

3-8-2019

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Recommended Citation

Sadik-Zada, Richard Elkhan and Gatto, Andrea, "Determinants of Public Debt and the Role of Energy: a Cross-Country Analysis" (March 08, 2019). *Fondazione Eni Enrico Mattei Working Papers*. Paper 1263.
<https://services.bepress.com/feem/paper1263>

March 2019



Working
Paper

004.2019

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Economic Theory

Series Editor: Matteo Manera

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Andrea Gatto, Department of Economic & Legal Studies (DISEG)

Summary

This paper investigates the major drivers of the public debt growth in 184 countries. Our analysis consists in a cross-country survey, which is conducted on the basis of the improved compilation of datasets on the central government debt for 2013. In order to differentiate between developing/transition and advanced countries, we generate dummy variables for the different country groups. Following existing literature, we employ military expenditure as a share of GNP, as a proxy of existent or potential conflict, induced driver of the public expenditure. The study finds that oil abundance, economic growth rate, the share of mineral rent in the total revenue, interest rate payments for foreign borrowings, and developing country dummy have statistically significant impact on the growth of the public debt. In contrast, defense spending, unemployment rate, and inflation rate do not have a statistically significant positive impact on the public debt rate.

Keywords: Fiscal Policy, Public Debt, Gross Capital Formation, Sovereign Wealth Funds, Oil Exporters

JEL Classification: F21, F34, F36, G15, H6, N1, F3

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Determinants of Public Debt and the Role of Energy: A Cross-Country Analysis

*Richard Elkhani Sadik-Zada*¹

*Andrea Gatto*²

Abstract:

This paper investigates the major drivers of the public debt growth in 184 countries. Our analysis consists in a cross-country survey, which is conducted on the basis of the improved compilation of datasets on the central government debt for 2013. In order to differentiate between developing/transition and advanced countries, we generate dummy variables for the different country groups. Following existing literature, we employ military expenditure as a share of GNP, as a proxy of existent or potential conflict, induced driver of the public expenditure. The study finds that oil abundance, economic growth rate, the share of mineral rent in the total revenue, interest rate payments for foreign borrowings, and developing country dummy have statistically significant impact on the growth of the public debt. In contrast, defense spending, unemployment rate, and inflation rate do not have a statistically significant positive impact on the public debt rate.

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1. Introduction

Sovereign borrowing as a tool of public finance emerged first in Great Britain after Britain's Glorious Revolution in 1688. America's Revolution in 1776 and European Enlightenment of the eighteenth century were three major events which led to a strengthening of the rule of law, sanctity of contract and parliamentary checks on the power of the heads of the states. This, in combination with the incessant money shortage of the state led to the emergence of the central banking. The money shortage and the rise of the division of powers were the results of the permanent wars taking place between European states inside Europe and outside Europe over the colonies. To assist governments in financing the war with France, Britain established 1694 Britain's Bank of England. In a similar manner, Denmark (1773), France (1800), Austria (1816), Norway (1816), Belgium (1850), Netherlands (1864), Germany (1875), Japan (1882), Italy (1893), Switzerland (1905), the United States (1913), and Canada (1933) established their central banks (Salsman, 2017); this fact produced an impetus for the emergence of public debt as a central instrument of fiscal policy.

Today, public debt is a global phenomenon practiced in most of the countries around the world, whereby developing countries rely more on the external than on the domestic borrowing. This is the result of the underdevelopment of the financial sector in a number of developing and transition economies.

This paper aims to contribute to the existing literature on public debts, attempting to define its determinants worldwide. The next **subsection (2)** deals with the literature review on the sources and determinants of the public debt. **Subsection 3** puts forth the major hypotheses of the survey. **Subsection 4** delivers a discussion on the underlying research methodology and data issues. **Subsection 5** scrutinizes the estimation results. **Subsection 6** concludes.

2. Literature review

2.1 Sources of Public Debt

The International Monetary Fund (IMF) defines debt *“as all liabilities that require payments of interest and/or principal by the debtor to the creditor at a date or dates in the future. Thus, all liabilities in the Government Finance Statistics system are debt except for shares and other equity and financial derivatives”* (IMF, 2011). Printing money, running down foreign exchange reserves, borrowing abroad, and borrowing domestically are four major forms of fiscal deficit financing (Fischer and Easterly, 1990). Printing money fuels inflation and the seigniorage revenue enabled by such a policy is non-linear in the inflation rate. Empirical surveys show that printing money has a very limited leeway for combating the budget deficit

