

Public Debt and Economic Growth in the European Union: Lessons for Post-pandemic Period

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Abstract

Europe's public debt situation is likely to persist in the coming years. This study evaluates the impact of public debt on growth in the EU-27 countries. The analysis, using dynamic panel threshold models, reveals an indirect connection between debt and growth from 1995 to 2023. The research identifies an indirect effect of general and central debt on economic growth during the COVID-19 pandemic. While government effectiveness positively influences growth in the long run, this effect is not observed during the pandemic. To ensure the robustness of our findings, dynamic panel data models and mean group (MG) estimators are employed. The empirical results support the need for policies to reduce public debt and promote sustainable growth in the EU.

Keywords: Debt, government effectiveness, economic growth, panel data models, COVID-19 pandemic

JEL Classification: C33, E01, H63

1. Introduction

Public debt levels in Europe have been increasing in the last decade, with the recent medical crisis having a lasting effect on the economy. While the road to financial recovery will be challenging, careful policymaking can help reduce debt levels and ensure long-run sustainability of the EU economy. As of December 2020, more than half of the EU-27 countries had debt-to-GDP ratios

exceeding 50%. This increase was primarily driven by the pandemic, which necessitated a surge in government spending. Greece has the highest public debt in the EU, reaching 165.5% of GDP in the third quarter of 2023 due to its ongoing financial crisis. Italy follows with a debt-to-GDP ratio of 140.6%, influenced by its large public sector and slow growth. Other states with debt-to-GDP ratios exceeding 100% include France, Spain, Belgium and Portugal. In contrast, Estonia has the lowest debt-to-GDP ratio at 18.2%.

The high level of public debt in Europe is a significant concern for policymakers. Excessive debt could crowd out private investment, hindering business growth and job creation. Additionally, it can generate higher interest rates, which makes it more expensive for governments to borrow money.

Governments can reduce public debt through various strategies, including spending cuts, tax increases or a combination of both. Additionally, stimulating economic growth can increase tax revenue and make it easier to manage debt. However, before implementing these measures, it is essential to understand the relationship between debt and economic growth. This study aims to assess the impact of public debt on economic growth in the EU-27, particularly during the COVID-19 pandemic. We employ a variety of panel data models, including dynamic panel data models, dynamic panel threshold models and panel autoregressive distributed lag models with mean group estimators, to ensure the robustness of our results. The empirical findings will be used to formulate policy recommendations aimed at achieving sustainable growth while effectively managing public debt in the EU.

The research question is: *Does public debt negatively affect economic growth in the EU-27?* The answer to this question will guide policy proposals aimed at ensuring sustainable economic development in the EU. To address this research question, we follow several steps. First, a literature review to examine previous empirical findings in this field is conducted. Then, we present the methodology and data, followed by results and discussion. These findings will allow us to formulate valuable conclusions regarding the impact of public debt on economic growth in the EU.

2. Literature Review

The relationship between government debt and economic growth is complex and has been extensively studied by economists (Égert, 2015; Augustine and Rafi, 2021). There is no definitive answer as to whether government debt is beneficial or harmful for economic growth. Government debt can be used to finance investments that promote economic growth, such as infrastructure projects and education (Saungweme and Odhiambo, 2018). However, it can also lead to higher interest rates, making it more expensive for businesses and consumers to borrow. The impact of government debt on economic growth depends on various factors, including the specific

circumstances of each country. A high level of government debt can increase the risk of a financial crisis, which can have a severe negative impact on economic growth (Salmon, 2021). Long-term coverage of public spending with deficits means an increase in redistribution by the amount of interest compared to the situation where the government covers its spending with taxes. According to Pikhart (2013), the sustainability of the government deficit should be analysed from both the primary and overall balance. Meng and Yin (2019) indicated that the impact of trust on the cost of debt is more significant in countries with weak governance and during financial crises. Therefore, it is important to consider government effectiveness and periods of crisis such as the COVID-19 pandemic while analysing the impact of public debt on growth, which is the objective of this paper.

