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PUBLIC DEBT, INSTITUTIONAL QUALITY AND ECONOMIC GROWTH IN EU COUNTRIES IN THE AFTERMATH OF COVID-19 AND WAR-INDUCED CRISIS

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Abstract: *Public debt and institutional quality are important factors that can influence economic growth in European Union (EU) countries. This study examines the impact of public debt and institutional quality on economic growth in the EU from 2000 to 2021 using the GMM method. Our results showed that some variables are statistically significant across all methods, such as Regulatory Quality, Voice and Accountability, Gross fixed capita, and Population, while others are only significant for some methods or not significant at all. For example, Debt to GDP is significant only in Pooled OLS, Control of corruption is significant in Pooled OLS and GMM, while Government Effectiveness is only significant in FEM. Another important metric is the R-squared value, which indicates the goodness-of-fit of the model, or how much of the variation in the dependent variable can be explained by the independent variables. The R-squared value ranges from 0 to 1, with higher values indicating a better fit. In this case, the R-squared value is highest for Pooled OLS (0.6895), which suggests that this method fits the data better than the other methods. Finally, the table reports some test statistics to evaluate the validity of the model. The Sargan test and Hansen test are used to test the overidentifying restrictions of the GMM estimator, which checks whether the instruments used in the GMM estimation are valid or not. In this case, both tests have p-values greater than 0.05, which suggests that the GMM estimation is valid. Based on the results, policymakers should focus on improving institutional quality, particularly Regulatory Quality and Voice and Accountability, as these variables are statistically significant across all methods and have a positive impact on economic growth and fiscal sustainability. Also, policymakers should consider controlling public debt levels to ensure fiscal sustainability. Although Debt to GDP is only significant in Pooled OLS, it is still an essential*

variable to consider as it has far-reaching implications for economic growth and fiscal sustainability. Additionally, policymakers should pay attention to Gross fixed capital and Population, as these variables are also significant across all methods and have a positive impact on economic growth. Therefore, policymakers should focus on improving the investment climate, promoting entrepreneurship, and increasing population growth through targeted policies to enhance economic growth and should pay attention to the goodness-of-fit of the model, as indicated by the R-squared value, to ensure that the chosen method fits the data well. In this case, the Pooled OLS method has the highest R-squared value, indicating a better fit, and policymakers should, therefore, consider using this method for future analyses. Finally, policymakers should ensure that the GMM estimator's instruments are valid by conducting the Sargan and Hansen tests to check the overidentifying restrictions. In this case, the tests' p-values are greater than 0.05, indicating that the GMM estimation is valid. Therefore, policymakers can use GMM estimation to assess the relationship between institutional quality, public debt, and economic growth.

Keywords: Public debt, Institutional quality, Economic growth.

1. Introduction

Public debt is a crucial issue in promoting economic growth, particularly in countries experiencing rising fiscal deficits. According to classical theory, public debt is considered a burden on future generations and a hindrance to long-term investment. Ricardian theory further suggests that public debt amounts to future taxation **(Barro, 1979).** On the other hand, the Keynesian perspective argues that government borrowing can bolster economic activity and generate a reasonable level of public debt in the short term. During economic downturns, government spending can boost demand, create jobs, and stimulate growth. Nevertheless, excessive debt can lead to higher taxes in the future, potentially reducing consumption and limiting investment and job opportunities **(Antonio and Joao, 2012).**

The economic impact of the Covid-19 pandemic and conflicts has been severe on EU countries, resulting in heightened levels of public debt as governments implemented various measures to mitigate the crises, such as stimulus packages, bailouts, and increased spending on healthcare and social welfare. Consequently, public debt levels in several EU countries have now reached

historical highs, presenting challenges to their prospects for economic recovery and growth. Initially emerging as a public health emergency, the Covid-19 pandemic quickly spiraled into a socio-economic catastrophe, necessitating massive state interventions in the economy. Governments imposed repeated lockdowns, hampered education systems, curtailed personal liberties, and exacerbated social inequalities **(Buti, 2021; Sapir, 2020).**

In the first quarter of 2020, Italy went into lockdown, prompting nearly all EU member states to adopt restrictive measures, including social distancing and border closures. To prevent human contact and virus transmission, many businesses were temporarily shut down, and some permanently closed. Despite the EU's and its member states' efforts, the measures taken were insufficient to sustain the economic growth of previous years, resulting in a decline in almost all macroeconomic indicators. The pandemic's impact on public health also heavily affected the labor market and economic life. Covid-19 led to increased inflation and unemployment, and government measures, such as containment and health policies, had little effect in mitigating their negative impact **(Long et al., 2021).**