and in the same time is very costly for macroeconomic stability and economic growth (Bua et al. 2014; Easterly and Schmidt-Hebbel, 1991). The literature on public debt, especially for the low-income countries, focuses on the external debt data. Not only the data availability issue, but also the fact that the government borrowing in most developing countries was made possible mainly over foreign debt sources. The role of the local debt market to finance budget deficits started to increase in the last decade, especially in 2008, during the financial crisis (Bua et al., 2014). Running down the foreign exchange reserves has no inflationary effects. Hence, this policy seems to be more advantageous than increasing the stock of money in the economy. Nevertheless, this policy has its limits and cannot be employed for a substantially long time due to the limits of the foreign exchange reserves. Despite this fact, as a short-term policy tool, this policy could be considered as an appropriate short-term tool for the emergency and crisis situations. Foreign lending does not create an inflationary pressure on the domestic economy nor leads to the crowding out of domestic lending to the private sector. This could eventually lead to the appreciation of the domestic currency over the increasing demand for the local currency and harm the domestic exports (Rordrik, 2008; Sachs and Werner, 1995). Foreign debt financing scales up the pressure on solvency and complicates the exchange rate management (Bua et al, 2014). Domestic borrowing does not have the inflationary pressure on the economy, nor leads to the appreciation of the local currency. The major concerns of the domestic borrowing result to be the crowding out effects of the private investments by the public investments and the increasing domestic interest rates. Domestic borrowing is more common in the countries with developed financial institutions. Thus, for a long time the domestic borrowing was latently assumed to be more widespread in the advanced and emerging economies, and much less in the low intensity conflicts (LICs). This opinion was backed by the absence of empirical data on the LICs. This paradigm has changed with the new data sets on the domestic public debt data for 36 LICs compiled in Bua et al. (2014). The dataset shows that the substantial share of the public debt in these LICs were generated through domestic borrowing. This is attributable to the result of the financial liberalization commenced in the late 1980s and early 1990s (Presbitero, 2012). Based on the dataset built by Bua et al. (2014), it is appreciable as well a slight increase of the already substantial domestic borrowing as the source of public debt (**Figure**

1). Domestic debt has increased from 12.3% in 1996 to 16.2% in 2011. The dataset presented in Presbitero (2012) yields the same result.

In addition, **Figure 1** also shows the evolution of the external debt in the LICs. There has been a steady decline of the external debt ratio over the period 1996-2008, from 72 to 23% in 2011. After 2008, this ratio did not change significantly.

It must be mentioned that domestic debt, especially in developing countries with high inflation rates, is mostly issued in

Figure 1. Domestic and External Public Debt (as % of GDP), 1996-2011

Source: Bua et al. (2011)

foreign currencies. A textbook case is Zimbabwe during hyperinflation. During the years of hyperinflation, Zimbabwe issued the majority of debt obligations in foreign currencies. However, this is not a problem happening solely to countries experiencing hyperinflation: the overwhelming majority of the LICs issue their public obligations in the currencies which dominate in the international financial and trade relations – i.e. US Dollars, Euro, and Yuan. This is an additional burden on the sovereign default risk, because the local governments are not able to control the factors determining the volatility of the foreign currency (Mupunga & Le Roux, 2014).

2.2 Determinants of the Public Debt

Forslund et al. (2011) identify six major categories determining the composition of the public debt in developing countries. These are:

- (1) macroeconomic imbalances;
- (2) country size and the level of development;
- (3) crises and external shocks;
- (4) openness;
- (5) exchange rate regime.

Macroeconomic imbalances category encompasses inflation,

current account balance, level of total public debt and exchange rate

misalignment. The second category, country size and level of development is related to

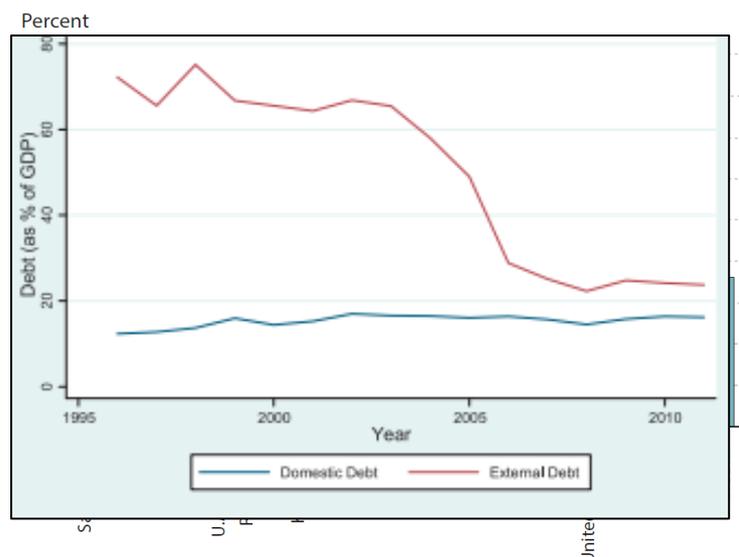


Figure 2. Total Public Debt to GDP, 1979-2010 Average
Source: Arias and Restrepo-Echavarria (2016) and WDI 2012.

