Public Spending Efficiency in time of Sanctions: Evidence from Developing Countries

Abstract

In this time of sanctions, this study analyzes the relationship between economic sanctions and Public Spending Efficiency(PSE). Using the Entropy balancing method on a panel of 124 countries from 1990 to 2017, we find that economic sanctions significantly reduce targeted countries' PSE. Our results are robust to several robustness tests including alternative specification and samples. We also use alternative methods to capture endogeneity using the instrumental variables method, where we instrument sanctions by political distance and the share of sanctioned trading partners, matching errors and their dynamics over time. Our analysis also reveals some heterogeneity depending on the type of economic sanctions and some macroeconomic factors. We highlight three main mechanisms by which sanctions can reduce PSE. These mechanisms include access to financial markets, reduction of government expenditure and economic recession.

Keywords: Economic Sanctions • Public Spending Efficiency • Entropy Balancing

JEL Codes: E6 • Q58 • E62 H5

1 Introduction

Economic sanctions can be defined as unilateral or multilateral coercive measures taken by one or more States or by international organizations against another State or non-state entity, with the aim of promoting a change in political, economic or social behaviour. These measures may include trade or financial restrictions, or specific prohibitions designed to isolate the target of sanctions economically. They have become a widely used tool of international politics to influence the behaviour of states in response to alleged violations of international law, human rights or other internationally accepted norms, such as recent coups d'etat and Russia's invasion of Ukraine, among others. Their use dates back to antiquity, but they have grown in importance and complexity in modern times, reflecting the increasing interconnection of global economies and changing geopolitical dynamics. The objectives of economic sanctions vary according to the political context and the motivations of the actors involved. However, they can also present significant risks. Economic sanctions reduce government revenues by limiting its ability to generate income through exports and foreign investment. With reduced revenues, the government has fewer funds available to finance its spending. In addition, these sanctions can increase the government's borrowing costs, as investors perceive greater risk and demand higher interest rates, or avoid lending to the country altogether. This limits the government's ability to finance its deficits and maintain public spending levels. Another consequence of sanctions is the devaluation of the local currency, which increases the cost of imports. These higher costs force the government to spend more on necessary imported goods and services, reducing the funds available for other public spending. In addition, sanctions can deter foreign direct investment, a crucial source of funding for public investment projects. A drop in such investment reduces the resources available for infrastructure and other long-term projects.

Sanctions also disrupt the country's overall economic activities, often leading to economic recession. An economy in recession generates less tax revenue, which further reduces the resources available for current and capital expenditure. Furthermore, governments may have to redirect their resources towards security and defense spending to deal with perceived threats, to the detriment of spending in areas such as health, education or infrastructure.

Limited access to international financial markets is another consequence of economic sanctions, restricting the country's ability to raise funds abroad and forcing the government to rely on domestic resources, often insufficient to maintain previous levels of public spending. Finally, sanctions affect state-owned enterprises by reducing their ability to operate efficiently, thereby reducing state revenues from these enterprises and further limiting the funds available for public spending.

By affecting economic conditions and poverty (Neuenkirch and Neumeier, 2016), sanctions can trigger the automatic stabilizers of fiscal policy, i.e. increasing certain types of expenditure during a downturn to boost activity and/or defer taxes. If such spending increases as a result of sanctions, this may be at the expense of productive capital spending (public investment) to protect vulnerable groups who suffer more from the adverse effects of sanctions (Escribà-Folch, 2012; Dizaji, 2014). This could therefore induce a decomposition effect in public spending. Furthermore, Neuenkirch and Neumeier (2016) mention that economic sanctions often deprive governments of the resources they need to perform their function. As a result, episodes of sanctions are often associated with a deficit in basic public goods and services. This suggests that sanctions may reduce both current expenditure and public investment. Finally, by restricting target countries' access to international capital markets (Hufbauer et al., 1990; Evenett, 2002), sanctions reduce the sources of finance available to fund their recurrent expenditure or the public investment necessary for the smooth operation of the private sector. In this context, political elites may choose to cut all expenditure uniformly, or reallocate within expenditure. In this context, political decision-makers must choose between uniformly cutting all spending or reallocating resources to fully fund certain categories, at the expense of major cuts in others. It is in this context that this article seeks to understand the impact of economic sanctions on the Public Spending Efficiency .

In this study, we analyze the effects of economic sanctions on public spending efficiency. This paper contributes in several aspects to the economic literature. To our best knowledge, it is the first to study the effect of sanctions on the economic behavior of countries with an overview of the impact on the Public Spending Efficiency . This paper also contributes to the growing literature on the economic effects of sanctions. In an era of growing sanctions like multiple wars like those in Russia and Ukraine, this study provides an overview of the consequences of these sanctions. The contribution of this paper will

therefore be to provide a general and in-depth understanding of the effects of economic sanctions on public spending in the target states, in particular the two major expenditure items which are current expenditure and productive capital expenditure (public investment). This study contributes to the literature on the cost-benefit analysis of sanctions for both sanctioned and sanctioning countries. Finally, It sheds light on how governments react to the financial constraints induced by sanctions by modifying the distribution of their expenditure.

To estimate the effect of economic sanctions on Public Spending Efficiency , we use an impact analysis method called Entropy Balancing developed by Hainmueller (2012) to address endogeneity that would mainly come from selection bias. On a panel of 124 countries from 1990-2017, our results show that economic sanctions significantly reduce public spending efficiency by 0.016 percentage points. Our results are very robust to several tests. First to several alternative specifications, then to alternative methods taking into account endogeneity, and finally to alternative samples. It also emerges that economic sanctions' effects depend on the economic sanction type. The effects also depend on structural macroeconomic factors such as countries' level of inflation, economic development, debt and globalization. We then identify three transmission channels through which economic sanctions penalize government habits. These include economic uncertainty marked by the volatility of the exchange rate and inflation, access to financial markets and economic recession.

Our article is structured as follows. Section 2 presents theoretical motivations for the identification of transmission channels. The third Section 3 describes data and stylized facts. We present the empirical approach and main results in Section 4. The various robustness and heterogeneity tests are discussed in Sections 5 and 6 respectively. In section 7 we examine the validity of our transmission channels and we conclude in Section 9.

2 Theoretical Motivations

This paper aims to investigate the effect of economic sanctions on PSE. This section presents the theoretical background to understand how economic sanctions might affect PSE.

One of the main points we highlight is the reduced access to financing in the international financial markets . Economic sanctions, especially financial sanctions, prevent sanctioned countries from accessing international financing. Thus, economic sanctions limit sanctioned countries' access to international financial markets by restricting their ability to borrow or attract foreign investment (Ghasseminejad and Jahan-Parvar, 2021; Bianchi and Sosa-Padilla, 2024). This reduction in liquidity hampers the ability of governments to finance essential public projects such as infrastructure, education, or health care. Without the ability to refinance their debt or raise new capital, these governments are forced to reallocate their resources inefficiently, prioritizing immediate spending over long-term investments. As a result, public projects stagnate or deteriorate, reducing the efficiency of public spending.

The second point we'd like to make is the reduction in government spending. During a period of sanctions, governments may or may not lose access to the enormous financial resources mentioned above. Under the impact of sanctions, sanctioned states often experience a significant decline in revenues, mainly due to lower tax revenues and losses related to export restrictions. This leads to a significant composition of expenditures (Gutmann et al., 2023). This financial pressure forces governments to make trade-offs between current and capital expenditures. This has a knock-on effect on public spending, with a direct impact on the quality and accessibility of public services (McLean and Whang, 2021). Budget cuts in key sectors such as education and health undermine human development and increase inequalities. By reducing the scope and impact of public policies, these measures weaken the state's ability to optimally achieve its objectives.

