The crowding-out effect of public debt on private investment in developing economies and the role of institutional quality

Van Bon Nguyen

Public spending is a crucial instrument of fiscal policy in running the economy. Most governments use public spending actively to overcome the cyclicality of the economy. However, the increase in government spending financed by public debt can negatively contribute to the private sector investment. This study raises two research questions: (i) Does public debt in developing countries crowd out private investment? (ii) What is the role of governance in public debt–private investment relationship in these countries? For the answers, we apply the two-step difference generalized method of moments Arellano–Bond estimator to empirically investigate the effects of public debt, governance, and their interactions on private investment for a sample of 98 developing countries from 2002 to 2019. We then employs the pooled mean group estimator to check the robustness of estimates. Results show that public debt crowds out private investment, whereas governance stimulates it. Notably, the crowding-out effect of interaction on private investment seems counterintuitive. Furthermore, economic growth and trade openness enhance private investment. These findings suggest policy implications for governments in developing countries for controlling and managing public debt to promote the private sector investment.

Keywords: developing countries; governance; private investment; public debt

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I. Introduction

Public spending plays a crucial role in the economic development and growth in most countries. It is an active instrument of fiscal policy to help governments run the economy and overcome economic cyclicality. The government actively increases public spending during a recession economy with more unemployment (an expansionary fiscal policy with increased government spending) and decreases it during a hot economy with high inflation (a contractionary fiscal policy with decreased government spending). However, increasing government spending financed by borrowing leads to increasing public debt. Economic history notes that public debt crises often lead to economic crises: the Latin American debt crisis of the 1980s, the East Asian financial crisis made official in 1997 with the collapse of the Thai baht, and the European sovereign debt crisis in the second half of 2009 with high public debt of Portugal, Ireland, Italy, Greece, and Spain. High public debt in these economies contributed to the public debt crises. These crises can also be seen as a result of failing macro-economic policy. These countries often have to implement austerity policies to receive rescue packages from the International Monetary Fund (IMF) or World Bank. Citizens in these countries face many difficulties with the high unemployment rate. Therefore, governments in developing economies should control public debt with strict fiscal discipline to avoid a public debt crisis in the future. On the contrary, private investment is an input of the growth model. In most economies, the private sector provides many jobs and contributes mainly to economic development and growth. Despite the negative role of public debt and the positive role of private investment in the economy, the effect of public debt on private investment remains a debate topic among economists and policymakers. Notably, no related studies introduce institutional quality/governance into the public debt–private investment relationship. This study thus raises two research questions: (i) Does public debt in developing countries crowd out private investment? (ii) What is the role of governance in the public debt–private investment relationship in these countries?

According to IMF (2021a), global public debt accounts for 97.8% of the world GDP in 2021. Although it is 0.8% lower than in 2020, it still stands at record-high level due to a massive fiscal response from governments to deal with the waves of the COVID-19 pandemic. The

statistical data from IMF note that global public debt is now up to $88 trillion but will decrease by 1% of the world GDP in 2022 and then steady at 97% GDP. Furthermore, preliminary estimates from IMF indicated that global debt in 2020 issued by households, nonfinancial corporations, and governments reached $226 trillion with an increase of $27 trillion from 2019. Notably, low-income and emerging economies accounted for only 7% of the accumulation of worldwide debt in 2020, whereas developed economies and China captured 90%.

Nevertheless, IMF (2021b) reports that high public debt need not increase immediate concerns on debt sustainability. Borrowing more is difficult for highly indebted developing and emerging economies though. To handle the sharp increase in public debt in developing economies, international financial institutions, including World Bank and IMF, provided debt relief, concessional loans, and grants in 2020 (IMF, 2021b). In particular, low-income developing economies need urgent finance for COVID-19 control measures, health and education, and social services, especially support for food programs in economies facing malnutrition risk.

