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Does Private Domestic Investment crowd in or crowd out Foreign Direct Investment (FDI) in Sri Lanka? Evidence from Multivariate Vector Error Correction Model

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Abstract: While private investment undoubtedly dominates the investment sector in Sri Lanka accounting for more than 75% of total investment, private domestic investment (PDI) comprises more than 95% of private investment. Although in order to attract FDI the government offers numerous incentives in the form of corporate tax incentives, import duties, tax on dividends, exemption on exchange control etc., its contribution to private investment has remained at minimal levels over the preceding decades. This study attempted to investigate the effect of PDI (crowding in or crowding out) on FDI applying a multivariate Vector Error Correction Model (VECM) for time series data from 1970 to 2014. Interestingly, short run dynamics suggested that FDI favors public investment at statistically significant levels. Conversely, associations between PDI and FDI in the short run were found to be insignificant. In conclusion, the effect of PDI is two-fold: complementary with public investment (crowding-in) but competing (crowding-out) for FDI in the long run investment equilibrium.

Keywords: *Domestic Private Investment (DPI), Foreign Direct Investment (FDI), Cointegration, VECM*

INTRODUCTION

Since the introduction of Keynes' (1946) individual investment function, the Harrod-Domar simple accelerator models and Solow's (1956) neo classical growth theories have been equally recognized and it has been empirically proven that investment is imperative for economic growth. Hence, as an emerging economy, it is essential to create a vigorous investment sector in Sri Lanka to achieve its expected economic targets. Among sources of investment, the domestic investment potential is limited due to low domestic savings, and hence foreign direct investment (FDI) is taken to be the most promising option available to boost investments in Sri Lanka (Jayasekara, 2014). Thus, FDI is expected to play a critical role in financing the widening current account deficits (Wijeweera and Mounter, 2008). Moreover, as a developing country it is essential to attract FDI as it will improve the efficiency and productivity of production systems by introducing new technologies, expanding export capacity, generating employment opportunities, harnessing human capital and strengthening linkages between other nations (Hansen and Rand, 2005; Jayasekara, 2014, Deshappriya, 2011). In addition, empirical findings reiterate the fact that FDI is a key determinant of economic growth in Sri Lanka, implying the need to implement strategies to ensure a FDI inflow (Balamurali and Bogahawatte, 2004; Deshappriya, 2011; Thilakaweera, 2012).

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Over the preceding four decades, the Sri Lankan investment sector contributed 27.6% of GDP on average. The highest share was observed over the period 2011 to 2014 at 30% of GDP, depicting increasing trends. At present, total investment accounts for 29.24% of GDP, with 22.44% of total investment generated from the private sector while 6.8% derives from the public sector. Nevertheless, the issue arises that even though private investment accounts for a greater portion of investment, the contribution from FDI is unbelievably low, i.e. only 1.26% of total private investment despite numerous attempts made by the government to incentivize FDI inflows (Central Bank of Sri Lanka, 2014). Furthermore, Sri Lanka is receiving a low amount of FDI compared to other Asian countries in spite of its desirable characteristics for FDI namely, favorable human development indices, higher literacy rates, trained labour force, relatively low wages, tax incentives, and the existence of a dynamic domestic private sector. For instance, even in the South Asian region, India and Bangladesh attract relatively higher FDI inflows and more specifically market based investors prefer comparatively larger markets such as India and Bangladesh over Sri Lanka (Sahoo, 2006; Jayasekara, 2014). Undoubtedly, the Sri Lankan economy has to face negative ramifications of the exceptionally lower amount of FDI unless careful attention is given to investigate reasons and proceed with remedial measures.

In the literature, ample attention has been paid to identifying determinants of FDI in Sri Lanka. Results of a fully modified OLS regression for data from 1975 to 2012 suggest that GDP growth, inflation, quality of infrastructure, lending interest rate, trained and skilled labour force, exchange rate and corporate income tax, and overall cost of production significantly affects FDI inflows (Jayasekara,2014). Wijeweera and Mounter (2008) provide evidence from a VAR model over the period from 1950 to 2004 that the wage rate is the most important factor determining FDI inflows in Sri Lanka; additionally GDP, exchange rate, interest rate, and level of external trade are found to significantly affect FDI inflows. Despite positive attitudes towards FDI from both civil society and foreign firms political instability, implied policy instability, lack of transparency of trade policies, poor law and order, direct and indirect regulatory barriers, poor infrastructure, lower levels of human capital development engender an unfavorable investment climate for FDI. Thus, policies must be directed to increase domestic savings, develop infrastructure, implement policies in a transparent manner, and encourage flexible labour market operations to enhance FDI inflow in Sri Lanka (Athukorala, 2003; Deshappriya, 2011).