Europe's public debt situation is a complex issue with no simple solutions. To reach long-term sustainability of the European economy, policymakers must address this challenge. The economic growth-debt nexus is multifaceted, with both negative and positive potential impacts. Yam-in *et al.* (2023) provided a valuable review of the existing literature. While many studies suggest a negative impact of high debt levels on growth, others highlight potential long-term benefits, such as the fiscal multiplier effect (Rahman *et al.*, 2019).

A significant contribution to the literature has been the exploration of potential nonlinearities, particularly threshold effects. This strand of research examines the possibility that debt levels exceeding a certain threshold may have different consequences for economic growth compared to more moderate debt levels. Reinhart and Rogoff (2010) pioneered research into the potential negative impact of government debt on economic growth. Using descriptive statistics from 1946 to 2009, they identified a critical debt-to-GDP ratio of 90%, above which they observed a significant slowdown in growth for advanced economies. Égert (2015) expanded upon Reinhart and Rogoff's work by employing nonlinear threshold models. His analysis revealed challenges in consistently identifying a clear negative relationship between public debt and economic growth. The findings were sensitive to the specific model chosen and the data period considered. In rare cases, a negative nonlinear effect similar to Reinhart and Rogoff's was observed, but at surprisingly low debt levels ranging from 20% to 60% of GDP. These findings, based on analyses of central and general government debt, were further supported by examining a shorter timeframe (1960–2010) using multivariate growth approaches and Bayesian model averaging.

Several studies have employed threshold regression techniques to examine the impact of high public debt on economic growth. Cecchetti *et al.* (2011) found a negative effect for OECD countries when debt exceeds 85% of GDP. Caner *et al.* (2010) identified a similar threshold of 77% for a broader group of countries. Minea and Parent (2012) used a different threshold regression method and pinpointed a range from 90% to 115% for the detrimental impact of debt. Kourtellos

et al. (2013) explored the relationship between democracy and the impact of public debt on economic growth. They found that high public debt only hindered growth in countries with lower levels of democracy. This aligns with the concept of parameter heterogeneity in economic growth, as emphasized by new growth theories, which highlight the influence of various fundamental factors on a country's economic trajectory.

Existing empirical analyses also refer to European countries. For example, Mencinger *et al.* (2014) analysed 25 EU member states, categorizing them as “old” and “new” members. Using a growth model incorporating debt levels, they found a statistically significant nonlinear effect of debt on annual growth rates. A critical debt-to-GDP ratio was identified, beyond which the positive impact of debt on growth reverses. This turning point was higher for older member states (80–94%) compared to newer members (53–54%), suggesting a lower threshold for negative debt effects in newer EU members. The panel of countries was extended by Jacobs *et al.* (2020), who analysed 31 EU and OECD states using panel vector autoregression. They found that high debt burdens can create a double challenge: slowing economic growth and triggering higher long-term interest rates, which can further discourage borrowing and investment. Considering more studies from literature, Heimberger (2023) estimated that a 10-percentage point increase in the public debt-to-GDP ratio typically leads to a 0.14 percentage point decrease in growth rates. Our paper analyses the relationship between debt and growth in all the EU-27 countries by also considering the COVID-19 pandemic context in a comparative analysis with a longer period than in previous studies.

While most studies have focused on developed countries, several have examined the impact of public debt on economic growth in developing countries. For example, Law *et al.* (2021) investigated 71 developing countries from 1984 to 2015 using a novel dynamic panel threshold analysis. They identified a surprisingly low threshold of 51.65% debt-to-GDP ratio, beyond which debt negatively affected economic growth. Some studies have focused on certain Asian countries, Lau *et al.* (2022) being an example. The authors analysed external debt in 16 Asian countries from 1980 to 2016. They found that high debt levels generally had a negative impact on economic growth, with a threshold below 30% for most countries. Managing debt levels effectively is crucial for sustainable growth in Asia, allowing the use of fiscal tools to address future challenges. Mohsin *et al.* (2021) investigated the impact of external debt on economic growth in South Asia from 2000 to 2018. While excessive external debt had a negative effect, responsible borrowing could be beneficial. The study emphasized the importance of investing in infrastructure and increasing trade openness for economic growth. Additionally, it highlighted the riskier nature of external debt compared to domestic debt, as high levels can significantly hinder growth.