The third point is poverty and economic recession caused by economic sanctions (Apeti and Edoh, 2024). Economic sanctions often cause economic recessions and increase poverty in targeted countries (Neuenkirch and Neumeier, 2016). Economic contraction reduces productive activity, which in turn reduces tax revenues and exacerbates fiscal imbalances. In addition, rising poverty increases demand for social assistance, forcing governments to allocate limited resources to urgent needs rather than strategic investments. In this context, public spending priorities are often diverted to economic survival measures, to the detriment of their overall efficiency. As a result, development programs are delayed or abandoned, further exacerbating economic and social difficulties.

These three main transmission channels are the ones we highlight in this article.

Economic sanctions can also create a high degree of uncertainty and macroeconomic instability in sanctioned countries, discouraging investment. Unpredictable fluctuations in exchange rates and inflation complicate the planning and implementation of public policies (Ghorbani Dastgerdi et al., 2018; Wang et al., 2019; Itskhoki and Mukhin, 2022). Investors, both domestic and foreign, are reluctant to commit resources in an unstable environment, reducing the flow of capital needed for development (Mirkina, 2018). Moreover, uncertainty often forces governments to adopt short-term fiscal policies in response to immediate crises, to the detriment of efficient resource allocation. This volatility not only discourages strategic investment, but also weakens the state's ability to maintain quality public services.

3 Data Summary and Stylized Facts

To assess the effect of economic sanctions on public spending efficiency, we use a panel of 124 developing countries over the period 1990-2017. Country data were selected based on data availability over our study period. The complete list of countries and variables used in this study is given in Appendix.

3.1 Description

Our public spending efficiency variable is the index constructed by Apeti et al. (2024) and published in Oxford Economic Papers. Public Spending Efficiency refers to the relationship between the socio-economic indicators targeted by the government and the level of public resources used to achieve them. This database provides a large dataset on Public Sector Efficiency using a parametric approach, covering many developing countries over the period 1990-2017. Efficiency scores can vary between 0 and 1, with higher scores indicating better performance. Empirically, efficiency is measured by the distance between inefficient units and those considered efficient, representing the efficiency frontier. considered efficient, representing the efficiency frontier. The authors consider technical efficiency, which refers to the ability of the public sector to produce a set of outcomes with as few inputs as possible, regardless of input prices. with as few inputs as possible, regardless of input prices. Firstly, they calculate what they call public sector performance

indices, which measure the government's performance in each of the dimensions considered through an aggregate index. Then, efficiency scores are calculated for each public sector dimension, using the composite outcome index as the dependent variable and public spending on each dimension as the input. The PSE index is so a composite indicator combining all dimensions considered.

Our data on Economic Sanctions are taken from the Global Sanction Database. They were extracted from the Global Sanctions Database (Syropoulos et al., 2024). It is the most commonly used database for studies of international sanctions (Wang et al., 2019; Morgan et al., 2023; Apeti and Edoh, 2024). This database defines a sanction case for each year in which there is an active sanction imposed by individual countries, a group of countries or international organizations such as the European Union (EU) or the United Nations (UN) (sanctioning state/entity), on a sanctioned state (target), to address a violation of international norms, with the aim of exerting pressure on target countries to modify their actions. It covers some 1,325 sanction cases (all bilateral, multilateral and plurilateral) over the period 1950-2022. However, due to the availability of data on the efficiency of public spending, we restrict ourselves to the period up to 2017. Information is provided on the type of sanction, the sender and the purpose of the sanction, as well as the categories of sanctions: trade, financial, travel restrictions, arms, military assistance and other types of sanctions. Finally, the database evaluates the effectiveness of each sanction in five categories, ranging from total failure to total success. Using this information, we construct our main treatment variable, US economic sanctions (trade and financial), which takes the value 1 if a country i is subject to US economic sanctions in a given year t, and 0 otherwise. Against this background, this paper provides a comprehensive analysis of how US economic sanctions affect the participation of target countries in GVCs. Against this background, this paper provides a comprehensive analysis of how U.S. economic sanctions affect the participation of target countries in GVCs. Building on the existing literature, we focus on U.S. sanctions for several reasons. First, the United States has historically been the world's most frequent user of international sanctions, accounting for nearly one-third of all sanctions imposed (Felbermayr et al., 2022; Morgan et al., 2023). Second, the United States has emerged from the Cold War as the dominant global hegemonic power (Adam and Tsarsitalidou, 2019). In addition, the United States not only leads in the unilateral imposition of sanctions, but also significantly influences sanctions

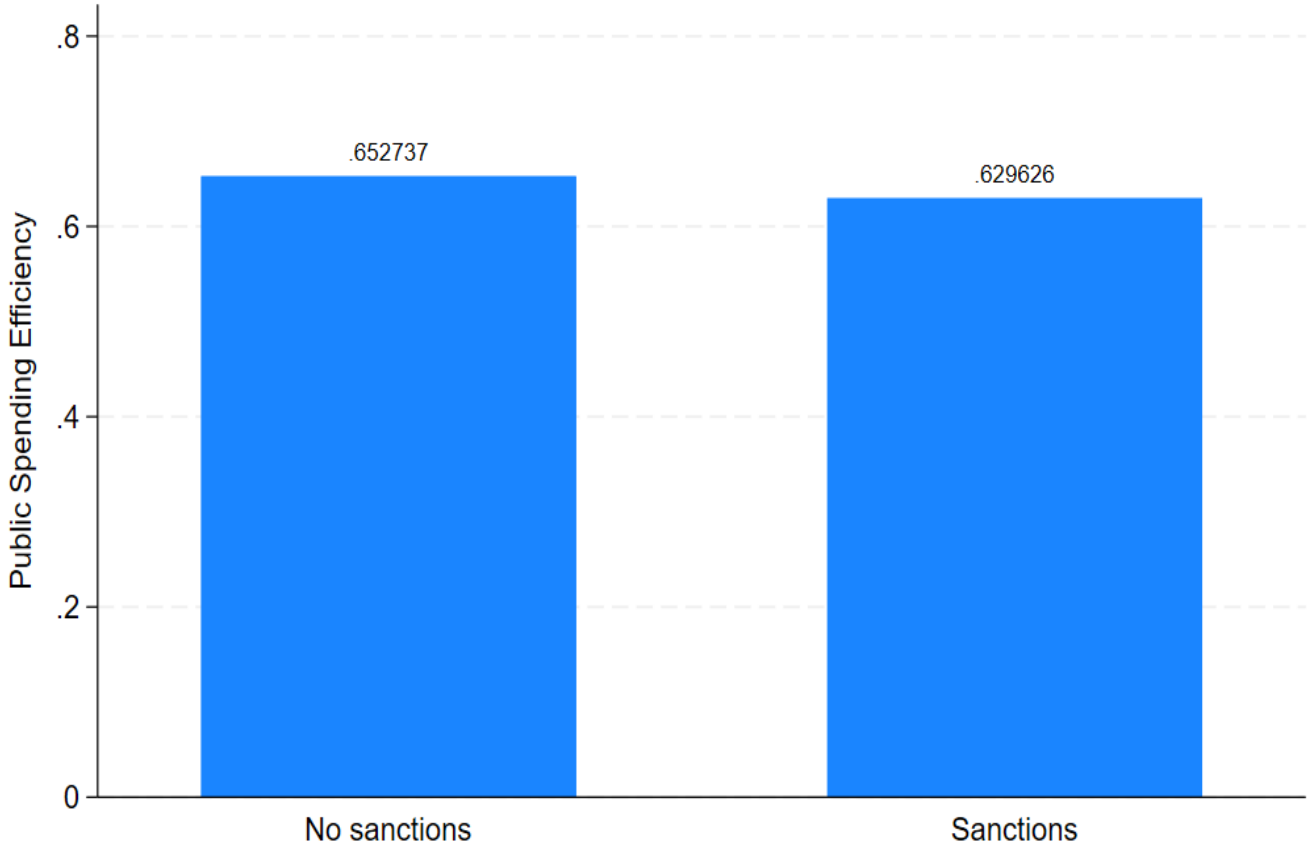
initiatives by entities such as the United Nations and various coalitions (Morgan et al., 2023). Finally, the United States has taken a leadership role in recent sanctions against Russia, effectively "showing the way" for its allies. While focusing on U.S. sanctions builds on the existing literature, it may overlook the wide range of sanctions imposed by other states and international organizations. To address this, we conduct a robustness test by including European Union (EU) and United Nations (UN) sanctions and a comprehensive measure that captures all sanctions worldwide. We have a total of 56 countries that have been subject to sanctions imposed by the US (thus corresponding to a total of 515 observations), out of a total of 124 countries (see Appendix for a list of all the countries in our sample).

