

Determinants of debt for local governments in Europe – panel data research

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Abstract

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In local government, debt is a key factor determining long-term solvency, stability and the level of fiscal strain. The indebtedness of this sector may affect the quality of life and private businesses alike. Thus, the aim of the article is to examine financial, economic and demographic determinants of local government debt in Europe, as well as to identify the associations between the debt burden and certain spending categories. The study concerns 27 European countries in the period 2007–2020. Therefore, panel data regression models were estimated, namely the fixed effects model and the random effects model. The survey showed that in the context of local government, the growth in debt per capita is positively affected by the decentralisation of expenditure and investment activity. However, an increase in the share of expenditure on housing and economic affairs in the budget decreases the debt burden, whereas an increase in the share of expenditure on education, health and social protection positively stimulates the level of indebtedness. In addition, local authorities should promote the growth of the working age population to mitigate the effects of urbanisation on the growth of debt and take advantage of periods of low interest rates to restructure the debt portfolio.

Key words

local government, Europe, debt, panel data models, determinants.

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Introduction

The processes of decentralisation of public authorities in Europe have resulted in the delegation of public tasks and opportunities

to raise certain funds. The growing needs of the local communities and insufficient revenues have resulted in the increasing of

debt as an instrument used to carry out new responsibilities (Bellot et al., 2017, 52). This mainly concerns the development of the infrastructure by means of which to deliver public goods and services, and to attract inhabitants and investors. Pinardon-Touati (2022, 1–4) shows that local debt may adversely affect private businesses. Further loans from the banking sector reduce both investment and wages. This crowding-out effect would undermine the stimulus effect of the debt-financed spending policy of the local government. Thus, an increase in debt results in underinvestment in business (Cao et al., 2022, 17). In addition, when the scale of this debt exceeds a certain level, economic growth could be suppressed by the crowding-out of private investment and a decline in public expenditure (Zhao et al., 2019, 19). Certain authors (Standar and Kozera, 2020, 2) envisage that the excessive indebtedness of local governments may lead to the deterioration of financial liquidity or, in extreme cases, cause a debt spiral. In turn, Micheli (2020, 1034) found that an increase in local governments' indebtedness per capita lowers apartment prices. Moreover, the effects of debt competition between levels of government are surveyed. Greer (2015, 763) shows that a growing amount of debt at a lower level of government increases the cost of interest at higher levels of government. Aghón and Letelier (1996, 82) highlight that whilst the bulk of local debt is geared to finance investment activity, access to these funds might be essentially fungible and result in fiscal troubles that are likely to cause pressure on central authorities. This indebtedness also stimulates long-term solvency (Gorina et al., 2018, 79–85).

However, greater debt transparency along with better debt management can mitigate certain costs tied to growing indebtedness or political and economic pressures for increased debt (Kose et al., 2020, 17). Thus, economies may benefit from debt, which is one of the sources of financing capital

formation to advance the development of infrastructure (urbanisation processes), education, or healthcare (Zhao et al., 2019). Debt accumulation enables local governments to capture the benefits of capital investments immediately, rather than waiting until sufficient savings from current income can be accumulated to cover this activity (Canuto and Liu, 2013, 1). Nevertheless, the findings of Chen and Li (2019, 350) show that this influence can differ within the country due to the size of the debt. Debt-financed expenses may increase growth prospects in sound fiscal conditions, where policy is aimed at maintaining long-term sustainability and a proper cyclical position (Kose et al., 2020, 17). Therefore, in a number of countries, 'golden rule' restrictions are implemented which imply that current local government revenues must finance current spending, and debt is aimed at capital expenditure (Lotz, 2006, 243). This solution contributes to a lower risk of fiscal distress brought upon by a failure to meet standards in the area of debt over successive years (Kloha et al., 2005, 314).

Simultaneously, empirical studies focus mainly on the debt predictors in a chosen country. This results in the specificity of the applied variables which in many cases cannot be compared from an international perspective. In addition, there is a dearth of survey data presenting the impact of the structure of expenditures on local borrowing. However, the perception that these relations could reduce fiscal distress has resulted in the improper delegation of tasks set against a background of fiscal policy. This sphere is crucial due to aspects of further administrative, financial and political decentralisation. Therefore, the aim of the article is to examine certain determinants of financial, economic and demographic debt in local government in Europe using longitudinal data. In addition, the goal of this article is to show the associations between debt and the share of certain spending categories,

with due consideration given to the financial factors. In this context, the research question relates to how the structure of expenditure along with other financial and socio-economic factors affects the debt burden of the local government.

The estimated empirical models could be applied in the debt prediction processes. As a result of the research procedure and the applied data concerning the situation in 27 European countries (Table 1) in the period 2007–2020, panel data regression models were estimated, i.e. the fixed effects model and the random effects model. Therefore, the author reviewed the literature on the indebtedness factors of local governments, taking into account common determinants in the regressions with the structure of expenditure, which is omitted in many surveys. Due to the different findings of studies based on the separate states, the results of the estimation in this paper could be a benchmark for further analysis. Thus, the novelty value of the article is the examination of the debt determinants from an international perspective. It is worth adding that the chosen countries have signed and ratified the European Charter of Local Self-Government, which has contributed to the implementation of certain common regulations in the field of financial management and the governance of the local public sector.