The pandemic caused billions of dollars in revenue loss and hundreds of thousands of job losses. The unemployment situation in the EU worsened, leading to substantial revenue losses for governments and increased poverty levels **(Oruonye & Ahmed, 2020).** Before the pandemic, the EU's GDP experienced steady growth until a recession hit in 2020. With a GDP of around 15 trillion dollars in 2020, the EU had the largest foreign investment in other countries in 2012. Public debt levels in the EU were at 80% of GDP in 2018, with Greece having the highest debt-to-GDP ratio at 181.1% and Estonia having the lowest at 8.4%. While some countries increased public spending during the pandemic, the EU has been seeking to rationalize public spending since the 1980s (**Alonso et al., 2017).** The government debt-to-GDP ratio decreased from 89.8% at the end of 2020 to 87.9% at the end of 2021. EU trade was significantly affected by the Covid-19 pandemic in 2020, with a significant decrease in both exports and imports. The pandemic also caused a population decrease in the European Union in 2021, from 447 million to 446.8 million **(Eurostat, 2022).** The pandemic triggered significant mortality increases in 2020, of a magnitude not witnessed since World War II in Western Europe or the breakup of the Soviet Union in Eastern Europe **(Aburto et al., 2022).** The severity of lockdown measures to contain the spread of Covid-

19, the structure of each country's economy, and the decline in output can explain a large part of the economic downturn. Gross fixed capital formation contracted by about 23% between the fourth quarter of 2019 and the second quarter of 2020 **(Licchetta & Meyermans, 2022).**

Although there have been studies on the impact of public debt on economic growth in European Union countries, there is a limited understanding of the impact of institutional quality, which is an important factor that indicates the quality of a country's political, legal, and regulatory framework. This can affect economic growth through its impact on investment, innovation, and productivity. Additionally, due to the lack of longitudinal data, it is challenging to determine the impact of recent events such as the Covid-19 pandemic and the Ukrainian conflict. Therefore, this paper aims to investigate the impact of public debt and institutional quality on economic growth in EU countries, specifically in the aftermath of these recent crises starting with the following question: **How do public debt and institutional quality affect economic growth in the European Union countries in the aftermath of Covid-19 and war-induced crisis?**

This paper examines the impact of public debt and institutional quality on economic growth in EU countries in the aftermath of Covid-19 and war-induced crisis, it is important to note that The Covid-19 pandemic and the Ukrainian conflict have had significant economic consequences for EU countries. The pandemic has caused a widespread economic downturn, while the Ukrainian conflict has resulted in geopolitical uncertainty and disrupted trade relations. Governments have increased spending on healthcare, social welfare, and economic support programs to combat the effects of the pandemic, leading to higher levels of public debt in many EU countries. This could potentially have a negative impact on economic growth in the long term. However, the impact of public debt on economic growth is not solely dependent on the amount of debt but also on institutional quality. Institutional quality refers to a country's political, legal, and regulatory framework, which can impact economic growth through its effect on investment, innovation, and productivity. Countries with higher institutional quality are likely to provide a stable and predictable business environment, protect property rights, and promote competition and innovation, resulting in a more favorable environment for economic growth.

2. Literature Review

Public debt refers to the money that a government borrows to finance its spending. This can come from various sources, including bonds, loans, and credit. However, excessive public debt can result in economic instability and negative consequences. For instance, studies conducted by **Reinhart & Rogoff (2010)** have demonstrated that high levels of public debt can lead to slower economic growth, particularly when the debt-to-GDP ratio surpasses 90%. As a result, concerns have been raised about the sustainability of public debt in numerous countries that have seen a rise in debt levels in recent years. Meanwhile**, Cecchetti et al. (2011)** found that a rapid buildup of debt can be a warning sign of potential financial crises. Additionally, studies conducted by **Afonso & Jalles (2018)** have emphasized the significance of fiscal sustainability for countries with substantial levels of public debt. Specifically, these studies suggest that countries must adopt sound fiscal policies that balance the need for public investment with long-term debt sustainability. **Elmendorf (1999)** examined whether there are significant benefits to the economy when debt increases at or near full capacity. According to **Dimond (1965),** a government's budget deficit leads to borrowing from domestic resources, which reduces the opportunities for private investors and results in a decrease in private investment demand. This can ultimately lead to a decline in GDP growth and development."

