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FISCAL SUSTAINABILITY AND ECONOMIC GROWTH IN THE LIGHT OF NEW ECONOMIC GOVERNANCE

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Abstract. This research estimates the effects of public debt on economic growth. In addition, it contributes to examining the impact of public debt on investment as a possible channel of impact on economic growth. The empirical analysis is based on a smooth transition panel data regression model. The results show the non-linear relationship between public debt and economic growth for the sample of 12 Euro area countries is markedly statistically significant. The sustainable threshold for this relationship is on average between 93% and 105%. This implies that public debt to gross domestic product ratios above this sustainable threshold would have a negative effect on economic growth. Although insignificant, the results for the sample of 20 Euro area countries could indicate that for the less developed Euro countries the potentially negative effects of high debt can already be seen at a lower level of public debt, which is the case for even more sensible debt reduction policies. Taking into consideration the fiscal rules, the results suggest that one size does not necessarily fit all. Moreover, the trade-off between fiscal consolidation and increased green public investment will be one of the key challenges of this decade given the reinstated European Union fiscal rules.

Keywords: fiscal policy, public finance sustainability, public debt, economic growth, fiscal rules, fiscal consolidation, new economic governance.

JEL Classification: C54, E62, H60, H63, O40.

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1. Introduction

In accomplishing economic and fiscal policy objectives, Member States have been supported by the European Union's (EU hereafter) economic governance framework. Since the Maastricht Treaty in 1992, this framework has contributed to reaching macroeconomic convergence, ensuring public finances in good condition and giving attention to macroeconomic imbalances. It has helped Member States following stability path, reaching better welfare and more jobs for EU citizens besides a common monetary policy and a common currency in the Euro area.

As a reflection of weaknesses in the EU framework for economic governance the latter has developed gradually and reforms have been proposed, most notably during times of economic crisis. Well-known legislative packages addressed as the *six-pack* and *two-pack* (European Commission, 2020a) responded to the global financial crisis and the sovereign debt crisis in the Euro area. Revision of fiscal control was adopted as well as national

budgetary stability requirements, fiscal coordination in the Euro area emphasized and more control given to macroeconomic imbalances.

Additional requirements incorporated into the revision of the EU framework for economic governance inevitably increased the complexity of the framework. In the light of different fiscal positions and other vulnerability risks it failed to differentiate sufficiently between Member States. Fiscal policies in Member States often not responded to build fiscal buffers in times of good economic conditions and continued to be pro-cyclical. The complexity of EU's fiscal rules have increased not enabling enough transparency and invariability. The performance of the state fiscal frameworks varied widely across Member States. Although the awareness of other risks to macroeconomic stability has raised, the policy response has been weak.

Health circumstances with the COVID-19 crisis has further affected the European economy and caused an economic downturn. Real gross domestic product (GDP hereafter) growth in the EU-27 was –5.6% in 2020, followed by a stronger-than-expected economic recovery (6% in 2021) thanks to support measures, although the recovery varied across Member States. As a result, public finances have deteriorated (e.g., mobilization of the general escape clause of the Stability and Growth Pact, SGP hereafter) and fiscal divergences between Member States have widened.

All Member States have faced marked upsurge in government deficits and debt ratios. EU government deficit in nominal terms has risen from 0.5% of GDP in 2019 to approximately 7% of GDP in 2020 and the overall debt ratio has increased strongly by 13 p.p. of GDP to 90% of GDP by the end of 2020 (Eurostat, 2023). The projections of fiscal indicators are to persist above the levels before the COVID-19 crisis in the coming years. The economic consequences of the COVID-19 crisis have hit severely some Member States, which experienced some of the largest increase in debt ratios. In response to the aforementioned crisis governments have provided direct fiscal stimulus, extensive liquidity support to the private sector amounting to almost 20% of GDP (mostly state assurances to companies and tax deferrals).

The imperfections of the economic governance framework have again come into the debate after the COVID-19 crisis. The key challenge now is to reduce the high and differentiated public debt ratios in a sustainable and growth-friendly way, while addressing the large investment needs in the context of fiscal consolidation, as the EU's decision to the twin transition, as documented in the EU Green Deal and the EU Digital Strategy, will inquire for extra annual private and public investment of around EUR 650 billion over the next decade (European Commission, 2023a). The activation of the general escape clause under the SGP has allowed Member States to respond to the COVID-19 crisis with significant fiscal support to their economies. The SGP aims to ensure the sustainability of public debt (preventive and corrective arms) and reflects the need to avoid negative externalities and the possible consequences of spillover effects between Member States in case of an excessive public debt in one of them. While a strong counter-cyclical response is associated with a temporary deviation from the budgetary requirements of the SGP, an important issue in this context concerns the economic consequences of high public debt, which is very likely to have a negative impact on economic growth, which only becomes relevant once a certain threshold of public debt is reached, i.e. when the debt becomes unsustainable.

The paper aims is to quantitatively estimate the effects of public debt on economic growth and to determine the sustainable debt threshold in the Euro area countries, taking into account the parameter heterogeneity. The empirical analysis is based on a smooth transition panel data regression model. Additionally, we provide a robustness check, as debt patterns vary across Euro area countries. Another essential point of issue regards the channels of expected impact on economic growth. Even before the crisis, the EU faced several long-term structural challenges as a result of COVID-19, which persist today. Despite the better labour market performance before the pandemic, the rapidly ageing population raises concerns about a decline in labour supply and thus potential economic growth in the EU, which is further hampered by weak productivity. Climate change comes with high socio-economic costs, but on the other hand, the EU is committed to the twin transition. Achieving the goals of the green and digital transition and ensuring economic growth and quality of life are linked to a sustained and substantial increase in public and private investment in the Member States. In the light of high investment needs, this paper additionally contributes to examining the impact of public debt on investment (public and private) as a possible channel of expected impact on economic growth.

