Corruption and public debt: an empirical analysis

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Abstract

We empirically investigate the relationship between corruption and public debt. By using a panel of 166 countries over the 1995-2013 period, we find that corruption in the public sector increases government debt. The effect, however, appears to be heterogeneous across income-related sample splits: it is stronger for advanced economies and weaker for less-developed countries. In addition, we disentangle the direct and indirect effect of corruption, the former operating via increased public expenses and the latter via the negative impact on GDP. We find that most of the effect is direct but for OECD high-income countries where the indirect effect accounts for almost one fourth of the direct one. These findings have important implications for policy makers as they suggest a hitherto neglected instrument for curbing public debt.

JEL Classification: D73, H63, O50
Keywords: Corruption, public debt

1. Introduction

This paper contributes to the literature on the macroeconomic implications of corruption. We aim at assessing whether corruption leads to an increase in public debt and - in turn - whether different levels of corruption can help explaining cross-national disparities in the amount and evolution of public debt. Although the literature on the damaging effects of corruption on growth is abundant (Del Monte and Papagni, 2001; Mauro, 1995; Méndez and Sepùlveda, 2006; Mo, 2001; Tanzi and Davoodi, 2002), only very recently the effect of corruption on public debt has been addressed. Cooray and Schneider (2013) analyze a sample of 106 countries in the 1996-2012 period and find that corruption affects public debt and that the extent of the shadow economy exacerbates the relationship between corruption and public debt. High-income OECD countries are excluded on the ground they have relatively low levels of corruption. Grechyna (2012a) focuses on 30 OECD members and finds a similar impact of corruption on central public debt.[1]

Our paper contributes to this recent strand of literature by providing a more comprehensive empirical investigation based on a very wide dataset composed of both developed and developing countries. This allows to overcome the external validity concerns of the aforementioned papers and to assess whether the effect is heterogeneous across income-related groups of countries. Furthermore, whereas previous works measure public debt in terms of central public debt, we rely on general government gross debt which is a more appropriate measure due to the effects of corruption both on central and local economy[2]. Finally, we also investigate the likely channels through which corruption affects debt, namely an increase in expenditures and a reduction of fiscal revenues (direct effect), or a decrease in GDP (indirect effect).

The rest of the paper unfolds as follows. Section 2 presents the econometric approach and the data we use. Section 3 provides the empirical results and Section 4 contains some concluding remarks.

2. Empirical methodology and data

The empirical analysis is based on the standard definition of the government's budget constraint. In year t, it can be written as:

$$B_t = (1 + r)B_{t-1} + G_t - T_t \quad (1)$$

where B is public debt, G is government spending, r is the nominal interest rate and T are taxes.

From equation (1) it is straightforward to derive the ratio of government debt to GDP. Dividing both sides of (1) by nominal output Y_t and defining g as the nominal growth rate of output, we can write the evolution of debt-to-GDP ratio as follows:

[1] Grechyna (2012b) presents a theoretical model for developed economies that relates the level of government debt to the degree of corruption. The model explains about 40% of variation in debt to GDP levels in a sample of 23 high-income countries. Accordingly, the author concludes that high levels of public debts can be ascribed, *ceteris paribus*, to high levels of corruption.

[2] In fact, González-Fernández and González-Velasco (2014) investigating the case of Spain, shown that corruption (and shadow economy) is a relevant determinant of Autonomous Communities debt.

$$\frac{B_t}{Y_t} = \left(\frac{1+r}{1+g}\right)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} = \left(\frac{1+r}{1+m+\dot{p}}\right)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} \quad (2)$$

where m is the growth rate of real output and $\dot{p}$ is the inflation rate.

Equation (2) shows that debt to GDP ratio at time t depends on debt ratio at $t-1$ and on primary deficit $(G_t - T_i)$. The latter term, in turn, as in the empirical model estimated by Woo (2003), is a function of real GDP growth, per-capita GDP and inflation. We extend this model by including corruption among the drivers of debt ratio. Indeed, corruption can raise government debt through various channels. As previously mentioned, corruption reduces GDP thereby leading, other things being equal, to an increase of debt to GDP ratio. In addition, existing literature has shown that corruption increases and distorts public expenditure (Mauro, 1998), reduces tax revenues (Kaufmann, 2010) and, by lowering bond ratings, entails higher costs of debt (Depken and Lafountain, 2006). Following these arguments, our empirical specification expresses debt ratio as a function of its lagged value, corruption, and the factors that affect primary balance.