Given the relevant topic, developing countries often use public spending to achieve economic development goals. They do not have enough investment capital, so they have to borrow. To compete with the private sector for available loans, governments in these economies often raise the interest rates of government bonds, which increases the interest rates in the economy. The consequence of rising interest rates decreases the private sector investment. On the contrary, the private sector's business activities contribute mainly to economic development and growth in developing economies (Khan & Reinhart, 1990). Improvement in the institutional setting promotes the private sector's development and investment by implementing appropriate administrative procedures, facilitating start-ups, supporting commercial activities, and so on (Feng, 2001; Aysan *et al.*, 2007; Munemo, 2012). According to Li (2003) and Li and Filer (2007), developing economies are those with relation-based governance (poor institutional quality). Governments in these economies design, formulate, and enforce regulations and policies non-transparently and non-publicly. Policies associated with public debt financed by borrowing often put pressure on the private sector. These policies (institutional quality) facilitate governments in these economies easily access loans that should be prioritized for the private sector's development. Therefore, the

interaction between institutional quality and public debt can reduce private investment.

Two research gaps exist. First, no studies empirically investigate the role of institutional quality/governance in the public debt–private investment relationship. Second, no studies use the two-step generalized method of moments (GMM) Arellano–Bond estimator for estimation and the pooled mean group (PMG) estimator for robustness check. This study focuses on these two aspects.

In short, the increase in public debt can crowd out private investment, and institutional quality may affect the public debt–private investment relationship. Given these facts, this study empirically investigates the effects of public debt, institutional quality, and their interaction on private investment for a sample of 98 developing countries from 2002 to 2019. We apply the two-step difference GMM Arellano–Bond estimator for estimation and the PMG estimator for robustness check.

The structure of the paper is as follows. Section 1 is the introduction, and Section 2 is the literature review that describes the theoretical views and the relationship between public debt and private investment. Section 3 presents the methodology and research data, and Section 4 is the results and discussion. Section 5 provides the conclusion and policy implications.

II. Literature review

Four theoretical views show the mechanisms through which public debt affects private investment (Lau *et al.*, 2019). First, the classical view argues that the crowding-out effect of government borrowing on the private sector investment can stem from moving resources of capital to the relatively less productive public sector from the private sector (Salsman, 2017). Second, the view by neoclassical economists emphasizes that government borrowing from banks stimulates government's purchasing power and allows it to compete with other sectors for resources (*i.e.*, available funds). Under full-employment conditions, government expenditure may replace the private sector investment by raising the price level and interest rates on credit (Bernheim, 1989). Third, Keynesian economists suggest that government spending can crowd in the private sector investment through multiplier effects (Salsman, 2017). In particular, according to Friedman (1978), if the low sensitivity of interest rate to investment and unemployment

exist, the impact of fiscal stimulus on the interest rate is of little or no significance, which stimulates total expenditure from the private and public sectors. Fourth, the views by the Ricardian equivalence note that government borrowing cannot crowd out the private sector investment as private investment and current interest rates will remain unchanged in the case citizens anticipate that governments will increase tax in the future to repay government debt (Bernheim, 1987). Savings will then increase by the amount of public debt issued to meet future tax obligations.

High public debt can lead to the public debt crisis and notably have adverse impacts on the economy (Burriel *et al.*, 2020). Thus, we think that governments in developed and developing countries should set up a public debt ceiling. Most studies in the literature note that public debt (domestic and external public debt) crowds out private investment. Ncanywa and Masoga (2018), Lau *et al.* (2019), de Mendonça and Brito (2021), and Vanlaer *et al.* (2021) argue that governments can compete for available funds with the private sector, which increases the interest rate in the economy and reduces private investment. Ncanywa and Masoga (2018) use the autoregressive distributive lag (ARDL) model for South Africa between 1995 and 2016. Similarly, Lau *et al.* (2019) apply the ARDL model for Malaysia from 1980 to 2016. Recently, de Mendonça and Brito (2021) use the one-step difference and system GMM Arellano–Bond estimators for 24 emerging economies from 1996 to 2018. In the same vein, Vanlaer *et al.* (2021) employ the one-step difference GMM Arellano–Bond estimator for 28 European Union countries from 1995 to 2016. Vanlaer *et al.* (2021) suggest that governments should think of attracting more foreign capital to compensate for the contraction in domestic private investment due to high public debt levels.

Korsah and Gyimah (2019) apply the vector error correction model for Ghana from1975 to 2014 and note that external public debt crowds in private investment. They emphasize that the government should use external debt to stimulate private investment in Ghana. Similarly, Zhou (2021) uses the fully modified ordinary least squares (OLS) approach for South Africa from 1995 to 2019. He finds that external public debt crowds in private investment but domestic public debt crowds it out. By contrast, Fagbemi and Adeosun (2020) indicate that public debt does not affect private investment using the panel dynamic least squares and panel fully modified least squares estimators for 13 West African countries between 1986 and 2018.

