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RESEARCH ARTICLE

Decomposing Crowding Out Effect in the Philippines: Leveraging Fiscal Policy to Drive Inclusive Growth

John Paolo R. Rivera[1*], Mary Grace R. Agner[1], Viory Yvonne T. Janeo[2] and John Angelo F. Cristobal[2]
[1]Philippine Institute for Development Studies
[2]University of Asia and the Pacific
*jrivera@pids.gov.ph

Fiscal stimulus programs have substantively kept the Philippine economy afloat during crises and in facilitating recovery. In pursuing steeper growth, there is a tendency to harness fiscal policy at the expense of crowding out private investment and consumption, which defeats the ultimate purpose of such policy. Using time series analysis, we assess the degree of crowding out effect in the Philippines and its implications for the effectiveness of fiscal policy as a macroeconomic stabilization and growth driver tool. Although scholarly literature has used aggregate government spending in probing the existence of a crowding out effect on aggregate investment and consumption spending, we decomposed government spending into its various components to establish which form of spending should be managed. Results show that the crowding effect on private consumption has nuances, whereas the crowding out effect on investment is validated. In terms of the type of expenditure, national government spending on interest payments and subsidies demonstrated a negative effect on specific classifications of consumption and investment. Findings provide fiscal policy directions to mitigate the crowding out effect and impediments to private consumption and investment, thereby facilitating robust and sustained economic growth.

Keywords: consumption, crowding out effect, fiscal policy, government spending

JEL Classifications: E62, E21, C54

Employing fiscal policy[1] is one of the policy tools used to help promote faster economic growth (Rivera et al., 2024; Mankiw, 2021; Blanchard, 2020). In the Philippines, fiscal stimulus programs played a vital role in keeping the economy afloat during the recent pandemic and in facilitating recovery in the post-2020 period (Debuque-Gonzales et al., 2022). The Philippines implemented several fiscal stimulus measures in recent years, including Bayanihan Acts I and II[2] (i.e., two rounds of stimulus packages in 2020 to support economic recovery from the COVID-19 pandemic; Department of Budget and Management [DBM[3]], 2023; Jahan, 2021); Corporate Recovery and Tax Incentives for Enterprises Act (CREATE) tax reform package (i.e., a package that lowered corporate income tax rate and provided huge fiscal stimulus for firms; DBM, 2023; Jahan, 2021); and below-the-line measures (i.e., credit guarantees and other measures that focused on social spending for the most affected sectors; Jahan, 2021). In fact, fiscal support measures implemented in 2020 were valued at 4.4% of the Philippine Gross Domestic Product (GDP), which worsened the fiscal deficit to 7.6% of GDP (Jahan, 2021).

However, although such programs seek to bolster the economy, they can also result in crowding out[4] consumption and private investments (Hur et al., 2010, 2014). For instance, during the health crisis of 2020, when the Philippine government stimulated the economy via fiscal stimulus, investment showed a significant decline in all quarters of 2020 (Basilio et al., 2022). Such an outcome presents the potential downside of fiscal interventions that may dampen private sector activity and stifle the policy's goal of boosting economic growth (International Monetary Fund, 2015; Organisation for Economic Cooperation and Development [OECD], 2010).

Arroyo (1987) empirically probed the idea of crowding out effect in the Philippines by analyzing the effect of government spending on private demand. Results confirmed the crowding out effect. However, like most studies, aggregate government spending was used in probing the existence of a crowding out effect on aggregate investment and consumption spending. Hence, we contribute to the scholarly literature by disaggregating government spending into its various components to help identify which form of spending needs to be managed to mitigate the crowding out effect. Using time series analysis, we assessed the degree of crowding out effect in the Philippines and its implications for the effectiveness of fiscal policy as a macroeconomic stabilization and growth driver tool.

Given the abovementioned backdrop, our study addressed the research question: *How do the different components of government spending in the Philippines affect private consumption and investment spending?* That is, *among the components of government spending, which generates a crowding out effect on private consumption and investment spending and how can this be managed?* In addressing our research question, we set the following specific objectives:

1. To determine which component(s) of government spending stimulate(s) crowding out effect on private consumption and investment spending.
2. To determine the direction of change for each component of government spending on private consumption and investment spending.
3. To craft policy frameworks on mitigating crowding out effect.

On a knowledge component, although most scholarly literature (Unsal, 2020; Omitogun, 2018; Xu & Yan, 2014; Basar et al., 2011; Wang, 2005; Mamatzakis, 2001; Gochoco, 1990; Arroyo, 1987; Canlas, 1986; Friedman, 1978; Buiter, 1977), which are discussed in our literature review, have looked at the effects of government spending on private consumption and investment spending at an aggregate level, we build on these, particularly on crowding out effect in the Philippines, by disaggregating aggregate government spending to identify which of its components drive crowding out effect. Findings are supplementary to the understanding of key stakeholders on the macroeconomic impacts of fiscal policy. Meanwhile, on the policy component, we contribute to policy formulation through recommendations anchored on the management of fiscal policy by looking into the nuances and peculiarities of the components of aggregate government spending.

In addressing our research questions and objectives, our locale is the Philippine economy, whose time series data on relevant macroeconomic variables were obtained from available observations from the Philippine Statistics Authority (PSA[5]) and the Bureau of the Treasury (BTr[6]).

Literature Review

Scholarly literature has confirmed that the crowding out effect has become a key focus of economic analysis (e.g., Bai et al., 2024; Jato & Nwankwo, 2024; Balcerzak & Rogalska, 2014; Xu & Yan, 2014; Arroyo, 1987; Friedman, 1978). Referred to as "diversion" by Keynes (Yeager, 1973), the crowding out effect has a long history in macroeconomic theory and policy discussions (Buiter, 1977). Unsal (2020) asserted that it is a vital macroeconomic study area. Various scholarly literature examined the impact of fiscal stimulus programs on private demand through cross-economy and economy-specific analyses. Specifically, Monadjemi (1993); Narayan (2004); Ahmed and Miller (1999); Erden and Holcombe (2005); Wang (2005); Cavallo and Daude (2011); Basar et al. (2011); Blackley (2014); Xu and Yan (2014); Omitogun (2018); Demirel et al. (2017) Mallick (2019); and Unsal (2020), among others, investigated the impact of fiscal stimulus on investment. Meanwhile, Canlas (1986), Arroyo (1987), Nieh and Ho (2006), and Cheng et al. (2021) probed the impact of fiscal

stimulus on consumption. A few, like Hur et al. (2010, 2014) and Heim (2012), have investigated the impact of fiscal stimulus on both investment and consumption.

Crowding Out Effect in Developed Economies

Empirical findings in Australia and the United States of America have revealed that government investment and government consumption crowd out private investment expenditure (Monadjemi, 1993)—significant and negative correlations between corporate profit, government investment policy, and government consumption spending accentuate these results.

Mamatzakis (2001) analyzed the effects of disaggregated measures of government spending and private investment in Greece. Results show that public investment positively affects private investment, whereas public consumption expenditures negatively affect private investment.

By analyzing the components of Canadian government expenditures separately, Wang (2005) found that government expenditure on education and health demonstrates a crowding in[7] effect with private investment, whereas government expenditure on capital and infrastructure shows otherwise. Results also revealed that there is no evidence of substitutability (crowding out) or complementarity (crowding in) of private investment with government expenditures on the protection of persons and property, expenditure on debt charges, and expenditure on services.

The following scholarly studies from the United States examined the crowding out effect. According to Heim (2012), government deficits financed through domestic borrowing led to the crowding out of private borrowing and spending by consumers and businesses, regardless of whether the economy is in a recession or not. In contrast, Blackley (2014) supported the Keynesian perspective, suggesting that public and private investments are complementary and that the public component helps maintain full employment. In the long run, it was argued that there is no crowding out effect associated with equal percentage changes in government purchases of domestic consumption and investment. Contrary to some previous findings, results revealed that public investment has a significant crowding-in effect on private investment, whereas military purchases have a significant crowding out effect, with an elasticity of -0.52.

With larger observations, Nieh and Ho (2006) emphasized that government and private consumption are complementary, indicating that increased government spending does not displace private consumption in 23 OECD economies. Meanwhile, using a different period and dependent variable, Unsal (2020) found that while economic growth and defense expenditures positively influence private investments, total government expenditures and social protection expenditures have a crowding-out effect on private investments in 17 OECD economies.

In the Eurozone, Demirel et al. (2017) investigated the effects of various exogenous variables (i.e., government expenditure, budget deficit, government debt, and interest rates) on private investments. Findings revealed that government debt, government expenditure, interest rates, and budget deficits negatively impact private investment.

Crowding Out Effect in Less Developed Economies

Canlas (1986) provided evidence that government purchases crowd out private consumption in the Philippines. By breaking down the government debt into public internal debt and public external debt, it was underscored that there is a decrease in private consumption as internal debt rises while it increases with a rise in external debt. Arroyo (1987) reached the same conclusion that government expenditures have a strong crowding out effect on private consumption, which tends to reduce economic output and employment. According to Gochoco (1990), less developed economies like the Philippines face limitations in financing budgetary deficits through money creation due to concerns about inflation. Borrowing from abroad is also challenging due to the burden of financing additional external debt, which carries interest rate and exchange rate risks. Hence, crowding out is likely to persist in the Philippines.