While most studies have focused on groups of countries, some have examined individual developing countries. Bal and Rath (2014) analysed the impact of public debt on India's economic growth from 1980 to 2011. Their ARDL model revealed a long-term connection between debt, total factor productivity, debt servicing and short-term economic growth. The authors emphasized the importance of long-term fiscal management to ensure intergenerational fairness, especially in the aftermath of the global financial crisis. Owusu-Nantwi and Erickson (2016) found a direct effect of public debt on economic growth in Ghana from 1970 to 2012. Similarly, Egbetunde (2012) observed a positive long-term impact of debt on economic growth in Nigeria from 1970 to 2010. However, Abdelkafi (2018) found no significant impact of debt on economic activity in Tunisia during the period 2002–2013.

3. Methodology and Data

The methodology focuses on a dynamic panel threshold model, but other methods such as MG estimators and dynamic panel data models are used for the robustness check. Let us start from a general specification of the dynamic panel threshold model:

$$y_{it} = \mu_i + \beta_1 z_{it} I(q_{it} \leq \gamma) + \delta_1 I(q_{it} \leq \gamma) + \beta_2 z_{it} I(q_{it} > \gamma) + \varepsilon_{it} \quad (1)$$

where μ_i is the state-specific fixed effect, $I(\cdot)$ is the indicator function that reflects the regime of the threshold variable q_{it} and the threshold level γ , δ_1 is the regime-dependent intercepts, i represents the state index, $i = 1, 2, \dots, N$; and t represents the time index, $t = 1, 2, \dots, T$, and z_{it} is the vector of m regressors including lagged values of the regressand and other endogenous variables. The vector contains exogenous variables that are independent of errors (z_{1it}) and endogenous variables being correlated with errors (z_{2it}); ε_{it} is i.i.d., $\varepsilon_{it} \sim (0, \sigma^2)$.

The present research extends Hansen's (1999) static panel threshold model by incorporating dynamic elements and addressing potential endogeneity issues in the regressors. The paper adapts the cross-sectional threshold model of Caner and Hansen (2004), which uses GMM estimators to handle endogeneity, to a dynamic panel setting.

To eliminate country-specific effects without compromising the distributional assumptions of the model, we employ the forward orthogonal deviation transformation proposed by Arellano and Bover (1995). This approach effectively removes fixed effects while maintaining well-behaved error terms, ensuring that the distribution theory of the original static panel threshold model remains applicable in our dynamic framework.

First, individual effects μ_i are deleted and forward orthogonal deviation transformation is ensured to eliminate fixed effects in order to avoid the autocorrelation of transformed errors as Arellano and Bover (1995) explained [$Var(\varepsilon_i) = \sigma^2 I_T \rightarrow Var(\varepsilon_i^*) = \sigma^2 I_{T-1}$]:

$$\varepsilon_{it}^* = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} - \frac{1}{T-t} (\varepsilon_{i(t+1)} + \dots + \varepsilon_{iT}) \right] \quad (2)$$

Average subtraction is made to the next values of the variable.

z_{2it} is constructed as a function of instruments x_{it} . The least squares method is used to estimate the fixed threshold γ . Then, z_{2it} is replaced with the predicted values determined in the previous stage. Starting from the estimated value of γ , the slope coefficients are estimated using the generalized method of moments (GMM). Following the approach of Caner and Hansen (2004), the confidence interval is computed for the threshold estimate:

$$\tilde{A} = \{ \gamma : LR(\gamma) \leq C(\alpha) \} \quad (3)$$

where $C(\alpha)$ is 95% percentile associated with the likelihood ratio statistic $LR(\gamma)$. The lagged endogenous variable acts as an instrument.