Previous research was largely focused on i) identifying a long run relationship between FDI and economic growth, and ii) investigating determinants of FDI in Sri Lanka. Nonetheless, counter effects, viz. crowding in or crowding out effects among FDI, public investment and private domestic investment have not gained much attention in the Sri Lankan context. Ambiguous claims arising from the dearth of literature provide no clear guidelines for policy makers. For instance, one study found FDI to crowd in domestic investment in the short run over the period 1959-2002 (Athukorala,2003), while inversely another study found domestic investment crowding in FDI for the period 1977 to 2003 (Balamurali and Bogahawatta, 2004). Moreover, Siriwardane (2009) discovered public investment crowding out private investment during 1978 to 2006. Notably, investigating the long run relationship between private domestic investment and FDI is totally neglected in the literature yet country specific information is substantial as crowding in or crowding out effects depend largely on the context. Thus this paper attempted to provide empirical evidence on crowding in or crowding out effects of PDI on FDI in Sri Lanka not only to offer critical inputs for policy makers but also to bolster and enrich the literature on Sri Lanka's investment sector.

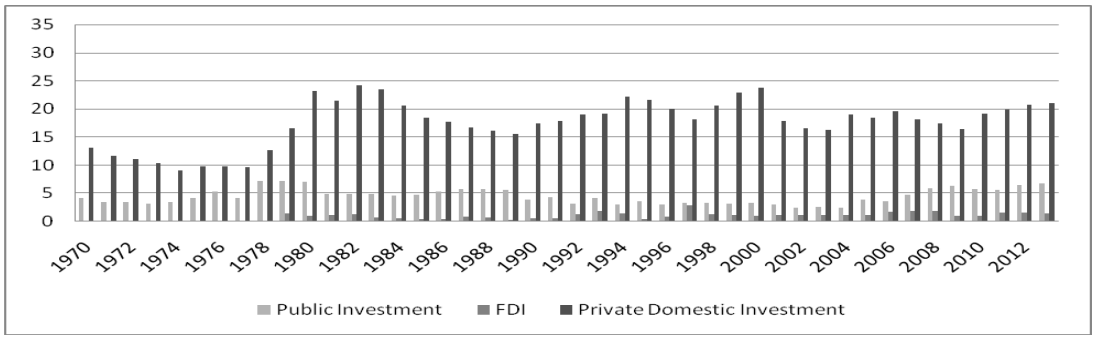
OVERVIEW OF INVESTMENT SECTOR IN SRI LANKA

Over preceding decades, investment was highly dominated by the private sector accounting for 19-20% of GDP on average, followed by the public sector (4.5% of GDP on average) and small amounts of FDI. Table 1 provides a picture of investment from 1970 to date. At a disaggregated level, the main contributor to private investment was the construction sector from the 1970s to date followed by plant and machinery, transport equipment and the plantation sector. Further, a preponderance of industries are privately owned and operated in Sri Lanka; food, beverage and tobacco products, textiles, wearing and apparel, non metallic mineral and basic metal industries are 100% privately driven. Wood and wood products, paper and paper products, chemical, petroleum, rubber and plastic product industries have become increasingly privatized over the past, promising private sector dominance in the near future. Yet chemical, petroleum, rubber and plastic product industries are less privatized/more publicly driven in Sri Lanka. The private sector attracts investment from both local and foreign investors; mainly in textile and wearing apparel, services, petroleum, rubber and rubber products. They attract higher FDI inflows compared to other industries (Central Bank Annual Reports, several years).

Table 1: Overview of investment sector in Sri Lanka from 1970-2013

	Total Investment	**Public Investment**	**Domestic Private Investment**	**FDI inflows**
1970-1980	17.51	4.82	12.45	0.23
1981-1990	24.91	5.05	19.17	0.70
1991-2000	25.23	3.43	20.53	1.27
2001-2010	23.26	4.08	17.89	1.30
2011-2013	28.41	6.33	20.55	1.53
Average	23.00	4.49	17.6	0.9

Note: Values are presented as a % of GDP
Source: Source: World Bank data accessed from http://data.worldbank.org/



Source: World Bank data accessed from http://data.worldbank.org/

Figure 1: Investment sector in Sri Lanka

Since the inception of open economic policies in 1978, successive governments have paid much attention and implemented an assortment of strategies to promote FDI. On the other hand, promoting FDI and trade policy reform were among the major objectives of economic liberalization. Accordingly, quantitative import restrictions were dismantled and replaced with tariffs to limit restrictions on trade to attract foreign investors. In parallel Export Processing Zones (EPZs) were established to encourage export expansion aiming both local and foreign investors. Further, complete foreign ownership of investment projects, tax and duty exemptions, and access to foreign currency credit at interest rates at the world financial markets were introduced to incentivize foreign investors. Nevertheless, political instability prevailing in the early and late 1980s in the island restrained achieving prime objectives of economic liberalization (Athukorala and Jayasuriya, 2004).