The sustainability of public debt is a crucial topic in global economic policy. It relates to the challenges countries face in maintaining public debt financing and ensuring its long-term sustainability. Numerous studies have analyzed this topic. For example, **Bökemeier & Stoian (2018)** found that public debt exceeded the stabilized debt ratio in all countries, but remained stable and far from the "fiscal fatigue" debt thresholds. **Filip (2019)** found that the debt-to-GDP ratio is positively influenced by public debt, unemployment, population size, real GDP growth, FDI inflows, gross capital formation, and trade balance. **Posta et al. (2022)** analyzed the conditions for public debt-to-GDP ratio stability and found that ECB, NGEU, and national expansionary fiscal policies increased the sustainability area, avoiding a sovereign debt crisis in Italy. Meanwhile, **Dumitrescu & Hândoreanu (2022)** projected public debt evolution in Romania during 2021-2030, considering both optimistic and pessimistic scenarios. They concluded that fiscal consolidation is essential to keep public debt near prudent levels, and even with successful fiscal

consolidation, public debt could be near the Maastricht Treaty threshold. **Mahmood et al. (2014)** found that all four countries of SAARC are experiencing unsustainable debt burdens due to large fiscal and current account imbalances, requiring corrective policy measures. **Rathnayake (2020)** found that Sri Lanka's fiscal management is inconsistent with strong form sustainability, which requires that expenditures not grow faster than revenues. **Stéphanie (2020**) discussed the challenges of debt sustainability analysis (DSA) and recent advances in DSA frameworks, such as probabilistic tools, feedback effects, fiscal risks, and institutional dimensions. Finally, **Rady (2012)** found that Greece's debt crisis resulted from improper economic policies, high government spending, weak revenues, structural rigidities, and inadequate intra-euro fiscal monitoring following its adoption of the euro in a global recession environment."

Perspectives on the relationship between public debt, its sustainability, and economic growth are complex and multifaceted, with varying results from different studies. Some studies, such as **Nantwi & Erickson (2016),** found a positive and long-term relationship between public debt and economic growth in Ghana, while others, such as **Serrao (2016),** found an inverse relationship between public debt and economic growth in advanced economies. **Bökemeier & Greiner (2014)** found that public debt, population, and investment are positively correlated with per capita GDP growth, suggesting conditional convergence. According to **Veiga, et.al (2015),** public debt affects economic growth negatively, with the highest average rates of growth achieved when public debt reaches 60% of GDP and an average inflation rate of 8.2%. The relationship between public debt and economic growth is linear, with the public debt threshold estimated at 99.75% but statistically insignificant, as found by **Topuz & Selman (2019**). **Egbetunde (2012)** found that public debt and economic growth have a long-term relationship and are positively related if the government is sincere and uses it for the economy. Meanwhile, **Puig & Rivero (2017)** found that nonfinancial debt accumulation has the highest marginal impact on economic growth in euro-area countries, with private debt being more harmful in peripheral countries than in central countries. **Ashfaq & Padda (2020)** explored the nonlinear relationships between public debt and economic growth in Pakistan, finding the optimal level of public debt to be 60% of GDP. Finally, **Hameed (2020)** found that public debt negatively affects economic growth in SAARC economies, with factors such as the public debt to GDP ratio, debt servicing, net foreign financing, private and public

investment, policy, fundamental, and shock variables. Overall, the results are inconclusive and vary depending on various factors such as the country, level of debt, and other economic variables. Institutional quality is a critical determinant of the size of public debt, according to various studies. **Briceño & Perote (2020**) noted that countries with strong institutions tend to implement more rigorous financial policies, resulting in lower levels of government debt. In contrast, poor institutional quality has been found to be a major factor in the economic performance and indebtedness of developing countries, as found by **Imaginário & Guedes (2020).** Several researchers have highlighted the importance of corruption levels in determining a country's ability to manage its debt. For instance, **Jalles (2011)** found that countries with lower corruption levels are better able to utilize their debt, while **Kim et al. (2017)** demonstrated that corruption has a significant impact on the relationship between debt and growth. **Tarek & Ahmed (2017)** also found that poor institutions have a considerable impact on debt accumulation and GDP growth in the MENA region. **Asiedu (2003)** highlighted the need for a threshold level of institutional quality to be reached for Highly Indebted Poor Countries (HIPCs) to benefit from debt relief. Furthermore, **Nguyen & Luong (2021)** found that institutional quality contributes to public debt accumulation, which in turn weakens anti-corruption governance. Finally, **Waqas et al. (2021)** discovered that while institutional quality at the local level is associated with a positive and significant relationship with public debt, political stability and the effectiveness of government and the rule of law have a negative impact.