In order to estimate the model we retrieve annual macroeconomic variables from the International Monetary Fund (IMF) database World Economic Outlook. We merge with data with the Corruption Perspective Index (CPI) developed and managed by Transparency International (TI). The CPI measures the perceived levels of public sector corruption worldwide and is the most frequently used proxy of corruption. The original index is an inverse measure of corruption since it ranges from 0, for totally corrupt, to 10 for countries without corruption. To obtain a direct indicator of corruption we compute the variable *Corruption* as 10 – CPI, so having 0 for no corruption and 10 for complete corruption. *Corruption* is our main explanatory variable of interest. The dependent variable is the ratio of general government gross debt to GDP (*Debt ratio*). A set of control variables affecting primary balance of a country are included in the model: *GDP per capita* is the log of gross domestic product per capita at constant US$ prices; *GDP growth* is the percentage change of gross domestic product at constant price and *Inflation* refers to the percentage change of consumer price index.

The final sample consists of a panel of 166 countries for which we have at least five contiguous observations over the 1995-2013 period. The selection of the time span is driven by data availability as CPI has been computed from 1995 onwards. Table 1 summarizes descriptive statistics of our variables for the whole sample and for income-related groups. We identify various groups of countries in order to investigate cross-national differences, if any, in the effect of corruption on public debt. High-income as well as Low- and Middle-income countries are identified in accordance with the World Bank Classification, High-income OECD refers to the 31 OECD members with gross national income per capita above 12,746 US$ and European Union refers to the EU 28.

The table shows similar mean values of public debt for the groups of countries. For corruption the evidence in mixed. On the one hand, it is stronger in low- and middle-income countries which average (6.9) is twice over that of high-income countries. On the other hand, the variable *Corruption* has higher standard deviation in the groups of advanced countries with maximum values very close to those of poor countries. This

suggests that the degree of corruption in advanced economies is highly heterogeneous and some of these countries are similar to less developed countries.

Table 1. Summary statistics.

	All countries	High-income	Low- and Middle-income	High-income OECD	European Union
Public debt % of GDP					
Mean	51.24	51.30	51.20	57.94	54.62
Std. dev. overall	37.70	36.82	38.23	38.05	30.53
Std. dev. within	21.78	14.73	24.99	15.61	13.81
Min	0	0.57	0	3.64	3.64
Max	647.67	243.20	647.67	243.20	175.08
Corruption					
Mean	5.57	3.27	6.90	2.73	3.58
Std. dev. overall	2.26	1.95	1.03	1.73	1.92
Std. dev. within	0.40	0.45	0.38	0.45	0.47
Min	0	0	2.9	0	0
Max	9	8.3	9	7.1	7.4
GDP per capita (constant US$)					
Mean	12,128	29,232	2,165	33,476	26,797
Std. dev. overall	17,232	18,270	2,424	18,670	17,602
Std. dev. within	4,110	6,695	817	7,503	6,174
Min	4.79	1816	4.79	4,654	2,019
Max	101,721	101,721	15,686	101,721	101,102
GDP growth (%)					
Mean	4.18	3.05	4.83	2.49	2.46
Std. dev. overall	4.93	3.84	5.37	2.98	3.54
Std. dev. within	4.38	3.37	4.88	2.75	3.35
Min	-62.07	-17.69	-62.07	-14.73	-17.69
Max	104.48	26.17	104.48	10.78	10.98
Inflation (%)					
Mean	6.28	3.13	8.11	2.60	3.30
Std. dev. overall	10.64	4.13	12.66	2.18	3.74
Std. dev. within	8.97	3.33	10.99	1.78	3.01
Min	-72.72	-4.94	-72.72	-1.70	-1.70
Max	325.02	85.74	325.02	19.9	45.66

Notes: The table presents descriptive statistics for the whole sample and sub-samples of countries during the period 1995-2013. High-Middle- and Low-income countries are identified in accordance with the World Bank. High-income OECD includes 31 OECD members with per-capita GNI above 12,746 US$, and European Union includes 28 members of the EU.

As described above, we estimate a dynamic specification of debt to GDP ratio. The baseline regression can be written as follows:

$$Debt\ ratio_{i,t} = \rho Debt\ ratio_{i,t-1} + \beta Corruption_{i,t} + \delta X_{i,t} + \gamma_t + \alpha_i + \varepsilon_{i,t} \quad (3)$$

where i and t indicate countries and years, respectively, $Debt\ ratio$ is the debt to GDP ratio described early, $Corruption$ is our measure of public corruption based on the CPI, X is the vector of control variables based on previous literature, γ_t refers to time-specific effects and α_i denotes country-specific fixed effects.

We adopt two different estimators to estimate equation (3), namely fixed effects (FE henceforth) and Arellano – Bond (AB henceforth) first difference Generalized Method of Moments (GMM henceforth). Both methods suffer from some shortcomings when used to estimate a dynamic equation in a *"small N – small T"* setting as our dataset is. In fact, the FE estimator is inconsistent, although the asymptotic bias tends to 0 for large *T*. The AB estimator, instead, is consistent but it might suffer from severe bias when *N* is small. Given that the average number of periods for each group of countries is above 10, so that the bias of the FE estimator might be not very large, we consider FE estimates as our benchmark results and we use AB ones for robustness purposes.