III. Methodology and research data

A. Methodology

Following de Mendonça and Brito (2021), the empirical equation is remodified as follows:

$$PIN_{it} = \alpha_0 + \alpha_1 PIN_{it-1} + \alpha_2 DEB_{it} + \alpha_3 GOV_{it} + \alpha_4 (DEB \times GOV)_{it}$$
$$+ Z_{it}\alpha' + \mu_i + \psi_{it}, \qquad (1)$$

where subscripts i and t are the country and time index, respectively. PIN_{it} is the gross fixed capital formation, which is a proxy for private investment, and PIN_{it-1} is the initial level of private investment. DEB_{it} is gross public debt; GOV_{it} is governance (the six dimensions of governance include control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability), which is a proxy for institutional quality; and $(DEB \times GOV)_{it}$ is the interaction between public debt and governance. Z_{it} is a set of control variables such as economic growth, trade openness, and inflation; μ_i is an unobserved time-invariant, a country-specific effect; and ψ_{it} is an observation-specific error term. α_0, α_1, α_2, α_3, α_4, and α' are estimated coefficients. Following the related studies, we use economic growth (Korsah & Gyimah, 2019; de Mendonça & Brito, 2021; Vanlaer *et al.*, 2021), trade openness (de Mendonça & Brito, 2021; Vanlaer *et al.*, 2021), and inflation (Korsah & Gyimah, 2019; de Mendonça & Brito, 2021) in the empirical models. The neoclassical investment model by Jorgenson (1963) argues that the desired amount of capital stock depends on output level. The increase in output (economic growth) helps the private sector increase the capital accumulation for investment. In the same vein, Keynes (1936) notes the importance of uncertainty in investment decisions. He argues that the private sector investment is subject to volatility because of uncertain return to investment. In particular, the economy has less capital accumulation under a highly uncertain economic environment. Some indicators can be used to capture economic instability, such as stock market volatility, commodity price deviation, inflation, and exchange rate variability. Therefore, economic growth and inflation are crucial factors of the private sector investment. Trade openness/liberalization is another determinant of private investment. A highly integrated economy sets up good conditions for the

private sector to receive more investment capital from other economies or international stock markets. Furthermore, the highly open-door policy encourages the private sector to expand production to export goods to other countries.

We use Equation (1) to investigate the effects of public debt, institutional quality, and their interaction on private investment for a sample of 98 developing countries from 2002 to 2019. We use six governance indicators by the World Bank (with values ranging from –2.5 to 2.5) to proxy for institutional quality (Kaufmann *et al.*, 2011). World Bank (2017) defines governance as a constructive process through which non-state and state actors interact together to design, formulate, and implement regulations and policies within a certain set of informal and formal rules that are shaped by power. Notably, Hope Sr. (2009) emphasizes that poor institutional quality in most developing economies leads to adverse effects on economic outcomes; thus, reforming institutional quality contributes to the development agendas in these countries. Good institutional quality will set up constructive governments with potential merits to implement development targets in the future.

According to Feng (2001), Aysan *et al.* (2007), and Munemo (2012), institutional quality/governance contributes significantly to the private sector investment decisions. The six governance indicators are designed based on the opinions of firms and individuals, in particular, to facilitate the development of the private sector (World Bank, 2021). We show the effects of these indicators on the private sector investment as follows:

(1) Corruption often leads to adverse influences on the economy. It is one of the main constraints facing companies in developing economies (World Bank, 2021). Gupta *et al.* (2002) highlight that corruption increases income and wealth inequality and poverty in several developing countries. In particular, it enhances the transaction costs of private investors, which leads to a decline in profit and investment.

(2) Government effectiveness measures the quality of the civil service, public services, and policy formulation and enforcement and captures the credibility of commitments by the government to such policies. It helps the government design, formulate, and implement sound citizen-centric policies (Duho, 2020). Government effectiveness reduces the transaction costs in the private sector operations and increases profit, thereby promoting private investment.