As of today, Sri Lanka is offering numerous incentives to attract FDI such as corporate tax incentives (full tax holiday for large scale enterprises), import duties (all import duties and levies are exempted on capital goods and raw materials for export oriented projects and custom duty exempted on capital goods for non-export oriented projects), taxes on dividends (any dividend paid to a shareholder of a small, medium or large scale company are exempted from dividend tax), and exemption on exchange control (for export oriented projects and large scale projects). Nevertheless, as per the data shown in figure 1, its contribution to total investment has stagnated at low levels (Investment Guide, Board of Investment, 2014). Contemporaneously, the service sector attracts highest FDI inflows followed by industry, specifically textiles, wearing and apparel, chemicals petroleum, rubber, food and beverage, and tobacco. In spite of the higher FDI flows to the service sector, its potential for employment generation is questionable. For instance in 2013, textile wearing apparel attracted Rs.71,000 million of FDI creating 300,000 jobs while the service sector attracted Rs.700,000 million adding only 120,000 to employment (Central Bank Annual Report, 2014).

METHODOLOGY

Theoretical model

Theory suggests that higher domestic investment is favorable for FDI on the basis of 'cost reducing and heighten competition hypothesis': higher PDI favors FDI creating an environment for higher returns to capital, thereby amplifying competition. On the other hand higher domestic public investment favors FDI by creating adequate infrastructure and public utilities thereby reducing the cost of doing business and incentivizing entrepreneurial activities (Nidikumara and Verick, 2008). Yet the role of private domestic investment engenders either negative or positive effects on FDI depending on i) the relationship between private firms and foreign firms and ii) the development of the private sector. If the private sector is well-developed, managing to reach technical and economic efficiencies, comply with international standards, and market is exhausted, then FDI inflows would be fewer, as huge competition discourages foreign investors. In contrast, foreign investors prefer countries in which private investment is well directed on downstream sectors that is known as 'backward linkage effect' between FDI and private domestic investment (Moses et al., 2013).

However, the empirical literature suggests crowd in/out effects vary widely depending on the context. A study based on transition economies in Eastern Europe claimed public investment does not crowd out private investment; however in developed Western Europe

public investment does crowd out private investment (Gijni and Kukeli, 2012). In the United States, public investment on equipment crowds out private investment. Conversely, public investment on structures crowd in private investment; yet the effect was found to be weak (Rossiter, 2002). In Fiji over the period from 1950 to 1975, public investment crowded in private investment; however later on (from 1975 to 2001), the relationship between public investment and private investment was statistically weak (Narayan, 2004). Referring to the relationship between FDI and domestic investment, FDI demonstrated a contemporaneous negative effect on domestic investment for developing countries but a contemporaneous neutral effect for developed countries. In the long run FDI has exhibited a neutral cumulative effect on domestic investment for developed countries but a positive effect for developing countries as per the results of a panel study with data over the period 1970 to 2004 from 50 countries (Wang, 2010). Furthermore, FDI crowded out domestic investment in Poland (1990-2000) but crowded-in in Hungary (1990-2000) and the Czech Republic (1993-2000) (Misun and Tomsk, 2002). According to an analysis over the period 1990-2008, FDI had no negative effect on domestic investment for new European Union (EU) countries whereas a significant crowding out effect was observed for older EU members (Pilbeam and Obolevicivte, 2012). A panel data study for developing economies in Asia, Africa and Latin America for the period 1971-2000 showed FDI had no effect on domestic investment in general; however in particular cases, for instance in Latin America FDI crowded out domestic investment (Agosin and Machado, 2007). Tang, Selvanathan and Selvanathan (2008) have found FDI crowding in domestic investment in China using VECM for 1988 to 2003 suggesting larger amounts of FDI received by China is boosting its economic growth via encouraging domestic investment.

FDI crowded out domestic private investment in Sub Saharan Africa over the period 1990 to 2003 (Mutenyo, Asmah and Kalio, 2010), and FDI was complementary with domestic investment in Malaysia over the period 1970-2009 (Lean and Tan, 2011). Moreover, it has been found that FDI and public investment was complementary to private domestic investment in the long run in Malaysia over the period 1960 to 2003 (Ang, 2009). Similarly, FDI crowded in private domestic investment in India but public investment neither crowded in nor crowded out private domestic investment over the period 1978/79 to 2009/10 as per the results of a structural VAR model (Rath and Bal, 2014). Furthermore, FDI positively affected private domestic investment in low-income countries and stimulated private domestic investment in developing countries over the period 1970 to 2009 (Sadig, 2013).