1. Literature review

In the literature, there are research studies which examine both the internal and external determinants of public debt. Fisher and Wassmer (2014, 146–147) show that the demand for public services and the financing of the infrastructure used to provide such services is the fundamental reason behind long-term borrowing by states and local governments in the USA. Therefore, the more populous states exhibit a higher level of borrowing *per person*, whereas Gross State Product (income) *per capita* is

associated with greater borrowing *per capita*. Even though a severe recession occurred, states and local units continued to incur debt to address public infrastructure demands, consistent with their earlier policy. Additionally, a larger fraction of the population being enrolled in public schools is associated with greater *per capita* borrowing.

In turn, the econometric models of Derycke and Gilbert (1985, 397) confirm the crucial impact of three types of variables upon the borrowing behaviour of the largest French local governments. Firstly, there are internal determinants, associated with needs for local public investment resulting from urbanisation, local housing development, and self-financing capacities (savings and grants). Secondly, there are external factors tied to the financial resources of lenders and the level of interest rates. Thirdly, the analysis also considers the macroeconomic policy measures imposed by the central government, which affect the level of borrowing of these units.

Poniatowicz et al. (2017, 100–101) underline the fact that economic doctrine distinguishes the following premises that justify the growing indebtedness of local governments, i.e. insufficient revenues, the aspects of cost- and time-effectiveness of infrastructure investments, or the necessity to comply with the concept of intergenerational equity.

Nevertheless, there are certain factors that may result in the higher indebtedness of the local units, such as:

- the inappropriate structure of public spending, i.e. the relatively high shares of rigid components (wages, pensions and interests), often under strict regulations. Budget rigidities constrain the ability to modify the size and structure of the public budget, especially in the short term, and may contribute to fiscal distress (Muñoz and Olaberria, 2019, 9–30);
- aspects of moral hazard, which encourages spending beyond revenue capacity,

safe in the knowledge that the higher tier of government will cover the indebtedness (Williams, 2020; 4). Shi and Hendrick underscore (2020, 138) that when multiple local governments receive funding from the state government, having the capacity to impose taxes and issue debt independent of the state fiscal base, they may be prompted to borrow excessively;

- a deficit bias causing an adverse incentive to overspend, undertax or borrow excessively, which poses a threat to fiscal discipline. Therefore, it manifests in the tendency to push the burden of fiscal discipline to future authorities and generations (Turley et al., 2021, 28);
- the problem of free-riding, resulting from the fact that the interests of individual local governments may diverge from the common national interest, e.g. due to electoral pressures and unsustainable fiscal policy. Finally some units would bear only part of the cost of mismanagement (Canuto and Liu, 2013, 3);
- the common pool problem, which arises when the costs of an activity that benefits a small community are shared among a larger group (Jordahl and Liang, 2010, 157). Fritz and Feld (2020, 90) found that during the process of amalgamation at the local level, higher debt dynamics appear when more municipalities take part in an amalgamation. In addition, forced amalgamations exploit the common pool created by amalgamation more than those conducted voluntarily by the units.

Tang (2022, 4) presents reasons for the active borrowing of local governments. Firstly, they tend to stimulate demand and production through loan consumption to boost local development, especially in an economic downturn, which leads to a decline in local tax revenues. Jalles and Medas (2022) show that the relationship between debt surges and economic growth are complex in the public sector. Debt surges tend to be followed

by weaker economic growth and persistently lower output. However, this negative relationship does not always hold. Thus, during periods of fiscal austerity, local governments may wish to issue more debt to increase the resources currently available for operating budgets (Greer and Denison, 2016, 116). The second reason for debt growth, as indicated by Tang (2020), is due to the competition among local governments to attract new entrepreneurs, which requires additional investment activity in conditions of limited amounts of one's own resources. Moreover, the decrease in the tax burden for local entrepreneurs raises the pressure on local finances, and the scale of indebtedness expands. Thirdly, the incentive of the 'soft constraint' of a budget and the separation of local government authority to borrow from responsibility for the debt also encourages these units to increase indebtedness.

Research findings have also indicated that inter-jurisdictional competition could be a driving force of excessive borrowing by local government. This is due to fiscal decentralisation and political centralisation, which pushes local governments to compete with each other to achieve better economic performance (Pan et al., 2017, 899–900). In the context of these studies, Yan et al. (2021, 13–14) found that urban expansion also affects local government debt. This results from two principal aspects: low density leads to the reduction of land output efficiency or the expansion of construction infrastructure.

Scholars also cite political factors as determinants of debt. This is recognised by the concept of the Political Budget Cycle (PBC), which argues that politicians seek to synchronise the timing of economic benefits and government profligacy with the elections calendar (Geys, 2007, 238). The PBC suggests that there is a debt expansion by the ruling party immediately before elections in an intent to promote its re-election (Benito et al., 2021, 2).