(3) Political stability scores the likelihood of politically motivated violence and political instability (World Bank, 2021). Political instability leads to uncertainty in the economy and impedes private sector investment. In particular, it discourages private investors who are willing to invest in the business and withdraw from previous investment projects.

(4) Regulatory quality measures the capability of the government to design, formulate, and enforce sound regulations and policies that allow and enhance private sector development and investment (World Bank, 2021).

(5) Rule of law measures the extent to which enterprises and individuals trust and obey society's rules. Notably, it captures the independence and functioning of the judiciary, including contract enforcement quality, property rights protection, the police, and the likelihood of violence and crime (World Bank, 2021). It supports enterprises in economic transactions as well as promotes investment and production in the belief that disputes will be properly adjudicated by the state.

(6) Voice and accountability is the guarantee of transparency and stability of information and policies built by governments. It holds policymakers responsible for failures in enforcing regulations and policies. The private sector investment decisions are subject to the credibility of these regulations and policies (Aysan *et al.*, 2007). Open elections and freedom of the press express the citizens' voice in the government's decision-making process. Therefore, Voice and accountability can increase private investment.

Some severe problems in econometrics arise from estimating Equation (1) that can make the results in the empirical models biased. (i) Economic growth and inflation can have a bidirectional relationship with private investment. They are endogenous variables that can result in the endogenous phenomenon. (ii) Unobserved characteristics like geography, culture, customs, and anthropology (fixed effects) that exist in μ_i may correlate with the regressors, which can lead to the endogenous phenomenon. (iii) A high autocorrelation stems from the presence of the lagged variable PIN_{it-1}. (iv) The panel dataset has a large unit of countries ($N = 98$) but a relatively short observation length ($T = 18$), which is not appropriate for some estimators. These problems can make the OLS regression inconsistent and biased. The random-effects model (REM) and the fixed-effects model (FEM) cannot handle serial

autocorrelation and endogenous phenomena. The IV-2SLS estimator needs some appropriate instrumental variables out of regressors in the empirical model. Following Judson and Owen (1999), we employ the two-step difference GMM Arellano–Bond estimator and the PMG estimator for estimation and robustness check.

Holtz-Eakin *et al.* (1988) are the first to propose the GMM modified by Arellano and Bond (1991). According to Holtz-Eakin *et al.* (1988), the empirical model using the difference/system GMM estimator can allow for nonstationary individual effects. Furthermore, it can apply instruments to the quasi-differenced autoregressive equations. In particular, it forms convenient test statistics, specifies lag lengths, and tests for the presence of errors. For estimation, the first difference in Equation (1) is taken to remove country-fixed effects. Next, the regressors in the first difference are used as instrumented variables by their lags under the assumption that there are no serial correlations in time-varying error terms in the original models (Judson & Owen 1999). This kind of strategy is called the difference GMM Arellano–Bond estimator (D-GMM) that can handle simultaneity biases in regressions.

The two-step D-GMM is more asymptotically efficient than the one-step D-GMM. However, applying the two-step S-GMM in small research samples as those in our study has some problems (Roodman, 2009). The proliferation of instrumental variables quadratically rises as the time dimension increases. In this case, the number of instruments is very large relative to the number of panel units. To eliminate this problem, Roodman (2009) suggests using the rule of thumb to keep the number of instruments less than or equal to the number of countries (the number of panel units).

We use the Arellano–Bond, Sargan, and Hansen statistics to test the validity of instruments in the two-step D-GMM. The null hypothesis for the Sargan and Hansen tests is H10: the instrumental variables are strictly exogenous, whereas the null hypothesis for the Arellano–Bond test is H20: no serial autocorrelation of errors in the first difference. We apply the Arellano–Bond test to search for the autocorrelation in the first difference and the Sargan and Hansen test to detect endogenous phenomena. We ignore the first autocorrelation test of errors AR(1) and keep the second autocorrelation test of errors AR(2).

We use the PMG) estimator by Pesaran *et al.* (1999) to check the robustness of the two-step D-GMM. The best advantage of the PMG is that it is appropriate for heterogeneous non-stationary panels in which

the number of time-series observations and number of groups can be relatively large (Blackburne III & Frank, 2007). This estimator relies on a combination of averaging and pooling of estimated parameters. It imposes homogeneity of the long-term parameters among countries while allowing the short-term slope coefficients to be heterogeneous between groups. Notably, the PMG estimator performs the adjustment dynamic between the long run and the short run. The heterogeneity of short-run parameters allows the dynamic specification to differ across countries. These specifications are complementary to the two-step D-GMM.