The specific dynamic panel threshold model of the public debt-GDP connection used in this study is given by:

$$GDP_{it} = \mu_i + \chi \times GDP_{i,t-1} + \beta_1 debt_{it} I(debt_{it} \leq \gamma) + \beta_2 debt_{it} I(debt_{it} > \gamma) + \alpha_1 \times gov_{it} + \varepsilon_{it} \quad (4)$$

Slope coefficients are regime-independent. GDP acts as the threshold variable. In this case, government effectiveness acts as the control variable in the panel threshold model. The estimation is based on three steps:

- estimation of the parameters in the reduced form of $\widehat{GDP}_{i,t-1}$ by explaining instruments using lagged predictors and introduction of $GDP_{i,t-1}$ into the structural form of the equation;
- estimation of the parameters in Equation (2) using least squares for γ , where $GDP_{i,t-1}$ is replaced by $\widehat{GDP}_{i,t-1}$ and the step is repeated for a certain subset of the support associated with debt; in this case, the sum of squares residuals denoted by $S(\gamma)$ is computed;
- $\hat{\gamma}$ is chosen as the value for which the sum of squared residuals is minimal and the slope of the parameters is computed using GMM for previously determined $\hat{\gamma}$ and instruments.

The research is conducted for the EU-27 member states for which the effect of public debt on growth is evaluated in two specific periods: in the long run (1995–2023) and in the short run during a recent short period of the COVID-19 pandemic (2020–2022). The data for 1995–2023 are considered variables:

- The general government debt-to-GDP ratio, provided by the OECD, measures the total general government debt as a percentage of GDP.

- GDP per capita, PPP (constant 2017 international \$), from the World Bank, represents the average income per person in a country, adjusted for differences in living costs across countries.
- Government effectiveness, as assessed by the World Bank, reflects perceptions of how well a government functions. It considers citizens' views on public services, the civil service and policymaking, including civil service independence and the government's ability to fulfil its commitments. The scores are typically located between -2.5 and 2.5 , with higher scores showing better effectiveness.

In the period 2020–2022, *i.e.*, the COVID-19 pandemic period, we use other variables reflecting debt that are provided by the World Bank and are measured as percent of GDP: general government debt, central government debt and local government debt.

Data in the natural logarithm form are used in the models and the associated descriptive statistics are reported in Table 1. GDP per capita has a lower range with respect to the other variables. One may observe that government effectiveness became negative during the pandemic, which shows that people perceived that government did not function well during the medical crisis.

Greece experienced the most significant increase in debt during the pandemic, as it already had a growing debt burden due to factors such as high government spending and the 2008 financial crisis. In contrast, Estonia achieved a minimum debt level of 1.76% of GDP in 2008, prior to the global financial crisis. Greece's existing debt made it more vulnerable to the economic downturn caused by the pandemic, which led to decreased government revenue and increased spending. Estonia, on the other hand, had a reputation for responsible fiscal policies and lower debt levels, providing it with a stronger financial buffer to weather the crisis. Additionally, Estonia's membership in the Eurozone before the crisis granted it access to financial support from other member states, helping it avoid excessive borrowing.

Table 1: Descriptive statistics for values in natural logarithm form (1995–2023 and 2020–2022)

Period	Variable	Abbreviation (values in natural logarithm)	Mean	Minimum value	Maximum value
1995–2023	General government debt-to-GDP ratio	<i>debt</i>	3.393	–2.309	5.396
	GDP per capita	<i>GDP</i>	10.433	9.169	11.700
	Government effectiveness	<i>gov</i>	0.157	–9.964	1.000
2020–2022	General government debt	<i>general debt</i>	11.762	8.535	14.897
	Central government debt	<i>central debt</i>	11.715	8.527	14.802
	Local government debt	<i>local debt</i>	8.454	0.693	12.421
	GDP per capita	<i>GDP</i>	10.022	9.019	11.68275
	Government effectiveness	<i>gov</i>	–0.265	–9.964	0.688

Source: Author's own calculations in Stata

4. Results

Prior to analysing the estimates, it was essential to assess cross-sectional dependence. Using Pesaran's (2007) test, we confirm cross-sectional dependence for GDP and debt but not for government effectiveness. Additionally, the CADF unit root test indicates that the series for GDP and debt are stationary at the 1% significance level, as shown in Table 2.

