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Is private investment being crowded out in India? Some fresh evidence

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Abstract

We reexamine the crowding out hypothesis for India for the period 1970-71 to 2009-10. Applying a flexible accelerator model in a VECM framework, we find that government investment crowds out private investment in the long run while GDP has a significantly positive impact on the later. We also find that in the long run causality runs from public investment and GDP to private investment.

The views are personal. All errors, if any, are ours.
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1. Introduction

How the government investment interacts with private investment in the Indian economy in the long run has inspired a good deal of research, often controversial. This relationship is critical to designing the long-term development strategies and short term stabilization programs. It is widely documented that public investment provides a significant stimulus to private investment.

The crowding out theory provides for the background for the determination of the long run relationship between public and private investment. When the negative effect of a decline in private investment fully cancels out the positive effect of increased government investment (in infrastructure etc.), it impedes economic growth meaning the private sector would have been more efficacious in utilizing the resources consumed by the government. On the other hand, when the government undertakes borrowing to finance public investment, it reduces the loanable funds available for private sector investment increasing interest rates and lowering private investment (Mitra, 2006). Going by the Keynesian theory, economic growth will increase if the positive effect of increased government investment offsets the negative effect of reduced private investment on account of the reluctance of the private sector to channel resources to key industrial projects thanks to its longer gestation period, higher costs and lack of social and physical infrastructure. Government investment in infrastructure and basic industries generates positive spillover effects (crowding in effect) and increases the private investment.

This paper reexamines the long term reaction of private investment to government investment in India for the period 1970-71 to 2009-10 and finds that government investment crowds out private investment, rather than complements it, in the long run. We also find that the causality runs from public investment and GDP to private investment in the long run.

2. Literature

The earlier empirical studies of the relationship between public and private investment for different economies have found different results. Ramirez (1994) and Greene and Villanueva (1990) found that public and private investment have a complementary relationship. Singh (2005) found the evidence of crowding in effect of public investment on private investment with a period of one year lag. Chakraborty (2006) found no direct crowding out of private capital formation by public investment; rather the two observe complementarity between them.

On the contrary, a strand of literature supporting the crowding out hypothesis is also equally substantial. Blejer and Khan (1984), and in the Indian case, Sunderrajan and Thakur (1980), Pradhan, Ratha and Sharma (1990) found evidence of crowding out effect of public investment on private investment. Serven (1996) found that in India government investment in non-infrastructure projects crowds out private investment in the long run. Mitra (2006) investigated the crowding-out effect in India in a Structural Vector Autoregression model and concluded that in the short-run government investment crowds out private investment. However, Mitra (2006)

did not examine the long-run impacts of public investment on private investment which is our main motivation in this paper.

For some history, Fig.1 in the Appendix presents the trend analysis of public and private investment as per cent of GDP (all are in real terms) in India. The gross capital formation witnessed a declining trend in the public sector especially since the late 1980s while private investment has shown a stupendous increase since the late 1990s. The public sector had played a significant role in the investment process in the 1970s, averaging almost 9 per cent of GDP. The 1980s had seen public investment averaging 12.22 per cent of GDP which declined to average 9.6 per cent of GDP in the 1990s and further slumped down to average 8.5 per cent in the decade 2000-09. The private investment which averaged 12 per cent of GDP in the 1980s has reached around 16.46 per cent in the 1990s and increased to average 24.21 per cent of GDP in the decade 2000-09.

3. Empirical Analysis

Because of the presence of several institutional and structural factors such as the absence of a well functioning capital market and a significant role of the government in capital formation, foreign exchange constraints and other market imperfections (that violates the basic assumptions of the accelerator model) in most developing countries like India, the standard model cannot be applied directly to them. Furthermore, even if standard investment model could be directly adapted to developing countries, severe data constraints arise when attempts are made to implement them empirically (Blejer and Khan, 1984).

We estimate the following flexible accelerator model of investment[1] in a VECM framework for India.

$$LRPI_t = \beta_0 + \beta_1 LRGDP_t + \beta_2 LRGI_t + u_t \qquad (1)$$

where $LRPI_t$ = natural log of real private investment, $LRGDP_t$ = natural log of real GDP, $LRGI_t$ = natural log of real government investment.