The contribution of this paper to the existing literature is that i) the results point to a relationship between public debt and economic growth which is not linear, with a sustainable threshold above which public debt has a negative effect on economic growth, ii) the results shed light on investment channels addressing the issue of potential higher economic growth below the abovementioned sustainable threshold, iii) the results provide an additional argument for prudent debt reduction policies and call for a renewed supervisory framework, iv) in the context of mobilising more private investment to facilitate the major transitions the EU is currently facing, the study adds to the discussion on the capital markets union. Given the perception that the EU might lag behind in competitiveness, growth and prosperity for its citizens, there seems to be a momentum to strengthen the capital markets union and v) address the issue of the increased need for public green investment in times of fiscal deficit consolidation and placement of its status within fiscal rules. The subsequent sections of the paper are as follows: Section 2 presents the theoretical background of the topic, the data and the methodology used are described in Section 3, Section 4 presents the results, the findings and implications are discussed next, and last Section provides a conclusion.

2. Literature review

The relationship between fiscal policy and economic growth is complex and of vital importance for policy-making. This debate was popularised by the seminal paper by Reinhart and Rogoff (2010). Economic theory leads to positive effects of government debt in the short run and negative effects of government debt on economic growth in the long run. In particular, an increase in fiscal deficit increases disposable household income in the short term, which in turn boosts aggregate demand. In the long term, however, the negative effect prevails, as there is a decline in public savings, whereas the influence of lower public savings is not balanced enough by private savings. Consequently, national accounts aggregates savings and investment fall, resulting in lower capital accumulation and pro-

ductivity (Heimberger, 2023; Kumar & Woo, 2010). Moreover, experience from the recent global financial crisis has shown that an increase in public debt has a potentially negative effect on sustained economic growth, not only in developing countries but also in advanced economies (Cecchetti et al., 2010).

In the empirical literature non-linear and concave functional form relation between public debt and economic growth prevails. Such form implies an inverted U-shape relationship implying a debt threshold beyond which the positive effect on economic growth turns into negative one (Grennes et al., 2010; Onofrei et al., 2022; Mensah et al., 2020). Mencinger et al. (2014) examined the relationship between public debt and economic growth for a panel dataset of countries in the EU, dividing them into subgroups of "old" and "new" member states. The authors applied generalised economic growth model augmented with the quadratic equation in debt variable. The impact of public debt on economic growth is statistically significant not linear across all models, with the debt thresholds for the "old" member states being roughly between 80% and 94% and the lower debt thresholds for the "new" member states between 53% and 54%. Mencinger et al. (2015) revisited the role of public debt on economic growth for a panel dataset of 36 OECD (Organisation for Economic Cooperation and Development, OECD hereafter) countries, dividing the sample into subgroups. The authors confirm positive impact at low levels of public debt, whereas the impact turns into negative one beyond certain debt threshold. For the sample of developed economies, the debt threshold is between 90% and 94%, whereas for the sample of emerging economies the debt threshold is much lower, between 44% and 45%. Based on a dynamic panel threshold technique for seventy-one developing countries from 1984 to 2015, Law et al. (2021) examine the empirical relationship in question. The authors find a negative and statistically significant effect of public debt on economic growth at a debt threshold of around 52%.

On the other hand, Panizza and Presbitero (2014) argue that the negative correlation between public debt and economic growth disappears when endogeneity is corrected using an instrumental variable approach in a sample of OECD countries (see also Ash et al., 2017; Ramos-Herrera & Sosvilla-Rivero, 2023). Based on a time series perspective and revisiting Reinhart and Rogoff (2010), Amann and Middleditch (2020) research that economic downturns tend to cause debt increases and not vice versa.

Checherita-Westphal and Rother (2012) investigate the average relationship between public debt and economic growth for a panel dataset sample of 12 Euro area countries using a growth model based on the conditional convergence equation, also augmented with various instrumental variables confirming non-linear relationship between public debt and economic growth with a debt threshold of roughly between 90% and 100%. Using dynamic threshold panel methodology in order to analyse the non-linear relationship between public debt and economic growth Baum et al. (2013) extend the discussion on debt sustainability in the Euro area focusing on a sample of 12 Euro area countries for the period 1990–2010. The results suggest a significantly positive effect of public debt on economic growth in the short term, whereas the effect in the long term is negative. Moreover, Gómez-Puig and Sosvilla-Rivero (2017) based on the growth literature apply a time-series analysis for EMU (Economic and Monetary Union, EMU hereafter) countries. The negative

impact is reached at a debt ratio of around 40% in central and around 50% in peripheral countries. The authors also suggest that since debt threshold is not the same for all EMU countries, the fiscal sustainability path should be adjusted.

The impact of an increase in public debt on economic growth has gained interest in the context of the COVID-19 pandemic, which led to a significant contraction in economic activity. Expansionary fiscal policies have led into significant increases in public debt. More recent studies (Bentour, 2021; Abbas et al., 2021; Liu & Lyu, 2021; Butkus et al., 2021; de Soyres et al., 2022; Efthimiadis & Tsintzos, 2023; Lee et al., 2023) argue that there is no common threshold that fits all countries and that the models should take into account fundamentals that make countries different from one another.

3. Data and methodology

This study quantitatively estimates the effects of public debt on economic growth, determines the sustainable debt threshold in the Euro area (EA hereafter) countries and examines the channels for the impact of public debt on economic growth primarily for a sample of twelve Euro area countries (EA 12 hereafter) that were among the first to adopt the Euro as scriptural money, namely Austria, Germany, Italy, France, Belgium, the Netherlands, Luxembourg, Ireland, Finland, Spain, Portugal and Greece. We extend the empirical analysis with an additional sample of all EU Member States that currently use the Euro as their official currency. These include 20 EU Member States (EA 20 hereafter), namely Austria, Belgium, Croatia, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain. Data is taken from the European Commission's AMECO database (European Commission, 2023c) and for the period 2000–2020. The variables used in the empirical analysis follow the standard growth literature (Romer, 1990; Barro & Sala-I-Martin, 2003; Jones, 2015), according to which a country's economic growth is affected by investment, demographics, research and development, economic policy, macroeconomic conditions, institutional development and trade openness, among other factors. This study considers GDP growth as the dependent variable and public debt as the threshold variable. The control variables considered in this study refer to gross fixed capital formation, fiscal indicators, interest rates, openness indicators and demographics. The list of variables used in the empirical analysis with their descriptive statistics is presented in Table 1.