In Fiji, Narayan (2004) examined the relationship between private investment and government investment over the period 1950 to 2001. Results showed that both variables are cointegrated and government investments positively influence private investment only for the period 1950 to 1975. However, there was no cointegration for the period 1976 to 2001, mirroring

the trend in private investments post-1976. Real private investment decreased from approximately 11% of GDP in 1976 to 3.4& of GDP in 2001, whereas real private investment increased from 18% of GDP to 22% of GDP during the period 1976 to 2001.

In Türkiye, although government investment spending crowds out private investment, data on total government spending, transfer payments, and private investments supported the crowding in hypothesis (Başar et al., 2011).

Examining the effect of the disaggregated government expenditure on private in Nigeria, Omitogun (2018) observed that the impact of government spending on private investment is conditional upon the specific elements comprising the expenditure. For instance, recurrent expenditure has a strong and positive correlation with private investment in the short run, whereas capital expenditure on administration, transfers, and lending rates crowds in private investment in the long run. On the other hand, recurrent expenditure on economic services has an adverse and substantial effect on private investment in Nigeria. Analyzing the increasing effect of the infrastructure and non-infrastructure components of government investments on private investments, Mallick (2019) reached the conclusion that in the short term, both government investment components have an adverse impact on private investment, with infrastructure investment showing a statistically insignificant effect. Results also uncovered that non-infrastructure public investment positively influences its infrastructure component.

Scholarly studies in the People's Republic of China have also examined the crowding out effect. Xu and Yan (2014) determined that government investment in public goods in the PRC led to a substantial increase in private investment. On the other hand, government investment in private goods, particularly in the industry and commerce sectors through state-owned enterprises, causes a significant decrease in private investment. Alternatively, Cheng et al. (2021) supported the crowding in effect concerning government health investment and household consumption, indicating a positive correlation. Based on mediation tests, government health investment primarily fosters regional economic growth, ultimately leading to increased household consumption.

Comparison of Crowding Out Effect in Developed and Less Developed Economies

Ahmed and Miller (1999) determined that in both developed and less developed economies, increased expenditure on social security and welfare leads to a crowding out effect on investment, whether financed through taxes or debt. However, in less developed economies, increased spending on transport and communication stimulates private investment. Results highlighted that it is important to note that their measure of investment includes both private and public investment, whereas government expenditure encompasses both current and capital spending. On the other hand, Erden and Holcombe (2005) found that public investment complements private investment in less developed economies but not in developed economies. This implies that, on average, a 10% rise in public investment corresponds to a 2% increase in private investment in 19 less-developed economies. For Hur et al. (2010, 2014), fiscal expansion has neither a strong negative effect nor positive effect on private consumption and investment in the region. In other words, fiscal expansion is neutral in terms of private demand. In a later study, however, Cavallo and Daude (2011) noted a strong and robust crowding out effect between public and private investments in 116 less-developed economies.

Table 1 summarizes the scholarly literature on the crowding out effect for developed and less developed economies, highlighting their approach and findings.

The Philippines' Fiscal Debt Standing

Since 2022, the national government's outstanding debt stock has increased, as seen in Table 2. Moreover, the Philippine Department of Finance's (DOF, 2024) debt management strategy is at 77:23 in favor of domestic borrowings to effectively mitigate foreign exchange risks. As of writing, DOF reiterated its "no new taxes" stance, stating the administration will exclusively implement reforms pending in Congress and target to enhance tax collection efficiency (Cruz, 2025). Hence, examining current debt standing in relation to a possible crowding-out effect in various components is critical in establishing policy guidelines in the Philippines.

Table 1. *Literature Matrix*

Author(s)	Locale	Period	Endogenous Variable	Methodology	Key Findings
Canlas (1986)	Philippines	1950 to 1983	Private consumption	Ordinary Least Squares (OLS)	Higher public internal debt decreases private consumption; higher public external debt increases it.
Arroyo (1987)	Philippines	1949 to 1983	Private consumption	OLS and Instrumental Variable Estimation	Government expenditure crowds out private consumption.
Monadjemi (1993)	Australia and USA	1976 to 1987; 1974 to 1987	Private investment	Cointegration, Regression Analysis, and Granger Causality	Government expenditure crowds out United States' private investment; there is a negative correlation between corporate profit and government consumption spending; public capital expenditure crowds out private investment expenditure in Australia.
Ahmed and Miller (1999)	39 economies	1975 to 1984	Domestic Investment (Private and public investment)	OLS (Fixed- and Random-effects)	Tax-financed government expenditure crowds out more investment than debt-financed expenditure; social security and welfare expenditures reduce investment; expenditure on transport and communication induces private investment in less developed economies.
Mamatzakis, (2001)	Greece	1950 to 1998	Private investment	Vector Error Correction Model (VECM)	Public investment positively affects private investment while public consumption expenditures have a negative effect on private investment.
Narayan (2004)	Fiji	1950 to 2001	Private Investment	Autoregressive distributed lag (ARDL), Dynamic OLS, Fully modified OLS, Error Correction Mechanism (ECM), Zivot and Andrews method	For the period 1950 to 1975, there was cointegration; government investment had crowding in effect on private investment; no cointegrating relationship for the period 1976 to 2001.
Erden and Holcombe (2005)	19 less developed economies	1980 to 1997	Private Investment	Pooled OLS, Fixed- and Random effects, System two-stage least squares (2SLS)	Public investment has a positive impact on private investment in developing economies; public investment has a negative impact on private investment in developed economies.

Table 1 (continued)

Author(s)	Locale	Period	Endogenous Variable	Methodology	Key Findings
Wang (2005)	Canada	1961 to 2000	Private Investment	Cointegration and ECM	Government expenditure on the protection of persons and property, expenditure on debt charges, and expenditure on services do not bear either a substitutability (crowding out) or complementarity (crowding in) relationship with private investment; government expenditure on education and health shows a crowding in effect whereas government expenditure on capital and infrastructure showed a crowding out relationship with private investment.
Nieh and Ho (2006)	23 OECD economies	1981 to 2000	Private consumption	Panel cointegration, Panel Fully Modified OLS, Panel Dynamic OLS, Seemingly Unrelated Regressions (SUR), and Two-step estimator	Government and private consumption are found to be complements.
Hur et al. (2014, 2010)	24 economies	Length of each economy's data (depends on data availability)	Private consumption and investment	Panel regression, ECM, and Structural Vector Autoregression (SVAR)	Evidence is decidedly mixed, with no clear evidence of either crowding out or crowding in.
Cavallo and Daude (2011)	116 less developed economies	1980 to 2006	Private investment	System Generalized Method of Moments (GMM)	There is a strong and robust crowding out effect that seemed to be the norm, both across economies and time.
Basar et al. (2011)	Türkiye	1987 to 2007	Private Investment	Johansen-Juselius cointegration	Total government spending and transfer payments have positive effects on private investments; government investment spending crowds out private investment.
Heim (2012)	USA	1960 to 2000	Private demand (borrowing and spending by consumers and businesses)	2SLS	Government deficits financed by domestic borrowing crowd out private borrowing and spending by consumers and businesses in both recession and non-recession periods.
Blackley (2014)	USA	1956 to 2010	Private investment	ARDL	Public investment has a significant crowding in effect on private investment, whereas military purchases have a significant crowding out effect.

Table 1 (continued)

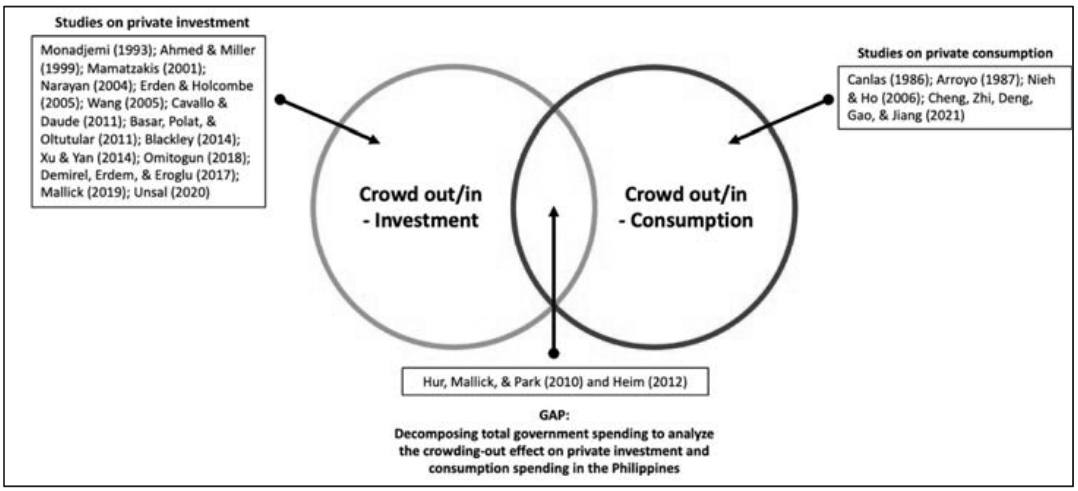
Author(s)	Locale	Period	Endogenous Variable	Methodology	Key Findings
Xu and Yan (2014)	PRC	1980 to 2011	Private investment	SVAR	Government investment in public goods crowds in private investment; government investment in private goods, industry, and commerce, mainly through state-owned enterprises, crowds out private investment.
Omitogun (2018)	Nigeria	1981 to 2015	Private investment	ARDL	The effect of government expenditure on private investment depends on the components of the expenditure; some are found to crowd out private investment, whereas some crowd in private investment.
Demirel et al. (2017)	Eurozone	2000 to 2015	Private investments	Panel OLS, Panel Dynamic OLS, Panel Fully Modified OLS	Government debt, government expenditure, interest rates, and budget deficits all affect private investment negatively, and the impact of economic growth is positive.
Mallick (2019)	India	1960 to 2018	Private investment	Structural Vector Auto-Regressive (SVAR)	The infrastructure and non-infrastructure components of government investments negatively affect private investment in the short run, but the effect of infrastructure investment is not statistically significant.
Unsal (2020)	17 OECD economies	1995 to 2017	Private investment	Panel Data Analysis (Huber-Eicker-White Estimator)	Economic growth and government defense expenditures positively affect private investments; total government expenditures and government social protection expenditures have a crowding out effect on private investments.
Cheng et al. (2021)	Inland provinces in PRC	2007 to 2019	Household consumption	Panel fixed effects and Sobel-Goodman mediation tests	Government health investment has a crowding in effect and can promote household consumption. Mediation tests found that government health investment promotes regional economic growth and subsequently increases household consumption.