We also include covariates in the first Entropy step (matching) and control variables in the second (weighted regression). These variables have been chosen purely on the basis of the economic literature. Among the covariates, economic growth, inflation, Democracy, Coups d'Etat, Conflict, Trade openess and Public Debt (see (Neuenkirch and Neumeier, 2016; Gutmann et al., 2021; Cruijsen et al., 2023; Apeti and Edoh, 2024). In the second stage, we use control variables to make our estimates more robust. These control variables are foreign direct investment, corruption as a proxy of institutional quality, stability for Environment, unemployment rate, Tax revenues, Trade globalization and Public debt purely chosen based on the economic literature of Public Spending Efficiency (Apeti et al., 2024). [1]

3.2 Data summary

[1] As we proceed, we will add additional control variables to test the robustness of our results.

Figure 1: Stylized Facts



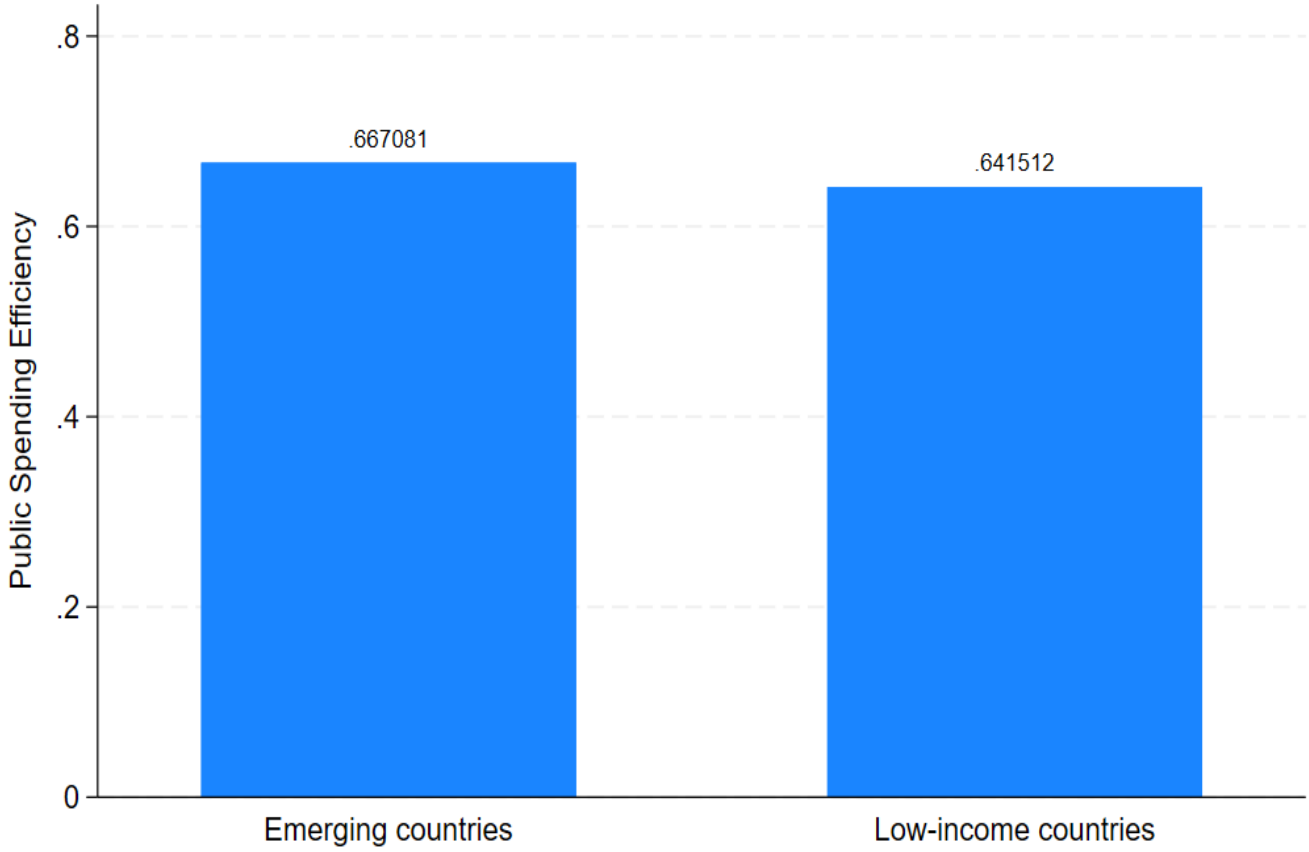
Notes: Author's calculation using Apeti et al. (2024) index

4 Empirical Approach and Main results

4.1 Entropy Balancing Method

This paper aims to analyze the effects of economic sanctions on the Public Spending Efficiency . In the literature on the effects of sanctions at panel data level, several methodological approaches have been adopted. For example, Neuenkirch and Neumeier (2015) analyze the effect of sanctions on economic growth using the Ordinary Least Squares (OLS) method. This same methodology is applied by several other authors, including Afesorgbor and Mahadevan (2016), Hatipoglu and Peksen (2018), Gutmann et al. (2023), and Gutmann et al. (2024). However, to address the endogeneity problem of economic sanctions, a number of papers in the literature turned to impact analysis methods. For example, Neuenkirch and Neumeier (2016) assess the effect of economic sanctions on