The methodological approach applied to quantitatively estimate the effects of public debt on economic growth and to determine the sustainable debt threshold in the Euro area countries is the panel smooth transition regression model as suggested by Gonzalez et al. (2005). This is a non-linear model that allows the regression coefficients to vary over time and across cross-sectional units, with a smooth change from one regime to another. Consider the following two extreme regimes of the aforementioned model to investigate the non-linear relationship between economic growth and public debt:

$$y_{it} = \mu_i + \beta_0' x_{it} + \beta_1' x_{it} g\left(q_{it};\ \gamma, c\right) + u_{it}, \tag{1}$$

for i = 1, …, N and t = 1, …, T and y_{it} is the dependent variable, μ_i represents fixed individual

effects, x_{it} is a vector of time-varying exogenous variables and u_{it} is an error term. The transition function $g(q_{it}; \gamma, c)$ is normalised to be bounded between 0 and 1. The transition function is a function of the threshold variable q_{it}, the slope parameter γ and the threshold parameter c. B_0 represent the regression coefficients in the first extreme regime while marginal effect of q_{it} in the second extreme regime is represented by β_0 and β_1 (when debt is above the threshold). For the modelling the distinctive choices are of the threshold variable and the selection of a transition function. For a logistic function, the transition function is given by:

$$g\left(q_{it}; \gamma, c\right) = \left\{1 + \exp\left[-\gamma \prod_{j=1}^{m}\left(q_{it} - c_j\right)\right]\right\}^{-1}. \quad (2)$$

The logistic function monotonically increases in q_{it}. Consequently, the two estimation frameworks match to high and low values of the threshold variable. The threshold value c determines the point at which the regimes are equally weighted, while γ controls the speed and smoothness of the transition. The specification step in the modelling procedure consists of testing for linearity, non-linear least squares is used for parameter estimation. The evaluation step deals with tests for no nonlinearity left after estimation. Testing for linearity can be implemented under the null hypothesis using either $\beta_0 = 0$ or $\gamma = 0$. Due to identification problem, Luukkonen et al. (1988) propose an approach in which g is replaced by a Taylor series expansion which is estimable under the null. In the evaluation phase, we test for no remaining nonlinearity after estimation. In the testing approach, the estimated model is tested against a model with additional regimes (van Dijk et al., 2002).

Table 1. List of variables and descriptive statistics (source: European Commission, 2023c)

Variable	Description	EA 12			EA 20		
		N	Mean	St.dev.	N	Mean	St.dev.
DEBT	Gross government debt (% of GDP)	252	78.77	38.26	420	64.97	37.67
EMPLOYMENT	Total employment (1000 persons)	252	12006.43	12545.83	420	7615.90	11110.04
GDP_GROWTH	Real growth of gross domestic product (%)	252	0.83	3.31	419	1.72	4.06
GDP_P_C	Gross domestic product at market prices per capita (Euro)	252	34533.81	16271.97	420	26280.14	16456.69
I_GOV	Investments – general government (% of GDP)	252	3.34	0.97	420	3.64	1.08
I_PRIVATE	Investments – private sector (% of GDP)	252	18.20	4.38	420	18.45	4.23
I_TOTAL	Investments – total economy (% of GDP)	252	21.54	4.40	420	22.06	4.44
GOV_EXPEND	Government expenditure (% of GDP)	252	47.27	6.67	420	44.93	6.77
GOV_REVENUE	Government revenue (% of GDP)	252	44.61	6.02	420	42.22	6.02

End of Table 1

Variable	Description	EA 12			EA 20		
		N	Mean	St.dev.	N	Mean	St.dev.
INFLATION	Annual rate of change in GDP deflator at market prices	252	1.18	0.95	420	1.40	1.47
LTNIR	Long-term nominal interest rates (%)	252	3.41	2.53	401	3.71	2.58
LTRIR	Long-term real interest rates (%)	252	1.62	3.03	401	1.58	3.38
OPENNESS	Exports and imports of goods and services summed (% of GDP)	252	111.46	74.33	420	124.65	70.53
POP_GROWTH	Growth rate of total population (%)	252	0.56	0.66	420	0.34	0.91
S_GOV	Disposable income less consumption – general government (% of GDP)	252	1.34	3.55	420	1.46	3.25
S_PRIVATE	Disposable income less consumption – private sector (% of GDP)	252	21.14	4.69	420	20.36	4.99
S_TOTAL	Disposable income less consumption – total economy (% of GDP)	252	22.48	5.72	420	21.82	5.56
STNIR	Short-term nominal interest rates (%)	252	1.60	1.79	409	1.89	2.27
STRIR	Short-term real interest rates (%)	252	–0.17	1.83	409	–0.25	2.55
TAXES	Current taxes on income and wealth, corporations (% of GDP)	252	3.54	3.64	399	3.21	3.18
TERMS_TRADE	Export prices relative to import prices	252	99.18	3.44	420	99.25	3.81
BUDGET_ BALANCE	General government net lending or net borrowing (% of GDP)	252	–2.66	4.16	420	–2.71	3.77
CREDIT	Domestic credit to private sector (% of GDP)	192	97.37	28.22	287	94.83	40.57

4. Results

Quantitative estimates of the effects and the sustainable debt threshold are based on a sample of EA 12. In addition, we have carried out additional assessments for a sample of EA 20. In fact, the sample of the 20 Euro area countries is more heterogeneous in terms of per capita income than the sample of the 12 Euro area countries, with an average income of EUR 26,280.14 per capita in the first sample (EA 20) and EUR 34,533.81 per capita in the second (EA 12). The latter could imply that the more developed Euro area countries have higher debt sustainability limits, while for the less developed countries the potentially negative effects of

high debt can already be seen at lower public debt levels. Given the negotiations on the fiscal rules reform, which were frozen by the EU during the economic crisis due to COVID-19, the escape clause will be deactivated after 2023 and the public deficit and debt rules will come back into force. From the perspective of the impact of public debt on economic growth, the path of debt reduction through fiscal consolidation is relevant and raises the issue of the surveillance framework (differential treatment of Member States).