Source: Tabulated by the authors from earliest to latest year of publication.

Table 2. *National Government Outstanding Debt Stock (in Million PHP)*

	2022	2023	2024
Domestic	9,414,152	10,199,690	11,185,921
External	4,403,754	4,766,017	5,212,040
Total	1,3817,906	1,4965,707	16,397,961

Source: Bureau of the Treasury (2024).



Source: Constructed by the authors.

Figure 1
Literature Map

Research Gap

Figure 1 illustrates the gap we found in our review of scholarly literature. We found mixed outcomes regarding the effects of fiscal policy on private consumption and investment in different economies. Differences in the size and impact of fiscal policy can be attributed to institutional quality, market access policies, or structural differences (Erden & Holcombe, 2005; Cavallo & Daude, 2011). Moreover, most scholarly studies mentioned focus on analyzing private investment and private consumption separately, apart from Hur et al. (2010, 2014) and Heim (2012). We also highlight that there is a dearth of recent empirical analyses on the crowding out effect in the Philippines. Hence, there is a need to examine the fiscal stimulus programs on both private investment and consumption spending in the Philippines.

Although most studies use aggregate government expenditure in probing the existence of a crowding out effect on private demand, government expenditure can be decomposed into its various components to establish which form of government expenditure must be managed. With the national government's debt management strategy prioritizing local borrowings, targeted analysis of investments and expenditures can boost fiscal efficiency and consolidation by eliminating waste and prioritizing high-impact initiatives. As such, bridging the gap will provide fiscal policy directions for the Philippine government to mitigate the crowding out effect and the impediments to private investment and consumption to facilitate a more sustained and robust economic growth trajectory. To do this, we build on the contributions of Wang (2005), Omitogun (2018), and Unsal (2020), in which disaggregated measures of government spending are used as explanatory variables.

Framework and Methodology

Theoretical Framework

Our study is anchored on the following theoretical underpinnings: (a) crowding out economic theory (Mankiw, 2021; Blanchard, 2020), (b) Ricardian equivalence (Buchanan, 1976), and (c) Barro's output effects of government purchases theory (Barro, 1981).

Crowding Out Effect

The theory contradicts the Keynesian idea that increasing government spending would stimulate economic growth. This positive effect of government spending on the economy also flows through to the other components of aggregate demand via the so-called multiplier effect (Mankiw, 2021; Blanchard, 2020). For instance, an increase in output will also increase consumption spending due to higher purchasing power as some businesses will hire more, which gives people more income they can spend. As a result, the growth of the economy is further amplified. In contrast, the crowding out effect refers to the detrimental impact of expansionary fiscal actions, such that the increase in public sector spending drives down private sector spending. An example of this is when the government, which is in a budget deficit, decides to borrow in the market for loanable funds to finance its spending. This activity reduces the supply of loanable funds in the market and raises interest rates, which could discourage the private sector from purchasing a new house or facility (Mankiw, 2021; Blanchard, 2020). This results in a failure to stimulate total economic activity. This economic theory could be analyzed in either nominal or real terms. When prices are constant, this theory can be seen through the effects of the growth in real government spending funded by debt or taxes. This theory also explains that government spending does not have a long-term effect on nominal income. Rather, it slows down economic growth as it brings about reduced growth of capital stock.

Ricardian Equivalence

This theory suggests that government spending financed through debt will not effectively stimulate the economy (Buchanan, 1976). This is because people anticipate in the future that the debt will be repaid in the form of higher taxes (Leiderman & Blejer, 1988). Hence, private consumption declines as the private sector saves and prepares for the future tax hike. Thus, the government's attempt to stimulate economic growth is negated.

Barro's Output Effects of Government Purchases

Barro (1981) suggested that private consumption decreases when government purchases increase. It points to a direct relationship between government purchases and output despite the initial dampening effect on consumption. It recognized the effect of government purchases on interest rates, but it also emphasized the temporary and permanent movements in government spending and its effect on the total output.

Research Design

In addressing our research questions and objectives, a time series econometric approach is employed following the tools from Enders (2004) and the time series technique implemented by Rivera and Tullao (2020, 2022a, 2023). We begin with the collection of secondary time series data on the following macroeconomic variables, also described in Table 3.

1. ***Breakdown of Government Final Consumption Expenditure (GFCE):*** allotment to local government units (LGUs), interest payments, tax expenditures, subsidy, equity, net lending, and national government (NG) disbursements.
2. ***Breakdown of Household Final Consumption Expenditure (HFCE):*** food and non-alcoholic beverages; alcoholic beverages and tobacco; clothing and footwear; housing, water, electricity, gas, and other fuels; furnishings, household equipment, and routine household maintenance; health; transport; communication; recreation and culture; education; restaurants and hotels; miscellaneous goods and services.
3. ***Breakdown of Gross Capital Formation (GCF):*** gross fixed capital formation (GFCF), changes in inventories, valuables.

Table 3. *Variable Description*

Code	Description	Measurement
C_t	Aggregate consumption spending	HFCE (in million PHP)
C_{1t}	Food and non-alcoholic beverages	Food and non-alcoholic beverages (in million PHP)
C_{2t}	Alcoholic beverages and tobacco	Alcoholic beverages and tobacco (in million PHP)
C_{3t}	Clothing and Footwear	Clothing and Footwear (in million PHP)
C_{4t}	Housing, water, electricity, gas and other fuels	Housing, water, electricity, gas, and other fuels (in million PHP)
C_{5t}	Furnishings, household equipment, and routine household maintenance	Furnishings, household equipment, and routine household maintenance (in million PHP)
C_{6t}	Health	Health (in million PHP)
C_{7t}	Transport	Transport (in million PHP)
C_{8t}	Communication	Communication (in million PHP)
C_{9t}	Recreation and culture	Recreation and culture (in million PHP)
C_{10t}	Education	Education (in million PHP)
C_{11t}	Restaurants and hotels	Restaurants and hotels (in million PHP)
C_{12t}	Miscellaneous goods and services	Miscellaneous goods and services (in million PHP)
I_t	Aggregate investment spending	GCF (in million PHP)
I_{1t}	Construction	Construction (in million PHP)
I_{2t}	Durable Equipment	Durable Equipment (in million PHP)
I_{3t}	Breeding Stocks and Orchard Development	Breeding stocks and orchard development (in million PHP)
I_{4t}	Intellectual Property Products	Intellectual Property Products (in million PHP)
I_{5t}	Changes in Inventories	Changes in Inventories (in million PHP)
I_{6t}	Valuables	Valuables (in million PHP)
G_t	Aggregate government spending	NG Expenditures (in million PHP)
G_{1t}	Allotment to LGUs	Allotment to LGUs (in million PHP)
G_{2t}	Interest payments	Interest payments (in million PHP)
G_{3t}	Tax expenditures	Tax expenditures (in million PHP)
G_{4t}	Subsidy	Subsidy (in million PHP)
G_{5t}	Equity	Equity (in million PHP)
G_{6t}	Net lending	Net lending (in million PHP)
G_{7t}	NG Disbursements	NG Disbursements (in million PHP)

Source: Tabulated by the authors.

Note that the above-mentioned variables are accessible from the PSA under Time Series Data of National Accounts and from the BTr under National Government Cash Operations Report. These were selected for their accessibility, allowing for replication, validation, and extension. Although data on GFCE from PSA's national accounts would have provided more consistency since our data on HFCE and GCF both came from it, only the aggregated GFCE values were available. As an alternative, we used the disaggregated government spending from the BTr, specifically its report on national government expenditures, to represent GFCE.

Moreover, each variable is expressed using quarterly data, covering the period from the first quarter of 2010 up to the second quarter of 2023. We note that the PSA reports consumption and investment spending on a quarterly basis, whereas the BTr reports government spending monthly. For consistency, we added the monthly government spending data from January to March, April to June, July to September, and October to December to obtain the quarterly values. Appendix 1 presents the dataset used.