To sum up, debt determinants are usually discussed under two broad categories: financial and non-financial (Ehalaiye et al., 2017, 515). Thus, when investigating the financial determinants of local government debt, Ehalaiye et al. (2017, 519) included the following as independent variables in the econometric model (panel data analysis): capital expenditures and investment in infrastructural assets; rates revenues; the net surplus (operating income less operating expenses); other assets apart from infrastructural assets; other income generated apart from rates revenues; control variables related to the effects of the type of council; and the effects of global financial crises. A vast catalogue of factors is included in the research of Bellot et al. (2017, 55–57), characterising political, demographic, geographical, fiscal and financial, economic and budgetary issues. In turn, Balaguer-Coll et al. (2016, 518–519) included certain financial variables concerning capital expenditures, net savings, a non-financial deficit in a non-financial surplus, one's own fiscal capacity and expenditure commitments, as well as socioeconomic (level of tourism, level of economic activity) and political (type of governing party, kind of region, scope of decentralisation) factors. A disparate approach was applied by Feld et al. (2011, 58), who assumed that the debt per taxpayer might be a function of average net income, unemployment rate, the tax rate of the media taxpayer, the share of own revenues, the number of taxpayers, average income to median income ratio, the number of political parties in the executive body, the proportion of some type of parties in the executive body, the strong role of the Minister of Finance in the budget process, and an institutional factor (an existence of a fiscal referendum). In contrast, Benito and Bastida (2004, 504), in examining (the panel data regression) factors influencing changes in an annual debt stock to total revenues, applied dummy variables for the geographical

location, economic level, level of population and political ideology as well as continuous variables in the sphere of capital expenditures and capital revenues independence ratio and a non-financial surplus or deficit. Moreover, Alińska et al. (2021, 121) emphasised the financial variable in the field of revenues and expenditures to estimate (by means of ordinary least squares regression) the factors of total liabilities in local government. Similarly, Serbes et al. (2020, 145), in their study (using the quantile regression) of debt *per capita*, introduced mainly financial predictors, i.e. expenditures *per capita*, capital expenditures *per capita*, share of rigid expenditures, the relationship between non-interest budget expenditures and non-interest budget revenues, tax revenues *per capita*, and the population. A different procedure was applied in the research of Delgado-Téllez and Pérez (2020, 232–239), who examined economic, political, and institutional factors on the change in the debt-to-Gross Domestic Product (GDP) ratio. They emphasised that the economic cycle as a fundamental determinant of budget balances is mainly responsible for debt growth, whereas political variables and the strength of fiscal regulations do not seem to have a noteworthy effect on debt. This is also dependent on the previous stock of the debt, market discipline, or aspects of fiscal decentralisation. Thus, some studies include macroeconomic and institutional factors that influence debt, such as level of GDP or GDP growth, the unemployment rate, the share of people of post-working age, miscellaneous political issues, certain territorial aspects or the income situation of residents (Veiga and Veiga, 2014, 31; Costa and Morais, 2021, 91; Yared, 2019, 117; Medve-Bálint and Bohle, 2016, 14–22; Chatterjee et al., 2019, 350). Navarro-Galera et al. (2015, 398) show that population density, immigration, economic level and the political orientation of the governing party are applied in some studies as variables affecting local government debt.

2. Methodology

The paper examined the available data in the fields of finance, economy and demography concerning 27 European countries (the members of the Organisation for Economic Co-operation and Development (OECD) plus Romania; Table 1), that characterises the financial situation and the fiscal position of the local government in these countries between 2007 and 2020 (for Iceland the debt level was available for the period 2007–2013). The data was extracted from the

databases of the OECD, the World Bank and the International Monetary Fund (IMF).

Due to the aim of the article and the data, panel models were applied. The simplest estimator for this kind of data is the pooled OLS (ordinary least squares) model, in which all entities are assumed to be homogeneous (Das, 2019, 501). In most cases this is unlikely to be adequate, but it does provide a baseline for comparison with more complex estimators (Cottrell and Lucchetti, 2022, 204). The pooled OLS model takes the form:

$$y_{it} = x_{it}\beta + u_{it},$$

where y_{it} is the dependent variable for the cross-sectional unit i (country in this research) in the period t , x_{it} is a $1 \times k$ vector of independent variables observed for unit i in the period t , β is a $k \times 1$ vector of the parameters, and u_{it} is an error or disturbance term specific to unit i in period t .

Considering the differences between the observations (i.e. countries), the fixed effects

model (FEM) and the random effects model (REM) might be applied, which decompose the unitary pooled error term, u_{it} . For the FEM, u_{it} is decomposed into a unit-specific and time-invariant constant coefficient, α_i , and an observation specific error, ε_{it} , and takes the form:

$$y_{it} = x_{it}\beta + \alpha_i + \varepsilon_{it}.$$

In the REM, u_{it} is the sum of the individual specific random component (v_i) and ε_{it} .