Therefore, the estimates are based on the two samples mentioned above (EA 12 and EA 20) and are presented in Table 3. The first step in the panel smooth transition regression estimation involves a linearity test. The results of the linearity test are presented in Table 2. Luukkonen, Saikkonen and Teräsvirta linearity tests are joint hypothesis tests for the significance of the elements of the Taylor expansion. Based on the results presented in Table 2, the linearity hypothesis is rejected at a 1% significance level for both mentioned samples suggesting non-linear relationship in both EA samples.

Next, we estimate a two-regime panel smooth transition regression model (Table 3). Prior to discussing the results, we test for whether there is additional unmodeled nonlinearity. The results in Table 4 indicate for both EA samples there is no remaining nonlinearity. However, for the EA 20 country sample, rejection is achieved at a lower 1% significance level, while for the EA 12 country sample, rejection is achieved at a higher significance level. The estimated panel smooth transition regression model with one transition is adequate.

Table 3 presents the estimation results of the panel smooth transition regression model for both country samples, namely EA 12 and EA 20. The estimations for both country samples give the threshold values, which are statistically significant at 1%. For the EA 12 country sample, the public debt to GDP threshold is 93.30%, while for the EA 20 country sample, the public debt to GDP threshold is significantly lower, at 51.63%. Additionally, this research uses dynamic panel smooth transition regression model (Table 5) as a robustness check to address the potential endogeneity of public debt. For both EA 12 and EA 20 country samples there is no remaining nonlinearity. The estimated sustainable debt threshold for the EA 12 country sample is 105% and is statistically significant, while for the EA 20 country sample the estimated sustainable debt threshold is 55.2% and is statistically significant. For both EA 12 and EA 20 country samples, the level of sustainable debt threshold is slightly higher than in the baseline estimates, but still robust. For the EA 12 country sample, the effect of low debt (below the estimated sustainable level of 93.30%) is statistically positively significant on economic growth, while the effect of high debt (above the estimated sustainable level of 93.30%) is statistically negatively significant on economic growth. The results for the EA 20 country sample are not statistically significant, although the sign of the public debt variable is positive in the first extreme regime and negative in the second extreme regime and indicates non-linear relationship. The same conclusion can be drawn from a robustness check. As regards the control variables, there are fewer statistically significant in the EA 20 country sample than in the EA 12 country sample and some variable signs are unexpected according to economic theory, such as the openness variable. On the other hand, investment, which is considered an important factor of economic growth (e.g., Liu et al., 2023), is statistically significant in the EA 12 country sample for a public debt below the sustainable threshold, while the effect of public and private investment is negative, but the effect of

total economy investment is positive. The situation might indicate a crowding-out effect, whereas in an estimation framework when public debt is above the sustainable breakpoint, the effect is no longer statistically significant but the coefficients are negative.

Table 2. Linearity test results

Null Hypothesis	EA 12		EA 20	
	F-stat	*p*-value	F-stat	*p*-value
H04: b1 = b2 = b3 = b4 = 0	5.085	0.000	5.057	0.000
H03: b1 = b2 = b3 = 0	5.085	0.000	5.057	0.000
H02: b1 = b2 = 0	5.085	0.000	5.057	0.000
H01: b1 = 0	5.807	0.000	5.913	0.000

Table 3. Panel smooth transition regression estimates (source: author's calculations)

Variable	EA 12		EA 20	
	First regime	Second regime	First regime	Second regime
DEBT	0.059** (0.025)	–0.180*** (0.037)	0.046 (0.055)	–0.025 (0.054)
GOV_EXPEND	–0.303*** (0.054)	0.036 (0.097)	–0.200** (0.080)	–0.053 (0.105)
POP_GROWTH	–0.649 (0.484)	–4.078** (1.512)	–1.794*** (0.406)	0.459 (0.822)
S_GOV	0.387*** (0.099)	0.259 (0.182)	0.516*** (0.150)	0.035 (0.197)
S_PRIVATE	0.016 (0.067)	–0.158 (0.204)	–0.015 (0.083)	0.034 (0.127)
I_GOV	–6.252* (3.170)	–2.361 (16.992)	1.664 (1.351)	–2.728 (1.981)
I_PRIVATE	–5.732* (3.140)	–4.521 (16.887)	3.670** (1.434)	–5.601** (2.071)
I_TOTAL	5.631* (3.136)	4.192 (16.979)	–3.331** (1.415)	5.088** (2.027)
OPENNESS	–0.014* (0.008)	0.034 (0.021)	0.014 (0.010)	–0.005 (0.014)
LTRIR	0.270** (0.124)	–0.459** (0.170)	–0.181 (0.150)	0.243 (0.197)
EMPLOYMENT	0.000*** (0.002)	0.000 (0.001)	0.000 (0.004)	0.000 (0.003)
LN_GDP_PC	2.756*** (0.858)	2.742 (1.820)	–0.808 (0.859)	3.432** (1.286)
TERMS_TRADE	–0.129** (0.055)	–0.073 (0.149)	0.168** (0.077)	–0.289** (0.105)
INFLATION	0.853*** (0.296)	–1.485** (0.658)	0.102 (0.315)	0.749 (0.499)
Threshold	93.30*** (5.366)		51.63*** (6.364)	
Slope	0.17* (0.104)		0.09** (0.032)	

Notes: *, **, *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis.

