). Regarding D_1, D_2 and the original income Gini coefficient, there is evidence to reject the null hypothesis that the means in each group are the same. As a matter of fact, countries with higher deprivation and countries with higher income inequality spend less on social benefits. As regards the at-risk-of-poverty rate, the null hypothesis is accepted: the difference between the means in each group is equal to zero. So regardless of whether relative poverty is low or high, the social spending level is the same.

Additionally, the sample was split into low- and high-GDP-per-capita countries (GDP per capita PPP based). The null hypothesis that the mean of the social spending-to-GDP ratio in each group is the same is rejected. Actually, richer countries have higher social spending in relation to GDP, and it is most likely a country's welfare that predominately determines the social expenditure level.

What's more, the above-described computation is repeated, but the sample is split into two groups according to the median value of the predictors (Table 5). It can be seen that using the median value of each predictor instead of the mean value does not change the results meaningfully.

Table 5. Poverty, income inequality, GDP per capita, and social spending-to-GDP ratio: countries divided according to the median value of predictor

	D_1		D_2		At-risk-of-poverty		Gini coefficient		GDP per capita	
	low	high	low	high	low	high	low	high	low	high
	n=14	n=14	n=14	n=14	n=14	n=14	n=14	n=14	n=14	n=14
median social spending/GDP	24.60	17.63	24.14	18.10	21.21	21.03	23.21	19.03	18.00	24.23
$(p > \|t\|)$	0.0000		0.0006		0.9275		0.0254		0.0003	

Notes: H_0: median (group A) – median (group B) = 0.
Source: Own calculations.

Of course, social expenditure may depend on many other factors, such as the unemployment level, the demographic structure of the population, and life expectancy. But each of these variables is potentially highly correlated with any of the poverty or income disparity indicators, and that is why none of them is considered.

Conclusions

The paper aims to capture the impact of poverty and income inequality on the public debt level, and particularly to verify the hypothesis that countries that report higher poverty or income disparity tend to have higher social spending. Relying on the tested DPD model for the EU, there is no evidence to support the belief that countries with deeper poverty or higher income inequality are the most indebted. Referring particularly to absolute poverty, the result is the same no matter if the overall deprivation indicator emphasizes average deprivation or grave deprivation. In fact, countries with higher absolute poverty or higher income inequality spend less on social benefits, and the degree of relative poverty has no influence on the social spending level (both countries with high relative poverty and those with low relative poverty have similar social spending levels). This may lead to the conclusion that poverty and income inequality do not contribute to public debt as neither variable is a factor that absolutely necessitates higher social spending.

A major limitation of this study is that it solely relies on the Gini coefficient as an income inequality measure, and since each measure of income inequality is normative, the study would benefit from further research going beyond the Gini coefficient. It would be interesting to see if assessing income inequality with the use of other comprehensive measures, for example the Theil coefficient, the Atkinson coefficient or the General Entropy measure, would lead to different conclusions.

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CZY UBÓSTWO I NIERÓWNOŚCI DOCHODOWE WPŁYWAJĄ NA DŁUG PUBLICZNY?

Streszczenie

Celem artykułu jest zbadanie wpływu ubóstwa i nierówności dochodowych na dług publiczny w krajach Unii Europejskiej, biorąc pod uwagę dynamiczną naturę zmiennej objaśnianej. Aby zmierzyć absolutny poziom ubóstwa, proponowany jest nowy całościowy miernik deprywacji, który pozwala na rozróżnienie między przeciętnym i skrajnym poziomem tego zjawiska. Przy identyfikacji nierówności dochodowych uwzględniane są dysproporcje w rozkładzie dochodów rynkowych, jako że najprawdopodobniej właśnie ten czynnik oddziałuje na rządowe wydatki o charakterze redystrybucyjnym (stosowany jest współczynnik Giniego). Dynamiczny model panelowy jest estymowany za pomocą skorygowanego estymatora LSDV (the bias-corrected LSDV estimator). Wyniki pokazują, że ani ubóstwo, ani nierówności dochodowe nie są statystycznie istotnymi predyktorami długu publicznego w relacji do PKB. Wynika to stąd, że państwa z wyższym poziomem absolutnego ubóstwa lub wyższymi dysproporcjami dochodowymi de facto wydają mniej na świadczenia społeczne, a kraje o wyższym poziomie relatywnego ubóstwa nie mają wyższych wydatków socjalnych niż pozostała część próby.

Słowa kluczowe: dług publiczny w relacji do PKB, wskaźnik deprywacji, współczynnik Giniego dla dochodów rynkowych, estymator Kivietsa

Kody klasyfikacji JEL: C23, D31, E62, H63