The current study attempted to investigate crowding in or crowding out effect of private domestic investment on FDI in Sri Lanka using data available at the World Bank data repository (available at http://data.worldbank.org/) for the period 1970 to 2014. The original source of data for total investment, private investment, public investment and GDP growth was World Bank national accounts data, and OECD National Accounts data files. International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates are original sources of data for domestic credit to private sector and International Monetary Fund, International Financial Statistics and Balance of Payment databases, World Bank, International Debt Statistics and World Bank and OECD GDP estimates are original data sources for FDI inflow. Table 2 provides detailed definition for each variable. In this study, private domestic investment was obtained subtracting FDI inflow from gross fixed capital formation (Ang, 2009).

Table 2: Data description

Variable	Definition
Total Investment/Gross fixed capital formation/Gross domestic fixed investment (as a % of GDP)	Land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, net acquisitions of valuables
Private investment/Gross fixed capital formation by the private sector(as a % of GDP)	Gross outlays by the private sector including non-profit agencies.
Public investment/Gross fixed capital formation by the government (as a % of GDP)	Investment by the government institutions and public corporations/ Difference between total investment and private investment
FDI inflow (as a % of GDP)	Net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor that is the sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital.
Trade (as a % of GDP)	Sum of exports and imports of goods and services measured as a share of gross domestic product.
Domestic credit to private sector (as a % of GDP)	Domestic credit to private sector by banks refers to financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks), such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises.
GDP growth (annual %)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Empirical model

The following regression model was estimated to find out the crowding in or crowding out effects of private domestic investment on FDI.

$$FDI = \beta 0 + \beta 1\, PDI + \beta 2\, PI + \beta 3\, DCP + \beta 4\, T + \beta 5\, GDP + Ui$$

where FDI = Foreign Direct Investment; PDI=Private Domestic Investment; PI=Public Investment; DCP=Domestic Credit to Private sector; T=Trade Openness; GDP=GDP growth; U=error term

Estimation Procedure

First, the Augmented Dicky Fuller (ADF) test (Dicky and Fuller, 1981) was used to test the hypothesis of having a unit root which is a priori test to detect stationary properties of data (estimated coefficients can show spurious regression).

$$\Delta Yt = \alpha 0 + \alpha 2t + \gamma Yt\text{-}1 + \sum_{i=1}^{k} \beta i\, \Delta Yt - 1 + \varepsilon i$$

where ΔYt= Yt-Yt-1, 1st difference of Y, t=trend; α,β and γ are parameters to estimate and ε is the stochastic disturbance.

Second, the long run relationship of the variables was tested using Johansen's multivariate cointegration method (Johansen, 1988; Johansen and Juselius, 1990). This approach was based on the Vector Autoregressive model (VAR) which is stated below.

$$\Delta Y_t = \pi Y_t\text{-}1 + \sum_{i=1}^{k-1} \Gamma i\, \Delta Yt\text{-}i + u_i$$

where Y_t= vector of the endogenous variables; Γ= matrix of VAR parameters for lag i; π= long run coefficient matrix

In the Johansen-Juselius cointegration test, trace statistic (λ trace stat) and maximum eigen value statistics (λ max stat) provide evidence for a long run relationship. As a priori, lag order should be selected using lag order selection criteria; for instance, Akaike's Information Criterion (AIC), Likelihood ratio (LR) test, Hannan-Quin Information Criterion (HQIC), Final Prediction Error (FPE) or Schwarz Bayesian Information Criterion (SBIC). In the above model, a cointergration rank (r) is given in the result only if the variables are cointegrated. Also if the variables are cointegrated, Vector Error Correction Model (VECM) can be written as follows;

$$\Delta FDIt = \alpha 1 + \sum_{i=1}^{k} \delta 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \delta 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \delta 3i\, \Delta PIt - i + \sum_{i=1}^{k} \delta 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \delta 5i\, \Delta Tt - i + \sum_{i=1}^{k} \delta 6i\, \Delta GDPt - i + \beta 1ECt\text{-}1 + \varepsilon 1t$$

$$\Delta PDIt = \alpha 2 + \sum_{i=1}^{k} \lambda 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \lambda 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \lambda 3i\, \Delta PIt - i + \sum_{i=1}^{k} \lambda 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \lambda 5i\, \Delta Tt - i + \sum_{i=1}^{k} \lambda 6i\, \Delta GDPt - i + \beta 2ECt\text{-}1 + \varepsilon 2t$$

$$\Delta PIt = \alpha 3 + \sum_{i=1}^{k} \gamma 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \gamma 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \gamma 3i\, \Delta PIt - i + \sum_{i=1}^{k} \gamma 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \gamma 5i\, \Delta Tt - i + \sum_{i=1}^{k} \gamma 6i\, \Delta GDPt - i + \beta 3ECt\text{-}1 + \varepsilon 3t$$