The PMG-based error correction model is shown as follows:

$$\Delta H_{it} = \Phi Z_{it-1} + \sum_{j=1}^{p} \delta_{ij} \Delta N_{it-j} + \mu_{it} + \psi_{it} \quad where \ \ Z_{it-1} = H_{it-1} - \theta N_{it-1,} \quad (2)$$

where H is private investment, Z_{it-1} is the deviation from long-run equilibrium at any period for group i, and Φ is the speed of adjustment or the error-correction coefficient. The vector θ captures the long-run coefficients. These coefficients express the long-run elasticity of private investment corresponding with each variable in N_{it-1}. The vector δ captures the short-run responses of the N variables. μ_i is a fixed effect, and ψ_{it} is an error term. For the validity of the PMG estimates, we use the value and significance level of the speed of adjustment Φ (negative, smaller than 1).

B. Research data

The data consist of gross fixed capital formation, gross public debt, governance indicators, real GDP per capita, trade openness, and inflation. We extract them from the IMF International Financial Statistics database and the World Bank Worldwide Governance Indicators and World Development Indicators database. The research sample contains 98 developing countries[1] from 2002 to 2019.

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[1] Algeria, Angola, Argentina, Armenia, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia, Brazil, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Rep., Chad, Chile, China, Colombia, Comoros, Dem. Rep. of the Congo, Rep. of Congo, Costa Rica, Côte d'Ivoire, Croatia, Dominican Rep., Ecuador, Egypt, Equatorial Guinea, Eswatini, Ethiopia, Fiji, Gambia, Georgia, Ghana, Guinea, Honduras,

The definition and descriptive statistics for the dataset are presented in the Appendix (Tables A, B, C, and D). The results in Table B indicate that the average score of each governance indicator is lower than zero, suggesting that most developing countries have poor governance. On the contrary, the matrix of correlation coefficients between variables in Table C shows that public debt is negatively associated with private investment, whereas trade openness and economic growth are positively linked. By contrast, the matrix of correlation coefficients among governance indicators in Table D notes that the value of correlation coefficients is higher than 0.8. Therefore, we use these indicators separately in the empirical model to remove the co-linearity among them.

IV. Estimated results and discussion

A. Two-step D-GMM estimates

Table 1 shows the two-step D-GMM estimates across all models. Each column in each table is the model corresponding with each governance indicator. Keynes (1936) shows the importance of uncertainty (inflation, for instance) in investment decisions of the private sector. Private investment can be subject to volatility because of uncertain return to investment. Hence, inflation (a proxy for macroeconomic instability) can affect private investment. On the contrary, the private sector investment can contribute to inflation. Buffie (1995) develops a theoretical framework in which public and private investment affect the price level in the economy (inflation). He notes that when social infrastructure has productivity higher than or equal to private capital, inflation seems to increase in the long run. Given these facts, inflation and private investment have a bidirectional relationship. In all the estimations, we detect that inflation is endogenous. Thus, we

Hungary, India, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyz Rep., Lesotho, Madagascar, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Macedonia, Oman, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, Solomon Islands, Sri Lanka, Tajikistan, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uzbekistan, Vanuatu, Vietnam, and Zambia.

use inflation as instrument in GMM style and the remaining variables (private investment, public debt, governance, economic growth, and trade openness) as instruments in IV style.

What these regressions show is that the negative impact of public debt on private investment depends on institutional quality. Rather surprisingly, this negative effect is higher as governance improves. This finding is consistent among almost all regressions. Furthermore, economic growth and trade openness enhance private investment.

