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The Effect of FDI on Domestic Investment and Economic Growth: Vector Autoregression Estimation of Causal Effects

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Abstract

There is evidence that foreign direct investment promotes growth in developing economies. At the same time, economic development attracts FDI. Further, FDI inflows may induce investment by national investors. To analyse the effect of FDI inflows on economic growth and domestic investment in developing countries, this paper has applied the vector autoregressive model for five Asian countries – India, Malaysia, Pakistan, Sri Lanka, and Thailand – for the period 1980-2020. In the VAR framework, the relationship between GDP, FDI, exports, infrastructure, and population growth are estimated endogenously by taking two-period lags of each of these variables. The estimated VAR results show that there is a positive impact of FDI on growth in these economies, except Pakistan, and the infrastructure facility is an important factor for attracting FDI. The impact of FDI inflows on domestic investment in India is significantly positive, with a more-than-two-fold increase in investment by the national investors.

Keywords: FDI Inflows, Economic Growth, Domestic Investment, Causality, VAR Estimation

JEL Classification: B23, C13, C32, E22, F21, F23, F43, G15

Introduction

The most striking aspect of the globalisation process has been the exponential growth of FDI inflows and the spread of multinational enterprises (MNEs) activity in most developing countries. Increasing demand for global brands and the opening of the economy provide a significant platform for multinational enterprises (MNEs) to exert vital influence on the economic activities of most developing countries. Growing collaboration by international companies with domestic business houses and enlarging direct business activities by subsidiaries in local markets envisage FDI flows. New information technology systems and a decline in global communication costs have made the management of foreign investments far easier than in the past. In the sea change, trade and investment policies and the global regulatory environment, including trade policy and tariff liberalisation, easing of restriction on foreign investments and acquisitions in many nations, and the deregulation and privatisation of many industries have been the main significant catalysts for FDI's expanded growth. Global changes in technology, growing liberalisation of the national regulatory frameworks governing investment in enterprises, and changes in the capital market have changed the size, scope, and methods of FDI. Many countries that favour FDI provide investment incentives by offering specially designed incentives and channels to attract MNEs to locate their production facilities in their territories. Governments in both developed, as well as developing countries alike, attract MNEs with various incentive packages to access their resources, viz. capital, technology, skilled labour, and market access, among others, to expedite the process of their development. Tax incentives are prominent and are found to have a greater effect on the FDI inflows and affiliate outputs than the extent of their localisation. Such mechanisms have been found to be favourably associated with MNE operations in the country.

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With global market integration and mobility of capital and labour, foreign direct investment (FDI) has become an integral part of global as well as domestic business and economic activities. For a host country that receives the FDI flows, FDI provides a strong impetus to economic growth. FDI can generate a direct and indirect effect on the host economies. Direct gains from FDI are obtained when it raises financial capital, technological know-how, and managerial techniques and productivity in the host country, and the foreign investor does not wholly appropriate this increase. Direct gains accrue to the labour in the form of lower prices, and to the government in the form of tax revenues. In a sense, the extent of the direct contribution of FDI to the growth of host economies depends on their efficiency relative to the domestic firms. In addition, FDI may exert indirect effects on the host economies. The indirect effects largely relate to the external effects or spillovers (Blomstrom & Persson, 1983). FDI also plays a major role in the promotion of entrepreneurship and the internalisation of businesses. Thus, the FDI flows not only provide much needed capital investments, but also provide the firms with new markets, marketing channels, low-cost production facilities, access to new technology, processing, products, organisational technology, and management skills.

It is against this background that FDI has been viewed by some as a panacea for declining domestic investment and higher costs of borrowing abroad. FDI appears attractive because it involves a risk-sharing relationship with investors from the home country. Such risk-sharing does not exist in the formal contractual arrangements for foreign loans. FDI appears particularly attractive when existing stocks are low. Low stocks of foreign-owned capital imply low flows of repatriated profits. Over time, however, success in attracting FDI will increase this counter-flow, which could exceed the alternative flow of interest payments in the longer run. However, not everything about FDI is positive for the host countries (Ram & Zhang, 2002). Sometimes, the economies of the host countries may suffer rather than prosper because of FDI. It is often said that FDI is the Trojan Horse the MNEs bring to the low-income countries. In the race for seeking more and more FDI inflows, however, the countries have overlooked the fact that all the flows of FDI do not benefit their host countries similarly. In fact, some FDI inflows may actually bring pretty little, if at all.