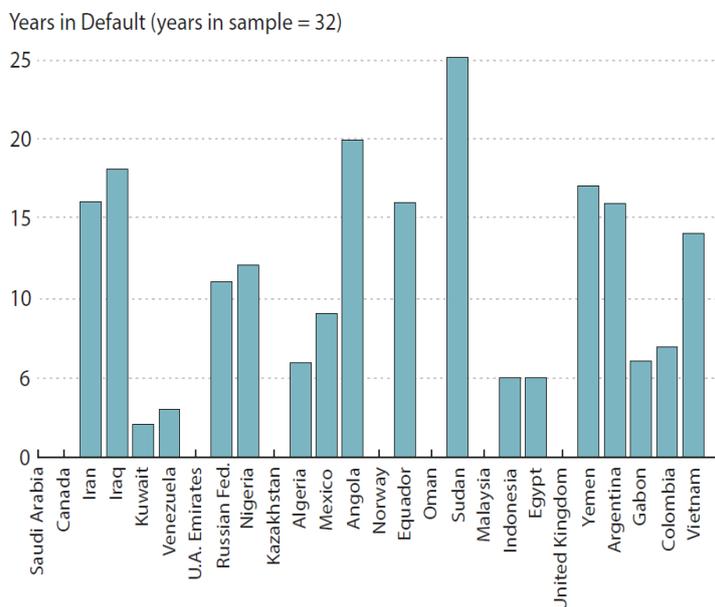
indicators such as GDP, per capita income, M2³ over GDP, and institutional quality. The third category, crises and external shocks, captures the crisis situations related to a sovereign default and other impulsive changes in the current macroeconomic situation. The fourth category sketches trade and capital account openness. The last category, exchange rate regime, is related to the fixed or floating exchange rates. Azam and Feng (2015), Ahmed (2012), Anfofum (2014), Dunne et al. (2004a), Dunne et al. (2004b), Narayan and Narayan (2005), Sezgin (2004), Muhanyi and Ojah (2014) and Karagöz (2018) detect a positive causal relationship between defense expenditure as an important driver of the public debt.

The relationship between oil abundance and public debt issues has not been yet studied exhaustively. Despite the intuition that the economies with substantial petroleum revenues should have a lower public debt share, and consequently a lower sovereign default risk, is not generally

valid. Hamann et al. (2016) and Arias and Restrepo-Echavarria (2016) show that this is by far not the case. **Figure 2** depicts the average public debt for 25 net oil exporters between 1979 and 2010. The cross-country average public debt to GDP ratio is 50%, ranging from 8% (UAE) to 179% (Sudan). As shown on **Figure 3**, only 8 of 25 countries did not have default episodes (Borzenstein & Panizza, 2008, Arias & Restrepo-Echavarria, 2016). The major problem in the public finance of the oil-producing economies is the volatility of the oil prices. Increasing oil prices lead to the rising oil extraction and higher GDP growth rates, improvements of the trade balance and current accounts, lower sovereign risk perception, and reduce the default risk. In the phases of shrinking oil prices, the opposite happens and the default risk increases substantially (Arias and Restrepo-Echavarria, 2016).

Figure 3. Default Episodes, 1979-2010

Source: Arias and Restrepo-Echavarria (2016).



³ Money supply measure, as defined by the Federal Reserve

3. Theoretical Framework and Hypotheses

Fiscal policy targets do stimulate the economy especially during or before a recession. The constitutive feature of the recession is the negative growth rate at least for six months (Sadik-Zada, 2000). Thus, we assume that especially in the times of very low or negative growth rates the governments employ the public debt as an anticyclical stimulation instrument. Based on this assumption, we test the following hypothesis:

Hypothesis 1: *Economic growth has a negative growth effect on the public debt.*

Armed with the same logic, we assume that especially in the recession phases with high pressure on the job market, governments employ public debt as a tool to compensate the recessive impulses by the positive fiscal impulses and to curb the job market.

To test for the relationship between unemployment rate and public debt, we test the following hypothesis:

Hypothesis 2: *There is a positive relationship between unemployment rate and public debt.*

To combat recession, governments increase public investments mainly financed over public debt. This is especially the case of recession phases due to decreasing tax revenues.

To assess the relationship between public debt and gross capital formation, we test the following hypothesis:

Hypothesis 2: *There is a positive relationship between gross capital formation (GCF) and public debt ratio in the short run.*

Increasing defense spending, especially in the developing countries, does not have strong positive effects on economic growth and is not considered as an anticyclical instrument. In fact, the majority of developing countries import most armament from the advanced economies. Increasing or high share of the defense spending as a budget item is a sign for the existence of the security risks.

In the next hypothesis, we test for the effect of the defense spending on the public debt.

Hypothesis 3: *There is positive relationship between defense spending and public debt ratio.*

Mohaddes and Raisi (2017) have shown that the existence of the sovereign wealth funds (SWFs) in the petroleum rich countries also serve actively as an anticyclical tool. The availability of the transfers from these SWFs to the state budgets could lead to fungibility between these transfers and the public debt.

Thus, we test this in the following hypothesis:

Hypothesis 4: *Petroleum (mineral) abundance has a negative impact on the public debt ratio.*

In order to take account for the structural differences between advanced and developing/transition economies, we include a dummy variable, which takes the value 1 for all developing and transition economies and 0 for the advanced economies. This variable captures also partly the diverging effect of the defense sector on the rest of the economy in these two groups.