Our time series data was sourced from PSA and BTr. This data was subjected to standard time series analysis tools: stationarity test (i.e., Phillips-Perron unit root test); optimal lag structure selection (i.e., information criterion approach); and cointegration test (i.e., Engle-Grager cointegration test) following the study of Rivera and Tullao (2020, 2022a, 2023). We used the optimal lag structure selection because insufficient lags may lead to omitted variable bias, while too many lags can quickly deplete degrees of freedom (Gujarati & Porter, 2009). By using the optimal lags suggested by the various information criteria, such as the final prediction error (FPE), Akaike information criterion (AIC), Hannan-Quinn information criterion (HQIC), and Schwarz Bayesian information criterion (SBIC), we were able to address this issue.

For the regression process, the effect of government spending on the consumption and investment variables were investigated using the equations listed below:

For Consumption:

$$C_t = f(G_t) \tag{1}$$

$$C_t = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{2}$$

$$C_{1t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{3}$$

$$C_{2t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{4}$$

$$C_{3t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{5}$$

$$C_{4t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{6}$$

$$C_{5t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{7}$$

$$C_{6t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{8}$$

$$C_{7t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{9}$$

$$C_{8t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{10}$$

$$C_{9t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{11}$$

$$C_{10t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{12}$$

$$C_{11t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{13}$$

$$C_{12t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{14}$$

For Investment:

$$I_t = f(G_t) \tag{15}$$

$$I_t = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{16}$$

$$I_{1t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{17}$$

$$I_{2t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{18}$$

$$I_{3t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{19}$$

$$I_{4t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{20}$$

$$I_{5t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{21}$$

$$I_{6t} = f(G_{1t}, G_{2t}, G_{3t}, G_{4t}, G_{5t}, G_{6t}, G_{7t}) \tag{22}$$

Note that the consumption and investment spending variables were regressed on the current and past values of government spending. From our equations, emphasis is placed on the impact of government spending on private consumption and investment spending. It did not control for the presence of other macroeconomic variables, such as interest rate, inflation, and GDP growth, that could potentially

influence how government spending impacts private consumption and investment spending. Therefore, we focused on the analysis of government spending and its impact on investment and consumption. Future studies could consider incorporating these factors into the model to provide a more comprehensive understanding of the interplay between government spending, private consumption, and investment spending.

Results and Discussion

Results of Standard Time Series Tests

Appendix 2 shows the results of the Phillips-Perron stationarity test. We observed that our variables exhibit different orders of integration. Some are stationary at level values (i.e., integrated of order 0), while others are stationary at first differencing (i.e., integrated of order 1). Because the highest order of integration takes precedence (Enders, 2004), we applied first differencing to all our variables.

Following the stationarity test, each equation was subjected to the Engle-Granger cointegration test, allowing us to identify whether a long-run relationship exists between the variables of interest. Appendix 3 presents the cointegration results. We discovered that all equations are cointegrated.

We also identified the optimal lag order, denoted by p, for each equation using various information criteria. Appendix 4 summarizes the optimal lag order we selected for Equations 1 to 22. The maximum lag order was chosen based on the recommendations of various information criteria. All our equations have been prescribed an optimal lag order of 4, except for Equation 15, which has been prescribed an optimal lag order of 3.

Empirical Results

On Consumption Spending

Empirical results revealed that the impact of government spending on consumption is ambiguous on an aggregated level as it can be positive or negative, which is, to some extent, consistent with the findings of Bai et al. (2024); Jato and Nwankwo (2024); Balcerzak and Rogalska (2014); Xu and Yan (2014); Arroyo (1987); and Friedman (1978). However, such results imply that the crowding out effect of government spending on private consumption cannot be fully established and validated. On a disaggregated level, we also found out that not all components of G_t crowd out consumption, which is contrary to most studies on crowding our effect for developed and less developed economies. Some components of G_t showed a positive effect on specific components of household expenditures, while other components of G_t were found to have no effect, statistically speaking. An example case for the former would be the positive effect created by interest payments (G_{2t}), subsidy (G_{4t}), and NG disbursements (G_{7t}) on housing, water, electricity, gas and other fuel expenditures by households (C_{4t}). Such results indicate nuances in the effect of government spending on consumption, which have not been captured by scholarly studies that used aggregate government spending. Moreover, such results also highlighted the value of using disaggregated data to see peculiarities in the behavior of our selected macroeconomic variables. Table 4 provides the summary details of the regression. The regression results can be replicated following the prompts listed in Appendix 5.

On Investment Spending

Aggregate-wise, we have observed that there is statistical evidence of crowding out effect on private investments. On a disaggregated level, findings reveal that all components of G_t have a statistically insignificant impact on half of the components of I_t. Only in breeding stocks and orchard development (I_{3t}), intellectual property products (I_{4t}), and changes in inventories (I_{5t}) where one can find some crowding out as well as crowding in effect on private investments. Such findings demonstrated greater consistency with scholarly literature (Cavallo & Daude, 2011; Ahmed & Miller, 1999), for both developed and less developed economies, but with some identified nuances that are evident in the Philippine macroeconomic environment as a less developed economy (Hur et al., 2010, 2014). Again, this highlighted the importance of utilizing disaggregated data to see idiosyncrasies (Erden & Holcombe, 2005) in the behavior of our selected macroeconomic variables. Table 5 provides the summary details of the regression. The regression results can be replicated following the prompts listed in Appendix 5.

Table 4. *Key Findings for Consumption Equations*

Equation	*Y*	*X*	Sign	Interpretation
1	Aggregate Consumption Spending (D1.C_t)	Aggregate Government Spending (D1.G_t)	+/-	Government spending has an ambiguous impact on consumption.
2	Aggregate Consumption Spending (D1.C_t)	Allotment to LGUs (D1.G_{1t})	-	Allotment to LGUs reduces consumption.
		Interest Payments (D1.G_{2t})	-	Interest payments reduce consumption.
		Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase consumption.
		Subsidy (D1.G_{4t})	-	Subsidy reduces consumption.
		Equity (D1.G_{5t})	0	Equity has no significant impact on consumption.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on consumption.
		NG Disbursements (D1.G_{7t})	+/-	NG Disbursements have an ambiguous impact on consumption.
3	Food and Non-Alcoholic Beverages (D1.C_{1t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for food and non-alcoholic beverages.
		Interest Payments (D1.G_{2t})	-	Interest payments reduce expenditures for food and non-alcoholic beverages.
		Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase expenditures for food and non-alcoholic beverages.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for food and non-alcoholic beverages.
		Equity (D1.G_{5t})	+	Equity increases expenditures for food and non-alcoholic beverages.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for food and non-alcoholic beverages.
		NG Disbursements (D1.G_{7t})	+/-	NG Disbursements have an ambiguous impact on expenditures for food and non-alcoholic beverages.

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
4	Alcoholic Beverages and Tobacco (D1.C_{2t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for alcoholic beverages and tobacco.
		Interest Payments (D1.G_{2t})	-	Interest payments reduce expenditures for alcoholic beverages and tobacco.
		Tax Expenditures (D1.G_{3t})	0	Tax expenditures have no significant impact on expenditures for alcoholic beverages and tobacco.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for alcoholic beverages and tobacco.
		Equity (D1.G_{5t})	-	Equity reduces expenditures for alcoholic beverages and tobacco.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for alcoholic beverages and tobacco.
		NG Disbursements (D1.G_{7t})	0	NG Disbursements have no significant impact on expenditures for alcoholic beverages and tobacco.
5	Clothing and Footwear (D1.C_{3t})	Allotment to LGUs (D1.G_{1t})	-	Allotment to LGUs reduces expenditures for clothing and footwear.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on expenditures for clothing and footwear.
		Tax Expenditures (D1.G_{3t})	0	Tax expenditures have no significant impact on expenditures for clothing and footwear.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for clothing and footwear.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for clothing and footwear.
		Net Lending (D1.G_{6t})	+	Net lending increases expenditures for clothing and footwear.

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
		NG Disbursements (D1.G_{7t})	0	NG Disbursements have no significant impact on expenditures for clothing and footwear.
6	Housing, water, electricity, gas and other fuels (D1.C_{4t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for housing, water, electricity, gas, and other fuels.
		Interest Payments (D1.G_{2t})	+	Interest payments increase expenditures for housing, water, electricity, gas, and other fuels.
		Tax Expenditures (D1.G_{3t})	-	Tax expenditures reduce expenditures for housing, water, electricity, gas, and other fuels.
		Subsidy (D1.G_{4t})	+	Subsidy increases expenditures for housing, water, electricity, gas, and other fuels.
		Equity (D1.G_{5t})	-	Equity reduces expenditures for housing, water, electricity, gas, and other fuels.
		Net Lending (D1.G_{6t})	-	Net lending reduces expenditures for housing, water, electricity, gas, and other fuels.
		NG Disbursements (D1.G_{7t})	+	NG Disbursements increase expenditures for housing, water, electricity, gas, and other fuels.
7	Furnishings, household equipment, and household maintenance (D1.C_{5t})	Allotment to LGUs (D1.G_{1t})	0	All components of G_t have no significant impact on expenditures for furnishings, household equipment, and household maintenance.
		Interest Payments (D1.G_{2t})	0	
		Tax Expenditures (D1.G_{3t})	0	
		Subsidy (D1.G_{4t})	0	
		Equity (D1.G_{5t})	0	
		Net Lending (D1.G_{6t})	0	
		NG Disbursements (D1.G_{7t})	0	

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
8	Health (D1.C_{6t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for health.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on expenditures for health.
		Tax Expenditures (D1.G_{3t})	0	Tax expenditures have no significant impact on expenditures for health.
		Subsidy (D1.G_{4t})	0	Subsidy has no significant impact on expenditures for health.
		Equity (D1.G_{5t})	+	Equity increases expenditures for health.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for health.
		NG Disbursements (D1.G_{7t})	0	NG Disbursements have no significant impact on expenditures for health.
9	Transport (D1.C_{7t})	Allotment to LGUs (D1.G_{1t})	-	Allotment to LGUs reduces expenditures for transport.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on expenditures for transport.
		Tax Expenditures (D1.G_{3t})	-	Tax expenditures reduce expenditures for transport.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for transport.
		Equity (D1.G_{5t})	+	Equity increases expenditures for transport.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for transport.
		NG Disbursements (D1.G_{7t})	-	NG Disbursements reduce expenditures for transport.
10	Communication (D1.C_{8t})	Allotment to LGUs (D1.G_{1t})	0	Allotment to LGUs has no significant impact on expenditures for communication.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on expenditures for communication.