Thus, this model is as follows (Cottrell and Lucchetti, 2022, 205):

$$y_{it} = x_{it}\beta + v_i + \varepsilon_{it}.$$

The choice of the type of panel data regression model results from the Wald test (the F statistic), the Breusch-Pagan test (the χ^2 statistic), as well as the Hausman test (the χ^2 statistic). Using the Wald test, the joint significance of the individual effects of the analysed observations is verified. In this test, the null hypothesis is that there are no specific individual effects (Das, 2019, 503–505). In turn, in the Breusch-Pagan test, the null hypothesis is that the variance of v_i in the REM equation equals zero. If this hypothesis is not rejected, then it is concluded that the pooled model is adequate (Cottrell and Lucchetti, 2022, 208). The Hausman test is applied when choosing between the FEM and the REM. The null

hypothesis here is that individual effects are uncorrelated with any regressor in the model. In other words, the null hypothesis in the Hausman test is that the preferred model is the REM rather than the FEM (Das, 2019, 508). In the model estimation, heteroscedasticity (the Modified Wald test, χ^2 statistic) and the autocorrelation (the Wooldridge test, the F statistic) are also checked. Therefore, a failure to meet the assumptions of the distribution of residuals results in the use of clustered standard errors (Hoechle, 2007, 285). Moreover, multicollinearity was also controlled using the absolute value of correlation coefficients with a threshold of 0.7 (Dormann et al., 2013, 32; Reddy and Balasubramanyam,

2021, 39). For the estimated models, a goodness of fit measure is presented: within R^2 .

In the paper, the debt *per capita* (table 1) of the local government, as a measure of the debt burden, was applied as the dependent variable in the models. Simultaneously, the debt-to-GDP ratio (%) was also considered. However, in this case the available data was only for the period 2009–2020, in which the correlation coefficient between this ratio and the debt *per capita* was 0.9144 and between the debt-to GDP-(%) and the natural log of the debt *per capita* was 0.8861. Finally, in attempting to examine the entire period, i.e. 2007–2020, and including the strong relationships between the aforementioned ratios, the debt *per capita* (table 1) was chosen as the dependent variable. It is worth adding that the application of debt to revenues (%) or debt to expenditures (%) as a dependent variable was also considered, but from the point of view of the aim of the article and the set of independent variables, it would have constrained the scope of the study and the likelihood of achieving the research goals.

In order to identify the factors affecting the dependent variable, a certain set of

variables was investigated (table 1). These variables were selected from the literature review as determinants of local government indebtedness that could be applied in international comparisons. It is worth adding that some scholars suggest not including an excessive number of regressors, and consequently to focus only on the most relevant ones (Benito and Bastida, 2004, 503). First, the single-factor models for each variable were estimated to check and control potential reverses of the coefficient sign in the final model. In this way the confounding was limited, which is perceived as a mixing of effects of the exposure being studied with the effect of another variable (Checkoway et al., 2004, 89). It may even reverse the apparent direction of an effect. Secondly, the author estimated seven models with different combinations of debt determinants. However, each variable appears in at least two regressions. This approach was an attempt to avoid misleading results and conclusions and confirm the stability of the results. Thus, the applied methodology takes aspects of the robustness check into account.

Table 1. Definition of the relevant variables and the countries applied in the estimations

Label	Definition/ Calculation	Source	Validity and specificity of debt predictors; examples of application	Expected sign
Dependent Variable				
Debt <i>per capita</i>	Total debt ÷ Population (natural log)	OECD, World Bank	Hildreth and Miller (2002, 107) suggest that if the economic base is diversified, the debt burden can realistically be viewed by outstanding debt <i>per capita</i> . This is also a ratio of fiscal strain (McKinney, 2004, 498). This kind of variable was applied in research by Martell et al. (2021, 58) and Balaguer-Coll et al. (2016, 518). Debt issued <i>per capita</i> was used in the regression of Fisher and Wassmer (2014, 127) and Serbes et al. (2020, 145). Debt in US dollars, current PPPs.	not applica- ble