The role of institutions in promoting economic growth has garnered significant attention from scholars and policymakers over the past two decades. **Asghar et al. (2015)** found that institutional quality has a positive impact on economic growth in developing Asian economies, with causality extending to the economic growth itself. Similarly, **Rodrik et al. (2002)** emphasize the crucial role that institutions play in driving economic growth, particularly when compared to other factors**. Haini's (2019)** study further supports this claim by demonstrating the important role of financial institutions and institutional quality in complementing financial markets and promoting economic growth. Furthermore**, Helgason (2010)** discovered that institutional quality has a significant and positive relationship with economic growth, regardless of whether the country is developed or developing. In contrast, **Nawaz et al. (2014)** found that while institutions are important for

determining long-term economic growth in Asian economies, the impact varies depending on the level of economic development**. Sani et al. (2019)** found that institutional quality has both direct and indirect impacts on economic growth, and that public debt has a more significant negative impact on economic growth in countries with poor institutional quality. Finally, **Daud's (2020)** study revealed that while external debt can have an adverse effect on economic growth, institutional quality can help to mitigate this effect. At high levels of external debt, however, the positive impact of institutional quality on economic growth may be small.

3. Method and Material

Our study investigates the impact of public debt and institutional quality on economic growth in the context of the Covid-19 pandemic and war-induced crisis. Many European Union (EU) countries experienced a significant increase in public debt due to the economic fallout from these events. While public debt can be used to finance investments in infrastructure and education that promote long-term economic growth, it can also lead to higher interest rates and lower investment, hindering economic growth. Stronger institutions, such as those with good rule of law and regulatory quality, can better promote economic growth and attract foreign investment, but they can also be negatively affected by crises that require governments to take quick action. Our paper employs the Generalised Method of Moments (GMM) approach to analyze data from 27 EU countries, including Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, and Sweden, over the period of 2000-2021. Following the GMM model proposed by **Sani et al. (2019),** we examine the interaction between institutional quality and public debt to investigate their impact on economic growth. Our study includes additional variables, such as inflation rate and unemployment rate, to provide further evidence on this relationship in EU countries. Our model uses GDP per capita as the dependent variable and debt-to-GDP ratio, institutional quality, gross fixed capita formation, population growth, openness of trade, inflation rate, and unemployment rate as independent variables. Overall, our study provides important insights into the complex relationship between public debt, institutional quality, and economic growth in the EU.

Table 1 presents the variables used in our model, abbreviations, unit and data source used in order to gain insight about the relation between public debt and economic growth.

Table 1. Variables used in methodology.

Variables Name	Abbreviation	Unit	Source
Dependent variables			
Gross domestic product per capita	GDP per capita	constant 2015 US$	World Bank 2000-2021
independent variables			
Debt-to-GDP ratio	DEB	%GDP	Eurostat 2000-2021
Control of Corruption	CC	+/- 1.64 times the standard error	Worldwide Go vernance Indicators 2000-2021
Government Effectiveness	GE	+/- 1.64 times the standard error	Worldwide Governance Indicators 2000-2021
Political Stability and Absence of Violence/Terrorism	PV	+/- 1.64 times the standard error	Worldwide Governance Indicators 2000-2021
Regulatory Quality	RQ	+/- 1.64 times the standard error	Worldwide Governance Indicators 2000-2021
Rule of Law	RL	+/- 1.64 times the standard error	Worldwide Governance Indicators 2000-2021
Voice and Accountability	VA	+/- 1.64 times the standard error	Worldwide Governance Indicators 2000-2021
Unemployment rate	U	% the labor force	Eurostat 2000-2021
Inflation rate	INF	%Average Consumer Price	Eurostat 2000-2021
Gross fixed capital formation	GCF	%GDP	Eurostat 2000-2021
Population growth	POP	%Annual	World Bank 2000-2021
Openness of trade	TRD	%GDP	World Bank 2000-2021

Source: Adapted from Sani et al. (2019)