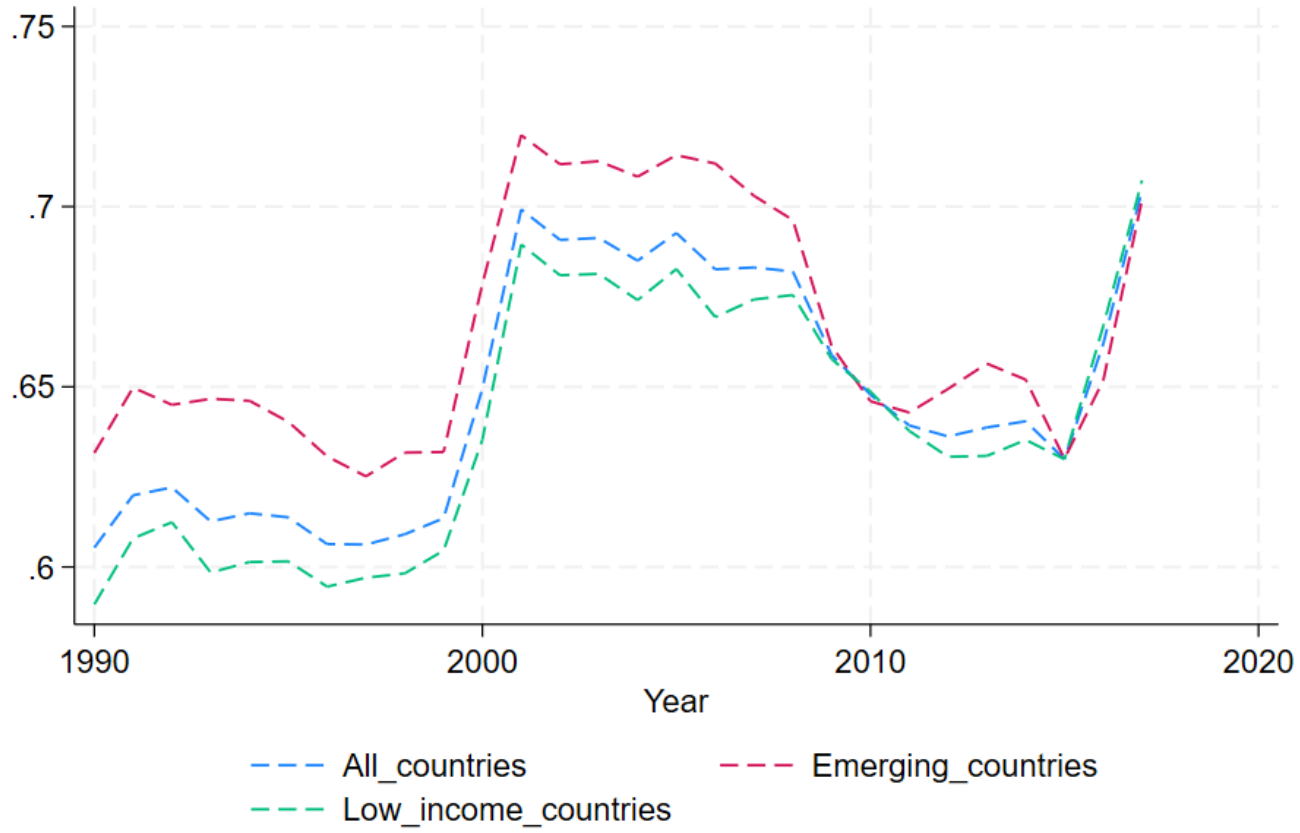
Figure 2: Stylized Facts



Notes: Author's calculation using Apeti et al. (2024) index

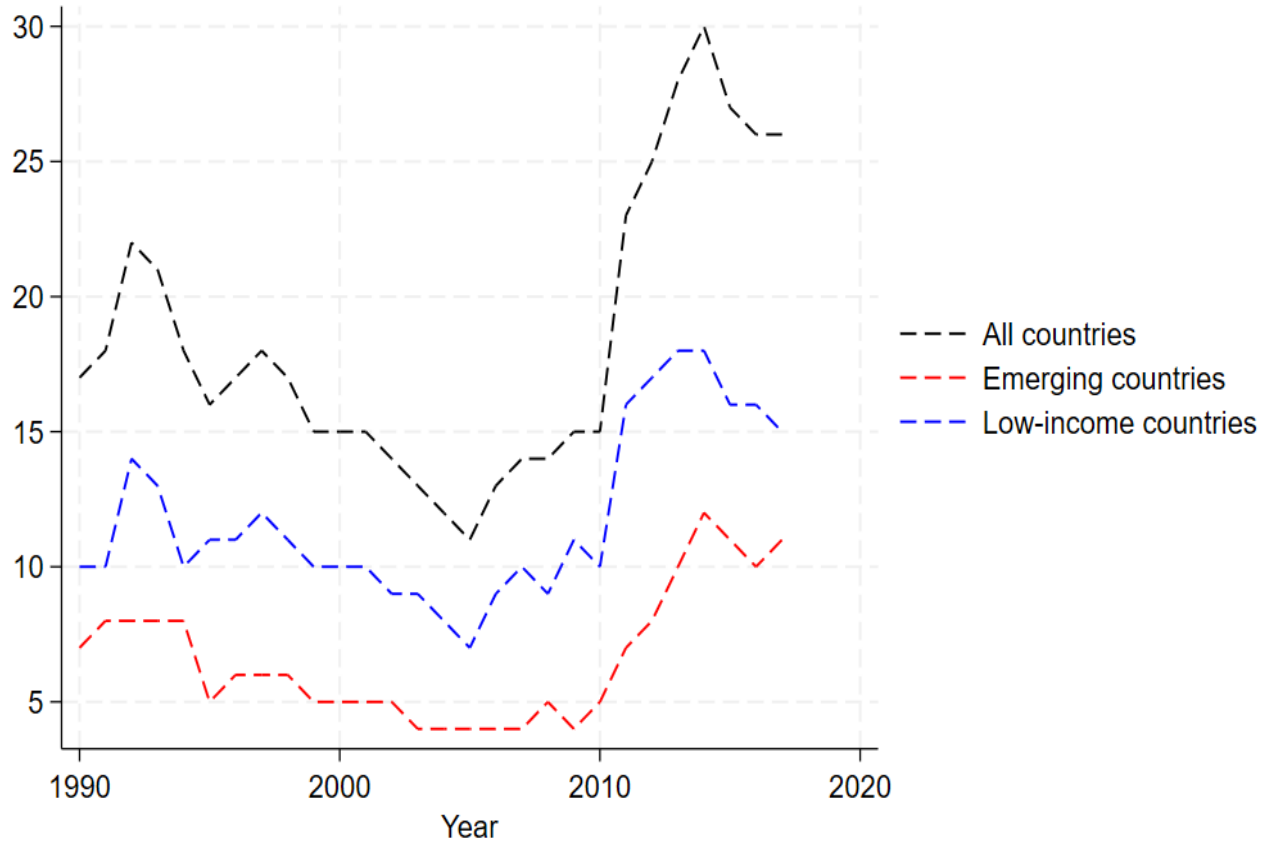
poverty using the impact analysis method mainly entropy balancing. Similarly, Afesorgbor (2019) and Gutmann et al. (2023) complete their respective analysis of the effect of sanctions on trade and economic growth using this method. Gutmann et al. (2021) use this method to analyze the effect of sanctions on life expectancy and mortality. Alternative methods such as the GMM system method have been applied to contain the endogeneity of sanctions (Afesorgbor and Mahadevan, 2016; Lv and Xu, 2017; Sun et al., 2021; Moteng et al., 2023). In this study, we will follow the literature of Neuenkirch and Neumeier (2016) and Gutmann et al. (2021) using entropy balancing. This choice is justified by the fact that country sanctions are not a random phenomenon, but can depend on several factors, such as the country's economic growth, institutional governance, the fragility of countries characterized by conflicts and coups d'état, and the country's economic situation. Among other things, these factors can also affect a country's capacity

Figure 3: Public Spending Efficiency Trend



to attract investments and efficiently disburse government spending, leading to the effect of sanctions being endogenous due to selection bias. Thus, the use of entropy balancing allows us to correct this bias. In addition to the problem of selection bias, there may be imbalance in the data, characterized by a difference between observations subject to sanction and those not subject to sanction. As a result, the problem of identification may arise if observed differences are also correlated with differences in expenditure (Allcott, 2015; Baccini et al., 2019; Apeti and N'doua, 2023), or if they reflect unobserved differences that could be at the origin of the correlation between sanctions and composition of public spending. Using entropy balancing helps to correct this bias too. This method is widely used in the economic literature including, Gutmann et al. (2023) to analyze the effect of sanctions on growth and its components, Wen et al. (2024) to assess the impact of sanctions on innovation, Huang and Yeh (2014) and Ogrokhina and Rodriguez

Figure 4: Sanctions Trend



(2019) to assess, respectively, the effect of inflation targeting on unemployment and debt composition, Neuenkirch and Neumeier (2016) to assess the impact of US sanctions on poverty, Balima (2020) to assess the effect of Coups d'Etat on the cost of debt, Gutmann et al. (2021), Apeti (2023) to analyse the effect of mobile money on household consumption volatility Apeti and Edoh (2023) to explore the effect of mobile money on tax revenue and a recent paper by Apeti and Edoh (2024) use this method to study the effect of economic sanctions on debt default. Entropy balancing helps to select matches for the units exposed to treatment and to estimate the ATT.