$$\Delta DCPt = \alpha 4 + \sum_{i=1}^{k} \eta 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \eta 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \eta 3i\, \Delta PIt - i + \sum_{i=1}^{k} \eta 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \eta 5i\, \Delta Tt - i + \sum_{i=1}^{k} \eta 6i\, \Delta GDPt - i + \beta 4ECt\text{-}1 + \varepsilon 4t$$

$$\Delta Tt = \alpha 5 + \sum_{i=1}^{k} \mu 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \mu 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \mu 3i\, \Delta PIt - i + \sum_{i=1}^{k} \mu 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \mu 5i\, \Delta Tt - i + \sum_{i=1}^{k} \mu 6i\, \Delta GDPt - i + \beta 5ECt\text{-}1 + \varepsilon 5t$$

$$\Delta GDPt = \alpha 6 + \sum_{i=1}^{k} \kappa 1i\, \Delta FDIt - i + \sum_{i=1}^{k} \kappa 2i\, \Delta PDIt - i + \sum_{i=1}^{k} \kappa 3i\, \Delta PIt - i + \sum_{i=1}^{k} \kappa 4i\, \Delta DCPt - i + \sum_{i=1}^{k} \kappa 5i\, \Delta Tt - i + \sum_{i=1}^{k} \kappa 6i\, \Delta GDPt - i + \beta 6ECt\text{-}1 + \varepsilon 6$$

α= parameter for speed of convergence/ adjustment coefficient for the long run equilibrium; β= parameter of cointegrating equation; κ,μ,γ,η,λ ανδ δ= short run coefficients; EC = Error correction term; ε= residual term

RESULTS AND DISCUSSION

Table 3 presents summary statistics of the variables. Minimum value for FDI was a negative value, which was in 1977 at the onset of economic liberalization after which FDI flows are positive, with the highest inflow observed in 1997.

Table 3: Summary Statistics, 1970-2014

Variable	Mean	Standard Deviation	Minimum	Maximum
FDI	0.91	0.66	-0.03	2.85
PI	4.49	1.37	2.42	7.27
PDI	17.60	4.15	9.05	24.28
T	68.17	10.79	46.23	88.64
DCP	22.00	7.70	8.82	33.97
GDP	4.91	2.05	-1.55	8.25

Source: Author's calculation

Augmented Dicky Fuller (ADF) test concluded all the variables are stationary at their 1st difference/I(1) I(1) variables, hypothesis of "there is a unit root" was rejected at 1st difference at statistical significance levels (α=0.01) confirming time series properties of variables are acceptable for a cointegration model (see table 4).

Table 4: Results of ADF test

Variable	**level**		**1st difference**	
	Test stat	**1%critical value**	**Test stat**	**1%critical value**
FDI	-3.202**	-3.628	-6.980***	-3.628
Public Investment	-1.801	-3.628	-5.108***	-3.628
Domestic Private Investment	-1.771	-3.628	-2.975***	-2.631
GDP growth	-1.368	-2.631	-10.701***	-3.628
Trade	-1.683	-3.628	-5.373***	-3.628
Domestic Credit to Private sector	-1.888	-3.628	-6.177***	-3.628

*** P<0.000; ** P<0.05; *P<0.0.10
Source: Author's calculation

AIC lag order selection criteria and likelihood ratio test suggested 4 lags for the model. Even though other lag order selection criteria (FDE, HQIC and SBIC) suggested 1 lag for the model, we selected four lags for the model as a model with more lags will provide more information about the long run equilibrium (see table 5).

Table 5: Lag order selection criteria

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-556.087		6467.1	28.1043	28.1959	28.3577
1	-428.529	255.12	679.268*	23.5264	24.1676*	25.2998*
2	-397.508	62.041	987.198	23.7754	24.9662	27.0687
3	-360.153	74.71	1310.92	23.7077	25.448	28.521
4	-308.708	102.89*	1347.72	22.9354*	25.2253	29.2687

*** P<0.000; ** P<0.05; *P<0.0.10
Source: Author's calculation

Results of Johansen cointegration test provided insights to prove that variables are related in the long run with two cointegrating equations; both trace value statistic and maximum eigen value statistic confirmed that cointegrating rank is two (see table 6).

Table 6: Results of Johansen cointegration test

Maximum rank	Trace statistic (λ trace)	5% critical value	Max statistic (λ max)	5% critical value
0	161.5510	94.15	69.5247	39.37
1	92.0263	68.52	45.4297	33.46
2	46.5967	47.21	22.7504	27.07
3	23.8463	29.68	18.2881	20.97

Source: Author's calculation

As per the results shown in the table 7, the first cointegrating equation is FDI = -2.847-0.113PDI + 0.035T + 0.053DCP + 0.473GDP + error (all coefficients including adjustment coefficient are significant at 1%, public investment was omitted in the model), and second cointegration equation is PI=14.12+ 0.511PDI- 0.184T - 0.086 DCP - 0.868GDP + error (all coefficients including adjustment coefficient are significant at 1%, FDI was omitted in the model).