Label	Definition/ Calculation	Source	Validity and specificity of debt predictors; examples of application	Expected sign
Independent Variables				
Financial				
Decentrali- sation	Local expendi- tures ÷ GDP (%)	OECD, World Bank	The variable represents the size of local finances in the economy (Hanif et al., 2020, 5) and thus fiscal decentralisa- tion. Some authors revealed that fiscal expenditure decen- tralisation increases the default risk of local government debts (Ouyang and Li, 2021, 644, 663).	(+)
Fiscal Exp. Decentr.	Local expendi- tures ÷ general government expenditures (%)	OECD	Higher fiscal expenditure decentralisation (Fiscal Exp. Decentr.) results in additional responsibilities of local gov- ernments and tends to enhance an incentive to spend and borrow more to stimulate local growth (Ouyang and Li, 2021, 654). Definition of local government and general govern- ment according to the OECD.	(+)
Invest- ment	Investment expenditures ÷ Population (natural log)	OECD	Expenditure on infrastructure expansion puts pressure on debt growth. The borrowing behaviour may be affect- ed by the needs for local public investment resulting from urbanisation and local housing development (Derycke and Gilbert, 1985, 397). Capital expenditures <i>per capita</i> were included in the model of Serbes et al. (2020, 145). Capital spending was included in the models of Balagu- er-Coll et al. (2016, 519), Ehalaiye et al. (2017, 519), Veiga and Veiga (2014, 11), Delgado-Téllez and Pérez (2020, 232). However, in the quantile regressions in the study of Ser- bes et al. (2020, 139), concerning units in Turkey, capital expenditures per capita were insignificant. Investment expenditures in US dollars, current PPPs.	(+)
Social Protection	Exp. on social protection in total (%)	OECD	Variables showing the significance of some core tasks (ex- penditures (exp.)) of local governments on their indebted- ness. Jin et al. (2019, 6, 11-18) indicate that many countries are facing large fiscal pressures from high levels of public debt and competing spending needs from infrastructure, health and social protection. Local governments play a major role in managing some public functions, i.e. education or healthcare, which are typically provided through munic- ipally-owned facilities. However, local units are constrained by legislation which sets out the framework, especially in the field of education, healthcare or distribution of social as- sistance. In other functions, i.e. economic affairs or housing and community amenities, local governments may be more flexible in terms of policymaking. Thus, certain functions, i.e. education or health, might increase the pressure to search for debt instruments to meet the needs. These functions, i.e. education or health, determine the quality of life (Iamtrakul et al. 2022, 347).	(+)/(-)
Education	Exp. on educa- tion in total (%)			
Health	Exp. on health in total (%)			
Economic Affairs	Exp. on eco- nomic affairs in total (%)			
Housing	Exp. on Housing and community amenities in total (%)			

Label	Definition/ Calculation	Source	Validity and specificity of debt predictors; examples of application	Expected sign
Demographic				
Population	Number of inhabitants (natural log)	World Bank	The demand for public goods, influenced by the size of the population, may affect the growth of local debt (Hájek and Hájková, 2009, 36–42). Population captures the demands for service and social policy pressures (Martell et al., 2021, 56) and is a proxy for market size (Fahmi et al., 2016, 70). This is included in the model of Serbes et al. (2020, 145).	(+)
Working Age	Population aged 15–64 as % of the total population	World Bank	Honda and Miyamoto (2020, p. 8) indicate that population aging is positively associated with high public debt resulting from increased fiscal spending (e.g. health care).	(-)
Urban Population	People living in urban areas as % of the total population	World Bank	Yan et al. (2021, 1) show that the scale of local government debt increases significantly with a rise in urban expansion.	(+)
Economic				
GDP	Gross Domestic Product (natural log)	World Bank	The variable reflecting the size of the economy that could hypothetically generate excessive expenditures by public services (Bellot et al., 2017, 57). Bellot et al. (2017) included the size of the “entity”, measured in GDP terms relative to the mean, and revealed its significance, as well as both direct and inverse relationships in certain cases.	(+)
GDP per capita	Gross Domestic Product per capita (natural log)	World Bank	This is an indicator of human development and welfare (Fikri and Zhu, 2015, 20). The factor considered in the study of Bellot et al. (2017, 55–57), which shows that relationship the between GDP <i>per capita</i> and debt is not always positive. Delgado-Téllez and Pérez (2020, 232–239) revealed that regions in Spain that have a higher GDP <i>per capita</i> tend to have less accumulation of debt. In turn, Yan et al. (2021) revealed that GDP <i>per capita</i> , as a proxy for urbanisation, is highly and positively correlated with local government debt. GDP in current US dollars.	(+)
GDP growth	GDP growth (annual %)	World Bank	This variable was included in the research of Bellot et al. (2017, 57). These authors argued that this shows whether there is a countercyclical budget.	(-)
Unemployment	Unemployment, total (% of total labour force)	World Bank	Unemployment rates indicate whether local government capital-financing policies respond to social burdens (Martell et al., 2021, 56). A higher unemployment rate might result in higher expenditures in the field of social protection and lower tax revenues. Veiga and Veiga (2014, 11, 31) included unemployment as a determinant of the gross municipal debt and revealed the significant and positive sign of the coefficient. This variable was also used in the estimation of Greer and Denison (2016, 125) and considered in the research of Feld et al. (2011, 58–60).	(+)

Label	Definition/ Calculation	Source	Validity and specificity of debt predictors; examples of application	Expected sign
Interest Rate	Long Term Interest Rates (%)	OECD, IMF	According to the safe asset provision theory, public debt should rise in response to increasing income risk, due to the fact that households and businesses facing greater income risk develop a stronger precautionary motive to save, driving down interest rates (Yared, 2019, 121). The level of the interest rates indicated in the estimation of Derycke and Gilbert (1985, 397) and in the research of Galiński (2015, 379–381). For Estonia the following were applied for the period 2011–2020: Harmonised Euro Area Rates, Loans, Non-Financial Corporations (IMF).	(-)
Codes of the 27 countries included in the research				
AUT, BEL, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, ISL, IRE, ITA, LTU, LVA, LUX, NLD, NOR, POL, PRT, SVK, SVN, ESP, SWE, CHE, GBR, ROU				

Note: Due to the availability of the data for the construction of the variables, absolute values of budgetary categories are in US dollars, current PPP, while the absolute value of GDP is in current US dollars

Source: own study based on databases of the OECD, the World Bank and the IMF

3. Research results and Discussion

The European countries studied herein differ from each other in terms of the fiscal situation of the local government and its place and role in the economy and public finance (Table 2). Furthermore, they operate in different financial, economic and demographic conditions that affect their financial decisions, especially with respect to the scope of the expenditures. Thus, there are disparities

in the field of the levels of debt *per capita* and the debt-to-GDP ratio (%) (Table 2).