3.1 Data and Methodology

Annual data spanning 1970-71 to 2009-10 is used for the empirical analysis of private investment in India. Data on public and private sector capital formation as well as GDP are taken from the National Accounts Statistics (Central Statistical Office, Ministry of Statistics and Programme Implementation). The source of the data on Wholesale Price Index (WPI) is the Office of the Economic Adviser, Ministry of Commerce and Industry. Data on capital formation in

[1] Although the coefficient on real prime lending rate (RPLR) is found negative in the long run equation, it is very small and insignificant. So we drop RPLR from the final specification. Before the financial sector reforms in the 1990s, interest rate was regulated in India and hence do not represent the true cost of capital.

household and private corporate sectors are added together to obtain private investment. In order to avoid the price effect, all the variables are defined in real terms. The GDP deflator (2004-05=100) has been used to convert the nominal data into real terms. All the variables are expressed in their natural logarithm value.

Johansen's Maximum Likelihood Approach to test for cointegration requires that all the variables to be I(1) i.e. integrated of order one. The long-run equilibrium relationship between the variables is represented by the cointegrating vector. The vector error correction model (VECM) captures the long-run equilibrium and as well as the short-run relationship between the variables. The VECM combines the long-run equilibrium relationship between the variables in level and the short-run relationship between the first differences of the variables. It has the advantage that all the variables in the estimated equation are stationary, so there is no problem of spurious regression. The VECM model also indicates the long-run causality[2] in terms of the error correction coefficient.

3.2 Estimation Results

In order to determine the order of integration of the variables, we have used both the augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests. From the unit root test results presented in Table-1 in the Appendix, we find that all the variables are non-stationary at levels and stationary at first-differences leading to a conclusion that all the variables are I(1) which prompts us to use Johansen's technique to test for cointegration between the variables. The optimum lag length of the model is determined by Schwartz Information Criterion (SBC) which is of order one. All the variables are found to have trend in level but not in first difference. Hence, we chose unrestricted intercept and no trend option in determining the number of cointegrating vectors among the variables. Table- 2 in the Appendix presents the cointegration test results, based on Maximum Eigenvalue and Trace of the stochastic matrix respectively. The test results indicate the presence of two cointegrating vectors among the variables.

Normalizing the cointegrating vector with respect to LRPI (our dependent variable) in order to identify the cointegrating equation leads to the following long-run equilibrium relationship between private investment, GDP and government investment.

$$LRPI_t = 8.39 - 0.21LRGI_t + 1.63LRGDP_t \qquad (2)$$

t- statistic (-2.21) (17.97)

The long-run equation indicates that GDP (which represents the accelerator effect) positively impacts private investment whereas government investment significantly crowds out private

[2] If the error correction coefficient for a particular variable in the VECM has the right sign and is statistically significant, it indicates that the variable is 'long-run Granger-caused' by the other variables in the cointegrating vector. The error correction term should be negative and statistically significant for the same to hold.

investment in the long run. A one per cent increase in GDP raises private investment by 1.63 per cent while a one per cent increase in government investment reduces private investment by 0.21 percent in the long run.

The cointegrating equation is thereafter used to estimate the error correction model. Table- 3 in the Appendix presents the estimated coefficients of the variables in each of the three error correction equations. The last row of the table shows the error correction coefficient that captures the (one period lagged) adjustment of each variable to any disequilibrium in the long run cointegrating relationship. We find that LRPI is the only variable that has a statistically significant error correction coefficient with the negative sign implying that GDP and government investment are weakly exogenous to private investment. Hence, we maintain that GDP and government investment have a long run causal relationship with private investment i.e. in the long run the causality runs from GDP and public investment to private investment. The short-run impact of government investment on private investment is negative but statistically insignificant whereas GDP has significantly positive impact on private investment in the short-run.

4. Conclusion

Empirical evidence suggests that in the long-run government investment crowds out private investment, rather than complements it, in India. Both GDP and public investment are the long-run forcing variables for explaining private investment meaning that the causality runs from public investment and GDP to private investment in the long run.

Future work should focus on whether the long run crowding out effect has been stronger after the Indian government undertook sweeping macroeconomic reforms beginning in 1991. An empirical study can also be made as to whether government expenditure other than capital expenditure (infrastructure investment) has a crowding out effect.