Hypothesis 5: *There is a difference between developing/transition and advanced economies in the public debt levels.*

The countries with a high level of public debt have a higher share of the interest rate as a share of public debt than the countries with a moderate public debt. We also want to assess the impact of the indebtedness on the level of additional indebtedness and employ the interest rate payments as an independent variable.

Hypothesis 6: *There is a positive relationship between interest rate payments and the public debt share.*

4. Research design

4.1 Data

The data on public debt have become more comprehensive, more accurate, and more readily available in recent years due to the efforts of Abbas et al. (2011), Jaimovich and Panizza (2010), and Bova et al (2016). Bua et al. (2014), introduced a new dataset on the stock and

structure of domestic public debt in 36 Low-Income Countries over the period 1971-2011. This dataset provides not only the information on the stock of public debt and interest payments, but also encompasses the information on maturity, currency composition, creditor base, and type of the financial instruments. For our analysis, we employ the data compilation provided by the last version of the World Development Indicators which incorporates the data sources mentioned above. We should stress our data collection choice. For the sake of completeness, we take the data of 2013. This choice is driven by data availability, and to avoid data loss or imputation: we chose the most recent, standard, and representative year in terms of data, 2014, presenting 2017 a lot of missing values. The years 2013 to 2015 are more complete. Nevertheless, to avoid a structural break, we take the observations for 184 countries before the dramatic shrinkage of the oil prices in November 2014.

4.2 Methodology

For the assessment of the major determinants of the public debt, this study applies a cross-country linear regression approach with data for 184 countries. To interpret the regression coefficients as elasticities, i.e. in percentages and to normalize the data, the natural logarithm of the dependent and all the independent variables are taken. To test for the existence of heteroscedasticity *Breusch-Pagan test* was applied.⁴ The test result indicates the absence of heteroscedasticity in the dataset (see **Appendix 2**). To assess the differences in the level of public debt between the advanced and developing economies, we employ a dummy-variable strategy. We classify all the EU-member states and all the high-income countries with a per capita income over 30000 in constant 2010 US Dollars as developed countries. Except for the UAE and Qatar, all the Gulf States are classified as developing countries.

In the equation (1) below, we represent...

The natural logarithm (\ln) of the share of the central government debt in GDP ($\ln gY$) is the dependent variable; \ln of the inflation rate ($\ln INFLAT$), \ln of the unemployment rate projected by the International Labour Organization (ILO), \ln of the unemployment rate ($\ln UEMP$), \ln of the share of the oil rents as a share of GDP ($\ln OilRent$), \ln of the share of the defence spending as a share of GDP ($\ln DEFENCE$), gross capital formation as a share of GDP ($\ln INV$), \ln of the mineral rent as a share of GDP ($\ln MINERAL$) and \ln of the interest payment for the public debt ($\ln INTEREST$) are the independent variables.

⁴ Heteroscedasticity refers to the circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it (cf. Wooldridge, 2013).

$$Y_i = \beta_0 + \beta_1 \ln gY + \beta_2 \ln INFLAT + \beta_3 \ln UEMP + \beta_4 \ln OilRent + \beta_5 \ln DEFENCE + \beta_6 \ln INV + \beta_7 \ln MINERAL + \beta_8 \ln INTEREST + \varepsilon_i \quad (1)$$

The log-log character of the regression model enables the interpretation of the coefficients in percentages.

5. Results

In the framework of the regression analysis, seven regression equations were conducted. The first equation, (1), is a bilateral regression with only GDP growth ($\ln gY$) as explanatory variable. Based on the regression output, 1% increase of economic growth leads to -3,32% decrease on the public debt. In all the following seven regressions I employ $\ln gY$ as an independent variable. In all of the 7 regression models $\ln gY$ has a statistically negative impact in the public debt. The coefficient of $\ln gY$, β_1 , varies between -2,85% and -6,34%. This shows a negative nexus between GDP growth and the level of public debt and corroborates Hypothesis 1 (*Economic growth has a negative growth effect on the public debt*). **Figure 4** and the fitted linear regression line (fitted values) also indicate a negative relationship between the growth rate of GDP and the public debt ratio.