3. Results

Table 2 presents our first set of the econometric estimates. They aim at quantifying the direct effect of corruption on public debt, i.e. the effect that goes through an increase in spending or a reduction in fiscal revenues and not through a decrease in GDP growth (which is included as regressor).

The analysis starts by investigating the relation between corruption and public debt in the whole sample. The coefficient of *Corruption* is statistically significant at usual levels and has a positive sign. This provides empirical support for our hypothesis that a high degree of corruption leads to an increase in public debt. The estimated long-run effect suggest that a one unit decrease in our measure of corruption leads to a decrease of approximately 5% in the public debt/GDP ratio. This effect is quite substantial once we consider that the average ratio is around 50% and standard deviation of corruption ranges at 2.26.

As a further step we analyze the effect of corruption in various groups of countries. According to the World Bank that classifies economies by their gross national per capita income, the whole sample is split into two groups identifying high-income countries and low- and middle-income countries. Estimating the model in such sub-samples, we find that the effect of corruption holds for high-income countries, while it is weaker and less significant for developing countries.

A possible explanation for the low significance of corruption in poor countries can be rooted in international aid. Low- and Middle-income countries receive more than 75% of total foreign aid. In some of these countries a large part of aid flow is used to finance debt and debt saving, without any impact on domestic expenditure. In such countries, often the more corrupted ones, foreign aid is a substitute of debt and service debt, reducing in this way the negative effect of corruption on public debt. In other countries, foreign aid increase domestic expenditure and therefore do not create new debt (Easterly, 2003). In the group of Low-

Middle-income countries the relationship between foreign aid and domestic expenditure could be quite different across countries, making difficult to establish a clear relation between corruption and public debt.

In order to check the robustness of the main finding for advanced economies, we estimate the model for two additional groups of countries, one identifying OECD countries with high-income and one identifying the 28 members of the European Union. The latter group represents an interesting case of analysis. Indeed, some European countries have high debt ratio and, at this particular moment in time, the debate on the reduction of public debt is very topical. Once again, the coefficient of *Corruption* is positive and statistically significant at usual confidence level, suggesting that public corruption plays an important role in explaining the level of national debts. Moreover, the magnitude of the effect appears to be quite large, ranging around a 25% decrease in the ratio for a one unit decrease in corruption.

As regards controls, we observe that, where statistically significant, they generally show the expected sign in the various groups of countries. *GDP growth* has the more robust effect on *Debt ratio*, being statistically significant in almost all the regressions. Contrary, the remaining explanatory variables have a weak impact on public debt. This is consistent with the evidence provided by Abbas et al. (2014) which highlights that real GDP growth is a key factor in explain the dynamic of sovereign debts whereas other factors, such as inflation and interest rates, have a low and less clear impact.

The estimates presented above quantify the effect of corruption on the Public Debt/GDP ratio controlling for GDP growth. As corruption has both a direct effect on the Public Debt/GDP ratio by increasing expenditures but also an indirect effect through a negative effect on GDP growth, it becomes interesting to assess the relative importance of the two effects. To this end, we have re-estimated eq. (3) by dropping GDP growth as regressor. In the new equation, the coefficient of corruption gives the overall (direct plus indirect) effect, so that the indirect effect can be computed as the difference between the estimated coefficients of corruption in the two equations.

Table 3 presents the estimates for the regression without GDP growth as regressor. As expected, the coefficient of corruption is now higher than before in all specifications, the only exception being the set of low and middle income countries. The indirect effect seems to be quantitatively relevant only for high income OECD countries, where it accounts for approximately one fourth of the direct effect, whereas it is modest for all other groups of countries. In turn, it appears that corruption affects public debt mainly through increased expenses and not through a decrease in GDP growth.

Results obtained with the AB estimator qualitatively confirm those obtained with the FE estimator. Both the positive effect of corruption on public debt and the relevance of the direct effect survive the use of the alternative estimator. The quantitative effect for high income countries appears instead to be much lower for the AB estimator.

Table 2. The direct impact of corruption on public debt. Econometric estimates.