We find the crowding-out effect of public debt on private investment in previous studies such as Ncanywa and Masoga (2018), Lau *et al.* (2019), de Mendonça and Brito (2021), and Vanlaer *et al.* (2021). This effect stems from the fact that governments raise the interest rate to compete for funds with the private sector, which leads to an increase in the interest rate in the economy. Consequently, the private sector reduces investment due to a decline in profit. However, improving institutional quality stimulates private investment. The private sector investment promotes the output and creates more jobs. In some cases, the private sector performs the role of the public sector. Therefore, governments improve regulations and policies to encourage the development of the private sector by facilitating start-ups, improving administrative procedures, supporting commercial activities, and so on. Aysan *et al.* (2007) and Su *et al.* (2021) concur with this finding. The interaction between public debt and governance impedes private investment though, which seems counterintuitive. Statistic data by the IMF show that most developing countries have budget deficits as public spending exceeds government revenue. Governments in these countries have to borrow to finance the increase in spending. Regarding borrowing, they often formulate and enforce regulations and policies (governance) to facilitate their easy access to loans, which compete for available funds with the private sector. Therefore, they can easily obtain loans that should be prioritized for the private sector's development, which decreases private investment.

Our findings suggest two crucial implications relating to borrowing and institutional improvement for governments in developing countries. (i) Government borrowing crowds out private investment. On the one hand, an increase in public debt can cause government debt to increase with the risk of leading to a public debt crisis and an economic crisis in the future. On the other hand, public debt reduces private investment. (ii) Improving institutional quality facilitates the development of the

private sector on the one side but facilitates government borrowing on the other side, leading to a decrease in the private sector investment. We thus recommend that governments in developing countries reduce public spending and transfer public investment projects to the private sector. In particular, institutional reform and improvement should pay attention to the government's competition for available funds with the private sector, which reduces private investment.

We find the positive effects of economic growth and trade openness in de Mendonça and Brito (2021). Economic growth increases capital accumulation for the development of the private sector. The increase in per capita income also promotes saving/investment, which sets up available funds to increase private investment. The open-door policy helps the private sector seek capital from capital markets in other

TABLE 1

PUBLIC DEBT AND PRIVATE INVESTMENT: TWO-STEP D-GMM ESTIMATES, 2002–2019

Dependent variable: Private investment (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Private investment (-1)	1.112***	0.962***	0.969***	0.915***	0.683***	0.718***
	(0.267)	(0.207)	(0.286)	(0.208)	(0.173)	(0.146)
Public debt	-0.169**	-0.223***	-0.047	-0.163***	-0.127***	-0.062**
	(0.073)	(0.077)	(0.033)	(0.059)	(0.052)	(0.031)
Governance	13.275***	12.750***	4.835**	10.538***	8.803***	6.139***
	(4.972)	(3.926)	(2.462)	(3.206)	(3.302)	(2.278
Public debt*Governance	-0.266**	-0.297***	-0.110*	-0.230***	-0.166***	-0.087*
	(0.109)	(0.096)	(0.060)	(0.074)	(0.068)	(0.048)
Economic growth	0.099***	0.103***	0.080***	0.086***	0.091***	0.088***
	(0.037)	(0.030)	(0.032)	(0.029)	(0.024)	(0.021)
Trade openness	0.123***	0.110***	0.121***	0.102***	0.092***	0.080***
	(0.035)	(0.031)	(0.038)	(0.034)	(0.027)	(0.027)
Inflation	-0.068	-0.103**	-0.049	-0.073	-0.042	0.010
	(0.056)	(0.053)	(0.055)	(0.053)	(0.042)	(0.036)
Instrument	20	20	20	20	20	23
Country/Observation	98/1372	98/1372	98/1372	98/1372	98/1372	98/1372
AR(2) test	0.722	0.966	0.919	0.967	0.968	0.949
Sargan test	0.983	0.541	0.955	0.834	0.103	0.165
Hansen test	0.957	0.939	0.904	0.967	0.841	0.905

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively. The value in the parentheses is the standard error.

countries. In addition, it facilitates capital inflows from other countries, making it easy for the private sector to access and increase investment.

B. Robustness check

For the robustness of the two-step D-GMM estimates, we apply the PMG estimator to estimate Equation (2). To examine the reliability of the sign and significance level of the estimated coefficients of variables of interest, we only use the independent variables such as public debt, governance, and interaction in the PMG estimation. We also use economic growth as a control variable in this estimation. The PMG estimator is a kind of panel error correction model that requires co-integration between the regressors and dependent variable. We first test the stationary of all variables in the empirical model to ensure that they all have the same order. Next, we perform the panel co-integration tests by Westerlund (2007).