Results suggested that the effect of private domestic investment is two-fold for the Sri Lankan economy in the long run; Private domestic investment crowds in public investment while crowding out FDI. Volume of trade, domestic credit to private sector and GDP growth are positively associated with FDI in the long run. Conversely, all above macroeconomic factors are negatively associated with public investment in the long run. According to the results, effects of macroeconomic variables on different investment options differ; trade openness, domestic credit to private sector and economic growth favor FDI inflow while discouraging public investment. Crowding out effect of private domestic investment can be supported by the backward linkage hypothesis; domestic downstream sector may not have yet developed in Sri Lanka to meet the demands of foreign investors. For instance, foreign investors might prefer Hyderabad, India over Sri Lanka due to skilled IT labour availability. Nonetheless, heightening competition hypothesis is not a matter-of-fact pertaining to Sri Lankan context as high tech and companies meeting international standards or massive markets are not linked with Sri Lankan context. Consequently, crowding out effect of private domestic investment does not imply that private domestic investment discourages FDI inflow. Conversely, it is suggested that it is crucial to revisit the private domestic

investment sector meticulously to restructure the relationships among private domestic investment and foreign investments. Moreover, domestic industries should focus on attracting foreign investors by strengthening downstream industries catering to their needs.

Table 7: Long run equations

Independent Variables	Coitegrating Equation 1 FDI	Cointegrating Equation 2 Public Investment
	Coefficient	Coefficient
FDI		0
Public Investment	Omitted	
Domestic Private Investment	-0.113(0.027)***	0.511(0.058)***
Trade	0.035(0.008)***	-1.850(0.017)***
Domestic Credit to Private sector	0.052(0.010)***	-0.085(0.023)***
GDP growth	0.472(0.079)***	-0.868(0.169)***
Constant	-2.847	14.124
Chi square	82.056	163.195
P>chi square	0.0000	0.0000

*** P<0.000; ** P<0.05; *P<0.0.10
Source: Author's calculation

Table 8 presents results of the VECM model, referring to short run dynamics. Two equations were found to be statistically significant: i) private domestic investment and ii) public investment. FDI crowds in public investment in the short run, and in contrast, private domestic investment crowds out public investment. This provides insights to the fact that the effect of private domestic investment on public investment depends on the time horizon. In the long run private domestic investment crowds in public investment even though it exhibits a crowding out effect in the short run. In the short run, FDI is associated with trade openness. Thus higher FDI flows will bolster trade expansion. However trade and GDP growth crowd out public investment in the short run; this can be due to trade expansion and economic growth opening up opportunities for private investors, thereby making public investment shrink.

Establishing validity of test results is important in econometric analysis. Consequently, a series of tests were conducted to test special assumptions of VECM. Lagrange-multiplier test confirmed no statistical evidence to prove autocorrelation at lag orders in the VECM, and thus the model is free from autocorrelation. As per the results, chi square value for lag 1 and lag 2 are 44.7625 (p>chi square = 0.1500), and 32.8667 (p>chi square = 0.6184) respectively. Null hypothesis of the test, 'there is no autocorrelation' was accepted at statistically significant levels. In addition, Jarque-Bera test, skewness test and kurtosis test were carried out to test whether errors are independently, identically, and normally distributed with zero mean and finite variance. It is important to test for normal distribution of errors because if errors are not normally distributed, estimated parameters are consistent but not efficient. Probability values indicated that for all the models except the difference model for domestic credit to private sector, errors are normally distributed not skewed (Table 9).