Table 4. No remaining nonlinearity test

Null Hypothesis	EA 12		EA 20	
	F-stat	*p*-value	F-stat	*p*-value
H04: b1 = b2 = b3 = b4 = 0	1.451	0.160	2.009	0.014
H03: b1 = b2 = b3 = 0	1.451	0.160	2.009	0.014
H02: b1 = b2 = 0	1.451	0.160	2.009	0.014
H01: b1 = 0	1.451	0.160	2.230	0.008

Table 5. Robustness check – dynamic panel smooth transition model (source: author's calculations)

Variable	EA 12		EA 20	
	First regime	Second regime	First regime	Second regime
GDP_GROWTH(-1)	–0.189** (0.077)	0.056 (0.219)	–0.058 (0.088)	–0.032 (0.159)
DEBT	0.091*** (0.016)	–0.207*** (0.044)	0.035 (0.047)	–0.017 (0.048)
GOV_EXPEND	–0.291*** (0.042)	–0.010 (0.122)	–0.200** (0.080)	–0.077 (0.111)
POP_GROWTH	–1.013** (0.452)	–6.249*** (1.697)	–1.834*** (0.385)	0.575 (0.842)
S_GOV	0.526*** (0.094)	–0.060 (0.195)	0.498*** (0.149)	0.065 (0.198)
S_PRIVATE	0.053 (0.064)	–0.394* (0.203)	–0.057 (0.080)	0.106 (0.129)
I_GOV	–5.888* (3.202)	4.441 (19.745)	–1.080 (1.768)	1.192 (2.544)
I_PRIVATE	–6.241* (3.176)	3.570 (19.604)	0.824 (1.800)	–1.740 (2.560)
I_TOTAL	6.250* (3.177)	–3.761 (19.682)	–0.508 (1.787)	1.205 (2.541)
OPENNESS	0.003 (0.005)	0.032** (0.014)	0.013 (0.009)	–0.002 (0.014)
LTRIR	0.284** (0.113)	–0.604*** (0.190)	–0.201 (0.145)	0.203 (0.197)
LN_GDP_PC	1.487** (0.621)	3.903** (1.719)	–0.818 (0.784)	3.646*** (1.281)
TERMS_TRADE	–0.111** (0.051)	–0.080 (0.154)	0.182** (0.070)	–0.315*** (0.102)
INFLATION	0.975*** (0.284)	–1.957** (0.781)	0.154 (0.308)	0.708 (0.505)
EMPLOYMENT			0.000 (0.002)	0.000 (0.001)
Threshold	105*** (1.134)		55.2*** (6.043)	
Slope	0.59 (0.411)		0.09** (0.033)	

Notes: *, **, *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis.

Counter-cyclical fiscal policy has its limits. One of the most important is the crowding-out effect. Namely, when the government increases its spending to stimulate demand, it triggers certain economic processes that lead to a reduction in spending in other sectors of the economy. This makes the government's measures less effective, because the crowding-out effect makes the overall effect of the increase in government spending less significant than it would otherwise have been. It is therefore important how the government finances its spending. In a closed economy, the government borrows domestically and its demand for credit reduces the amount of free financial resources (savings) available to finance business investment and consumer consumption and increases the interest rate on the financial market. This both means that businesses will be able to finance less investment than before and that households will be less able to increase their consumption because of the shortage of debt. In an open economy, a country can of course borrow abroad. This avoids direct effects on the domestic financial market, but triggers indirect effects. Borrowing abroad increases the inflow of foreign money into the economy and thus creates upward pressure on the domestic currency, which inhibits domestic exports. Domestic exports becomes less profitable, and when domestic exporters raise the prices of their products, they become less competitive and thus lose their market share. Another limitation of countercyclical fiscal policy is that the response of economic operators to fiscal policy measures depends not only on the measures but also on the expectations of

economic operators. When the government deficit increases and thus domestic aggregate demand increases, domestic interest rates rise and savings increase. In the short term, the crowding-out effect can be mitigated by monetary policy, which lowers interest rates and thus mitigates the impact of higher government borrowing on domestic interest rates (e.g., Mackiewicz, 2023; Alesina & Perotti, 1997; Afonso & Alves, 2015).

Additionally, we investigated public debt channels to affect economic growth. We focused on private and public investment for both EA 12 and EA 20 country samples. The results for public and private investment are shown only for the EA 12 sample, as the results for the EA 20 sample are inconclusive. In the specification for public investment, I – general government is considered the dependent variable, while public debt is considered the threshold variable and I – private, the lagged natural logarithm of GDP per capita, openness, the lagged long-term real interest rate, the lagged government revenue and GDP growth are seen as control variables. In the private investment specification, I – private is considered the dependent variable, while public debt is taken as the breakpoint variable and I – government, GDP growth, GDP per capita, taxes, openness, long-term nominal and real interest rates, credit and terms of trade are seen as control variables. The specifications follow Checherita-Westphal and Rother (2012). The empirical results of the public and private investment channels are presented in Table 6.