Further, with the growing role of WTO in international business regulations, multilateral agreements in investments aim for the security of foreign investments with virtually unfettered rights to invest in all sectors of the host country, and to obtain for them the same treatment as domestic investors. The host country has to agree with the multilateral agencies to open the market, deregulate the industries, remove protective regulations, and most importantly, abide by the international standards and regulations. In some developing countries, the MNEs might adversely affect the development of domestic firms, and otherwise be a source of economic exploitation. The MNEs may put pressure on domestic businesses, as local firms have to compete with the MNEs, and in the course of time, domestic firms may face the risk of elimination. Some specific drawbacks that the LDCs may suffer as a result of the entry by MNEs are: (i) MNCs may repatriate more funds than they bring in to their home countries, (ii) MNCs may transfer inferior technologies to the host countries, (iii) MNCs may monopolise some markets in the host countries by destroying domestic competition through price cutting, (iv) MNCs may focus only on the domestic markets of the host country and may not contribute to the exports from the host country, (v) MNCs may exert undue influence on the political and regulatory system of the host countries to benefit the foreign investors, and (vi) MNCs may have a negative impact on the cultural and social norms of the host countries by imposing alien standards.

Since the 1997 East Asian financial crisis, the relationship between FDI, exports, and economic growth has gained importance and attention among policymakers and researchers. The long-term benefits of FDI and the impacts of FDI flows on growth and income distribution are not clearly established. Without an understanding with certainty of how FDI is attracted to the country and its effects in the short and long term, the task is more difficult, as the mechanisms through which FDI will bring changes in the economy is not clear. To explore the nexus between the FDI inflow and economic growth, it is necessary to evaluate the relationship, along with other economic factors like exports, imports, trade policy, and infrastructure development, and in general, economic forces operating in the domestic markets. Further, it is also important to understand the direction of causation: is it the FDI inflows that cause economic growth or the other

way. Another important question is: do FDI crowd out or increase domestic private investment.

Therefore, the main objectives of this paper are to examine the relationship between FDI inflows and economic growth, and analyse the relationship between FDI inflows and domestic private investment. The impact of FDI inflows on growth is estimated by Vector Autoregressive (VAR) method for five Asian economies for the period 1980 to 2020. The impact of FDI inflows on domestic investment is estimated for the period 1991-2020 for India by OLS.

Review of Literature

From the theoretical point of view, FDI inflows are expected to accelerate the economic growth of the host country. Fry (1993) examines the question of whether FDI inflows affect national savings, both directly and indirectly, in the presence of incentive-disincentive packages and other economic distortions, by analysing the rate of economic growth in l6 Pacific Basin developing countries with a control group of 11 other developing countries. The estimated reduced-form current account equations show that FDI has a significant negative impact on national savings in all the l6 countries. For the control group, this negative effect is similar in magnitude to FDI's negative effect on domestic investment, implying a zero effect on the current account. Fry concludes that FDI has a negative effect on economic growth in the control group countries, but a positive effect on growth in the Pacific Basin countries.

Borensztein et al. (1998) test the effect of FDI on technology diffusion and economic growth in a cross-country analysis of 69 developing countries for the period 1970-1989. The seemingly unrelated least squares (SURE) estimates show that there exists a positive effect on the economic growth of FDI inflows, and also that FDI exerts a positive effect on domestic investment.

Agrawal et al. (2000) also find a strong positive impact of FDI inflows on GDP growth rate in five South Asian countries – India, Pakistan, Bangladesh, Sri Lanka, and Nepal – during the late eighties and early nineties, supporting the view that FDI is more likely to be beneficial in more open economies. Further, an increase in the FDI inflows in South Asia is also associated with a 4-5% increase in nationally owned investment, suggesting a complementarity and linkage effect between foreign and domestic investments.

Harrison and McMillan (2003), using firm-level data in the Ivory Coast, analyse whether incoming FDI in developing countries plays an important role in alleviating credit constraints of domestic firms. The study finds a difference between credit constraints faced by foreign and domestic firms. While the investment of public firms is not sensitive to debt ratios and foreign borrowing in domestic credit markets, private firms are crowded out by foreign borrowing and are more credit constrained than foreign firms. A major reason behind more credit constraints on domestic enterprises than on foreign firms in the same sector is crowding out by foreign entrants. Hence, foreign firms might be a better investment than domestic firms.

Calderon et al. (2004) analyse the dynamic relationship between greenfield investments, mergers and acquisitions, domestic investment, and GDP. The VAR estimates show that both GI and M&As influence domestic investment, but they are led by GDP growth. This reflects that economic growth is an effective pull factor for foreign investment, which is an important indicator of domestic investment.