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
	Communication (D1.C_{8t})	Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase expenditures for communication.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for communication.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for communication.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for communication.
		NG Disbursements (D1.G_{7t})	0	NG Disbursements have no significant impact on expenditures for communication.
11	Recreation and Culture (D1.C_{9t})	Allotment to LGUs (D1.G_{1t})	0	Allotment to LGUs has no significant impact on expenditures for recreation and culture.
		Interest Payments (D1.G_{2t})	+	Interest payments increase expenditures for recreation and culture.
		Tax Expenditures (D1.G_{3t})	0	Tax expenditures has no significant impact on expenditures for recreation and culture.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for recreation and culture.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for recreation and culture.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for recreation and culture.
		NG Disbursements (D1.G_{7t})	-	NG Disbursements reduce expenditures for recreation and culture.
12	Education (D1.C_{10t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for education.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on expenditures for education.

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
	Education (D1.C_{10t})	Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase expenditures for education.
		Subsidy (D1.G_{4t})	0	Subsidy has no significant impact on expenditures for education.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for education.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for education.
		NG Disbursements (D1.G_{7t})	+	NG Disbursements increase expenditures for education.
13	Restaurants and Hotels (D1.C_{11t})	Allotment to LGUs (D1.G_{1t})	0	Allotment to LGUs has no significant impact on expenditures for restaurants and hotels.
		Interest Payments (D1.G_{2t})	+/-	Interest payments have an ambiguous impact on expenditures for restaurants and hotels.
		Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase expenditures for restaurants and hotels.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for restaurants and hotels.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for restaurants and hotels.
		Net Lending (D1.G_{6t})	0	Net lending has no significant impact on expenditures for restaurants and hotels.
		NG Disbursements (D1.G_{7t})	-	NG Disbursements reduce expenditures for restaurants and hotels.
14	Miscellaneous goods and services (D1.C_{12t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on expenditures for miscellaneous goods and services.
		Interest Payments (D1.G_{2t})	-	Interest payments reduce expenditures for miscellaneous goods and services.

Table 4 (continued)

Equation	*Y*	*X*	Sign	Interpretation
	Miscellaneous goods and services (D1.C_{12t})	Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase expenditures for miscellaneous goods and services.
		Subsidy (D1.G_{4t})	-	Subsidy reduces expenditures for miscellaneous goods and services.
		Equity (D1.G_{5t})	0	Equity has no significant impact on expenditures for miscellaneous goods and services.
		Net Lending (D1.G_{6t})	+/-	Net lending has an ambiguous impact on expenditures for miscellaneous goods and services.
		NG Disbursements (D1.G_{7t})	+/-	NG Disbursements have an ambiguous impact on expenditures for miscellaneous goods and services.

Source: Tabulated by the authors.

Table 5. *Key Findings for Investment Equations*

Equation	*Y*	*X*	Sign	Remarks
15	Aggregate Investment Spending (D1.I_t)	Aggregate Government Spending (D1.G_t)	-	Government spending reduces investment spending.
16, 17, 18, 22	Aggregate Investment Spending (D1.I_t), Construction (D1.I_{1t}), Durable Equipment (D1.I_{2t}), and Valuables (D1.I_{6t})	Allotment to LGUs (D1.G_{1t})	0	All components of G_t have no significant impact on the listed dependent variables.
		Interest Payments (D1.G_{2t})	0	
		Tax Expenditures (D1.G_{3t})	0	
		Subsidy (D1.G_{4t})	0	
		Equity (D1.G_{5t})	0	
		Net Lending (D1. G_{6t})	0	
		NG Disbursements (D1.G_{7t})	0	

Table 5 (continued)

Equation	*Y*	*X*	Sign	Remarks
19	Breeding Stocks and Orchard Development (D1.I_{3t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on breeding stocks and orchard development.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on breeding stocks and orchard development.
		Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase breeding stocks and orchard development.
		Subsidy (D1.G_{4t})	-	Subsidy reduces breeding stocks and orchard development.
		Equity (D1.G_{5t})	+/-	Equity has an ambiguous impact on breeding stocks and orchard development.
		Net Lending (D1. G_{6t})	0	Net lending has no significant impact on breeding stocks and orchard development.
		NG Disbursements (D1.G_{7t})	+/-	NG Disbursements have an ambiguous impact on breeding stocks and orchard development.
20	Intellectual Property Products (D1.I_{4t})	Allotment to LGUs (D1.G_{1t})	+/-	Allotment to LGUs has an ambiguous impact on intellectual property products.
		Interest Payments (D1.G_{2t})	0	Interest payments have no significant impact on intellectual property products.
		Tax Expenditures (D1.G_{3t})	+	Tax expenditures increase intellectual property products.
		Subsidy (D1.G_{4t})	-	Subsidy reduces intellectual property products.
		Equity (D1.G_{5t})	0	Equity has no significant impact on intellectual property products.
		Net Lending (D1. G_{6t})	0	Net lending has no significant impact on intellectual property products.
		NG Disbursements (D1.G_{7t})	0	NG Disbursements have no significant impact on intellectual property products.

Table 5 (continued)

Equation	*Y*	*X*	Sign	Remarks
21	Changes in Inventories (D1.I_{5t})	Allotment to LGUs (D1.G_{1t})	0	Allotment to LGUs has no significant impact on changes in inventories.
		Interest Payments (D1.G_{2t})	+	Interest payments increase changes in inventories.
		Tax Expenditures (D1.G_{3t})	0	Tax expenditures have no significant impact on changes in inventories.
		Subsidy (D1.G_{4t})	-	Subsidy reduces changes in inventories.
		Equity (D1.G_{5t})	0	Equity has no significant impact on changes in inventories.
		Net Lending (D1. G_{6t})	0	Net lending has no significant impact on changes in inventories.
		NG Disbursements (D1.G_{7t})	+	NG Disbursements increase changes in inventories.

Source: Tabulated by the authors.

Conclusions and Recommendations

Our study explicated the effects of various components of aggregate government spending on private consumption and investment in the Philippines. In addressing our research question, we put emphasis on identifying which components lead to a crowding out effect and what policy intervention or measures must be undertaken to manage its impacts on consumption and investment. Our findings showed that government spending on certain components, particularly allotment to LGUs, interest payments, and subsidy, tends to crowd out aggregate private consumption, while components of government spending demonstrated weak to the statistical absence of crowding out investments. Such is likely due to the reallocation of financial resources in the economy, rising interest rates, or distortions in market dynamics caused by these expenditures. Conversely, government spending in areas such as tax expenditures and NG disbursements appear to reinforce private sector activities, stimulating greater economic participation.

In addressing our first research objective, we found that crowding-out effects were observed most prominently in subsidies and interest payments, as they directly competed for financial resources that could otherwise flow to private investments and consumption.

In addressing our second research objective, we underscore that the direction and magnitude of change in private consumption and investment varied across government spending categories, emphasizing the importance of targeted fiscal policies rather than across-the-board policies. The changing signs and ambiguity of impact across time were seen in all government spending components, indicating an adjustment period, some nuances, and the gradation of impact until total effects on consumption and investment are manifested. As such, while vital government functions require sustained financing, expenditure allocation and spending must take into account the intended and unintended consequences of private sector activity—consumption and investment.