Table 6. Public and private investment channels for EA 12 (source: author's calculations)

Variable	Private investment		Variable	Public investment	
	First regime	Second regime		First regime	Second regime
DEBT	–0.240*** (0.055)	0.160*** (0.053)	DEBT	0.122 (0.249)	–0.006 (0.379)
I_GOV	–0. 883* (0.491)	1.395** (0.553)	I_PRIVATE	–0.396 (0.425)	0.719* (0.373)
GDP_GROWTH	0.153 (0.109)	–0.292** (0.134)	LN_GDP_PC(–1)	3.892 (4.035)	–7.430 (4.393)
GDP_P_C	0.000 (0.003)	0.000 (0.054)	OPENNESS	0.002 (0.014)	–0.016 (0.018)
TAXES	–0.152 (0.099)	0.259 (0.271)	LTRIR(-1)	–0.150 (0.223)	0.252 (0.268)
OPENNESS	–0.029** (0.013)	0.051*** (0.015)	GOV_ REVENUE(–1)	–0.071 (0.131)	0.101 (0.179)
LTNIR	0.354 (0.313)	0.255 (0.369)	GDP_ GROWTH(–1)	–0.215 (0.283)	0.310 (0.340)
LTRIR	–0.251 (0.169)	–0.392 (0.256)			
CREDIT	0.043*** (0.014)	–0.076*** (0.018)			
TERMS_TRADE	0.329*** (0.049)	–0.077 (0.056)			
Threshold	60.76*** (2.619)			37.80 (2.538)	
Slope	0.18*** (0.059)			0.01 (0.006)	

Notes: *, **, *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis.

The results for the public investment channel indicate a non-linear impact of public debt on public investment, with public debt to GDP sustainable threshold now much lower (37.80%), although the relationship is not statistically significant. Nevertheless, above the sustainable threshold, a negative association prevails, which could be the result of fiscal consolidation efforts where governments cut public investment spending. Despite insignificant results, in times of ambitious EU "green" goals and its commitment to the twin transition, it is an important question of harmonizing green public investment with fiscal consolidation, which will be tackled in the discussion part. Considering the private investment channel, the results confirm the unsystematic impact of public debt on private investment, while the sustainable threshold for public debt to GDP ratio is now much lower, at 60.76%. Above this sustainable threshold, positive association between public debt and private investment might indicate Ricardian equivalence. The government expects that by increasing its spending it will encourage other sectors in the economy to spend more, as their incomes will also increase due to higher demand (multiplier effect of government spending). Likewise, it expects these sectors to increase their consumption or investment due to the tax cuts, which in turn will increase the disposable income of households and businesses. Additionally, there might be indirect impact through politically motivated decisions by economic policy makers interested in gaining political support and re-election.

5. Discussion and implications

For the EA 12 country sample the results confirm statistically significant unsystematic relationship between public debt and economic growth. The sustainable threshold of this relationship is on average between 93% and 105%. This implies that public debt to GDP above this sustainable threshold would have a negative effect on economic growth. Although insignificant, the results also allow similar conclusions to be drawn for the EA 20 country sample, where the sustainable threshold is significantly lower than that of EA 12 countries (on average between 52% and 55%), which could indicate that more developed Euro area countries consequently have higher debt sustainability thresholds, while for less developed countries the potentially negative effects of high debt can already be seen at lower levels of public debt (e.g., Woo & Kumar, 2015; Albu & Albu, 2021), which calls for even more prudent debt reduction policies. In recent study by Shah et al. (2025) authors used dynamic panel threshold model and divided the sample into two subsamples of countries using the World Bank classification to investigate the effects of public debt on economic growth. Similar to the results of our study authors report significant unsystematic relationship between public debt and economic growth. Their results similarly to ours indicate higher debt threshold for more developed countries than for less developed countries. Morina et al. (2023) emphasize investment as important growth factor and for the OECD countries confirm positive effect of investment on economic growth. Moreover, Mu (2024) point out that green investment is also important factor to build high quality economic growth. Our results confirm the importance of total economy investment in the EA 12 for the below the sustainable debt threshold regime, while the effect of public and private investment is negative. The effect of inflation and long-term interest rate turns negative for the above the

sustainable debt threshold regime. The situation might indicate a crowding-out effect and as suggested by Miyamoto et al. (2020) the strength of infrastructure governance is also a factor to be considered when determining the effects of public investment. Miyamoto et al. (2020) argue that the effect of public investment on output is stronger in countries with stronger infrastructure governance reaching investment efficiency and productivity with stimulating private investment. Contrary, in countries with weaker infrastructure governance crowding-out of private investment, inefficient use of public money and higher debt-to-GDP ratios can influence negative impact on output. Negative effect of population growth might coincide with the results of Brida et al. (2024) indicating the mature economies facing European Commission (2024) with population ageing, decline in working-age population and higher total cost of ageing (pension, health care, long-term care and education expenditure) affecting long-term sustainability of public finances. Burden of government expenditures is particularly important in the context of the reform of economic governance in the EU. Unrealistic fiscal planning practices lead to risks of inefficient public spending and potential difficulties in setting targets in the context of renewed economic governance at EU level. A central element of this will be a multi-annual plan that cannot be changed. It should also be based on realistic forecasts of government fiscal aggregates.

Among other factors, the critical role of independent fiscal institutions should be emphasised. Government budget decisions must be based on economic and tax revenue forecasts that are realistic and independent of political interests, thus building on the quality of the country's institutions that contribute to compliance with fiscal rules and have a moderating role in the debt-growth nexus like political stability and control of corruption (e.g., Cooray & Özmen, 2024; Gómez-Puig & Sosvilla-Rivero, 2024; Căpraru et al., 2024).

In order to strike the right balance between ensuring the sustainability of public finances and enabling adequate support for economic growth, it is important that fiscal rules do not impose unrealistic requirements on the fiscal policy implementation in terms of the speed of public deficit reductions and that they allow for sufficient levels of investment. It is also important that the setting of fiscal targets allows for the implementation of Member States' specificities where warranted, as also shown by the results of our empirical analysis.

Fiscal rules need to be reinstated after the COVID-19 and energy crises, in a form that allows for proper management of public finances and risks in the years to come, because after all, repaying public debt is a heavy burden, especially in times of rising interest rates, and interest money would be better spent on other development priorities. Our analysis of investment channels shows that the sustainable threshold is well below the 93%–105% threshold (see, for example Turan & Iyidogan, 2023). In this context, the potentially positive impact of public debt on economic growth could be achieved if debt were used to finance productive investment.