According to the characterised methodology, nine models with different sets of variables were estimated (Table 3), i.e. six fixed-effects models (FEM) and three random-effects models (REM). Tests for heteroskedasticity (the Modified Wald test, χ^2 statistic) and autocorrelation (the Wooldridge test, the F statistic) (Table 4) resulted in the use of clustered standard errors.

Table 2. Descriptive statistics

Variable	Mean	Standard deviation	Min	Max
Debt per capita (log)	7.65	0.85	5.16	9.49
Debt per capita	2,913.77	2,345.72	173.98	13,264.11
Decentralisation (%)	13.04	6.69	2.30	33.94
Fiscal Exp. Decentr. (%)	23.92	12.19	5.66	64.68
Investment (log)	6.27	0.52	4.87	7.63
Investment	607.25	335.01	129.68	2058.19
Social Protection (%)	18.24	11.01	2.56	57.06
Education (%)	21.78	11.07	0.39	41.15

Variable	Mean	Standard deviation	Min	Max
Economic Affairs (%)	13.95	5.18	3.27	28.53
Health (%)	10.64	11.42	-0.05	49.34
Housing (%)	5.19	3.64	0.12	26.13
Population (log)	16.05	1.45	12.65	18.67
Working Age (%)	66.36	2.13	61.58	72.22
Urban Population (%)	74.03	12.42	51.98	98.08
Unemployment (%)	8.02	4.47	2.01	27.47
GDP (log)	26.37	1.44	23.30	29.01
GDP per capita (log)	10.42	0.64	9.01	11.73
GDP growth (%)	1.25	3.89	-14.84	25.18
Interest Rate (%)	3.11	2.74	-0.52	22.50
Debt to GDP (%)	6.84	4.10	0.65	21.33

Note: Statistics for the period 2007-2020, apart from Debt to GDP (%), which, due to the availability of the data, includes only the years 2009-2020.

Source: own study based on the OECD, World Bank and IMF databases

In each model the debt determinants are statistically significant (Table 3). An increase in *Investment* affected a rise in *Debt per capita*. According to Model 1, a 1% growth in capital expenditures *per capita* resulted in an

increase in debt *per capita* by 0.2270%. In addition, the growth of *Decentralisation* resulted in higher *Debt per capita*. The importance of fiscal expenditure decentralisation was confirmed by Models 5 and 6.

Table 3. Determinants of *Debt per capita* in local government in Europe in 2007–2020 –fixed effects model (FEM) and random effects model (REM) estimation

Variable/ Model (type)	Model 1 (FEM)	Model 2 (FEM)	Model 3 (FEM)	Model 4 (FEM)	Model 5 (FEM)	Model 6 (FEM)	Model 7 (REM)	Model 8 (REM)	Model 9 (REM)
Intercept	9.9872*** (1.0086)	6.0236*** (0.1698)	-10.9871* (3.5675)	-0.0208 (1.3180)	14.0359*** (1.2913)	13.2719*** (1.0584)	-3.7607 (2.8495)	-4.8734 (1.3527)	4.9901** (2.1495)
Decentrali- sation	-	0.0610*** (0.0086)	-	0.0745 (0.0084)	-	-	-	0.0674*** (0.0104)	-
Fiscal Exp. Decentr.	-	-	-	-	0.0337*** (0.0105)	0.0256** (0.0115)	-	-	-
Investment	0.2270*** (0.0673)	-	0.3141** (0.1130)	-	-	-	0.2107** (0.0826)	-	0.3226*** (0.0801)
Social Protection	0.0238** (0.0094)	0.0178*** (0.0063)	-	-	-	-	-	-	-
Education	0.0218*** (0.0060)	0.0102** (0.0039)	-	-	-	-	0.0220*** (0.0077)	-	-