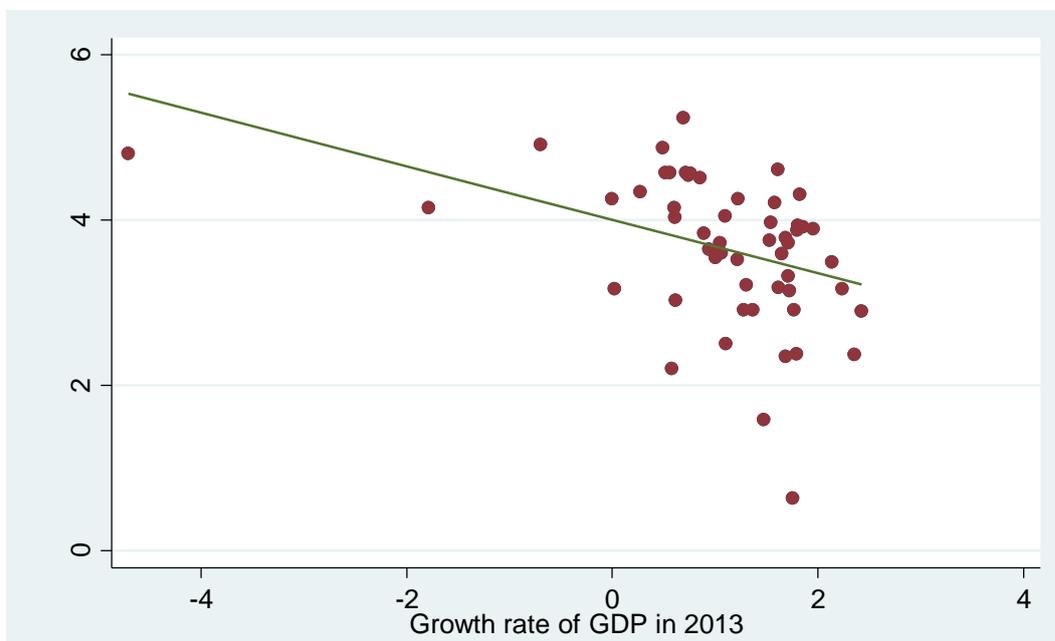


Figure 4. Public debt and the growth rate of GDP, 2013.
Source: Authors' illustration.

Inflation rate ($\ln INFLAT$), unemployment rate ($\ln UEMP$), and defence spending ($\ln DEFENCE$) have no statistically significant impact on the public debt. This result rejects Hypothesis 2 and shows that there is no statistically significant relationship between unemployment (inflation) and the level of public debt. The share of oil rent ($\ln OILRent$) and mineral rent as a share of GDP ($\ln MINERAL$) has a statistically significant negative impact on the dependent variable (equations (4) and (5) for oil and equation (6) for mineral rent).

In Equation (6) we included gross capital formation as a share of GDP ($\ln INV$) as a control variable to test Hypothesis 3. Estimation output rejects this hypothesis and shows that there is no statistically significant relationship between gross capital formation, which is a proxy for total investment share in GDP, and public debt.

The coefficient of $\ln OilRent$ varies between (-0,177) and (-0,196). This implies that an increase of the oil revenues by 1% leads to a decrease of the public debt by 1,77 (1,96%) (Equations (4) and (5)). **Figure 5** also indicates the negative relationship between oil rent as a share in total public revenue and the public debt.

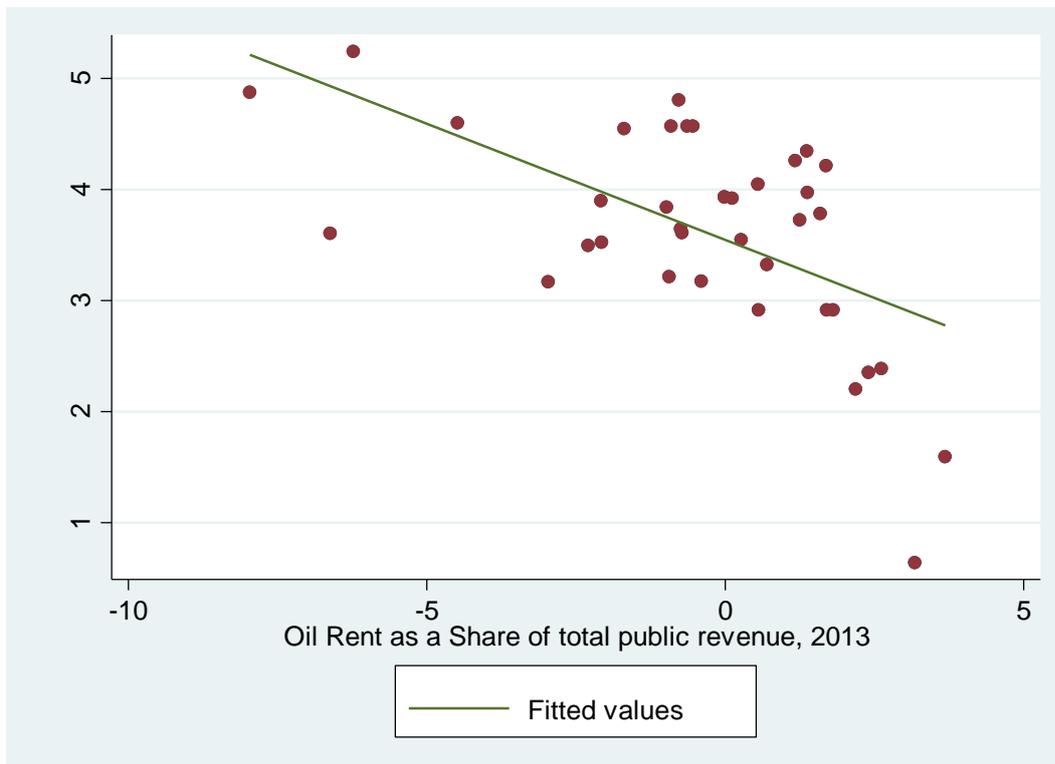


Figure 5. Public debt and oil rent as a share of total public revenue, 2013.
Source: Authors' illustration.

lnMINERAL, another proxy for the natural resource abundance, also has a statistically significant negative impact on the level of public debt: 1% increase of the mineral rent as a share of GDP leads to 0.05-0,06% decrease of the public debt level. We can observe that oil abundance has a much stronger impact on the public debt level than mineral rent. These results corroborate Hypothesis 4. This implies a positive relationship between resource abundance and fiscal stability. Interest payments (public debt related) as a share of total revenue have a statistically significant positive impact on the level of public debt: An increase of the interest payments by 1% lead to an increase of the public debt by 0,593%.