We now define the average treatment effect on treatment using the following specification :

$$ATT=E[\ Y_{(1)}|\ T=1] - E[\ Y_{(0)}|T=1\ ]$$

Y(.) represents Public Spending efficiency. *T* is the Our variable of interest and is a dummy which takes the value 1 if a country was subject to economic sanctions (financial or commercial) in a given year t and 0 otherwise. However, there may be a problem in our control group. Indeed, it cannot be excluded that the government expenditure and its efficiency variable in the control group decreases as in the treated group, mainly due to the various factors we mentioned above. This could therefore bias our results, as the allocation of sanction treatment is no longer random. To this end, the matching procedure will reproduce a situation where our observation units are randomly affected by the treatment (economic sanctions). These units will then be matched with those who were not exposed to the treatment, taking into account their characteristics and similarities. We can therefore rewrite the following new specification:

$$ATT=E[\ Y_{(1)}|\ T=1,\ X=x] - E[\ Y_{(0)}|T=0, X=x\ ] \quad (1)$$

X=x represents a vector of variables that can affect both the treatment(sanctions) and Public Spending Efficiency. Entropy balancing requires two steps. First, we compute weights that are assigned to units not exposed to treatment. These weights are chosen to satisfy pre-specified equilibrium constraints involving sample moments of the pre-treatment characteristics while, at the same time, remaining as close as possible to uniform base weights. In our analysis, the equilibrium constraints require equal covariates means between the treatment and control groups, which ensures that the control group contains non-treatment units that are, on average, as similar as possible to the units that received treatment(Neuenkirch and Neumeier, 2016; Gutmann et al., 2021). In the second step, these weights obtained in the first step are used in a weighted regression analysis that includes the treatment indicator as an explanatory variable. We thus have the following equation:

$$Y_{it} = \beta_i + \rho T_{it} + \alpha X_{it} + \mu_t + \varepsilon_{it} \quad (2)$$

Table 1: Before: without weighting

	1	2	(3) = (2) - (1)		
	Sanctions	Without Sanctions	Difference	T-test	P-value
$Growth_{t-1}$	4,181	3,884	-0,297	8,278	0,000
$Inflation_{t-1}$	14,97	22,96	7,99	-3,367	0,000
$Democracy_{t-1}$	3,686	3,776	0,09	11,650	0,000
$Coups_{t-1}$	0,065	0,024	-0,041	-4,340	0,000
$Conflict_{t-1}$	0,032	0,003	-0,029	-8,729	0,000
$Trade_{t-1}$	54,31	75,25	20,94	8,960	0,000
$Debt_{t-1}$	61,32	50,59	-10,73	-5,323	0,000

In this equation "i" and "t" represent countries and years respectively, while ρ represents the ATT as defined above. Economic outcome (Public Spending Efficiency) represent "Y". The country and year fixed effects are represented respectively by β_i and μ_t. [2] We also include a vector of control variables (X_{it}) thus representing the determinants of government expenditure, general investment and public expenditure efficiency.

4.2 Main Results

The results of the effect of economic sanctions on the Public Spending Efficiency are presented in column [1] of Table **??**. These results are obtained using weighted regression with weights constructed using Entropy Balancing. This column shows that economic sanctions reduce the Public Spending Efficiency . We include country and year fixed effects and the main controls in the second step. The main controls in the second step allow us to improve effect estimates and obtain more robust results.[3] Our results thus show that economic sanctions reduce significantly by 1.6 (0.016*100) percentage points the PSE. Considering the magnitude of the effects, economically, the average efficiency decreases from 0.65 to 0.62%. This corresponds to 22.85% of the standard deviation of PSE with low variabilities. Therefore, We can conclude that our result is economically significant and that sanctions reduce Public Spending Efficiency.

[2]Country and year fixed effects are powerful tools to control for unobserved heterogeneity in panel data and obtain more reliable estimates of causal relationships. They provide a better understanding of the factors that influence the variables of interest, taking into account the specificities of each country and temporal variations.

[3]The coefficients of the control variables not reported in this table show that only the unemployment rate has a negative and significant effect on the PSE.

Table 2: After: with weighting

	1	2	(3) = (2) - (1)		
	Sanctions	Without Sanctions	Difference	T-test	P-value
$Growth_{t-1}$	4,181	4,18	-0,001	0.90	0.370
$Inflation_{t-1}$	14,97	15,06	0,09	-0.03	0.978
$Democracy_{t-1}$	3,686	3,689	0,003	-0.03	0.976
$Coups_{t-1}$	0,065	0,064	-0,001	0.02	0.986
$Conflict_{t-1}$	0,032	0,032	0	0.02	0.985
$Trade_{t-1}$	54,31	54,66	0,35	-0.18	0.859
$Debt_{t-1}$	61,32	61,27	-0,05	0.01	0.990

Table 3: Impact of Economic sanctions on Public Spending Efficiency

	(1)	(2)	(3)	(4)	(5)
	PSE	PSE	PSE	PSE	PSE
Sanctions	-0.016**	-0.019**	-0.018**	-0.053***	-0.019**
	(0.007)	(0.008)	(0.007)	(0.013)	(0.008)
Observation	864	780	782	462	811
R-squared	0.6268	0.6244	0.7681	0.6269	0.626
Country & Year Fixed effects	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES

Notes:This table reports estimates of the impact of economic sanctions on PSE. The main model results are reported in Column [1]. Columns [2]-[5] display results using alternative subsamples. Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

5 Robustness Check

In this section, we use several tests to see the sensitivity of our results.

5.1 Alternative Samples

On the one hand, we examine whether the effect is conditioned by our sample. To do this, we first remove periods marked by crises, notably the financial crises of 2008-2009 and the hyperinflation crises of 2007-2008, which could have altered government behavior and thus affected the efficiency of their public spending. Then we remove the periods marked by the expansion of crypto-currencies (2008-). Cryptocurrencies can be used as an alternative source of financing for various sanctioned countries. The effect could therefore be masked by these periods. We then exclude countries that are fragile according to the IMF classification. Our aim here is to isolate the effect that these countries with different characteristics could have. The different results are presented in columns [2]-[5] of Table 3 and show that our results remain robust to these alternative sub-samples.

On the other hand, we add additional control variables to minimise the omission bias of relevant variables. These variables were purely selected from the economic literature on the determinants of Public Spending Efficiency. These control variables include natural resource rents (% of GDP), inflation, population density (% of total population), fiscal balance, democracy, trade openness, Industry value added(% of GDP), agriculture value added(% of GDP), press freedom, Government durability, growth, financial globalization, property rights, Democracy, and trend. The results are presented in Table A2 and show that economic sanctions do reduce the PSE.

5.2 Alternative Methods

In this section, we use alternative methods to check that our results are robust. We, therefore, use PSM methods, the instrumental variables method to address endogeneity, and a diff in diff method to address the character of our treatment.

PSM Estimates. First, we test the robustness of our results using the PSM, which is part of an impact analysis methodology. It allows us to correct for endogeneity problems, especially selection bias. The results in column [1] of Table 4 summarise the estimation

Table 4: Impact of Economic sanctions on Public Spending Efficiency using alternative methods

Efficiency	(1) PSM	(2) IV(1)	(3) IV(2)
Sanctions	-0.028**	-0.030***	-0.042***
	(0.008)	(0.010)	(0.010)
Sanctions_{t-1}		0.825***	0.827***
		(0.040)	(0.009)
Instrument		0.172**	-0.037**
		(0.08)	(0.018)
Country and Year Fixed Effects	YES	YES	YES
Main controls	YES	YES	YES
Observations	774	861	886
Hansen Test P-value		0.1585	0.1933
Cragg-Donald Wald stat		853.500	791.304
Stock-Yogo stat.		19.93	19.93

Notes:This table reports estimates of the impact of economic sanctions on PSE using alternative methods. Robust standard errors are in parentheses. All regressions include the constant, not reported in the table. * p < 0.1, ** p < 0.05, *** p < 0.01

of sanctions (ATT). The conclusions are consistent with our baseline results: sanctions increase the probability of sovereign debt default.