The stationary tests in Table 2 present that private investment, public debt, the six dimensions of governance, and economic growth are significantly stationary at levels less than 10%, implying that all variables in the empirical model have integration of zero-order I(0). The Westerlund panel co-integration tests in Table 3 show that at least three in four tests reject the null hypothesis of no co-integration — a covariate is considered co-integrated with the dependent variable.

TABLE 2

FISHER TYPE UNIT ROOT TESTS: 2002–2019

Variables	Augmented Dickey–Fuller test		Phillips–Perron test	
	Prob > chi2		Prob > chi2	
	Without trend	With trend	Without trend	With trend
Private investment	312.404***	234.939**	251.168***	185.354
Public debt	397.467***	288.934***	354.643***	248.660***
Governance 1	237.362**	224.104*	356.701***	313.820***
Governance 2	251.390	210.220***	367.185***	342.375***
Governance 3	279.929***	258.694***	441.370***	423.104***
Governance 4	351.074***	303.117***	331.068***	293.898***
Governance 5	205.253	272.532***	250.666***	291.322***
Governance 6	366.100***	369.590***	303.531***	295.102***
Economic growth	287.369***	240.302**	435.613***	201.006

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Therefore, public debt, the six dimensions of governance, and economic growth are co-integrated with private investment.

Table 4 reports the estimated results across all empirical models by

TABLE 3

WESTERLUND PANEL CO-INTEGRATION TESTS: 2002–2019

Normalized variable: Private investment (% GDP)

Covariates	G_t	G_α	P_t	P_α
Public debt	-2.800***	-9.031***	-28.795***	-10.365***
Governance 1	-2.353***	-9.158***	-20.461***	-11.145***
Governance 2	-2.564***	-8.265**	-32.879***	-12.186***
Governance 3	-2.479***	-9.210***	-27.361***	-9.670***
Governance 4	-2.55***	-8.228**	-25.238***	-8.761***
Governance 5	-2.751***	-8.881***	-30.970***	-11.628***
Governance 6	-2.689***	-7.365	-20.570***	-8.984***
Economic growth	-2.843***	-7.446	-29.001***	-12.381***

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

TABLE 4

PUBLIC DEBT AND PRIVATE INVESTMENT: PMG ESTIMATES, 2002–2019

Long-run co-integrating vectors
Dependent variable: Private investment (% GDP)

Variables	GO1	GO2	GO3	GO4	GO5	GO6
Public debt	-0.146***	-0.049***	-0.119***	-0.038**	-0.020	-0.125***
	(0.006)	(0.019)	(0.010)	(0.020)	(0.017)	(0.008)
Governance	5.537***	2.065**	2.950***	5.606***	3.621***	2.991
	(0.927)	(1.085)	(0.443)	(1.468)	(1.035)	(2.189)
Public debt*Governance	-0.012***	-0.022*	-0.049***	-0.033**	-0.029**	-0.037***
	(0.002)	(0.015)	(0.007)	(0.015)	(0.012)	(0.012)
Economic growth	0.106***	0.612***	0.172***	0.590***	0.510***	0.483**
	(0.007)	(0.044)	(0.010)	(0.044)	(0.035)	(0.041)
Error correction	-0.294***	-0.473***	-0.387***	-0.464***	-0.516***	-0.482***
	(0.027)	(0.027)	(0.034)	(0.030)	(0.028)	(0.028)
Observation	1666	1666	1666	1666	1666	1666
Log likelihood	-3107.80	-3065.55	-3147.86	-3041.41	-3040.59	-3051.42

Note: ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively. The value in the parentheses is the standard error.

the PMG estimator. In line with the two-step D-GMM estimates, public debt crowds out private investment, whereas governance enhances it. However, the interaction reduces private investment. Furthermore, economic growth stimulates it. The value and significance level of the speeds of adjustment at the bottom of the tables indicate that PMG estimates are highly reliable.

V. Conclusion and policy implications

Governments in developing countries use government spending as one of the active instruments of fiscal policy to overcome the economic cyclicality. Public spending financed by debt may lead to an adverse impact on the private sector investment. On the contrary, governance can contribute significantly to the public debt–private investment relationship in these countries. Given these facts, we empirically examine the effects of public debt, governance, and their interaction on private investment for a sample of 98 developing countries from 2002 to 2019 by applying the two-step D-GMM for estimation and the PMG for robustness check. The estimated results note that the negative effect of public debt on private sector investment depends on institutional quality. This negative effect is higher as governance improves. This finding is consistent among almost all regressions, which seems counterintuitive. Besides, economic growth and trade openness promote private investment in these countries.