DEPENDENT VARIABLE: Central government debt as a share of GDP in 2013								
VARIABLES	1	2	3	4	5	6	7	8
<i>lnGDP</i>	-0.323*** (0.0892)	-0.285*** (0.102)	-0.298*** (0.108)	-0.234** (0.0857)	-0.446 (0.268)	-0.634*** (0.211)	-0.323* (0.166)	-0.0791 (0.112)
<i>lnINFLAT</i>		-0.168 (0.151)	-0.140 (0.165)	0.00729 (0.230)	0.0383 (0.245)			
<i>lnUEMP</i>			0.0459 (0.142)	0.144 (0.188)	0.164 (0.197)	-0.302 (0.316)	0.287 (0.188)	0.399** (0.176)
<i>lnOilRent</i>				-0.196** (0.0788)	-0.177** (0.0725)			
<i>lnDEFENCE</i>					-0.110 (0.226)			
<i>lnINV</i>						0.0744 (0.202)	-0.0492 (0.125)	-0.0453 (0.105)
<i>lnMINERAL</i>						-0.0684** (0.0328)	-0.0532* (0.0263)	-0.0180 (0.0247)
<i>lnINTEREST</i>							0.593*** (0.110)	0.698*** (0.0655)
<i>DEVELOPING</i>								-0.641*** (0.199)
Constant	4.009*** (0.139)	4.163*** (0.196)	4.043*** (0.376)	3.575*** (0.514)	3.849*** (0.447)	4.780*** (0.764)	2.338*** (0.653)	2.728*** (0.463)
Observations	55	51	49	35	34	33	33	33
R-squared	0.163	0.198	0.209	0.434	0.433	0.343	0.684	0.757

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. Linear Regression Estimations (1) - (8).
Authors' own regression estimations.

In order to control for the difference between developing and developed countries we add a dummy variable, *DEVELOPING*, which take the value 1 if the country in the dataset is a developing or transition economy, and 0 if the country is a developed country with high income level or an EU-member country. We find that being a developing country has a statistically significant negative impact on the public debt ratio. Being a developing country leads on average to 6,5% decrease of the public debt as a share of GDP.

As shown in the estimation output sketched in **table 1**, the coefficients of determination in the estimations range between 16,3 and 75,5%. This implies that all the regression models explain a substantial share (at least 16,3% and at utmost 75,5%) of the variations of the dependent variable, i.e. *lnDebt*.

6. Concluding remarks

Cross-country regression survey shows that a greater growth rate of the aggregate GDP has a statistically negative impact on the public debt as a share of GDP. This effect vanishes if we include the developing country dummy in Equation (8). Unemployment has a statistically significant impact on the level of public debt only in the last regression Equation (8). Interest payments also have a statistically significant positive impact on the level of public debt (Equations (7) and (8)). Oil rent as a share of total revenue (Equations (4) and (5)) has a statistically significant negative impact on the level of public debt. The same is true for the mineral rent as a share of total revenue (Equations (6) and (7)). Defense spending does not have a statistically significant impact on the level of the public debt (see **Appendix 3**).

The central limitation of the study is related to the endogeneity and multicollinearity issues. These problems shed a shadow on the estimation results and make a further elaboration of the econometric strategy necessary.

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APPENDIX 1: STATA COMMANDS FOR TABLE 2⁵