The nonlinear relationship between debt and economic growth is checked using the Ramsey reset linearity test, for which the computed F -statistic is 1.16, with a p -value higher than 0.1. Therefore, a nonlinear relationship between the variables is not supported. Debt in various forms is used as a threshold variable for models that cover two periods of analysis (1995–2023 and 2020–2022). Table 3 reports the estimations for thresholds as values and as confidence intervals for the 5% significance level. The marginal effects of debt on economic growth in both regimes (low and high debt) are measured by $\hat{\beta}_1$ and $\hat{\beta}_2$. Robustness is checked by adding government effectiveness as a control variable and α_1 provides a measure of the impact of government effectiveness on growth.

Table 2: Preliminary tests to check for cross-sectional dependence and unit root (1995–2023)

Variable	CD-test (<i>p</i> -value)	CADF test (one lag)	CADF test (two lags)
GDP	–3.48 (0.001)	–3.733 (0.000)	–3.439 (0.000)
debt	–2.73 (0.007)	–3.722 (0.000)	–2.799 (0.003)
gov	–1.36 (0.183)	–3.531 (0.000)	–3.205 (0.000)
ΔGDP	–	–4.699 (0.000)	–4.443 (0.000)
Δdebt	–	–5.149 (0.000)	–3.562 (0.000)
Δgov	–	–4.802 (0.000)	–3.672 (0.000)

Source: Author's own calculations in Stata

For the initial model, the debt threshold is estimated at 73.21%, being included in the 95% confidence interval [61.89%, 82.3%], while in the model including government effectiveness, the confidence interval is narrower [61.33%, 81.24%]. Our analysis indicates a statistically significant threshold, as evidenced by the likelihood ratio statistic exceeding the critical value. The estimated threshold value is consistent with previous findings by Caner *et al.* (2010), who reported thresholds of 77% for developed and emerging economies and 64% for developing countries. Our results appear more plausible than those of Reinhart and Rogoff (2010) and Egbert (2015), who employed non-dynamic models and potentially neglected the endogeneity of initial income.

To further validate our findings, we compare our results to those of Mencinger *et al.* (2014), who examined 25 EU countries. Their study identified thresholds between 80% and 94% for old member states and between 53% and 54% for new member states. While these comparisons provide some context, it is important to note that differences in sample countries, time periods and control variables make direct comparisons challenging.

Having calculated the threshold value, we will now examine how debt influenced economic growth between 1995 and 2023. The estimation results indicate that only the upper regime-dependent parameter (β_2) is significant at the 10% level, while the lower regime-dependent coefficient (β_1) is not significant. Specifically, a public debt higher than 73.21% of GDP reduces economic growth by 0.025 percentage points at each increase in debt by one percentage point. The results are similar in the model that includes government effectiveness as a control variable: for a public debt that surpasses 73.21% of output, the economic growth decreases by 0.022 percentage points with each growth of public debt by one percentage point. The values of 0.025 and 0.022 are quite

close to that indicated by Hansen (2000) at 0.017 percentage points. Moreover, the effect of government effectiveness on growth is direct and significant at the 1% level. The growth of government effectiveness by one percentage point increases the economic growth by 0.198 percentage points. This result confirms that government effectiveness is a key factor in ensuring sustainable development in a country or a region.

Table 3: Dynamic panel threshold models to explain economic growth in EU member states (1995-2023 and 2020-2022)

Variable	Period 1995–2023		Period 2020–2022 (COVID-19 pandemic)					
Explanatory variable	<i>debt</i>		<i>general debt</i>		<i>central debt</i>		<i>local debt</i>	
Threshold estimates “ γ ”	73.21%	73.21%	57.82%	57.82%	55.77%	55.77%	10.55%	10.55%
95% confidence interval	[60.89, 82.3%]	[61.33%, 81.24%]	[54.48%, 60.19%]	[53.92%, 59.44%]	[51.48%, 62.98%]	[52.87%, 60.38%]	[8.99%, 11.4%]	[9.42%, 10.9%]
Impact of debt								
$\hat{\beta}_1$	0.0637 (0.35)	0.0376 (0.56)	0.061 (0.43)	0.0343 (0.54)	0.072 (0.38)	0.066 (0.41)	0.025 (0.67)	0.024 (0.672)
$\hat{\beta}_2$	−0.025* (0.07)	−0.022* (0.082)	−0.015* (0.080)	−0.014* (0.08)	−0.022* (0.071)	−0.02* (0.07)	−0.031* (0.07)	−0.029* (0.068)
Impact of covariate								
	–	0.198*** (0.002)	–	0.633 (0.342)	–	0.755 (0.122)	–	0.663 (0.134)

Note: p -values are in brackets. * denote significance at the 10%, *** denote significance at the 1%.