In addressing our third research objective, we provide a six-pronged policy recommendation to mitigate the crowding out effect while ensuring efficient use of government resources. First, the national government, through DBM, may shift budget priorities toward critical sectors with a complementary relationship to private consumption and investment (i.e., infrastructure, transportation, communication, healthcare, and education). These sectors have the capability to enhance productivity and encourage private sector activity. Second, the national government, through the Public-Private Partnership Center (PPPC), can increase and enhance collaboration with the private sector to finance and implement projects that are usually government-funded to reduce fiscal burden, expand fiscal space, and ensure that essential public services are delivered. Third, the national government may adopt counter-cyclical fiscal policies wherein, during periods of economic downturn, focus on stimulus spending in areas that catalyze private investment and consumption. On the other hand, during economic booms, reduce expenditures that risk exacerbating inflation and crowding out effects. Fourth, the national government must enhance fiscal efficiency and strengthen fiscal consolidation by minimizing leakages and redirecting resources from non-essential expenditures to high-impact initiatives. Fifth, there is a need to develop a sustainable debt strategy wherein upward pressures on interest rates due to government borrowing can be managed. This can be done through a prudent mix of domestic and external debt that will help ease the financial crowding out effects on private sector borrowing. Finally, echoing the recommendations of Rivera and Tullao (2022b, 2023), there is a need to create and ensure a conducive economic environment through consistent regulatory reforms (e.g., market-friendly policies, improved ease of doing business, targeted incentives to private enterprises) to enhance consumer and investor confidence. By striking a balance between public and private sector interests, aligning fiscal policies with private sector needs, and focusing on expenditures that drive inclusive and sustained economic growth, the Philippine government can manage the adverse effects of crowding out while achieving its developmental goals.

As an extension, future studies may expand the disaggregation by exploring regional impacts to see how government spending impacts regional private sector activity in the Philippines. This would provide a more localized and granular understanding of crowding out effects to assist policymakers in addressing regional disparities. Likewise, future studies may also investigate sector-specific responses by looking into how specific sectors (e.g., agriculture, manufacturing, services) respond to various components of government spending. This can reveal targeted strategies to enhance private investment and consumption in critical sectors.

Through these developments in the discourse of crowding out effect, our understanding of the complex relationship between government spending and private sector dynamics can be reinforced towards more refined insights for policy development.

Declaration of Ownership

This report is our original work.

Conflict of Interest

We declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Endnote

[1]Use of spending levels and tax rates by the national government (i.e., fiscal sector) to influence the economy (Kramer et al., 2024; Mankiw, 2021; Blanchard, 2020).

[2]Both Acts provided for COVID-19 response and recovery interventions and mechanisms to accelerate the recovery and resiliency of the Philippine economy. See https://web.senate.gov.ph/Bayanihan-to-Heal-as-One-Act-RA-11469.pdf.

[3]Responsible for the sound and efficient use of government resources for national development and acts as an instrument for the meeting of national socio-economic and political development goals. See http://dbm.gov.ph/.

[4]An economic theory that explains how increased government spending can reduce private sector spending. This happens when the government funds increased spending by raising taxes or borrowing money. Note that higher taxes can reduce income and spending by individuals and firms while greater borrowing can increase interest rates (i.e., borrowing costs), which can reduce borrowing demand and spending (Mankiw, 2021; Blanchard, 2020; Hur et al., 2010).

[5]Central statistical authority of the Philippines mandated to collect, compile, analyze, and publishe statistical information on economic, social, demographic, political affairs, and general affairs in the Philippines. See https://psa.gov.ph/.

[6]Manages the finances of the government, by attempting to maximize revenue collected and minimize spending. See https://www.treasury.gov.ph/.

[7]As opposed to crowding out, this is an economic theory that government borrowing can increase demand and stimulate private spending. It is based on the idea that government spending can increase the value of wealth for economic actors resulting to increased private spending (Mankiw, 2021; Blanchard, 2020).

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Appendix

Appendix 1: Dataset

Dataset for Investment Spending

Quarter	I	I_1	I_2	I_3	I_4	I_5	I_6
2010 Q1	411,846	274,525	122,977	76,185	4,665	-66,844	338
2010 Q2	607,373	431,338	130,905	64,656	4,473	-24,562	562
2010 Q3	516,452	329,609	128,822	55,071	7,218	-4,715	447
2010 Q4	690,450	333,425	158,445	93,304	6,078	98,462	737
2011 Q1	542,058	287,953	162,223	78,069	5,531	8,090	192
2011 Q2	502,596	324,842	129,963	69,637	4,885	-26,966	234
2011 Q3	505,978	294,152	145,597	56,731	7,824	1,371	304
2011 Q4	618,973	341,105	128,498	85,579	6,749	56,507	534
2012 Q1	471,105	287,655	158,885	82,439	7,255	-65,478	349
2012 Q2	554,814	363,091	139,291	68,953	5,418	-22,157	218
2012 Q3	546,995	367,166	152,455	55,720	7,870	-36,539	323
2012 Q4	714,421	458,023	149,320	89,997	8,813	7,852	417
2013 Q1	615,198	402,573	175,198	80,494	7,759	-51,229	403
2013 Q2	661,457	440,312	157,247	67,569	6,187	-10,254	396
2013 Q3	671,810	386,308	174,580	55,824	8,995	45,820	283
2013 Q4	760,718	437,989	180,612	93,808	11,291	36,684	335
2014 Q1	662,869	392,292	192,271	70,825	8,975	-1,857	363
2014 Q2	719,529	475,017	165,397	73,494	8,573	-3,166	213
2014 Q3	705,254	436,132	187,495	63,044	13,166	4,865	552
2014 Q4	845,796	524,399	182,366	95,465	12,369	30,752	446
2015 Q1	714,675	422,366	204,384	73,766	11,533	2,423	203
2015 Q2	826,153	551,927	188,436	77,218	8,989	-502	86
2015 Q3	802,818	482,852	233,382	66,972	17,065	1,932	615
2015 Q4	983,110	585,570	257,781	101,501	17,367	20,333	558
2016 Q1	861,764	476,133	277,355	77,884	17,385	12,875	133

Quarter	I	I_1	I_2	I_3	I_4	I_5	I_6
2016 Q2	1,034,695	655,758	292,887	80,357	12,310	-7,066	449
2016 Q3	968,213	579,980	307,184	78,994	22,149	-20,492	398
2016 Q4	1,153,703	640,817	342,847	107,407	21,306	41,235	90
2017 Q1	1,007,110	516,578	326,466	82,773	22,675	58,580	38
2017 Q2	1,132,602	704,807	321,610	87,270	20,124	-1,228	19
2017 Q3	1,066,586	627,410	346,841	84,423	28,113	-20,265	65
2017 Q4	1,250,029	709,449	393,161	113,784	26,552	5,680	1,404
2018 Q1	1,042,614	591,574	333,330	90,383	25,206	1,067	1,054
2018 Q2	1,305,208	816,124	398,562	94,912	25,451	-30,400	560
2018 Q3	1,246,250	710,197	407,681	92,135	34,789	1,302	146
2018 Q4	1,365,034	821,892	387,447	120,330	33,335	1,087	943
2019 Q1	1,130,741	641,461	352,724	92,254	28,634	15,425	243
2019 Q2	1,297,367	839,456	336,887	97,737	33,849	-11,043	481
2019 Q3	1,237,959	807,238	372,307	91,674	39,643	-73,314	413
2019 Q4	1,466,282	917,836	362,607	121,963	39,251	24,332	293
2020 Q1	991,934	630,876	344,504	90,656	29,192	-103,447	153
2020 Q2	625,145	579,981	136,798	99,878	26,176	-217,889	201
2020 Q3	757,159	441,881	246,407	90,224	34,929	-56,469	187
2020 Q4	1,001,594	589,796	273,868	109,117	37,508	-8,859	164
2021 Q1	852,223	472,020	306,525	87,797	29,518	-43,761	125
2021 Q2	1,148,345	784,810	266,854	97,189	28,973	-29,742	260
2021 Q3	908,516	551,836	259,552	88,267	41,354	-32,614	121
2021 Q4	1,142,715	681,711	288,072	103,097	44,568	25,011	256
2022 Q1	1,002,855	535,718	334,220	91,089	32,623	9,129	76
2022 Q2	1,346,434	905,000	293,930	96,527	29,896	20,875	207
2022 Q3	1,073,474	611,472	290,439	86,189	42,879	42,356	139
2022 Q4	1,186,524	740,520	295,498	104,315	44,033	1,816	342
2023 Q1	1,129,136	614,020	361,157	92,953	33,443	27,473	89
2023 Q2	1,345,905	924,339	325,621	96,544	30,959	-31,960	403