One of the government's primary objectives in debt management is to establish a well-functioning or liquid market for government securities. With the globalisation of financial markets and the creation of a single monetary area in Europe, it is crucial to attract the right mix of investors to buy government-issued debt, enabling the country to borrow and manage public debt efficiently in the long run. This has important implications for the development of the primary and secondary markets for government securities.

A developed market for government securities brings benefits to the country's financial system as well as to the economy as a whole. As there is usually no purely private interest in providing adequate liquidity, it is essential for the government to play an appropriate role in this area (Bank for International Settlements, 2022).

The role of the Central bank is to ensure the stability of the financial system. If the liquidity of government securities is low, the Central bank cannot effectively manage financial market liquidity through open market operations. Furthermore, information on market conditions provides the Central bank with an adequate basis for deciding on monetary policy measures (e.g., Aguilar et al., 2024).

As the debt manager, the government must ensure that the cost of borrowing is kept low. An efficient, liquid and transparent secondary market for government securities provides the country with benefits when issuing government securities. In fact, it is precisely because of the developed secondary market for government securities that investors demand lower yields on these financial instruments when they are issued as they do not require a so-called illiquidity premium. In addition, a country needs a liquid secondary market for its instruments, even if it manages the country's liquidity through repos or purchases of its financial instruments on the financial market (International Monetary Fund, 2001).

In its role as financial market regulator, the country must create or promote a structure in the government securities market that ensures transparent and fair conduct of business by financial market participants, which is possible in the case of an efficient government securities market.

In the context of the European Green Deal and targets, more green investment will be needed, which will also have to be coordinated for the purpose of fiscal consolidation after the massive fiscal support during the health circumstances of COVID-19 pandemic. The latter will require significant efforts to find a balance between reducing current expenditure and the increased need for green investments. One of the ways to achieve this is, for example, to centrally finance all green investments in the EU through EU bonds, which could ensure persistence with EU targets and defend against greenwashing. Such a green EU fund could, like the Recovery and Resilience Facility (RRF hereafter), exempt grants from tax rules, while loans are not exempt. If the fund would be based on a significant redistribution of resources between Member States, its political feasibility is questionable. In addition to the green investment option mentioned above, the literature also mentions that green investments could be financed by government deficits that would not be subject to fiscal rules, but this requires a prior narrow and clear definition of what counts as green investments in the first place. In any case, such an option would require a revision of legislation that could take years (Wolff & Darvas, 2022).

The European Green Deal and the EU Digital Strategy (European Commission, 2019) set out the foundation for the green and digital transition in the EU, for which a substantial private and public investment will be needed. Cohesion Policy funds are helping Member States to meet these needs and additional support is also provided under the RRF, but further efforts will certainly be needed to mobilise private investment.

The capital markets union (CMU hereafter) is one of the ways to mobilise more private investment. It is a long-term EU project aimed at creating a single capital market across the

EU to ensure the flow of investment and savings between all Member States for the benefit of citizens, businesses and investors.

According to the European Commission (2015), to strengthen investment for the long term, stronger capital markets are needed. With stronger capital markets not only new sources of funding for businesses will be available (including small and medium sized companies, SMEs hereafter) but also the tradition of bank financing in the EU will be complemented. Despite the economic progress made by the EU through the principle of free movement of capital, individual capital markets in the EU are still relatively underdeveloped. With diversified sources of funding, stronger capital markets would help to optimise the spread of risk (e.g., Eichacker, 2023), making European consumers and companies less vulnerable to credit constraints. Financial integration would achieve greater cross-border risk-sharing in the EU, while increasing the competitiveness of European economies.

The creation of a CMU would make it possible for SMEs to access finance as easy as large companies, but it is imperative to converge the cost of investing and access to investment products across all EU Member States. Businesses need easy access to finance in other EU Member States, without unnecessary bureaucratic and legal obstacles to obtaining finance. Barriers preventing companies from obtaining finance on capital markets are present at all levels of financing and limit SMEs from raising finance through equity and debt capital (e.g., High Level Forum on the CMU, 2020; Alonso et al., 2022).

Market-based finance remains constrained in the EU due to inefficiencies and structural biases in the financial system, where there are significant incentives that work in favour of debt finance. Companies' access to the public market is hampered by the many obligations and costs associated with listing on the public market. There is a long-standing trend of declining initial public offerings of shares to the public in the EU, as the public market does not represent an optimal source of funding for SMEs. The lack of easily accessible, reliable, understandable and comparable public information on companies in smaller EU Member States affects the ability of companies to attract investors (e.g., European Commission, 2020b; High Level Forum on the CMU, 2020).

After almost a decade of development, the EU CMU project has resulted in useful legislative proposals, such as the European Single Access Point (ESAP), the European Long-Term Investment Funds (ELTIF), the revision of the Markets in Financial Instruments Regulation (MiFIR) and the Markets in Financial Instruments Directive (MiFID II), which are the most important pieces of EU legislation for regulating investment services and activities in financial markets. The review of this regulatory framework includes the establishment of an EU-wide continuous information system for shares, bonds, listed investment funds and derivatives to increase market transparency and facilitate access to market data. This will give investors access to up-to-date information on transactions across the entire EU. The legislative proposals also include listing rules for companies, in particular SMEs, which aim to make EU public capital markets more attractive to EU companies and to make it easier for companies of all sizes, including SMEs, to list on European stock exchanges (European Council, 2024). This package aims to reduce the administrative burden for companies and facilitate their access to more sources of finance, while maintaining a sufficient level of transparency, investor protection and market integrity (e.g., Maurin et al., 2024).

On the other hand, there has been little progress in terms of the stated objective of promoting market integration through convergence in structural areas such as taxation, insolvency law and pension funding. The momentum to accelerate action towards a capital markets union, beyond mere rhetoric, seems appropriate, because on the one hand it appears as an imperative, reflecting the sense that the EU is lagging behind the dynamics of the US capital market, while at the same time it is about the increasingly pressing needs stemming from the green transition, the climate transition, the technological transition and ensuring the EU's security (e.g., Véron, 2024).