Source: Author's own calculations in Stata

In the COVID-19 pandemic period, the analysis reveals a significant negative impact of debt on economic growth only when debt levels exceed specific thresholds, because only the upper regime-dependent coefficient (β_2) is significant at the 10% level. These thresholds vary based on the type of debt (general, central or local). For instance, when general debt surpasses 57.82% of GDP, each additional percentage point of debt reduces economic growth by 0.015 percentage points in the basic model and by 0.014 percentage points when government effectiveness is added as a control variable. Similar thresholds exist for central and local debt. For central debt higher than 55.77% of output, a one-percentage point increase in central debt generates a decrease in growth by 0.022 percentage points in the basic model and by 0.02 when we control for government effectiveness. Moreover, when local debt surpasses 10.55% of GDP, any additional growth

of local debt by one percentage point brings a decrease in growth by 0.031 in the basic model and by 0.029 when government effectiveness acts as the control variable. These findings align with previous research by Eberhardt and Presbitero (2013), which established a nonlinear relationship between public debt and economic growth.

During the pandemic, we observe that government effectiveness had a minimal impact on growth. This is likely due to the prioritization of public health and containment efforts, which may have overshadowed traditional economic development initiatives. Kose *et al.* (2023) supported this hypothesis, suggesting that the short-term focus on pandemic response can limit the effectiveness of government interventions in areas such as infrastructure and education.

To assess the robustness of our findings, we employ the dynamic common correlated effects estimator (CS-ARDL) method for the entire period (1995–2023). The application of this additional method brings value to the previous findings by allowing us to analyse both short-run and long-run relationships between debt, growth and government effectiveness and not just the overall connection. Moreover, this dynamic model allows us to highlight the impact of GDP and debt in the previous periods on economic growth. However, this method cannot be applied to short periods such as the COVID-19 pandemic, but the data availability allowed us to make a deeper analysis of the impact of debt on growth during the pandemic by considering specific types of debt (general debt, central debt and local debt) and not just total debt as in the dynamic panel threshold model. The data for these types of debt are not available for the entire period, but the analysis is relevant enough for a short period of crisis such as the previous medical crisis.

Our findings in Table 5 suggest no long-term connections between debt, growth and government effectiveness, but there is a short-run relationship between economic growth and debt. In the short term, more government borrowing can enhance economic activity by funding investments in infrastructure or social programmes. However, high levels of borrowing can also crowd out private investment as interest rates rise, potentially limiting long-term growth potential. This trade-off highlights the importance of carefully managing government debt levels (Ale *et al.*, 2023).

Table 6 indicates that both general and central debt have a negative effect on economic growth, while local debt does not. Government effectiveness also appears to have no significant influence on growth in these estimations.

General and central debt often involve larger-scale projects and programmes that benefit the entire country. When these debts become excessive, they can constrain resources available for productive investments, hindering economic growth (Nöh, 2019). In contrast, local debt is typically used for smaller-scale projects within specific regions. These projects may have a more direct and positive impact on the local economy, potentially mitigating any negative effects of borrowing (Pan *et al.*, 2017).

Table 5: CS-ARDL model to explain economic growth in EU-27 in short and long run (1995–2023)

Variable	Coefficient (p-value in brackets)
Short-term estimations: mean group	
ΔGDP_t-1	−0.542*** (0.000)
ΔGDP_t-2	−0.392*** (0.000)
debt	−0.071* (0.051)
Δdeb_{tt}	0.225 (0.181)
deb _{tt} −1	−0.062* (0.051)
deb _{tt} −2	−0.004 (0.811)
$\Delta deb_{tt}-2$	0.308*** (0.000)
Adjusted term: mean group	
GDP	−1.933*** (0.000)
Long term estimations: mean group	
debt	0.003 (0.91)
gov	0.475*** (0.001)

Note: * denote significance at the 10%, *** denote significance at the 1%.