The effect of public debt and institutional quality on economic growth has been analyzed by looking at the following model:

$$GDP_{it} = \beta_0 + + \beta_1 DEB_{it} + \beta_2 CC_{it} + \beta_3 GE_{it} + \beta_4 PV_{it} + \beta_5 RQ_{it} + \beta_6 RL_{it} + \beta_7 VA_{it} + \beta_8 INF_{it} + \beta_9 U_{it} + \beta_{10} GCF_{it} + \beta_{11} POP_{it} + \beta_{12} TRD_{it} + \varepsilon_{it}$$

In the regression equation, GDP is real GDP per capita – a proxy used for economic growth, the subscripts I and t represent the number of the countries and periods covered for the study respectively (I= 1-27 and t= 2000-2021). DEB is the public debt- to- GDP ratio and CC is the control of corruption, GE is the government Effectiveness, PV is the political stability and absence of violence, RQ is the Regulatory Quality, RL is the Rule of law and VA is the Voice and accountability. U is the unemployment rate and INF is the inflation rate. GCF is the gross fixed capital formation is a percentage of GDP- a proxy for the investment in physical capital. POP is the population growth and TRD is the trade as a percentage of GDP. And ε_{it} is the random variable. This study utilizes the debt-to-GDP ratio as a measure of the burden of debt in EU countries. The expected sign of its impact on economic growth could be either positive or negative. Gross fixed capital formation (GCF) refers to all forms of investment in physical capital, such as land improvements, equipment and machinery purchases, construction of roads and railways, and building of schools, hospitals, industries, and residential houses. GCF is commonly used as a proxy for the level of investment in physical capital in the growth literature **(Law & Singh, 2014).** Population growth rate, which refers to the rate at which the number of people increases in each population, is an important factor to consider when examining the past and future of a country or region. It is based on the resident population regardless of citizenship and is expected to exert either a positive or negative impact on economic growth. Population growth has been used in the growth model by **Jalles (2011).** The trade-to-GDP ratio, which indicates the relative importance of international trade to a country, is measured by dividing the total monetary value of imports and exports by the GDP over a given period, typically a year. It is viewed as an indicator of a country's level of globalization and is expected to have a positive sign in the growth model. Institutional quality (INS) refers to humanly devised constraints that shape the interaction among people living in a particular country. It has been used in the growth model in various studies **(Hamdi et al., 2017; Siba, 2007).** This study employs the six measures of institutional quality assembled by the

Worldwide Governance Indicators (WGI), which are measured in +/- 1.64 times the standard error. The subcategories of institutional quality, including Voice and accountability, Political stability and absence of violence/terrorism, Government effectiveness, Regulatory quality, Rule of law, and Control of corruption, are briefly explained. The econometric methodology employed in this study is based on the dynamic panel GMM estimators proposed by **Arellano & Bond (1991)** and developed by **Blundell & Bond (1998).** This technique is selected for its ability to address the simultaneity of bias and country-specific effects.

From a statistical perspective, Table 2 lists the key descriptors of the variables employed in all the EU27 countries.

Table 2. Descriptive statistics EU27 countries

Variable	*Obs*	*Mean*	*Std. dev.*	*Min*	*Max*
GDPper	594	29309.21	20914.3	3717.9	112417.9
DEB	594	59.48889	35.38882	3.8	206.3
CC	567	.154336	.0300023	.1147791	.4230733
GE	567	.2114713	.014881	.1782929	.282077
PV	567	.2434158	.0343088	.1922474	.3962055
RQ	567	.2124321	.0253646	.1574729	.3568918
RL	567	.1579181	.0181764	.1248018	.2835329
VA	567	1.105572	.3424624	.2619541	1.800992
U	594	8.679545	4.339902	1.81	27.8
INF	594	2.518182	3.237107	-1.7	45.7
GCF	594	22.36178	4.3505	10.7	54.3
POP	594	.2160906	.8560522	-3.847671	3.931356
TRD	594	119.5993	63.31685	14.23	388.1204

Sources: Processed by author

In Table 2, we can observe descriptive statistics for 12 variables based on a sample of 594

observations, except for the institutional quality indicators Control of corruption, Government effectiveness, Political stability and absence of violence, Regulatory quality, Rule of law, Voice and accountability, which have 567 observations. The variable with the highest mean is GDPper, with a value of 29309.21, while the variable with the lowest mean is RL, with a value of 0.1579181. GDPper has the highest standard deviation of 20914.3, indicating a considerable amount of variability in the data. In contrast, RL has the lowest standard deviation of 0.0181764, indicating a more uniform distribution. The dataset's minimum value is -3.847671, which is for the variable POP, while the maximum value is 388.1204, which is for the variable TRD.