Lumbila (2005) estimates the effects of FDI inflows on economic growth in 47 African countries over the period 1980-2000. The weighted seemingly unrelated least squares results show that FDI inflows exert a positive impact on growth in Africa. The FDI inflows not only bring fresh capital to African countries, but also allow these economies to take advantage of technology and managerial practices. A 10% increase in the inflows of FDI causes the host economy to grow by 0.34%. The impact of FDI inflows on growth in the host country is further enhanced by trained human capital, attractive investment climate stemming from a developed infrastructure from lower country risk, and a stable macro environment. The results are also supportive of a small crowding-in-effect, i.e. one-dollar increase in the net inflow of FDI is associated with an increase in domestic investment in the host economy of about 0.048 dollars.

An International Monetary Fund (2005) study analyses the significant determinants of FDI inflows in India. Estimating a reduced-form equation of fixed effects model, the study significantly finds that the most

important factors influencing FDI into India are not FDI-specific policies, but rather, the broader economic policies, including corporate taxes, trade openness, and other business climate issues like regulatory quality and burden. Further, some institutional factors and the quality of infrastructure are the significant determinants of India's FDI inflows. Agosin and Machado (2005), using panel data of 36 developing countries, examine the long-term crowding out effect of FDI on domestic investment.

Reddy and Mohanty (2007) examine the interrelations among the variables FDI, GDP, and exports and imports of four countries – China, India, Malaysia, and Singapore – using panel data methods. They estimate that one dollar of FDI inflow adds about 3.27 dollars to the GDP of each country, suggesting that FDI promotes economic growth. Further, an autoregressive forecast of the FDI inflows to these countries shows that China has been able to attract US$15 billion more in FDI than India, because of the combined effects of its policies.

Banga (2008) examines the relationship between FDI inflows and infrastructure using aggregate FDI inflows in 15 developing South, East, and South-East Asian countries for the period 1980-81 to 1999-2000. The study finds that the availability of electricity is indeed an important factor in FDI flows. The paper also emphasises the role of labour costs, labour productivity, and educational attainment in attracting FDI into Asian countries. The panel random effects estimates show that fiscal incentives have an insignificant impact on aggregate FDI, but the removal of restrictions or lower tariffs attract aggregate FDI and attract FDI notably from developing countries. Further, bilateral investment treaties with developed countries have a significant impact on aggregate FDI inflows.

Miankhel et al. (2009) adopt a time-series framework of a vector autoregressive model to examine the relationship between growths in export, FDI, and GDP among the emerging economies – a multivariate causality study. The paper further examines whether the established causality between FDI and growth is effective in the short run or in the long run. In the analysis, export growth precedes GDP growth, and then GDP growth precedes FDI growth, implying that it is exports that drive FDI through the channelling effect of GDP. The results show that in South Asian countries, the export-growth hypothesis holds both in the short- and long-run. However, it is the GDP growth in the long run that attracts FDI in India, while on the other hand, GDP leads to export growth in Pakistan. In Thailand, there exists a bidirectional relationship between GDP and FDI under a block exogeneity test. There is no specific relationship either in the short run or in the long run in the case of Malaysia. In the case of Mexico, exports precede FDI in the short and long runs, while in Chile, it is FDI that is driving other economic variables in the short and long runs.

Lautier and Moreaub (2012) investigate the impact of domestic investment on FDI in developing countries using a large cross-country sample. The paper observes a bi-directional relationship between FDI and domestic investment, and that domestic investment is a strong catalyst for FDI in developing countries. The study also finds a strong influence of previous domestic investment on foreign investors.

Al Khatib et al. (2012) estimate the long-run relationship between real GDP growth rate, FDI, gross domestic investment, the export of goods and services, and domestic credit in Jordon; the study shows that real GDP and export of goods and services are the controlling factors of domestic investment.

Herzer (2012) analyses the effect of FDI on economic growth in two ways: one, based on the long-run relationship between FDI and output, and the other, cross-country differences in FDI growth effects. The panel estimates show that volatility of FDI is directly related to macroeconomic uncertainty, which in turn affects domestic investment. Another important factor that affects FDI growth is political and economic stability.

Kumar (2012) studies the impact of FDI on export and growth in India. In the Indian context, FDI is viewed as an accelerator of host country economic growth by promoting host country exports. The empirical estimates indicate that FDI indeed has a positive impact on India's export boom, as its effects are much larger than those of domestic capital.