Source: Author's own calculations in Stata

Overall, this analysis indicates that public debt at various levels negatively affects economic growth in the EU-27, during both the period 1995–2022 and the COVID-19 pandemic. However, the threshold value at which debt is detrimental to growth is lower during the pandemic. While effective government practices can promote long-term economic growth, their impact may be less pronounced during a pandemic. The exceptional circumstances of a crisis can overshadow traditional growth strategies, making it more difficult for good governance to yield immediate results. However, long-term planning and robust institutions fostered by effective governments remain crucial for a faster recovery and sustainable future growth (Carnazza and Liberati, 2021).

Table 6: Dynamic panel data models to explain economic growth in the EU-27 based on general debt, central debt and local debt (2020–2022)

Variable	Coefficient (p-value in brackets)					
GDP in previous period	0.941*** (0.000)	0.933*** (0.000)	0.984*** (0.000)	0.941*** (0.000)	0.933*** (0.000)	0.984*** (0.000)
general debt	−0.057* (0.06)	–	–	−0.059* (0.06)	–	–
central debt	–	−0.064* (0.075)	–	–	−0.088*** (0.000)	–
local debt	–	–	−0.026 (0.27)	–	–	−0.029 (0.26)
gov	–	–	–	0.114 (0.779)	0.835 (0.239)	0.556 (0.455)
Constant	0.01 (0.08)	0.003 (0.554)	0.006 (0.655)	0.01 (0.08)	0.001 (0.586)	0.005 (0.667)

Note: * denote significance at the 10%, *** denote significance at the 1%.

Source: Author's own calculations in Stata

Effective governments can stimulate economic growth through various strategies. These include implementing stable policies to foster a predictable business environment, investing in infrastructure, promoting education and training to develop a skilled workforce and ensuring fair competition and consumer protection through effective regulation and enforcement. These factors are essential for innovation, economic competitiveness and overall economic prosperity (Dai *et al.*, 2023).

5. Discussion and Policy Proposals

This study revealed the negative influence of public debt on economic growth in the period 1995–2023 and a negative impact of general and central debt on growth during the pandemic. Several previous studies have also found a negative relationship between debt and economic growth. For example, this conclusion was also drawn by Cecchetti *et al.* (2011) for 18 OECD countries from 1980 to 2010, Cordella *et al.* (2005) for 79 developing countries from 1970 to 2002 and Egert (2015) for 20 advanced and 24 emerging economies from 1949 to 2009. Compared to previous studies, this paper used dynamic panel threshold models that have the advantage of identifying the limit after which debt negatively affects growth. Moreover, from a technical point of view,

the dynamic panel threshold models and the other approaches based on dynamic panel data models and MG estimators have the advantage of reducing endogeneity, thus providing more reliable estimates compared to other papers that are limited to fixed or random-effect models (Cordella *et al.*, 2005). Compared to previous studies such as those of Egert (2015), Cordella *et al.* (2005) or Cecchetti *et al.* (2011), the main strength of this paper is the analysis of the debt-growth nexus during the pandemic period, when local debt had no significant impact on growth. However, our research is limited to an overall analysis of all the EU member states, whereas specific research for each country might lead to different results. Therefore, a future study should consider the debt-growth nexus for each EU member state. However, such as cross-country analysis is not possible for the COVID-19 pandemic context because of the short period.

For a public debt higher than 73.21% of GDP, this paper shows that the economic growth decreases by 0.022–0.025 percentage points with each growth of public debt by one percentage point. These values are higher than the results indicated by Hansen (2000) at 0.017 percentage points, but this could be explained by the multiple crises that affected the EU countries in the analysed period (global financial crisis in the late 2000s, COVID-19 pandemic).