1	use "C:\Users\admin\Dropbox\Public Debt\24.04.dta"
2	regress lnDebt lngY, vce(robust)
3	ssc install outreg2
4	outreg using myreg.doc, replace
5	regress lnDebt lngY lnINV, vce(robust)
6	regress lnDebt lngY lnUEMP, vce(robust)
7	regress lnDebt lngY lnINTEREST, vce(robust)
8	regress lnDebt lngY lnPCI, vce(robust)
9	outreg using myreg.doc, replace
10	regress lnDebt lngY, vce(robust)
11	outreg2 using sevinge.doc, replace ctitle(1)
12	seeout using "sevinge.txt"
13	shellout using ""sevinge.doc""
14	shellout using ""sevinge.doc""
15	gen lnINFLAT=ln(YR2013Inflationconsu)
16	regress lnDebt lngY lnINFLAT, vce(robust)
17	outreg2 using sevinge.doc, append ctitle(2)
18	regress lnDebt lngY lnINFLAT lnUEMP, vce(robust)
19	outreg2 using sevinge.doc, append ctitle(3)
20	seeout using "sevinge.txt"
21	regress lnDebt lngY lnINFLAT lnUEMP, vce(robust)
22	regress lnDebt lngY lnINFLAT lnUEMP lnOilRent, vce(robust)
23	outreg2 using sevinge.doc, append ctitle(4)
24	regress lnDebt lngY lnINFLAT lnUEMP lnOilRent lnDEFENCE, vce(robust)
25	outreg2 using sevinge.doc, append ctitle(5)
26	regress lnDebt lngY lnINFLAT lnUEMP lnOilRent lnDEFENCE lnINV, vce(robust)
27	regress lnDebt lngY lnINFLAT lnUEMP lnOilRent lnINV, vce(robust)
28	regress lnDebt lngY lnINFLAT lnOilRent lnINV, vce(robust)
29	regress lnDebt lngY lnOilRent lnINV, vce(robust)
30	regress lnDebt lngY lnINV lnMINERAL, vce(robust)
31	regress lnDebt lngY lnINV lnMINERAL lnINV, vce(robust)
32	regress lnDebt lngY lnINV lnMINERAL lnUEMP, vce(robust)
33	outreg2 using sevinge.doc, append ctitle(6)
34	regress lnDebt lngY lnINV lnMINERAL lnUEMP lnINTEREST, vce(robust)
35	outreg2 using sevinge.doc, append ctitle(7)
36	shellout using ""sevinge.doc""

⁵ For a full list of the stata commands see the do-file.

APPENDIX 2: Heteroskedasticity and Multicollinearity Tests

- **Heteroskedasticity Test**

```
. estat hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of lnDebt

chi2(1)      =      1.17
Prob > chi2  =      0.2786
```

The heteroscedasticity test shows that there is no heteroscedasticity because the P-value 0.2786 is greater than 0.005.

- **Heteroskedasticity Test Model 5**

```
. hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of lnDebt

chi2(1)      =      3.91
Prob > chi2  =      0.0480
```

The heteroscedasticity test for model 5 shows that there exists heteroscedasticity for model 5.

- **Multicollinearity Test**

```
. vif
```

Variable	VIF	1/VIF
lnPCI	3.24	0.308761
lnINFLAT	2.67	0.374333
lnUEMP	1.70	0.587419
lngY	1.68	0.594168
lnDEFENCE	1.55	0.647016
lnINV	1.42	0.704009
lnMINERAL	1.24	0.807020
Mean VIF	1.93	

The rule of thumb: If all vif-values are less than 10 then it can be concluded that there is no multicollinearity in the dataset.

APPENDIX 3: Regression Estimations with *lnDEFENCE*

Linear regression

Number of obs = 33
 F(7, 25) = 31.08
 Prob > F = 0.0000
 R-squared = 0.7656
 Root MSE = .46123

lnDebt	Robust		t	P> t	[95% Conf. Interval]	
	Coef.	Std. Err.				
lngY	-.0905965	.141691	-0.64	0.528	-.3824146	.2012216
lnINV	-.0007423	.113095	-0.01	0.995	-.2336657	.2321811
lnMINERAL	-.0158622	.0277523	-0.57	0.573	-.0730191	.0412948
lnUEMP	.3358068	.1913663	1.75	0.092	-.0583196	.7299331
lnINTEREST	.725654	.068402	10.61	0.000	.5847775	.8665305
Devel	-.6297367	.2142159	-2.94	0.007	-1.070923	-.1885508
lnDEFENCE	.1392224	.1691691	0.82	0.418	-.2091879	.4876326
_cons	2.636197	.4896482	5.38	0.000	1.627747	3.644646

. regress lnDebt lngY lnMINERAL lnUEMP lnINTEREST Devel lnDEFENCE , vce(robust)

Linear regression

Number of obs = 38
 F(6, 31) = 26.57
 Prob > F = 0.0000
 R-squared = 0.7492
 Root MSE = .44879

lnDebt	Robust		t	P> t	[95% Conf. Interval]	
	Coef.	Std. Err.				
lngY	-.2231513	.1386878	-1.61	0.118	-.506007	.0597044
lnMINERAL	-.0289094	.0253788	-1.14	0.263	-.0806697	.0228509
lnUEMP	.1445688	.1318217	1.10	0.281	-.1242833	.4134209
lnINTEREST	.6381418	.0823463	7.75	0.000	.4701953	.8060883
Devel	-.5087088	.1889063	-2.69	0.011	-.8939858	-.1234318
lnDEFENCE	.1269872	.1495183	0.85	0.402	-.1779573	.4319318
_cons	3.144059	.4727041	6.65	0.000	2.179973	4.108145

. regress lnDebt lngY lnMINERAL lnINTEREST Devel lnDEFENCE , vce(robust)

Linear regression

Number of obs = 38
 F(5, 32) = 21.51
 Prob > F = 0.0000
 R-squared = 0.7368
 Root MSE = .45249

lnDebt	Robust		t	P> t	[95% Conf. Interval]	
	Coef.	Std. Err.				
lngY	-.2692371	.127021	-2.12	0.042	-.5279704	-.0105037
lnMINERAL	-.0255204	.0247525	-1.03	0.310	-.0759397	.0248988
lnINTEREST	.6141596	.0785581	7.82	0.000	.4541419	.7741773
Devel	-.5064927	.1855837	-2.73	0.010	-.8845144	-.128471
lnDEFENCE	.1496637	.149986	1.00	0.326	-.1558477	.4551752
_cons	3.500219	.3466033	10.10	0.000	2.794212	4.206227

In all three estimations the natural defence spending as a share of GDP is not statistically significant (p-values are greater than 0,005, i.e. 5%). Thus, the positive coefficient values do not lead to the conclusion that the effect is positive.