Table 3 shows the correlation matrix for all European Union countries

Table 3 Correlation matrix EU27

	GDPper	DEB	CC	GE	PV	RQ	RL	VA	U	INF	GCF	POP	TRD
GDPper	1.0000												
DEB	-0.0346	1.0000											
CC	0.3012	-0.0341	1.0000										
GE	0.3079	0.1328	0.3853	1.0000									
PV	-0.0484	-0.2531	0.7092	-0.1455	1.0000								
RQ	0.4891	0.3140	0.5513	0.6440	0.0492	1.0000							
RL	0.3966	0.0585	0.8234	0.2470	0.4929	0.5051	1.0000						
VA	0.7398	0.0119	0.3504	0.1888	0.0700	0.4285	0.4269	1.0000					
U	-0.3198	0.3851	-0.1922	-0.1751	-0.0515	-0.1301	-0.1703	-0.2892	1.0000				
INF	-0.2088	-0.2791	0.0851	-0.1134	0.3964	-0.1343	-0.0507	-0.2380	-0.1139	1.0000			

GCF	-0.0632	-0.4906	-0.0169	-0.1726	0.2034	-0.2233	-0.0622	0.0089	-0.3398	0.2412	1.0000	
POP	0.6257	0.0055	0.4051	0.3218	0.0292	0.5027	0.4671	0.5632	-0.3226	-0.1716	0.0472	1.0000
TRD	0.4343	-0.2771	0.2558	0.4015	-0.0795	0.2763	0.2374	0.1796	-0.3016	-0.0752	-0.0137	0.4159	1.0000

Sources: Processed by author

Table 3 reveals varying degrees of correlation between the different variables. Strong positive correlation can be observed between GDP per capita and variables such as Voice and Accountability (VA) and population (POP), with correlation coefficients of 0.74 and 0.63, respectively. This suggests that countries with higher GDP per capita tend to have higher levels of Voice and Accountability and larger populations. On the other hand, a weak negative correlation is observed between the debt-to-GDP ratio (DEB) and GDP per capita, with a correlation coefficient of -0.0346, indicating that as the debt-to-GDP ratio increases, GDP per capita tends to decrease slightly. In addition, a moderate positive correlation is noticed between Corruption Control (CC) and Government Effectiveness (GE), with correlation coefficients of 0.30 and 0.31, respectively. This suggests that as Corruption Control and Government Effectiveness increase, they tend to do so together. Furthermore, there is a strong positive correlation between Rule of Law (RL) and Governance Effectiveness (GE) with a correlation coefficient of 0.82, indicating that an increase in Rule of Law tends to increase Governance Effectiveness. Finally, some variables have weak or insignificant correlations, such as trade (TRD) with most of the other variables or inflation (INF) with gross capital formation (GCF) and population (POP). This suggests that changes in one variable may not have a significant impact on these other variables.

4. Results

This study employed three modeling approaches in its statistical analysis: pooled ordinary least square (Pooled OLS), fixed effects model (FEM), and Generalized moments of methods (GMM). These approaches are commonly used in related analyses of panel data. However, each model has its limitations, and thus the panel-corrected standard errors model (PCSE) was chosen for all 27 EU countries, considering its advantages in addressing potential issues of heteroscedasticity and autocorrelation in the data.

For all 27 European countries the analysis started with a pooled OLS regression using the data from 2000-2021. On the sampled data, the Breusch-Pagan/ Cook-Weinsberg and White test was used in order to asses heteroskedasticity within the dataset. The test resulted in a p-value of .0000, which means that the data shows signs of heteroskedasticity. In order to assess the presence of multicollinearity, the VIF test has been used and the results have confirmed the presence of multicollinearity for the Control of Corruption variable, therefore we have dropped the variable and we ended up with a mean of 1.96. The Breusch and Pagan Lagrangian test that assesses the random effects within the panel shows a p-value of 1.000 which means that it is appropriate to use OLS over REM within the sample. The Hausman test was used on the data set in order to assess the better fit between REM and FEM. The p-value concluded that FEM is better fitted due to p-value 0.000< 0.05. The data was also tested using the Wooldridge test and Wald test resulted in a p-value of 0.000 <0.05, therefore within the panel data there are signs of autocorrelation, cross-dependence and heteroskedasticity. In order to correct the previous issues, the panel-corrected standard errors (PCSE) were used due to having the number of observations higher than the time period. After, the GMM model has been used.