	All countries		High-income		Low- and Middle-income		High-income OECD		EU 28	
	FE	AB	FE	AB	FE	AB	FE	AB	FE	AB
Corruption	0.952*	1.502**	0.929*	1.126*	0.769	1.763	1.158**	0.974*	1.182***	0.859*
	(0.580)	(0.731)	(0.563)	(0.613)	(0.935)	(1.327)	(0.454)	(0.555)	(0.379)	(0.473)
GDP per capita	2.349*	-2.109	-1.348	5.734	1.717	-5.013	-1.030	-3.287	-4.219**	-3.298
	(1.234)	(5.900)	(2.956)	(7.584)	(1.490)	(7.008)	(1.694)	(6.237)	(1.778)	(4.746)
GDP growth	-0.429**	-0.215	-0.656***	-0.409***	-0.353*	-0.177	-0.810***	-0.273**	-0.699***	-0.358**
	(0.181)	(0.151)	(0.183)	(0.132)	(0.179)	(0.147)	(0.268)	(0.129)	(0.203)	(0.155)
Inflation	-0.060*	0.010	-0.024	0.047	-0.056	0.005	-0.004	0.206	-0.111	-0.137
	(0.055)	(0.044)	(0.189)	(0.164)	(0.061)	(0.050)	(0.248)	(0.252)	(0.080)	(0.183)
Lag Debt ratio	0.809***	0.779***	0.917***	0.885***	0.779***	0.809***	0.957***	0.787***	0.950***	0.800***
	(0.030)	(0.068)	(0.029)	(0.084)	(0.047)	(0.077)	(0.017)	(0.185)	(0.021)	(0.098)
Obs.	2,134	1,954	792	740	1,342	1,214	557	525	465	436
Number of groups	166	166	51	51	115	115	31	31	28	28
Hansen (p-value)	--	0.348	--	0.049	--	0.303	--	0.759	--	0.985
AB test for AR(2) (p-value)	--	0.246	--	0.995	--	0.316	--	0.252	--	0.367
Long-run effect	4.979	6.784	11.175	9.800	3.475	9.247	27.093*	4.578	23.508*	4.303
	(0.123)	(0.113)	(0.181)	(0.232)	(0.442)	(0.263)	(0.082)	(0.286)	(0.057)	(0.107)

Notes: The dependent variable is Debt ratio. The explanatory variables are defined as given in the text. Columns labeled with FE refer to fixed effects estimator and columns labeled with AB refer to first difference GMM estimator. First step estimates; robust standard errors in parentheses. The sample consists of 166 countries in the period 1995-2013. ***, **, * statistically significant at the 1, 5 and 10% level.

Table 3. The overall impact of corruption on public debt. Econometric estimates.

	All countries		High-income		Low- and Middle-income		High-income OECD		EU 28	
	FE	AB	FE	AB	FE	AB	FE	AB	FE	AB
Corruption	0.971	1.489**	1.120	1.062*	0.592	1.724	1.432***	1.031*	1.192**	0.416
	(0.633)	(0.742)	(0.716)	(0.627)	(0.960)	(1.347)	(0.490)	(0.562)	(0.462)	(0.575)
GDP per capita	2.270*	-5.394	-3.230	0.803	1.408	-8.540	-2.990*	-5.488	-6.021***	-4.658
	(1.190)	(5.802)	(2.693)	(6.999)	(1.452)	(6.931)	(1.598)	(6.020)	(1.797)	(4.419)
Inflation	-0.033	0.021	-0.001	0.045	-0.033	0.013	0.045	0.228	-0.086	-0.145
	(0.060)	(0.045)	(0.218)	(0.175)	(0.066)	(0.051)	(0.274)	(0.255)	(0.085)	(0.197)
Lag Debt ratio	0.812***	0.780***	0.913***	0.843***	0.780***	0.811***	0.957***	0.761***	0.951***	0.843***
	(0.029)	(0.067)	(0.028)	(0.108)	(0.047)	(0.076)	(0.017)	(0.205)	(0.023)	(0.092)
Obs.	2,134	1,954	792	740	1,342	1,214	557	525	465	436
Number of groups	166	166	51	51	115	115	31	31	28	28
Hansen (p-value)	--	0.230	--	0.038	--	0.262	--	0.855	--	0.996
AB test for AR(2) (p-value)	--	0.363	--	0.991	--	0.402	--	0.223	--	0.518
Long-run effect		6.764		6.766		9.103		4.318	--	2.657

Notes: As in Table 2

4. Conclusions

This paper has analyzed the relationship between corruption and public debt. By using a large sample of countries over the 1995-2013 period, we find empirical evidence that public corruption contributes to increase sovereign debts. The estimates point out that such effect is highly heterogeneous across income-related groups of countries, being stronger for high income countries. In turn, different levels of corruption can explain cross-national disparities in the extent of public debt. We also tried to disentangle the overall effect of corruption into the effect stemming from increased expenses and the one stemming from decreased growth. We found that the former is by far the most important one.

Taken together, these findings have important policy implications and indicate that, improving action against corruption of public sector, governments could achieve a significant reduction of their sovereign debt. Further research is needed to examine more in depth the topic and, in particular, to estimate the accurate impact of corruption on public debt.

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