Dataset for Consumption Spending

Quarter	C	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
2010 Q1	1,929,592	639,868	53,265	50,846	243,405	68,315	66,807	209,443	58,923	42,800	97,621	170,306	227,993
2010 Q2	2,030,708	705,532	67,049	60,907	250,917	77,743	65,889	238,327	59,685	44,443	98,735	153,597	207,884
2010 Q3	1,939,923	675,545	63,773	54,062	232,006	63,308	76,670	199,208	48,786	40,406	103,569	166,494	216,096
2010 Q4	2,314,840	878,615	73,691	61,460	235,306	77,381	69,601	217,017	64,856	55,880	120,253	189,602	271,178
2011 Q1	2,021,322	677,040	53,822	53,776	247,732	71,794	71,904	225,274	59,822	41,222	101,941	177,378	239,618
2011 Q2	2,129,049	745,151	67,188	61,673	260,932	84,425	70,532	238,298	61,255	45,581	104,350	165,813	223,851
2011 Q3	2,070,681	738,870	61,571	56,888	231,562	67,010	81,891	205,474	50,421	43,583	109,195	181,872	242,344
2011 Q4	2,450,123	912,114	79,713	64,024	249,327	82,313	75,563	221,092	66,344	61,075	128,658	206,611	303,287
2012 Q1	2,168,390	731,346	56,483	55,178	260,637	73,790	81,372	238,900	65,026	47,727	104,403	195,984	257,544
2012 Q2	2,273,112	805,192	71,377	64,721	270,191	86,137	80,613	242,080	67,157	48,211	108,000	176,867	252,567
2012 Q3	2,212,883	773,345	65,497	58,568	255,242	71,823	92,754	230,530	55,722	47,955	112,595	193,133	255,718
2012 Q4	2,606,341	960,484	84,833	64,772	264,291	83,431	81,256	232,629	73,446	65,494	130,582	219,704	345,417
2013 Q1	2,291,103	776,755	55,374	57,126	262,305	77,425	83,865	254,908	70,639	51,266	111,403	211,454	278,583
2013 Q2	2,390,956	843,898	67,435	61,596	292,900	81,786	85,679	258,619	72,318	52,605	111,811	189,184	273,124
2013 Q3	2,355,858	825,336	66,004	60,488	283,863	76,100	99,859	238,230	59,324	49,736	119,660	203,875	273,383
2013 Q4	2,761,690	1,014,632	90,997	67,746	286,095	86,023	88,521	248,170	76,863	68,283	136,625	232,351	365,385
2014 Q1	2,441,153	813,527	59,388	63,459	275,121	83,872	89,126	282,855	74,277	55,814	121,826	225,958	295,930
2014 Q2	2,530,825	876,162	77,052	63,700	308,265	85,461	93,119	287,998	72,212	53,096	119,009	207,840	286,911
2014 Q3	2,479,539	852,033	72,638	60,839	299,385	78,988	112,786	258,069	61,142	50,368	129,669	221,681	281,941
2014 Q4	2,914,944	1,071,835	98,962	71,872	303,652	87,930	96,459	267,773	79,696	73,969	146,703	235,313	380,781
2015 Q1	2,591,280	851,115	68,543	55,494	291,300	86,435	96,516	326,064	77,858	62,045	126,681	246,108	303,121
2015 Q2	2,695,933	933,286	77,559	60,633	328,046	86,901	101,991	322,265	76,410	61,231	120,322	224,065	303,224
2015 Q3	2,636,266	896,797	75,512	63,535	300,527	80,259	120,721	286,749	67,452	52,304	133,991	247,308	311,111
2015 Q4	3,111,056	1,142,641	101,587	75,710	307,611	91,910	107,034	285,976	90,476	80,105	148,674	263,116	416,214
2016 Q1	2,777,972	905,304	72,953	53,011	322,037	92,343	106,121	348,469	81,781	67,503	131,597	269,308	327,544
2016 Q2	2,898,169	1,000,300	82,515	59,221	349,833	88,559	110,649	356,137	80,790	70,111	130,503	243,693	325,859
2016 Q3	2,828,137	970,620	80,620	60,592	315,057	81,014	132,530	322,664	68,003	54,731	144,184	261,647	336,475

Quarter	C	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
2016 Q4	3,319,183	1,210,692	105,488	74,725	328,936	93,364	116,301	320,374	92,209	81,653	159,106	284,812	451,524
2017 Q1	2,943,490	956,717	71,863	56,466	339,302	94,410	115,862	372,431	82,927	66,971	143,681	289,837	353,024
2017 Q2	3,073,414	1,059,166	83,158	59,071	370,699	91,218	120,354	379,999	81,430	68,917	139,161	270,681	349,562
2017 Q3	2,983,445	1,013,129	74,642	60,087	335,897	90,719	143,571	332,208	71,559	55,221	159,920	287,840	358,651
2017 Q4	3,527,479	1,275,330	100,597	75,138	363,930	103,695	126,862	327,110	97,429	85,895	167,607	319,429	484,456
2018 Q1	3,114,801	1,006,691	67,746	56,870	370,453	99,222	122,718	382,728	88,923	69,798	153,649	316,747	379,255
2018 Q2	3,263,873	1,132,968	80,511	57,975	404,525	97,085	122,378	386,090	87,205	72,671	150,327	287,983	384,155
2018 Q3	3,148,718	1,045,323	70,835	59,645	365,616	97,018	149,773	336,748	73,268	57,735	192,036	304,562	396,160
2018 Q4	3,722,692	1,338,921	94,768	75,449	384,536	109,102	132,656	329,161	101,918	89,532	200,520	343,675	522,454
2019 Q1	3,308,748	1,065,738	65,258	59,216	394,240	103,430	129,016	404,217	96,437	75,041	171,582	336,499	408,072
2019 Q2	3,445,708	1,195,240	79,207	61,129	426,008	100,902	128,739	398,600	92,104	77,921	171,985	302,536	411,337
2019 Q3	3,337,241	1,091,080	70,003	61,281	393,878	102,426	159,847	359,025	78,501	61,796	198,878	325,982	434,543
2019 Q4	3,935,759	1,402,836	90,784	77,924	406,111	115,300	142,260	346,495	108,850	95,792	208,784	371,009	569,614
2020 Q1	3,314,612	1,116,360	53,646	59,285	403,692	93,673	139,511	374,107	101,391	70,726	173,995	288,475	439,752
2020 Q2	2,917,737	1,250,583	46,568	36,527	457,352	73,656	112,319	158,887	100,032	25,857	146,841	103,669	405,446
2020 Q3	3,030,086	1,145,023	53,300	52,720	421,121	91,757	156,313	231,892	83,857	28,891	167,277	155,871	442,065
2020 Q4	3,648,922	1,476,522	74,022	67,231	431,617	108,406	138,394	239,987	113,288	48,947	179,018	210,823	560,665
2021 Q1	3,156,809	1,143,280	47,075	50,555	402,798	88,236	149,876	269,106	108,331	46,347	176,602	235,704	438,900
2021 Q2	3,130,131	1,285,705	46,958	53,519	487,550	85,147	130,214	189,405	113,724	29,492	163,051	126,134	419,233
2021 Q3	3,245,553	1,178,278	49,598	67,403	434,548	98,817	181,924	272,140	90,194	35,148	191,320	175,344	470,840
2021 Q4	3,922,624	1,552,718	66,587	73,008	443,648	107,528	162,065	275,543	122,470	68,302	195,092	256,717	598,947
2022 Q1	3,471,757	1,256,130	50,553	54,667	425,402	95,902	151,545	312,380	115,535	54,000	197,350	283,206	475,086
2022 Q2	3,396,882	1,357,560	48,416	56,123	522,107	91,625	126,790	237,301	124,682	40,868	175,355	168,176	447,878
2022 Q3	3,505,507	1,226,975	44,126	65,215	440,401	107,970	191,497	325,899	96,738	51,366	202,235	244,297	508,788
2022 Q4	4,196,072	1,614,494	69,194	80,450	463,596	117,590	170,571	297,223	129,858	78,883	215,144	320,329	638,741
2023 Q1	3,694,991	1,264,232	50,415	53,375	441,894	93,247	163,369	357,160	121,224	70,084	210,426	351,253	518,313
2023 Q2	3,583,956	1,363,466	44,005	40,796	553,861	89,130	137,776	308,694	130,952	49,066	187,608	207,366	471,236

Dataset for Government Spending

Quarter	G	G_1	G_2	G_3	G_4	G_5	G_6	G_7
2010 Q1	400,003	70,438	108,898	6,875	3,324	449	2,688	207,331
2010 Q2	388,830	74,392	37,804	18,165	4,139	377	1,771	252,182
2010 Q3	365,671	67,636	97,847	4,136	2,208	72	2,072	191,700
2010 Q4	367,880	67,086	49,695	17,787	11,334	1,251	2,727	218,000
2011 Q1	349,275	76,376	90,720	10,091	7,073	0	2,422	162,593
2011 Q2	349,596	78,818	43,782	4,688	7,089	116	9,938	205,165
2011 Q3	371,211	74,871	87,940	4,682	4,948	188	2,841	195,741
2011 Q4	487,614	85,049	56,554	14,072	34,595	12,585	2,854	281,905
2012 Q1	394,884	71,006	98,489	8,237	5,632	0	3,162	208,358
2012 Q2	400,421	78,382	51,521	9,021	7,142	900	8,457	244,997
2012 Q3	427,586	74,050	95,239	4,502	5,693	0	10,412	237,690
2012 Q4	554,869	74,884	67,550	16,318	24,171	20,440	5,389	346,117
2013 Q1	430,803	80,288	98,336	1,357	4,168	226	-8,116	254,544
2013 Q2	459,950	83,615	58,799	12,097	9,048	107	4,675	291,609
2013 Q3	477,034	76,877	100,954	3,985	22,184	248	5,639	267,147
2013 Q4	512,368	76,475	65,345	5,572	30,929	10,898	14,428	308,721
2014 Q1	482,533	85,104	103,129	60	1,227	138	4,909	287,966
2014 Q2	505,175	88,978	56,612	13,831	48,313	295	1,549	295,597
2014 Q3	468,371	85,776	97,652	2,040	12,668	799	1,957	267,479
2014 Q4	525,540	84,377	63,792	13,601	18,232	516	4,980	340,042
2015 Q1	504,047	97,066	100,614	6,732	3,692	146	2,218	293,579
2015 Q2	567,942	96,831	55,508	2,400	40,278	171	441	372,313
2015 Q3	558,540	96,831	99,629	1,329	11,849	19	1,833	347,050
2015 Q4	600,116	96,831	53,613	7,360	22,194	431	5,204	414,483
2016 Q1	591,466	121,725	102,623	724	8,244	8,173	3,504	346,473
2016 Q2	629,805	108,451	51,089	4,623	28,353	276	587	436,426
2016 Q3	639,166	108,068	96,064	1,698	45,779	48	-375	387,884