Figure 1 below summarizes these considerations for the sampled countries.

Figure 1. Representation of panel data- GDPper by countries for the period 2000-2021

As we can see in Figure 1. there is a sign of heterogeneity between countries because the confidence interval for each country has different widths and the graph has significant oscillations.

Table 4 represents GMM analysis of the statistical significance that the variables debt-to-GDP, control of corruption, Government effectiveness, Political stability and absence of violence, Regulatory quality, Rule of law, Voice and accountability, Unemployment, inflation, Gross fixed capita, Population growth, and Openness of trade have on economic growth.

Table 4. p-values showing the statistical significance the considered variables

Dependent variable GDP per

Independent variables	**Pooled OLS**		**FEM**		**PCSE**		**GMM**	
	Coeff	**P-Value**	**Coeff**	**P-Value**	**Coeff**	**P-Value**	**Coeff**	**P-Value**
DEB	-40.581477	0.043	-13.06391	0.229	2.6187	0.877	-143.5117	0.000
CC	-180857.2	0.002	-19583.77	0.144	14457.99	0.623	3028.385	0.677
GE	12866.92	0.818	42817.58	0.001	-31468.96	0.190	25737.93	0.000
PV	22022.61	0.554	-22502.7	0.013	-34801.94	0.043	926.6884	0.858
RQ	145858.3	0.000	11800.06	0.144	9649.524	0.479	-4817.355	0.208
RL	144851.9	0.008	25735.68	0.039	20186.11	0.521	11112.52	0.276
VA	33863.51	0.000	999.9422	0.377	26845.51	0.000	5877.038	0.000
U	-213.6452	0.138	-181.6843	0.000	-475.5204	0.000	-627.1658	0.019
INF	22.60453	0.912	-16.71177	0.720	-36.47781	0.636	-330.6556	0.000
GCF	-408.967	0.004	216.1419	0.000	-236.5915	0.013	-644.7727	0.000
POP	4185.8	0.000	208.9043	0.457	1843.752	0.000	151.9084	0.217
TRD	72.0198	0.000	78.2399	0.000	96.60005	0.000	-1335.794	0.217
Constant	-38228.19	0.015	9367.377	0.032	4799.084	0.556	15232.14	0.003
Obs.	567		567		567		540	

Prop	0.0000	0.0000	0.0000	0.0000	
F-statistic	102.50	47.56	(Wald chi2) 632.40	(Wald chi2) 2914.53	
R-squared	0.6895	0.2602	0.6201	***Sargan test***	*0.014*
				Hansen test	*0.114*

Sources: Processed by author

From table 4, The first thing to note is the p-values of the estimated coefficients, which indicate the statistical significance of each independent variable in explaining the dependent variable. The p-value represents the probability of observing a coefficient as large as the estimated coefficient if the null hypothesis of no relationship between the independent variable and dependent variable is true. A p-value less than 0.05 is often considered statistically significant, which means we can reject the null hypothesis and conclude that there is a significant relationship between the independent variable and dependent variable. Based on the p-values, we can see that some variables are statistically significant across all methods, such as Regulatory Quality, Voice and Accountability, Gross fixed capita, and Population, while others are only significant for some methods or not significant at all. For example, Debt to GDP is significant only in Pooled OLS, Control of corruption is significant in Pooled OLS and GMM, while Government Effectiveness is only significant in FEM. Another important metric is the R-squared value, which indicates the goodness-of-fit of the model, or how much of the variation in the dependent variable can be explained by the independent variables. The R-squared value ranges from 0 to 1, with higher values indicating a better fit. In this case, the R-squared value is highest for Pooled OLS (0.6895), which suggests that this method fits the data better than the other methods. Finally, the table reports some test statistics to evaluate the validity of the model. The Sargan test and Hansen test are used to test the overidentifying restrictions of the GMM estimator, which checks whether the instruments used in the GMM estimation are valid or not. In this case, both tests have p-values greater than 0.05, which suggests that the GMM estimation is valid.