The findings in the study recommend that governments in developing countries should be prudent in formulating and implementing policies and regulations (governance/institutional quality) relating to public debt. Not only does public debt crowd out private investment but policies and regulations (governance) associated with public debt reduce it as well. These governments must control and gradually reduce public debt to avoid adverse effects on the economy and the private sector investment. They should design, formulate, and implement policies and regulations (governance) to decrease public debt. In particular, national resources (capital and land) should be prioritized for the private sector's development because the private sector contributes significantly to economic growth and development in these countries. Future research should consider the role of governance/institutional quality in the public debt–private investment relationship by the kind of debt (domestic public debt/external public debt). From econometric perspective, the

two-step system GMM Arellano–Bond estimator is more asymptotically efficient than the two-step D-GMM (see more in Roodman, 2009). In particular, for the case of persistent variables, their past values do not give much information about their future changes, making their lags weak instrumental variables in the two-step D-GMM (Arellano & Bover, 1995). Therefore, applying the two-step S-GMM in empirical models is a suggestion for future research.

Disclosure statement

No potential conflict of interest was reported by the author.

Appendix

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TABLE A1

DATA DESCRIPTION

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Variable	Definition	Type	Source
Regulatory Quality (GO1)	Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.		
Rule of Law (GO2)	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence.		
Voice and Accountability (GO3)	Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government as well as freedom of expression, freedom of association, and free media.	Level	World Bank
Control of Corruption (GO4)	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption as well as "capture" of the state by elites and private interests.		
Government Effectiveness (GO5)	Government effectiveness captures perceptions of the quality of public services, the quality of the civil service, the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.		
Political Stability (GO6)	Political stability and absence of violence/terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.		
Private investment (PIN)	Gross fixed capital formation (% GDP)	%	IMF
Public debt (DEB)	Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future (% GDP).	%	IMF
Economic growth (GDP)	GDP per capita (constant 2010 US$)	Level	World Bank
Trade openness (OPE)	Trade is the sum of exports and imports of goods and services (% GDP).	%	World Bank
Inflation (INF)	Inflation, consumer prices (annual %)	%	World Bank

TABLE A2
DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
Regulatory quality	1,764	-0.429	0.636	-1.826	1.724
Rule of Law	1,764	-0.378	0.641	-2.270	1.572
Voice and Accountability	1,764	-0.387	0.815	-2.810	1.384
Control of Corruption	1,764	-0.332	0.646	-2.625	1.538
Government Effectiveness	1,764	-0.431	0.631	-1.816	1.555
Political Stability	1,764	-0.396	0.767	-2.233	1.292
Private investment	1,764	23.196	8.361	4.445	80.817
Public debt	1,764	46.349	28.531	0.488	185.31
Economic growth	1,764	5138.67	6453.273	194.8731	49578.36
Trade openness	1,764	79.099	34.517	0.167	210.400
Inflation	1,764	6.263	7.180	-7.44	108.893

TABLE A3
MATRIX OF CORRELATION COEFFICIENTS BETWEEN VARIABLES

	PIN	DEB	GDP	OPE	INF
PIN	1				
DEB	-0.050**	1			
GDP	0.122***	-0.148***	1		
OPE	0.211***	0.001	0.287***	1	
INF	-0.024	0.074***	-0.136***	-0.076***	1

Note: ***, **, and *denote significance at 1%, 5%, and 10% levels, respectively.

TABLE A4
MATRIX OF CORRELATION COEFFICIENTS BETWEEN SIX DIMENSIONS OF GOVERNANCE

	GO1	GO2	GO3	GO4	GO5	GO6
GO1	1					
GO2	0.824***	1				
GO3	0.626***	0.528***	1			
GO4	0.719***	0.848***	0.475***	1		
GO5	0.894***	0.878***	0.636***	0.825***	1	
GO6	0.614***	0.544***	0.501***	0.608***	0.629***	1

Note: ***, **, and *denote significance at 1%, 5%, and 10% levels, respectively.

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