The negative effect of debt on growth might be explained by several reasons. For example, higher government borrowing leads to higher interest rates. In such a case, it is more expensive for companies to borrow and invest, which limits their activities and overall growth is affected (Bastida *et al.*, 2014). High levels of government debt can also reduce investor confidence, deterring private investment, which reduces economic growth. Countries with high debt levels may find it difficult to attract new investment, creating a debt trap that can constrain growth (Dantama *et al.*, 2017). In the recent medical crisis, governments imposed lockdowns and restrictions on businesses and social activities to contain the spread of the virus. This led to a significant decline in economic activity as businesses were forced to close or operate at reduced capacity. Governments increased spending during the COVID-19 pandemic to support essential services and the decline in economic activities, which lead to higher debt levels. Businesses were forced to lay off workers due to the economic downturn, leading to a surge in unemployment. This reduced consumer spending and created a vicious cycle of economic decline. The pandemic caused significant volatility on financial markets, leading to a decline in investor confidence and a reduction in investment and consequently in economic growth (Charaia and Papava, 2021).

More policy proposals to lower public debt and support economic growth are necessary. Fiscal consolidation and expenditure reform should consider the reduction of wasteful spending, more measures to reduce corruption and ensure fair competition in public procurement processes (Apergis and Apergis, 2019), more reforms to ensure the sustainability of social security systems, such as increasing retirement ages or adjusting benefits, more measures to combat tax evasion and avoidance,

such as improving tax administration and enforcement (Halkos *et al.*, 2020), debt restructuring options, such as debt relief or debt-for-growth swaps, international cooperation to address debt problems, especially for countries facing multiple crises (Teixeira *et al.*, 2024). Implementing structural reforms to improve the efficiency of the economy and enhance its competitiveness can also contribute to reducing public debt and increasing growth (Müller *et al.*, 2019).

This study supports the hypothesis that government effectiveness enhances economic growth in the long run. Effective governments play a crucial role in promoting economic growth. Firstly, they establish a stable and predictable environment for businesses and individuals by ensuring the rule of law, reducing corruption and streamlining bureaucracy, which enhance growth (Getinet and Ersumo, 2020). Secondly, a government that functions well invests in essential public goods such as infrastructure, education and research and development, which might promote long-run economic growth (Ajayi and Edewusi, 2020). Finally, they create social safety nets to provide a stable and productive workforce. Alam *et al.* (2017) confirmed the positive impact of effective government on growth in a study of 81 countries from 1996 to 2011.

Despite the positive long-term impact of effective government, our analysis found no significant effect during the pandemic. The pandemic itself was a severe economic shock, with lockdowns, travel restrictions and supply chain disruptions significantly disrupting economic activity. While good governance can mitigate some of these effects, the magnitude of the pandemic may have overshadowed the impact of government effectiveness.

Given these findings, policymakers should focus on debt sustainability by increasing government revenue through a fair and efficient tax system (Gnangnon, 2021; Hilton, 2021), enhancing government effectiveness by strengthening institutions and improving governance to ensure efficient use of public funds (Yusuf and Mohd, 2021), developing pandemic-specific policies by exploring issuing of pandemic recovery bonds with longer maturities to spread out debt repayment and reduce immediate pressure (Ndoricimpa, 2020). The specific policy mix will vary depending on the unique circumstances of each EU member state.

6. Conclusions

The debt situation in the EU will continue to remain challenging in the next years. The empirical results suggest that public debt negatively affects economic growth in the EU, during both the period 1995–2023 and the COVID-19 pandemic. While government effectiveness can enhance economic growth in the long run, it had little effect during the pandemic.

Given these findings, policymakers should prioritize reducing public debt in the EU-27 to minimize its negative impact on growth. The strategies to reduce public debt should consider

fiscal consolidation and expenditure reform (elimination of unnecessary or inefficient expenditures, measures to reduce corruption and ensure fair competition in public procurement processes, reforms to ensure the sustainability of social security systems, such as increasing retirement ages or adjusting benefits), tax reform or debt restructuring and debt relief.

Our study provides a comprehensive overview of the influence of public debt on growth in the EU. However, because of limited data availability, a panel data approach was employed. Moreover, the differences in the results based on various methods are a limitation of the study based on the fact that each method is based on own hypotheses. To delve deeper into the growth-debt nexus, future studies should conduct country-specific analyses using advanced methodologies. Particular attention should be paid to more vulnerable EU states, such as Greece, France, Italy, Spain, Portugal and Belgium. Additionally, future research should consider incorporating more control variables, including human capital, trade openness and inflation.

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