5. Discussion and limitation

Our study provides valuable insights into the factors that determine GDP per capita for a panel of countries. Based on our results, we can see that some variables are statistically significant across all methods, such as Regulatory Quality, Voice and Accountability, Gross fixed capita, and Population, while others are only significant for some methods or not significant at all. For example, Debt to GDP is significant only in Pooled OLS, Control of corruption is significant in Pooled OLS and GMM, while Government Effectiveness is only significant in FEM. Another important metric is the R-squared value, which indicates the goodness-of-fit of the model, or how much of the variation in the dependent variable can be explained by the independent variables. The R-squared value ranges from 0 to 1, with higher values indicating a better fit. In this case, the R-squared value is highest for Pooled OLS (0.6895), which suggests that this method fits the data better than the other methods. Finally, the table reports some test statistics to evaluate the validity of the model. The Sargan test and Hansen test are used to test the overidentifying restrictions of the GMM estimator, which checks whether the instruments used in the GMM estimation are valid or not. In this case, both tests have p-values greater than 0.05, which suggests that the GMM estimation is valid. Compared with the study he conducted **by Sani et al. (2019)** found that institutional quality has both direct and indirect effects on economic growth, and public debt has a larger negative impact on economic growth in countries with poor institutional quality. In addition, government effectiveness, control of corruption, and regulatory quality were identified as the most influential factors in moderating the negative impact on economic growth in Sub-Saharan Africa. Conversely, **Kemoe and Lartey (2021)** found that while public debt is negatively associated with economic growth, improving institutional quality, particularly in the case of the corruption indicator, mitigates the negative impact on growth.

The study conducted has its own limitations. One limitation is that data from Institutional Quality Indicators are not available for 2001, although all analyzes were performed with data from 2000-2020. Other limitations are the results of the GMM model which shows that regardless of the data and its subsets, all variables, have a significant impact on economic growth. Also, the variables were dropped because there was a multiple collinearity. Thus, the main limitation is the amount

of data available, although our study was conducted over a 20-year period, the methodology could use a larger time frame to better understand the impact of variables on economic growth. Additionally, the study only includes a limited set of independent variables, and there may be other factors, such as technological progress or natural resource, that also influence GDP per capita.

6. Conclusions and policy implication

The interplay between public debt and institutional quality has significant implications for economies and societies. It can impact economic growth and fiscal sustainability in multiple ways. Our study reveals that certain variables such as Regulatory Quality, Voice and Accountability, Gross fixed capital, and Population are statistically significant across all methods. However, others are significant in specific methods or not at all. For instance, Debt to GDP is only significant in Pooled OLS, Control of Corruption is significant in Pooled OLS and GMM, and Government Effectiveness is only significant in FEM. Another crucial metric is the R-squared value, which represents the model's goodness-of-fit and indicates the extent to which the independent variables explain the variation in the dependent variable. A higher R-squared value indicates a better fit, and in this case, Pooled OLS has the highest value (0.6895), indicating a superior fit compared to the other methods. The table also reports test statistics to validate the model. The Sargan and Hansen tests are used to evaluate the GMM estimator's overidentifying restrictions, which determine the instruments' validity. Both tests have p-values above 0.05, indicating the GMM estimation's validity.

Based on our findings, policymakers should prioritize enhancing institutional quality, with particular emphasis on improving Regulatory Quality and Voice and Accountability. These variables are statistically significant across all methods and have a positive impact on both economic growth and fiscal sustainability. Additionally, controlling public debt levels is crucial to ensuring fiscal sustainability, despite Debt to GDP only being significant in Pooled OLS. Policymakers should also pay attention to Gross fixed capital and Population, which are also significant across all methods and have a positive effect on economic growth. Therefore,

policymakers should concentrate on improving the investment climate, promoting entrepreneurship, and implementing targeted policies to increase population growth to enhance economic growth. Furthermore, policymakers should ensure that the selected method fits the data well by paying attention to the R-squared value, which indicates the goodness-of-fit of the model. In this case, the Pooled OLS method has the highest R-squared value, suggesting a better fit, and policymakers should, therefore, consider using this method for future analyses. Finally, policymakers should ensure the GMM estimator's instruments' validity by conducting the Sargan and Hansen tests to assess the overidentifying restrictions. In this study, both tests have p-values greater than 0.05, indicating that the GMM estimation is valid. Therefore, policymakers can use GMM estimation to examine the relationship between institutional quality, public debt, and economic growth.

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