The climate and energy crises highlight the importance of the green transition, in which businesses will play a key role in addition to the EU's commitment. By investing in climate change adaptation and mitigation measures, particularly energy efficiency, businesses can increase their resilience to increasing extreme weather events, reduce energy costs and pursue net-zero emissions targets. The rapidly changing business environment and uncertainty have become a constant that companies must face.

According to the results of the European Investment Bank's Investment Survey (European Investment Bank et al., 2023), 60% of businesses in the EU cite high energy costs as the main barrier to investment, while the security of energy supply in the EU remains uncertain and a potential source of future price volatility. 40% of companies are making investment in energy efficiency, with the highest share of companies in Western and Northern Europe, energy-intensive manufacturing companies and large companies. Only 33% of companies have insured their businesses against physical risks or extreme weather events. European companies have mixed views about the impact of green transition on their business. Only 29% are optimistic. In particular, there is a lot of uncertainty and risk associated with companies' green investment decisions, including falling demand and tighter financing conditions. Energy prices remain volatile against a backdrop of supply and demand fluctuations, and inflation trends are uncertain.

Implications for economic policy are severalfold. The challenges faced by the economic policy framework have been aggravated by the COVID-19 crisis. Possibilities to reduce public debt ratios were limited as the crisis required response to avoid from the worst scenarios. At the same time, criticism has been repeatedly raised in the ongoing debate regarding renewed economic governance framework that fiscal rules have excessively emphasized austerity so far. Consequently, Member States have taken saving measures commonly driven by contraction of public investment. According to the ongoing debate this should not be optimal as the excellence of public finances is important to secure economic growth and development. The EU's temporary fiscal support instruments, together with the counter-cyclical discretionary fiscal policies, have proved successful in mitigating the impact of the crisis, underlining the importance of creating fiscal space under normal economic circumstances that can be used in times of crisis. An effective approach requires policy coordination at all levels. Moreover, the use of vague indicators has become difficult as it has become evident that rules cannot incorporate all possible circumstances. And there are new risks related to the obligation to reduce high debt ratios in a sustainable and growth-friendly way, varying from member state to member state. This spring, the EC adopted fiscal policy guidance for 2024 (European Commission, 2023b) to help Member States prepare their

stability and convergence programmes and strengthen policy coordination. Fiscal policies in the period 2023–2024 need to ensure medium-term debt sustainability and promote a sustainable increase in potential growth. In the event of renewed pressure on energy prices and the extension of support measures, these measures need to be better targeted than in the past, especially to support vulnerable households and businesses. Public finances are geared towards quantification and differentiation and a single operational indicator based on net primary expenditure. Given the high investment needs (public and private), an effective approach to absorbing the RRF (European Commission, n.d.) and other EU funds is needed, especially with regard to green and digital transformation and resilience objectives.

6. Conclusions

The results show the non-linear relationship between public debt and economic growth for the EA 12 country sample is markedly statistically significant. The sustainable threshold for this relationship is on average between 93% and 105%. This implies that public debt to GDP ratios above this sustainable threshold would have a negative effect on economic growth. Although insignificant, the results also indicate similar conclusions for the EA 20 country sample, whose sustainable threshold is significantly lower than that of the EA 12 countries (on average between 52% and 55%), which might indicate that for more developed Euro countries, higher debt sustainability thresholds apply, while for less developed countries, the potentially negative effects of high debt can already be seen at a lower level of public debt, which is the case for even more sensible debt reduction policies.

In light of the negotiations on the fiscal rules reform, which the EU froze during the economic crisis caused by COVID-19, the escape clause will be deactivated at the end of 2023 and the rules on public deficits and debt will come back into force. From the perspective of the impact of public debt on economic growth, the path of debt reduction through fiscal consolidation is relevant and raises the question of public finance quality control framework and the different treatment of Member States.

Moreover, we investigated investment channels for the impact of public debt on economic growth as the European Green Deal and its targets will require higher green investment. Most of this investment will have to be private, but the share of public investment will also be important. For the private investment channel (similarly, though uncharacteristically, indicated for the public investment channel), the sustainable threshold is well below the 93–105% threshold. In this context, the potentially positive impact of public debt on economic growth could be achieved if the debt were used to finance productive investment. Public green investments and their status in the context of fiscal consolidation are also important in this regard. Besides options such as financing green investments through government deficits that would not be counted under fiscal rules, it is necessary to define narrowly and clearly what counts as green investment in the first place.

Various other studies have analysed the relationship between public debt and economic growth. In general, public finances are considered fiscally sustainable if, in the long run, they provide the government with sufficient financial resources to cover all its liabilities. The accumulation of public debt over time leads to an increase in the interest ratio of total

government expenditure, and higher indebtedness can lead to a country's credit rating being downgraded, consequently raising its borrowing costs. Empirical studies suggest unsystematic and concave functional form between the aforementioned variables. However, the ongoing debates on the debt-to-GDP threshold have not yet led to a common consensus on what is sustainable public debt. The state has a major influence on the financial market through its borrowing and management of public debt. An efficient financial system is central to the smooth functioning of the economy and to savings and investment and, on the other hand, to the wealth of people and businesses. Therefore, countries endeavour to ensure the stability of the financial system as a whole through the various ways in which the financial market and the financial system are regulated and supervised. Financial market liquidity is an important lever for maintaining a country's financial stability. Studies have shown that one of the primary objectives in debt management is a liquid secondary market for government securities, which are often seen by investors as a substitute for cash, for example because of the lower transaction costs, the constant supply of securities to buy and sell, and the efficient custody of these financial instruments. Given the high investment needs (private and public), the potential could also be seen in the revival of capital markets union.

Additional challenges to fiscal sustainability in Member States are seen in long-term structural trends like demographic changes and extreme weather events causing pressure to public finances. The renewed economic governance framework should also help Member States address such challenges which call for investment and reforms.

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