IV Estimates. Second, we rely on an instrumental variables (IV) approach to deal with the potential endogeneity of US sanctions. Indeed, our estimates may still suffer from problems of reverse causality. For example, Jing et al. (2003) suggests that the imposition of sanctions is endogenous to the political process and the specific outcomes that the sender seeks to achieve. In the context of sanctions, Neuenkirch and Neumeier (2015) also argue that sanctions may be imposed in response to an environment perceived as unfavourable by the sanctioning state, meaning that the negative effects associated with sanctions could reflect the direct impact of the target's own policies. In such cases, the use of instrumental variables is well suited to address this issue, as instrumental variables allow controlling for potential endogeneity issues arising from unobserved time-varying factors that may affect both the likelihood of being sanctioned and the Public Spending Efficiency . The challenge with this approach, of course, is to identify the variables that

affect the likelihood of being sanctioned but do not affect public spending efficiency other than through the effect of US sanctions. Consequently, our IV approach uses two instruments in the last two columns of table 4. First, we use an internal instrument, i.e. the lagged (by one year) variable of US sanctions in each last two columns. Indeed, US economic sanctions tend to be very persistent; once a country is sanctioned, these measures are often extended or intensified over time. As a result, past sanctions are often correlated with current sanctions. Second, we use an external instrument - the political proximity of the US to the sanctioned countries combined with the lagged variable of sanctions. Given that we're focusing here on US sanctions, a country's probability of being sanctioned may increase as a result of its political divergence with the USA. Political proximity to the United States could play an important role in influencing the likelihood of a country being sanctioned. [4] In general, countries that are closely aligned with US interests and values through shared policies, strategic alliances, or economic partnerships are less likely to face sanctions, as these alignments often reflect mutual interests in stability, security, or trade. Conversely, countries that pursue policies contrary to U.S. interests - such as aligning with rival powers, supporting U.S.-designated terrorist organisations, or undermining democratic norms - are at greater risk of sanctions. However, as is well known, the validity of the exclusion restriction cannot be directly tested, but we can discuss potential violations of our identification assumptions. A violation of the exclusion restriction could arise if political proximity to the US directly affects Public Spending Efficiency, through trade linkages for example. This is not a real issue as our baseline controls include trade openness. Third, we again used the lagged variable of sanctions and combined it with an external instrument represented by the share of sanctioned trading partners. The idea is to show that a country surrounded by sanctioned trading partners is more likely to be sanctioned because of its proximity to those partners.[5]

The results presented in the last two columns show that economic sanctions significantly reduce the Public Spending Efficiency using political proximity in column [3] and share of sanctioned trading partners in column [4]. The IVs method focuses on the local causal effect (Local Average Treatment Effect, LATE), often for a sub-population affected

[4]This variable was constructed using the difference in votes between the USA and the sanctioned countries.

[5]This variable was constructed using all the different trading partners of the sanctioned countries.

by the instrument (in this case, political distance from the US and sanctions in partner countries) (Angrist and Imbens, 1995). It therefore captures a specific causal effect, whereas Entropy Balancing provides a more global estimate (ATT). If the causal effect is stronger in the subgroup influenced by the instrument, the IV coefficients may be higher. In this context, the coefficients are significantly higher than those obtained with Entropy Balancing.

Diff-in-Diff Estimates. The choice of the diff-in-diff method must consider the heterogeneous nature of the sanctions in our sample. We use the Two-way fixed effects method developed by Callaway and Sant'Anna (2021) to do this. This is an advanced econometric approach designed to analyse the effects of policies or interventions, particularly when treatments are applied at different times to different groups, as in the case of economic sanctions. Our tests are quite robust and show that sanctions reduce the efficiency of public spending, as shown in Table A3.

5.3 Alternative Specifications

The results of our analysis show that economic sanctions reduce the Public Spending Efficiency . In this section, we attempt to further test the robustness of our results using alternative specifications. We reconstruct the treatment dates of the sanctions using randomly assigned placebo dates. The intuition is that assigning random 'placebo' adoption dates allows us to observe whether similar effects appear even when the treatment date is wrong. If significant results appear with the wrong dates, this would suggest that the observed treatment effects may be due to underlying trends rather than the US sanctions themselves.

6 Heterogeneity

So far, we have shown that sanctions reduce the Public Spending Efficiency . In this section we examine whether this effect is conditioned by a number of factors.

6.1 Type of Sanctions

Economic sanctions include trade sanctions and financial sanctions. Trade sanctions refer to multiple restrictions on imports and exports from sanctioned countries. The main aim of these types of sanctions is to exert economic pressure on target countries and encourage them to comply with international rules and standards. Financial sanctions, on the other hand, refer to restrictions on international markets, preventing access to international credit and financing for local activities such as investment in renewable energy production. To examine the differential effects of these two types of economic sanctions, we use the same main model specification, with trade and financial sanctions as the variables of interest. The results are presented in the first three columns of Table A1 and show that financial and success sanctions reduce public spending efficiency while trade sanctions has no effect on public spending efficiency. This may simply be because trade sanctions may encourage a country to invest more in developing its domestic industry in order to reduce its dependence on imports. This strengthening of local production may in some cases have no impact on the efficiency of spending in the short term, or may even increase the Public Spending Efficiency in the medium or long term by promoting self-sufficiency.

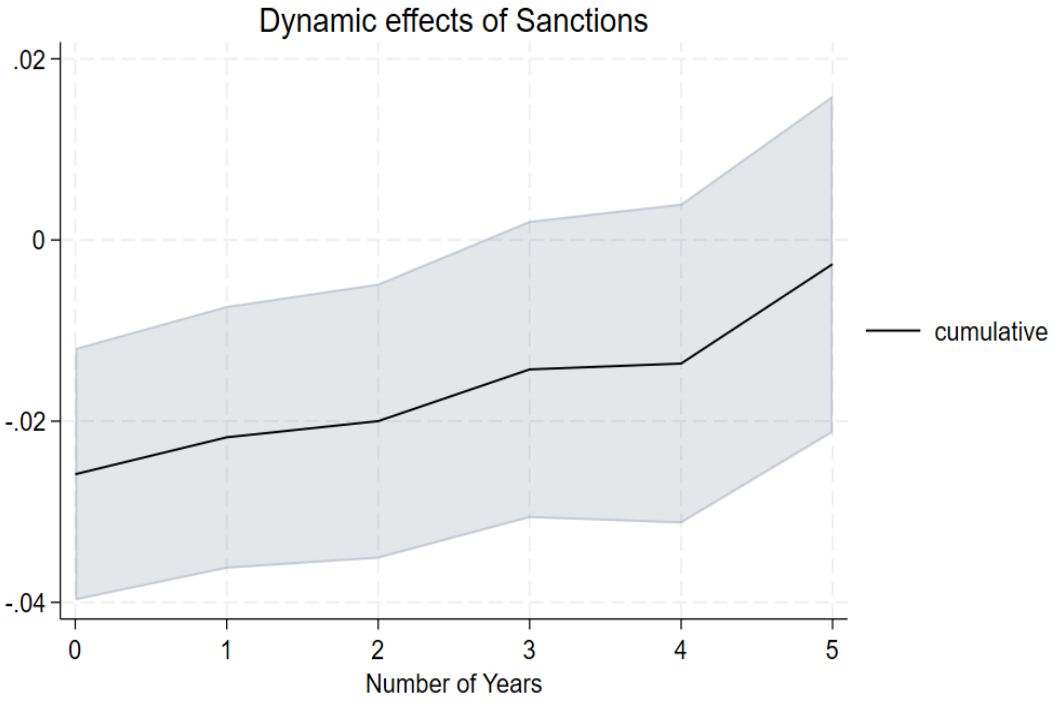
6.2 Dynamic effects of sanctions

In this section, we examine whether the effect of economic sanctions on the efficiency of public spending is temporary or persistent over time. Analyzing the dynamic effects over time is critical to understanding whether the impact of economic sanctions on public spending efficiency is temporary or persistent over time. Indeed, sanctions may initially cause significant disruptions, such as budget adjustments or increased inefficiencies, but these effects may diminish or disappear as governments adapt to the new economic situation. By examining year-to-year variations in these effects, it is possible to determine whether sanctions have only transitory effects or whether they impose long-term structural constraints. This is essential for the overall interpretation of the results, especially when it is observed that the negative effect tends to fade after a certain period of time.