Variable/ Model (type)	Model 1 (FEM)	Model 2 (FEM)	Model 3 (FEM)	Model 4 (FEM)	Model 5 (FEM)	Model 6 (FEM)	Model 7 (REM)	Model 8 (REM)	Model 9 (REM)
Health	0.0361*** (0.0084)	0.0264*** (0.0078)	-	-	0.0266*** (0.0087)	0.0299*** (0.0104)	0.0345*** (0.0102)	-	-
Economic Affairs	-	-	-0.0404*** (0.0118)	-0.0166** (0.0060)	-	-	-	-0.0139** (0.0061)	-0.0356*** (0.0085)
Housing	-	-	-	-0.0213** (0.0100)	-	-	-	-	-0.0284* (0.0151)
Working Age	-0.0760*** (0.0133)	-	-	-	-0.1154*** (0.0219)	-0.0988*** (0.0172)	-	-	-0.0607*** (0.0177)
Urban Popu- lation	-	-	0.0444** (0.0204)	-	-	-	0.0349*** (0.0096)	-	-
Unemploy- ment	-	-	0.0206** (0.0079)	-	0.0222** (0.0104)	-	-	0.0323*** (0.0064)	0.0344*** (0.0088)
GDP	-	-	0.5226 (0.2179)	-	-	-	0.2559*** (0.0959)	-	-
GDP per capita	-	-	-	0.6766*** (0.1310)	-	-	-	1.1196*** (0.1235)	0.4920*** (0.1504)
GDP growth	-0.0077*** (0.0018)	-	-0.0064* (0.0032)	-	-	-	-	-0.0058** (0.0027)	-0.0094*** (0.0029)
Interest Rate	-	-	-	-	-	-	-0.0243* (0.0127)	-0.0185** (0.0091)	-0.0220** (0.0111)
No. obs.	371	371	371	371	371	371	371	371	371
Within R ²	0.4551	0.4464	0.2803	0.5046	0.4118	0.3574	0.3048	0.5686	0.4977

Note: 1) ***, ** and * denotes statistical significance at the 1%, 5% and 10% levels respectively,
2) clustered standard errors in parentheses (...), 3) p-value in brackets [...]

Source: own study

In contrast, Model 2 indicates that an increase of the expenditures in GDP by one percentage point affected the growth of debt *per capita* by 6.10%. The structure of the expenditures was also significant for the level of the indebtedness of local governments in European countries. Therefore, an increase of the share of the expenditures on a) social protection, b) health, and c) education influenced the growth of *Debt per capita*. The growth of the shares of these types of expenditures lends their structure more rigidity. Simultaneously, there is less room for manoeuvre during a recession. In turn, the higher the share of expenditures on a) economic affairs and b) housing, the lower the *Debt per capita*. These types of spending form the basis for the development of local governments

and are crucial in the process of attracting new residents and entrepreneurs.

As far as demography is concerned, the log of the population did not reveal its significance (either as a variable in the single-factor models or as an additional factor in the estimated models). Nevertheless, the growth of the *Working age* population influenced the decline in *Debt per capita*. The one percentage point increase of the *Working Age* population in the total population resulted in the drop of the debt *per capita* by 7.60% (Model 1). This could contribute to higher tax revenues and finally the greater capability to finance investment activity from one's own resources. It is worth noting that Maličká et al. (2023, 9–10) revealed that the growth of the share of the population

aged 14–65 in the total population positively affected the importance of real estate tax in total tax revenues in the analysed municipalities. In addition, the growing population of working age may enhance local financial autonomy (Jemna et al., 2013, 46–58).

In addition, an increase in *Unemployment* by 1% drove a rise in *Debt per capita* by 2.06% (Model 3). Simultaneously, unemployment can directly affect quality of life (Seed and Lloyd, 1997, 91). Therefore, the growth in the number of people falling into the *Working age* category and the decline in the *Unemployment* numbers might also be predictors of the quality of life in the localities as well as the situation on the labour market. It is worth adding that quality of life is determined by social, economic and environmental factors (Šuljová and Kubina, 2022, 10). In contrast, a rise in the share of the *Urban population* affected the increase in *Debt per capita*. The one percentage point growth of the population in urban areas corresponded with an increase of the debt per capita by 4.44% (Model 3). Areas that are more urbanised require more investment to compete, a requirement which in

many cases is financed through borrowing. Furthermore, the larger the economy (GDP) and the *GDP per capita*, the higher the *Debt per capita*. This means that the development of the country along with the process of the decentralisation of public finance influence the growth of local government indebtedness. On the other hand, an increase in *GDP growth* resulted in the lower debt burden in local governments. Thus, the local government sector benefits from economic development that positively affects the sustainability of their finances. The cost of raising external capital was also significant with respect to the indebtedness of local governments. As a consequence, a one percentage point decrease in the *Interest Rate* resulted in *Debt per capita* growing by 1.85% (Model 8) in local government. Thus, the public finance sector took advantage of low interest rates, in particular to finance investment activity or restructure the debt portfolio. However, Postuła et al. (2019, 218) revealed that in the process of financial planning, local government entities are unable to effectively take advantage of the availability of low and ultra-low interest rates.