Table 8: Results of the Vector Error Correction Model

		ΔFDI	**ΔPublic Investment**	**Δ Private Domestic Investment**	**ΔTrade**	**ΔDomestic credit to private sector**	**ΔGDP growth**
FDI	lag 1	0.274 (0.464)	1.372 (0.437)***	0.863 (1.517)	7.718 (4.204)*	2.233 (4.356)	0.312 (1.975)
	lag 2	-0.104 (0.322)	0.862 (0.304)***	-0.225 (1.054)	1.418 (2.922)	2.543 (3.027)	-0.549 (1.372)
	lag 3	0.050 (0.261)	0.636 (0.246)**	1.136 (0.855)	4.310 (2.370)*	1.907 (2.456)	1.093 (1.113)
Public Investment	La g 1	-0.107 (0.175)	-0.434 (0.165)***	-0.946 (0.573)	0.104 (1.588)	0.788 (1.646)	-0.251 (0.746)
	lag 2	-0.180 (0.162)	-0.038 (0.153)	-0.574 (0.532)	1.056 (1.474)	1.150 (1.528)	0.030 (0.692)
	lag 3	-0.045 (0.159)	-0.144 (0.150)	-0.255 (0.521)	0.436 (1.446)	0.631 (1.499)	0.205 (0.679)
Private Domestic Investment	lag 1	0.058 (0.094)	-0.024 (0.88)	0.130 (0.308)	0.714 (0.853)	0.506 (0.884)	-0.027 (0.401)
	lag 2	0.011 (0.064)	-0.139 (0.060)**	-0.310 (0.209)	-0.158 (0.580)	-0.149 (0.602)	-0.296 (0.272)
	lag 3	-0.019 (0.066)	0.064 (0.067)	-0.355 (0.217)	-0.944 (0.602)	0.307 (0.624)	-0.156 (0.283)
Trade	lag 1	0.007 (0.029)	0.017 (0.027)	-0.124 (0.094)	0.199 (0.263)	0.035 (0.272)	-0.018 (0.123)
	lag 2	0.015 (0.036)	-0.042 (0.034)	0.094 (0.118)	0.263 (0.328)	0.064 (0.340)	-0.012 (0.154)
	lag 3	-0.008 (0.030)	-0.088 (0.029)***	-0.014 (0.100)	0.065 (0.279)	0.075 (0.289)	0.060 (0.131)
Domestic credit to private sector	lag 1	-0.041 (0.028)	-0.006 (0.027)	0.018 (0.094)	-0.122 (0.260)	0.149 (0.270)	-0.002 (0.122)
	lag 2	0.017 (0.029)	-0.016 (0.027)	-0.093 (0.095)	-0.143 (0.263)	-0.048 (0.273)	0.038 (0.123)
	lag 3	-0.030 (0.028)	-0.031 (0.026)	-0.106 (0.093)	-0.225 (0.258)	-0.036 (0.267)	-0.039 (0.121)
GDP growth	lag 1	-0.291 (0.141)**	-0.457 (0.133)***	-0.184 (0.462)	-1.313 (1.280)	-0.150 (1.326)	-0.483 (0.601)
	lag 2	-0.227 (0.125)*	-0.256 (0.119)**	-0.034 (0.412)	-1.566 (1.142)	-0.089 (1.183)	-0.048 (0.536)
	lag 3	-0.120 (0.080)	0.024 (0.075)	-0.146 (0.261)	-1.563 (0.725)	-0.516 (0.751)	-0.063 (0.340)
Constant		0.172 (0.101)	-0.055 (0.096)	0.273 (0.332)	-0.017 (0.922)	0.201 (0.955)	0.244 (0.433)
-ce1		-0.856 (0.464)*	-1.555 (0.438)***	0.853 (1.519)	-6.915 (4.210)	-2.618 (4.361)	0.403 (1.978)
-ce2		-0.118 (0.179)	-0.194 (0.169)	1.015 (0.587)	-2.558 (1.628)	-1.748 (1.686)	0.081 (0.765)
R square		0.5667	0.8368	0.6700	0.5948	0.2490	0.4950
Chi square		23.541	92.273	36.543	26.427	5.997	17.647

	ΔFDI	ΔPublic Investment	Δ Private Domestic Investment	ΔTrade	ΔDomestic credit to private sector	ΔGDP growth
P>chi2	0.3158	0.0000	0.0190	0.1906	0.9994	0.6712

log likelihood = -332.0065, AIC=23.3003
*** P<0.000; ** P<0.05; *P<0.0.10
Source: Author's calculation

Table 9: Test results for normal distribution of error term

Equation	Jarque-Bera test	Skewness test	Kurtosis test
ΔFDI	0.6636	0.4954	0.5510
ΔPublic Investment	0.2062	0.0969	0.5257
ΔPrivate Domestic Investment	0.6378	0.7911	0.3624
ΔTrade	0.6833	0.3918	0.8664
ΔDomestic credit to private sector	0.0019	0.7588	0.0004
ΔGDP growth	0.5878	0.3921	0.5654

Further, eigen value stability condition was used to identify whether number of cointegraitng equations have correctly specified in the model. If K variables and r cointegrating equations are specified in VECM, then there should be K-r unit eigen values. If the model is stable, then moduli of the remaining eigen values should be less than one. Accordingly, the specified model in the study composed with 6 variables and 2 contegrating equations, then 4(6-2) unit eigen values. As per the results, moduli of the remaining eigen values are less than one. Thus confirmed model is stable. Additionally, eigen values of the companion matrix was plotted. According to the graph, none of the remaining eigen values present closer to the unit circle. This provided evidence that model is specified correctly (See Figure 2).