Some authors have also tried to quantify the effects of sanctions over time (Mirkina, 2018; Apeti and Edoh, 2024). Mirkina (2018) shows that the effects of sanctions can

be limited to the short term, depending on the cost of sanctions, the primary sanction imposed and the decade. In the same vein, Apeti and Edoh (2024) show that the effect of sanctions can also be limited to the short term (7 years maximum). In this article, using the method of local projections developed by Jordà (2005), our results support the findings of previous authors and show that the effect of sanctions on the efficiency of public spending is limited to the short term (maximum 3 years after the imposition of sanctions), as shown in graph5. [6]

Figure 5



6.3 Level of development

As mentioned above, economic sanctions are coercive instruments used by states or international organisations to influence the behaviour of targeted countries. However, their effectiveness depends on many factors, including the level of economic development of the

[6]The local projections method is a relatively recent and flexible econometric technique, particularly useful for analysing the dynamic responses of a variable to an exogenous shock(like partially imposition of economic sanctions). It has become popular because of its ability to adapt to complex forms of temporal response, without the rigid constraints imposed by traditional models such as VAR (Vector AutoRegression) models

sanctioned country. In an economically developed country, diversification of economic activities acts as a shock absorber and a means of adapting to sanctions. Highly diversified economies, with robust sectors in agriculture, industry and services, have alternative means of maintaining financial flows and meeting domestic needs. Sanctions against Russia are a perfect example of this. Despite severe sanctions since 2014, Russia has been able to redirect its gas and oil exports to new economic partners to secure its public finances, thanks to its dominant energy sector (Nguyen and Do, 2021). In contrast, Iran's less diversified economy and heavy reliance on oil has had a much more drastic impact on public spending (Kelishomi and Nisticò, 2022). At another level, countries with a high level of economic development have strong institutions and well-structured economic policies that enable them to maintain a degree of stability during periods of sanctions. Among other things, these institutions help to reduce capital flight, avoid excessive corruption, which is often exacerbated in situations of scarcity, and optimise the use of available financial resources. With this in mind, in this section we seek to examine the impact of economic sanctions on PSE according to the level of development of the countries in our sample. We therefore split our sample in two. We then look at the impact on emerging markets and countries classified as low-income by the IMF. Our results are presented in Table 5 The column [1] shows the results according to the sample of our main model, while columns [2]-[5] show the results according to the use of alternative subsamples used in the robustness exercise. These results clearly confirm that the effect of sanctions is more prolonged in low-income countries than in emerging markets. [7]

[7]To confirm these results, we conduct further tests using the interaction between the level of economic development and our sanctions variable. The results, which are not presented in this article but are available on request, show that the effect of economic sanctions is attenuated by the level of economic development.

Table 5: Impact of sanctions on PSE according level of development

PSE	Emerging countries [1]	Emerging countries [2]	Emerging countries [3]	Emerging countries [4]	Emerging countries [5]
Sanctions	-0.005	-0.006	-0.008	-0.074***	-0.012
	(0.013)	(0.013)	(0.012)	(0.015)	(0.011)
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	414	373	376	216	400
PSE	Low-income countries [1]	Low-income countries [2]	Low-income countries [3]	Low-income countries [4]	Low-income countries [5]
Sanctions	-0.032***	-0.045***	-0.038***	-0.011	-0.052***
	(0.011)	(0.013)	(0.012)	(0.009)	(0.011)
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	450	407	406	246	411

Notes : This table displays the impact of sanctions on PSE according level of development. The first column shows our main model results, while the last four columns show alternative sample results. All regressions include the constant not reported in the table. Robust standard errors are shown in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1 .

6.4 Macroeconomic factors

In this section, we look at the macroeconomic effects that may condition the effect of economic sanctions on Public spending efficiency. To do so, we always start with our main model and then interact these different variables with our variable of interest capturing economic sanctions. We then plot these different results on Graph 6 for a better reading of the results. In this study, we consider four macroeconomic variables: (i) exchange rate,(ii) debt level and (iii) institutional quality.

First, we interact our sanction variable with the exchange rate, a major determinant of public spending (Bouakez and Eyquem, 2015). Sanctions create an uncertain economic environment, which can scare off foreign investors and even prompt domestic investors to take their funds out of the country for fear of continued currency devaluation. This outflow of capital leads to increased pressure on the local currency, as investors seek to convert their assets into foreign currency. This increases the volatility of the exchange rate, especially if the outflows are massive and sudden. We therefore expect the effect of sanctions to be conditional on this variable and to encourage investors due to the direct impact of currency fluctuations. On the one hand, economic sanctions can reduce a country's access to foreign exchange, weakening its currency's value. A depreciated currency makes imports more expensive. For example, essential or strategic goods (en-

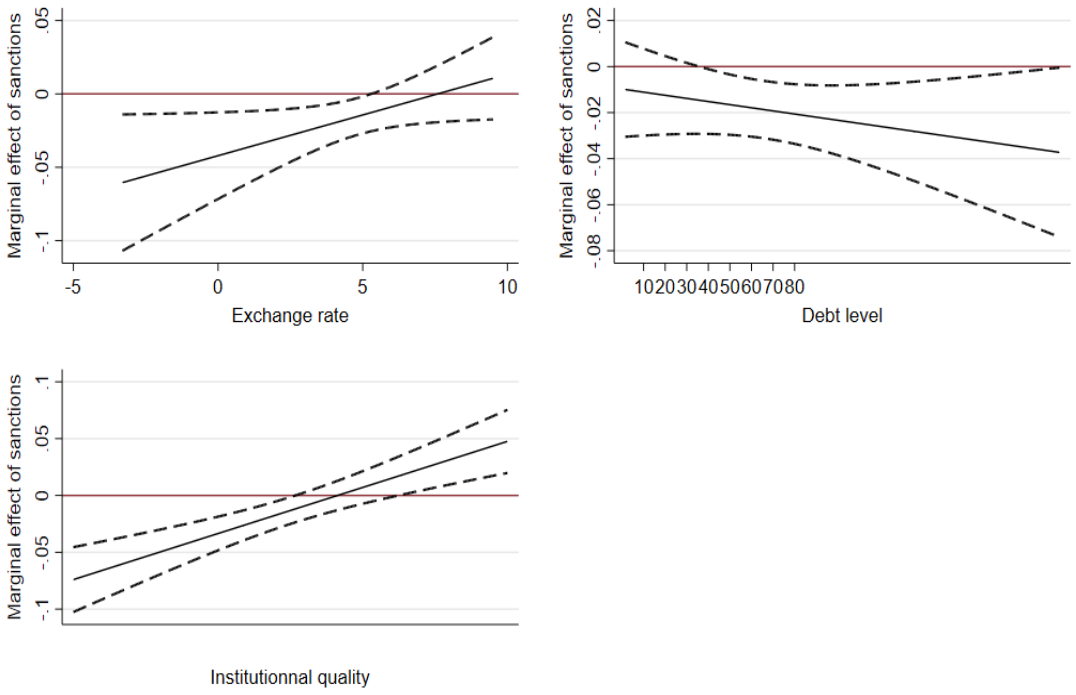
ergy, food, medicine) imported in dollars or euros will cost much more, leading to higher inflation in the sanctioned country. This increase in inflation reduces Public Spending Efficiency, as the government has to allocate more resources to buy the same goods and services as before. This has a snowball effect, making it harder to maintain essential public services and control government spending. Second, exchange rate fluctuations, especially if they are highly volatile, make the country less attractive to foreign investors. An unstable exchange rate increases the risk of investment, which can discourage capital inflows. A decline in foreign investment slows economic growth and limits the fiscal resources that the government can generate from new economic activity. Without these resources, the government may be forced to redirect its spending in a sub-optimal manner, thereby limiting the overall efficiency of its public spending. The first graph in Figure 6 shows that there may be an offsetting effect. Indeed, an appreciation of the national currency can offset the negative effects of sanctions by promoting investment.