Table 4. Diagnostic tests for the estimated models

Test/ Model (type)	Model 1 (FEM)	Model 2 (FEM)	Model 3 (FEM)	Model 4 (FEM)	Model 5 (FEM)	Model 6 (FEM)	Model 7 (REM)	Model 8 (REM)	Model 9 (REM)
Wald test	118.882 [< 0.001]	184.320 [0.001]	61.650 [< 0.001]	89.928 [< 0.001]	148.558 [< 0.001]	145.143 [< 0.001]	70.484 [< 0.001]	99.421 [< 0.001]	86.789 [< 0.001]
Breusch-Pagan test	1,534.05 [< 0.001]	1,727.00 [< 0.001]	1,252.23 [< 0.001]	1,670.25 [< 0.001]	1563.66 [< 0.001]	1,858.07 [< 0.001]	1,314.02 [< 0.001]	1,654.73 [< 0.001]	1,490.12 [< 0.001]
Hausman Test	18.87 [0.004]	21.38 [0.001]	15.93 [0.014]	13.80 [0.008]	21.02 [< 0.001]	9.38 [0.025]	9.35 [0.155]	7.09 [0.313]	8.88 [0.352]
Modified Wald test for Heteros.	6,154.00 [< 0.001]	1,147.43 [< 0.001]	18,492.81 [< 0.001]	3,704.13 [< 0.001]	5487.63 [< 0.001]	8,557.49 [< 0.001]	4,885.59 [< 0.001]	1,193.14 [< 0.001]	2,849.31 [< 0.001]
Wooldridge test for Aurocorr.	71.515 [< 0.001]	75.553 [< 0.001]	80.246 [< 0.001]	68.701 [< 0.001]	66.905 [< 0.001]	103.553 [< 0.001]	105.620 [< 0.001]	60.397 [< 0.001]	52.782 [< 0.001]

Note: 1) under the level of the statistic is the *p*-value in brackets [...]

Source: own study

The inclusion of each variable in at least two models and in certain cases in both the

fixed effects (FEM) and the random effects (REM) regressions (based on the Hausman

test) shows the stability of the empirical results. None of the variables reveal a high change in level or in the coefficient sign (Table 3).

Conclusions

The indebtedness of local government is the key aspect of the sound fiscal position thereof. The debt burden determines both the possibility of delivering public goods and services and the risk of fiscal distress. Borrowing may increase the development of the local economy or create dysfunction in business. The level of debt per inhabitant can be also a proxy for fiscal strain. Therefore, this can affect the quality of life in the localities.

The findings revealed that variables concerning the fiscal position and the financial situation of local government and the economic conditions in the states affect the level of the debt *per capita* of the public finance sector. The more decentralised the state, the greater the burden of local government debt on its inhabitants. Therefore, this complies with the findings of Ouyang and Li (2021) that growing fiscal expenditure decentralisation leads to a higher risk of default. The delegation of tasks increases the awareness of local authorities of the need to improve infrastructure to meet the requirements of the communities in a competitive environment. The intensified investment activity results in a larger debt burden. Furthermore, the larger the population in urbanised areas, the higher the debt per capita, although the size of the population is not the key debt determinant. Therefore, this confirms the findings of Yan et al. (2021) that urban expansion is tied to local government debt. Hence, the policy supporting an increase of the share of the working age population might mitigate the pressure on the growth of indebtedness. The estimation showed that the debt burden is affected by the expenditure structure. As consequence, the direction of spending

influences the debt per capita in the local government. Higher expenditure on health, education and social protection affect the growth of local levels of indebtedness. Thus, in line with the conclusion of Jin et al. (2019), expenditure on health and social protection contribute to larger fiscal pressure. In addition, these types of expenditures are dependent on the legal framework and thus make the structure of the local budgets more rigid. In the short run, they are less flexible in terms of the process of adjusting them to the prevailing economic conditions. Local governments with high levels of expenditure on education, healthcare, and social protection might be particularly vulnerable to the fiscal strain. These categories of expenditure also require significant capital outlays to maintain and improve their quality. Thus, delegating tasks in education, healthcare and social protection to local government should include funding to cover additional operations. Moreover, in formulating the strategy of the local development, policy-makers should be aware that the potential increase of these services puts pressure on debt growth. Thus, it can be mitigated by policies promoting the growth of the working age population to enhance tax revenues.

The paper confirms that local government takes advantage of economic growth to decrease the level of debt per inhabitant. The survey also revealed that an increase of expenditure on economic affairs and housing reduces local government debt per capita. Expenditure in these budget categories stimulates the basis for further development and attracts inflows of people of working age and entrepreneurs, which in turn might increase fiscal capacity. They also improve the quality of life in the localities. Therefore, local governments which can do more than perform only administrative functions and which possess greater capability to stimulate development tend to be less indebted. Hence, the process of fiscal decentralisation should include the transfer of competences in the

field of economic affairs along with granting financial independence.

Greater levels of indebtedness of the local governments are visible in larger economies, possibly because of intensified capital expenditures and, as indicated by Yan et al. (2021), urban economic development along with the processes of urbanisation. This also results from greater fiscal expenditure decentralisation, which is in line with the results of Ouyang and Li (2021). In addition, lower interest rates lead to higher debt per capita. This influences the lower costs of the debt service and, given the conditions of the 'golden rule' restrictions, contributes to higher capital expenditure. Therefore, where possible, local government should take advantage of low interest rates to restructure its debt portfolio, which is not common practice.

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