APPENDIX 4: Description of the Dataset

. describe

Contains data from C:\Users\wirdrei\Downloads\24.04.dta

```

obs:          269
vars:         38          25 Apr 2018 12:54
size:        79,624

```

variable name	storage type	display format	value label	variable label
CountryName	str52	%52s		Country Name
CountryCode	str3	%9s		Country Code
Developing	byte	%10.0g		Country Code
YR2013Central~e	double	%10.0g		2013 [YR2013] - Central government debt, total (% of GDP) [GC.DOD.TOTL.GD.ZS]
D	double	%10.0g		2013 [YR2013] - Central government debt, total (current LCU) [GC.DOD.TOTL.CN]
YR2013Oilrent~f	double	%10.0g		2013 [YR2013] - Oil rents (% of GDP) [NY.GDP.PETR.RT.ZS]
YR2013Officia~g	double	%10.0g		2013 [YR2013] - Official exchange rate (LCU per US\$, period average) [PA.NUS.FCR]
YR2013GDPgrow~u	double	%10.0g		2013 [YR2013] - GDP growth (annual %) [NY.GDP.MKTP.KD.ZG]
YR2013GDPperc~a	double	%10.0g		2013 [YR2013] - GDP per capita (constant 2010 US\$) [NY.GDP.PCAP.KD]
I	double	%10.0g		2013 [YR2013] - GDP per capita (constant LCU) [NY.GDP.PCAP.KN]
YR2013Grossfi~i	double	%10.0g		2013 [YR2013] - Gross fixed capital formation (annual % growth) [NE.GDI.FTOT.KD.]
K	double	%10.0g		2013 [YR2013] - Gross fixed capital formation (% of GDP) [NE.GDI.FTOT.ZS]
YR2013Grosssa~s	double	%10.0g		2013 [YR2013] - Gross savings (% of GDP) [NY.GNS.ICTR.ZS]
YR2013Undisbu~e	double	%10.0g		2013 [YR2013] - Undisbursed external debt, official creditors (UND, current US\$)
N	double	%10.0g		2013 [YR2013] - Undisbursed external debt, private creditors (UND, current US\$)
O	double	%10.0g		2013 [YR2013] - Undisbursed external debt, total (UND, current US\$) [DT.UND.DPPG]
YR2013Unemplo~o	double	%10.0g		2013 [YR2013] - Unemployment, total (% of total labor force) (modeled ILO estima
Q	double	%10.0g		2013 [YR2013] - Unemployment, total (% of total labor force) (national estimate)
YR2013Inflati~u	double	%10.0g		2013 [YR2013] - Inflation, consumer prices (annual %)

APPENDIX 4: continued

YR2013Inflati~d	double	%10.0g	2013 [YR2013] - Inflation, GDP deflator (annual %) [NY.GDP.DEFL.KD.ZG]
YR2013Informa~m	double	%10.0g	2013 [YR2013] - Informal employment (% of total non-agricultural employment) [SL]
U	double	%10.0g	2013 [YR2013] - Inflation, GDP deflator: linked series (annual %) [NY.GDP.DEFL.K
YR2013Interes~t	double	%10.0g	2013 [YR2013] - Interest payments on external debt, public and publicly guarante
W	double	%10.0g	2013 [YR2013] - Interest payments (% of revenue) [GC.XPN.INTP.RV.ZS]
X	double	%10.0g	2013 [YR2013] - Interest payments on external debt, total (INT, current US\$) [DT]
Y	double	%10.0g	2013 [YR2013] - Interest payments on external debt (% of exports of goods, servi
YR2013Militar~i	double	%10.0g	2013 [YR2013] - Military expenditure (% of GDP) [MS.MIL.XPND.GD.ZS]
YR2013Mineral~s	double	%10.0g	2013 [YR2013] - Mineral rents (% of GDP) [NY.GDP.MINR.RT.ZS]
lnDebt	float	%9.0g	
lnOilRent	float	%9.0g	
lngY	float	%9.0g	
lnPCI	float	%9.0g	
lnINV	float	%9.0g	
lnUEMP	float	%9.0g	
lnDEFENCE	float	%9.0g	
lnINTEREST	float	%9.0g	
lnMINERAL	float	%9.0g	
lnINFLAT	float	%9.0g	

Sorted by:

Note: dataset has changed since last saved

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