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Appendix

Table-1: Results of Unit Root Tests

			ADF	PP
LRPI	Level	test statistic	-2.91	-2.69
		p-value	0.17	0.25
	First Difference	test statistic	-8.68	-9.24
		p-value	0.00	0.00
LRGI	Level	test statistic	-1.75	-1.81
		p-value	0.71	0.68
	First Difference	test statistic	-6.37	-6.38
		p-value	0.00	0.00
LRGDP	Level	test statistic	-1.32	-1.32
		p-value	0.87	0.87
	First Difference	test statistic	-5.84	-5.86
		p-value	0.00	0.00

Note: ADF: Augmented Dickey-Fuller; PP: Phillips-Perron; Test critical values at 1% level of significance are -4.21 at level and -3.62 at first difference for both ADF and PP unit root tests. The test equation includes trend and intercept at level but only intercept at first difference.

Table- 2: Testing for Cointegration between LRPI, LRGDP and LRGI

Null Hypothesis	Alternative Hypothesis	Test Statistic	95% Critical Value
Maximum Eigenvalue Test			
r = 0	r = 1	24.214	21.131
r<= 1	r = 2	18.357	14.264
r<= 2	r = 3	2.573	3.841
Trace Test			
r = 0	r>= 1	45.146	29.797
r<= 1	r>= 2	20.931	15.494
r<= 2	r>= 3	2.573	3.841

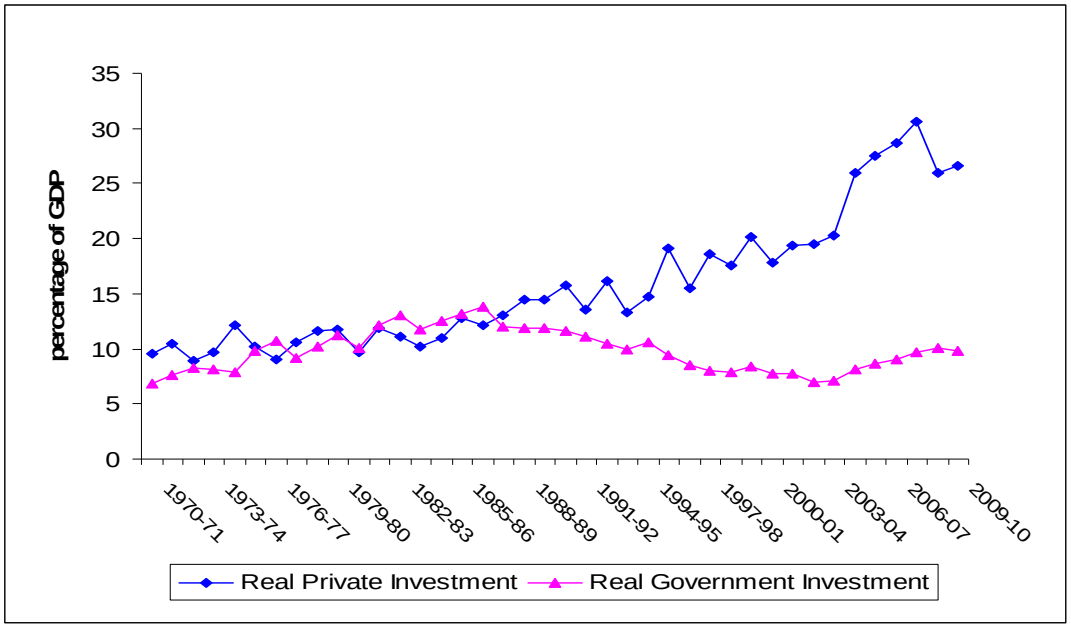
Note: Cointegration with unrestricted intercepts and no trends in the VAR.

Table- 3: Estimated VECM for LRPI, LRGI and LGDP

Regressor	ΔLRPI	ΔLRGI	ΔLGDP
Intercept	0.017	0.019	0.063***
	(0.421)	(0.600)	(6.812)
ΔLRPI(-1)	-0.198	0.06	-0.054
	(-1.100)	(0.437)	(-1.393)
ΔLRGI(-1)	-0.235	-0.13	-0.137***
	(-1.038)	(-0.742)	(-2.767)
ΔLGDP(-1)	1.743**	0.842	0.049
	(2.476)	(1.549)	(0.319)
ECM(-1)	-0.462**	0.008	0.142***
	(-2.131)	(0.048)	(2.997)

Note: t-statistics are in parenthesis. ** Significance at 5% level. *** Significance at 1% level.

Fig. 1: Trends in public and private investment in India



Data source: National Accounts Statistics (Central Statistical Office, Ministry of Statistics and Programme Implementation) and Office of the Economic Adviser, (Ministry of Commerce and Industry).