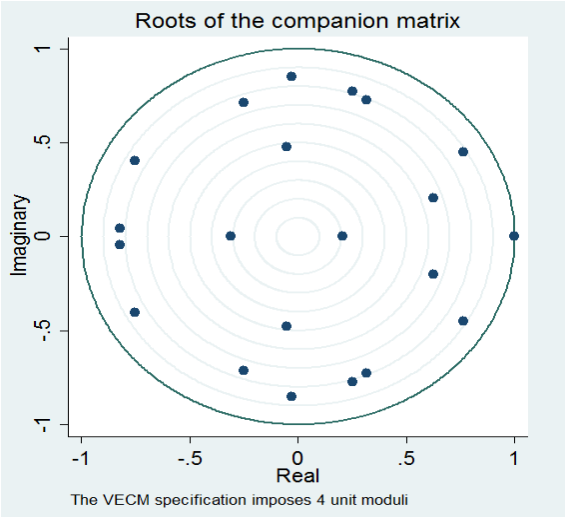


Figure 2: Eigen values of the companion matrix

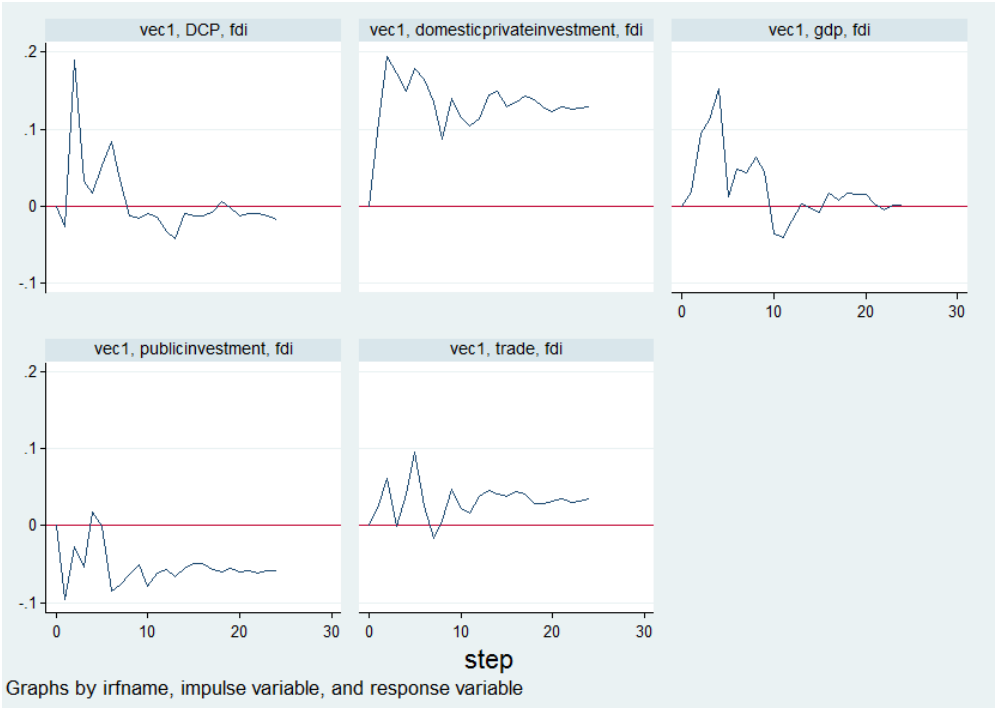


Figure 3: Impulse Response Functions

Finally, Impulse Response Functions (IRFs) were derived from VECM model. IRFs explain the nature of effect of one variable to another variable; the effect can be of two types: i) transitory effect, where the effect/shock will die out over the time, and ii) permanent effect, where the effect/shock will not die out over time. IRF converges towards zero with time in the case of the transitory effect, but not in the case of permanent effects. Figure 3 presents IRFs derived for the model. Accordingly, shocks to GDP growth and domestic credit provided to private sector have transitory effects on FDI. Conversely, shocks to private domestic investment, public investment and trade have permanent effects on FDI.

CONCLUSION

While, private domestic investment dominates the investment sector, contribution from FDI remains exceptionally low irrespective of numerous incentives offered by the government to attract FDI to Sri Lanka. This paper provides empirical evidence to bolster the argument that the crowding out effect of private domestic investment on FDI could explain poorer FDI inflows. As regards the results of the Johansen cointegration test and Multivariate Vector Error Correction model for the period 1970 to 2014, the effect of private domestic investment is two-fold in the long run investment equilibrium. It is complementary (crowding-in) with public investment while competing (crowding-out) with FDI. In the short run FDI crowds in public investment at statistically significant levels. Thus it is recommended to revisit and restructure domestic private investment aiming to facilitate foreign investment by building stronger links with foreign firms, developing downstream industries targeting not only contemporary but also potential future FDI trends.

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