Then, on the second graph in Figure 6, we can see that a country's high level of debt does not mitigate the effect of economic sanctions on PSE. The interaction here between debt levels and economic sanctions has a negative impact on PSE by limiting investment, increasing costs, creating uncertainty and diverting these countries' resources to other priorities. A high level of debt makes sanctioned countries particularly vulnerable to the effects of economic sanctions, by limiting their access to financing and increasing their financing costs. This complicates the development of public expenditure. Sanctions worsen financial constraints, leaving little room for long-term investments. Thus, heavily indebted countries are less likely to be able to have a better public spending efficiency in the context of sanctions.

Countries with strong institutions (good governance, transparency, low corruption, clear rules) are often better prepared to deal with economic sanctions. These institutions promote efficient reallocation of resources and allow countries to adapt more quickly to economic shocks by finding alternative solutions. On the other hand, in countries where institutions are weak, sanctions can worsen existing problems, such as resource mismanagement and corruption, thereby limiting the ability to attract foreign investment or allocate domestic funds towards development projects. Better institutional quality is often synonymous with Public spending (Apeti et al., 2024). It thus mitigates the effect of economic sanctions on public spending efficiency in our case as presented in the fourth

graph in Figure 6.

Figure 6: Macroeconomic factors



7 Validity of Transmission channels

Since the beginning of this article, we have shown that sanctions reduce the Public Spending Efficiency. In this section, we provide empirical evidence on the potential transmission channels through which economic sanctions may reduce the Public Spending Efficiency in sanctioned countries. As mentioned above, we expect that economic sanctions can reduce Public Spending Efficiency by (i) reducing government expenditure, (ii) increasing poverty, and (iii) reducing access to international financial markets for financing activities. We regress our sanction variable on these transmission channels using the same basic specification as in the economic literature (Bambe, 2022; Apeti and Edoh, 2024; Sawadogo, 2024).

Table 6: Validity of Transmission Channels

	(1) GDP per capita	(2) Access to financial markets	(3) Government expenditure
Sanctions	-0.157***	-0.5190***	-0.950**
	(0.0200)	(0.1209)	(0.4379)
Observation	903	749	903
Controls	YES	YES	YES
Country and Year Fixed Effects	YES	YES	YES

All regressions include the constant not reported in the table. Robust standard errors are shown in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

8 Let's go beyond US sanctions

In this study, we have focused on US sanctions in order to analyze their effects on the public spending efficiency of sanctioned countries. Far from being a choice on the part of the authors, this follows the recent trend in the economic literature on sanctions (Apeti and Edoh, 2024). However, in this section we seek to examine the effect of other types of sanctions, i.e. those imposed by the European Union (EU), the United Nations (UN) and, in a general context, all types of sanctions. The results presented in the last three columns of Table A1 show that economic sanctions generally reduce the Public Spending Efficiency . EU sanctions are significant while UN sanctions are not. This last result is not surprising, since UN sanctions often aim to minimise the negative effects on the population by being limited to arms embargoes or targeted restrictions that do not directly affect economic trade or services essential to the population. UN sanctions are therefore generally less restrictive and designed not to hinder essential public spending, unlike the more severe financial and trade sanctions imposed by the US and the EU.[8]

[8]We also tested the robustness of these other forms of sanction. The results remain robust and will be available on request.

9 Conclusion

In this study, we examine the impact of economic sanctions on Public Spending Efficiency. We base our analysis on a panel of 124 countries between 1990 and 2017, using the entropy balancing method to account for selection bias that may lead to endogeneity. The results show that economic sanctions significantly reduce the PSE of sanctioned countries. This result represents 0.016 percentage points. A number of robustness tests are conducted to confirm our results. First, we use alternative sample that exclude periods of crisis, hyperinflation, cryptocurrency expansion, fragile states, and then add additional control variables to reduce omitted variable bias. Second, we use alternative methods to confirm the robustness of our main entropy-based results. Our analysis also shows some heterogeneity depending on the type of economic sanctions, dynamic effects, and Macroeconomic factors. Our analysis also provides empirical evidence that the effects of economic sanctions transits through three main economic channels: International financial markets, Government expenditure and Poverty(recession).

To mitigate the impact of sanctions on the efficiency of public spending, sanctioned countries should diversify their sources of financing by strengthening their domestic tax base and seeking partnerships with regional institutions. They should improve the transparency and efficiency of public administration to reduce waste, while prioritizing investments in social and strategic sectors such as education, health and infrastructure. Supporting the informal economy and self-sufficiency mechanisms is essential to build local resilience. At the same time, regional alliances and alternative trading systems can reduce dependence on sanctioned markets. Countries should promote a more targeted use of sanctions to limit their impact on populations and essential public services, while exploring innovative solutions to address economic challenges. Finally, dialogue and negotiation should be preferred to immediate sanctions in order to limit the multiple harmful effects of this policy instrument.

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10 Appendix

Table A1: Type of sanctions

	(1) PSE	(2) PSE	(3) PSE	(4) PSE	(5) PSE	(6) PSE	(7) PSE
Trade Sanctions	0.002						
	(0.013)						
Financial Sanctions		–0.016**					
		(0.008)					
Failed Sanctions			0.002				
			(0.010)				
Success Sanctions				-0.378***			
				(0.088)			
EU Sanctions					-0.031***		
					(0.010)		
UN Sanctions						-0.002	
						(0.015)	
All Sanctions							-0.016**
							(0.008)
Observation	981	981	981	981	981	981	981
Country Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES

All regressions include the constant not reported in the table. Robust standard errors are shown in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Robustness check: Adding Controls.

GVCs	Rents [1]	Inflation [2]	Density of Population [3]	Fiscal balance [4]	Democracy [5]
US Sanctions	-0.018**	-0.019**	-0.018**	-0.016**	-0.017**
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	864	864	864	864	864

GVCs	Trade openess [6]	Industrialization [7]	Agriculture valued added [8]	Press freedom [9]	Government durability [10]
US Sanctions	-0.018**	-0.019**	-0.019**	-0.017**	-0.014*
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	864	864	864	864	864

GVCs	Growth [11]	Financial globalization [12]	Property Rights [13]	All crises [14]	All additional controls [15]
US Sanctions	-0.017**	-0.016*	-0.015*	-0.016*	-0.015*
	(0.008)	(0.0086)	(0.0084)	(0.0083)	(0.008)
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Observations	864	864	864	864	864

Notes : This table displays the robustness of our results using additional control variables. All regressions include the constant not reported in the table. Robust standard errors are shown in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1 .

Table A3: Diff-in-diff estimates

PSE	Pre-treatment	Post treatment
Sanctions	-0.005	-0.062**
	(0.0054)	(0.0299)
Observations	736	736
Year fixed Effects	YES	YES
Country fixed Effects	YES	YES
Controls	YES	YES

Unreported constant included. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1