Quarter	G	G_1	G_2	G_3	G_4	G_5	G_6	G_7
2016 Q4	688,899	111,532	54,678	8,749	20,814	3,184	11,582	478,360
2017 Q1	615,362	122,409	97,855	1,743	19,666	0	-1,735	375,424
2017 Q2	715,468	151,273	53,722	2,994	38,553	3,240	407	465,279
2017 Q3	683,716	128,273	97,393	1,662	25,406	41	-4,131	435,072
2017 Q4	809,223	128,195	61,571	1,931	47,463	2,077	1,222	566,764
2018 Q1	771,964	148,739	97,162	4,379	45,288	2,031	-241	474,606
2018 Q2	831,595	153,920	68,348	3,831	22,456	556	1,611	580,873
2018 Q3	886,186	140,163	105,817	5,778	57,090	1,260	5,467	570,611
2018 Q4	918,698	132,828	77,888	7,604	11,818	138	-1,962	690,384
2019 Q1	777,990	149,501	107,770	3,987	9,304	42	3,544	503,842
2019 Q2	812,200	146,217	72,301	7,593	17,394	535	15,268	552,892
2019 Q3	1,036,708	162,648	113,670	10,488	130,371	1,103	-2,899	621,327
2019 Q4	1,170,836	159,630	67,133	5,247	44,455	1,642	1,151	891,578
2020 Q1	849,231	187,625	119,882	1,971	22,440	0	4,815	512,498
2020 Q2	1,164,497	221,594	67,794	4,480	106,248	553	6,078	757,750
2020 Q3	1,008,922	197,514	125,298	13,288	30,075	812	5,626	636,309
2020 Q4	1,204,756	197,813	67,438	13,330	70,255	11,445	5,595	838,880
2021 Q1	1,017,927	206,873	125,856	6,700	11,419	45,336	5,688	616,055
2021 Q2	1,188,497	241,625	82,677	8,914	76,863	622	1,103	776,693
2021 Q3	1,169,806	215,237	130,815	13,968	65,593	757	5,234	738,202
2021 Q4	1,299,409	228,963	90,084	7,127	38,892	805	5,852	927,686
2022 Q1	1,101,208	267,356	149,329	6,628	26,274	496	738	650,387
2022 Q2	1,300,504	263,967	107,886	12,113	26,471	199	10,829	879,039
2022 Q3	1,268,445	291,727	142,761	9,233	69,509	227	8,476	746,512
2022 Q4	1,489,483	280,234	102,882	11,810	78,156	10,236	7,162	999,003
2023 Q1	1,089,570	230,859	141,977	4,296	21,308	117	640	690,373
2023 Q2	1,322,280	230,535	140,481	8,830	42,388	62	11,553	888,431

Appendix 2

Summary Results of the Phillips-Perron Stationarity Test

Variable	Order of Integration	Test Statistic, Z(t)	Critical Value	Alpha	MacKinnon p-value for Z(t)
C_t	1	-24.640	-3.577	1%	0.0000
C_{1t}	0	-3.039	-2.928	5%	0.0314
C_{2t}	0	-5.620	-3.576	1%	0.0000
C_{3t}	0	-7.281	-3.576	1%	0.0000
C_{4t}	1	-27.570	-3.577	1%	0.0000
C_{5t}	0	-3.648	-3.576	1%	0.0049
C_{6t}	1	-23.088	-3.577	1%	0.0000
C_{7t}	0	-3.012	-2.928	5%	0.0338
C_{8t}	1	-47.393	-3.577	1%	0.0000
C_{9t}	0	-4.661	-3.576	1%	0.0001
C_{10t}	1	-11.037	-3.577	1%	0.0000
C_{11t}	0	-3.004	-2.928	5%	0.0345
C_{12t}	1	-28.806	-3.577	1%	0.0000
I_t	1	-14.340	-3.577	1%	0.0000
I_{1t}	1	-19.746	-3.577	1%	0.0000
I_{2t}	1	-10.459	-3.577	1%	0.0000
I_{3t}	1	-46.163	-3.577	1%	0.0000
I_{4t}	1	-11.147	-3.577	1%	0.0000
I_{5t}	0	-5.235	-3.576	1%	0.0000
I_{6t}	0	-5.525	-3.576	1%	0.0000
G_t	1	-24.386	-3.577	1%	0.0000
G_{1t}	1	-8.486	-3.577	1%	0.0000
G_{2t}	0	-8.941	-3.576	1%	0.0000
G_{3t}	0	-7.727	-3.576	1%	0.0000
G_{4t}	0	-6.293	-3.576	1%	0.0000
G_{5t}	0	-6.634	-3.576	1%	0.0000
G_{6t}	0	-7.028	-3.576	1%	0.0000
G_{7t}	1	-40.349	-3.577	1%	0.0000

Stata command used: pperron

Source: Computed by the authors.

Appendix 3

Summary Results of the Engle-Granger Cointegration Test

Equation	Test Statistic, Z(t)	Critical Value	Alpha	Remarks
1	-10.602	-4.115	1%	Cointegrated
2	-8.619	-6.435	1%	Cointegrated
3	-9.317	-6.435	1%	Cointegrated
4	-10.126	-6.435	1%	Cointegrated
5	-7.402	-6.435	1%	Cointegrated
6	-7.283	-6.435	1%	Cointegrated
7	-8.753	-6.435	1%	Cointegrated
8	-7.583	-6.435	1%	Cointegrated
9	-6.925	-6.435	1%	Cointegrated
10	-8.471	-6.435	1%	Cointegrated
11	-7.960	-6.435	1%	Cointegrated
12	-8.056	-6.435	1%	Cointegrated
13	-6.620	-6.435	1%	Cointegrated
14	-8.383	-6.435	1%	Cointegrated
15	-11.015	-4.115	1%	Cointegrated
16	-7.046	-6.435	1%	Cointegrated
17	-6.822	-6.435	1%	Cointegrated
18	-8.770	-6.435	1%	Cointegrated
19	-9.259	-6.435	1%	Cointegrated
20	-7.485	-6.435	1%	Cointegrated
21	-9.334	-6.435	1%	Cointegrated
22	-9.269	-6.435	1%	Cointegrated

Stata command used: egranger

Source: Computed by the authors.

Appendix 4

Summary of Optimal Lag Order Selection

Equation	FPE	AIC	HQIC	SBIC	Chosen *p*
1	4	4	4	4	4
2	4	4	4	1	4
3	4	4	4	1	4
4	4	4	4	1	4
5	4	4	4	1	4
6	4	4	4	1	4
7	4	4	4	1	4
8	4	4	4	2	4
9	4	4	4	1	4
10	4	4	4	1	4
11	4	4	4	1	4
12	4	4	4	1	4
13	4	4	4	1	4
14	4	4	4	4	4
15	3	3	3	3	3
16	4	4	4	1	4
17	4	4	4	1	4
18	4	4	4	1	4
19	4	4	4	1	4
20	4	4	4	1	4
21	4	4	4	1	4
22	4	4	4	1	4

Stata command used: varsoc

Note: AIC = Akaike Information Criterion; HQIC = Hannan-Quinn Information Criterion; SBIC = Schwarz-Bayesian Information Criterion

Source: Computed by the authors.

Appendix 5

Stata Do File for Regressions

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1. regress D1.C D1.G L1.D1.G L2.D1.G L3.D1.G L4.D1.G

2. regress D1.C D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.
   G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.
   G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.
   G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

3. regress D1.C1 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

4. regress D1.C2 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

5. regress D1.C3 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

6. regress D1.C4 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

7. regress D1.C5 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

8. regress D1.C6 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

9. regress D1.C7 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
   L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
   L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
   L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

10. regress D1.C8 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
    L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
    L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
    L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

11. regress D1.C9 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
    L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
    L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
    L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

12. regress D1.C10 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2
    L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4
    L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6
    L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7
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13. regress D1.C11 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

14. regress D1.C12 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

15. regress D1.I D1.G L1.D1.G L2.D1.G L3.D1.G

16. regress D1.I D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

17. regress D1.I1 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

18. regress D1.I2 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

19. regress D1.I3 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

20. regress D1.I4 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

21. regress D1.I5 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

22. regress D1.I6 D1.G1 L1.D1.G1 L2.D1.G1 L3.D1.G1 L4.D1.G1 D1.G2 L1.D1.G2 L2.D1.G2 L3.D1.G2 L4.D1.G2 D1.G3 L1.D1.G3 L2.D1.G3 L3.D1.G3 L4.D1.G3 D1.G4 L1.D1.G4 L2.D1.G4 L3.D1.G4 L4.D1.G4 D1.G5 L1.D1.G5 L2.D1.G5 L3.D1.G5 L4.D1.G5 D1.G6 L1.D1.G6 L2.D1.G6 L3.D1.G6 L4.D1.G6 D1.G7 L1.D1.G7 L2.D1.G7 L3.D1.G7 L4.D1.G7

Stata command used: regress

Each number corresponds to the equation number and variable code stated in Table 2.