Singh et al. (20l2) examine the role of FDI and FII in India in bridging the gap between savings and investment, improving the quality and availability of goods, and economic development. It is found that foreign investment flows are supplementing the scarce domestic investment

in developing countries, and these investments meet the financial requirements for building the basic and essential infrastructure industries of the priority sector.

Blonigen and Piger (2014) using the Bayesian Model Averaging (BMA) method, examine the determinants of three different measures of FDI, viz. FDI stock, affiliate sales, and cross-M&As. The three specifications used in the paper postulate a role for economic size and trade frictions as driving forces of FDI. While affiliate sale is considered the appropriate measure of actual multinational firm activity in a host country, M&As are the desired ones which dominate over the other two FDI measures. The Bayesian Model Averaging (BMA) analysis indicates that many of the covariates used in prior FDI studies do not have a high probability of inclusion in the true FDI determinants model, once a comprehensive set of potential determinants are considered. However, there is no evidence that policy variables controlled by the host country impact the FDI.

Masry (2015) analyses various factors that attract FDI in Egypt during 1961-20l2, where two developments, the global financial crisis of 2008 and the Arab Spring revolutions that had major impacts on the Egyptian economy and political struggle, have shaken the FDI inflows in Egypt. The study finds that the factors that attract FDI in Egypt are GDP, economic openness, general government expenditure, and employment. In general, countries with large trade market potentials and relatively higher contribution of industries to GDP are more likely to be successful in attracting FDI.

Empirically, while the studies have used a slightly different set of independent variables in addition to FDI, the dependent variable in almost all studies is either the logarithm of the growth in per capita GDP or the logarithm of the GDP growth rate itself. Further, the independent variable representing FDI is scaled as the ratio of FDI inflows to the GDP of the country or the ratio of FDI inflows to the gross capital formation of the country. The studies are generally based on the conventional neoclassical production function approach, adding foreign capital as an additional variable; the estimation techniques are SURE, VAR, and autoregressive methods.

Overall, the time-series and panel studies show that FDI inflows promote economic growth. However, the extent to which a country benefits from FDI depends on its trade policies, labour force skills, business climate, domestic investment, infrastructure, and other factors.

Data and Methodology

This paper analyses the impact of FDI inflows on the economic growth of five Asian countries – India, Malaysia, Pakistan, Sri Lanka, and Thailand – for the period 1980 to 2020, and the effect of FDI inflows on domestic investment in India for the period 1991-2020. Malaysia and Thailand from East Asia have been included as these countries have been successful in attracting FDI, being among the top ten FDI recipient countries. India, Pakistan, and Sri Lanka from South Asia have been considered as they have sizeably liberalised their economy. The data for the study on GDP, FDI, exports, and control variables have been collected from the UNCTAD Handbook of Statistics, IMF International Financial Statistics, and the World Bank World Development Indicators. All variables are defined in real values by deflating them to 2000 prices using GDP deflators, and are expressed in US$ for comparison. The time-series data on domestic investment have been collected from the RBI Handbook of Statistics on the Indian Economy.

The growth of output is measured as the current per capita GDP. Net FDI inflow measure is defined as the net inflow 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. The net FDI inflow is the sum of equity capital, reinvestment of earnings, and other long-term capital and short-term capital as shown in the balance of payments. The level of infrastructure development in an economy is measured by the telephone mainlines, which are telephone lines connecting a customer's equipment to the public switched telephone network. The size of the population represents the demand side of the economy. Table 1 presents the descriptive statistics of the variables used in the empirical analysis of this paper. Table 1 shows that Thailand and Malaysia have received the largest FDI inflows, and the FDI inflow into them is also substantial compared to Pakistan. Malaysia is better positioned in terms of infrastructure.

Table 1: Descriptive Statistics of Variables

Variable	*India*	*Malaysia*	*Pakistan*	*Sri Lanka*	*Thailand*
GDP per capita (US$)	445.80 (204.14)	3637.78 (1651.94)	561.36 (151.34)	742.97 (426.26)	1874.27 (928.52)
Net FDI inflows (US$)	18950.97 (31223.87)	27782.43 (21445.26)	6004.35 (7138.87)	1388.11 (1012.45)	25253.39 (28738.41)
Exports (US$)	40965.46 (43400.49)	67296.17 (54601.49)	8072.00 (4939.07)	3526.81 (2219.41)	51454.13 (45532.45)
Telephone mainlines (per 100 persons)	1.77 (1.48)	12.71 (6.09)	1.54 (0.98)	1.54 (0.98)	3.80 (2.04)
Population growth rate (annual per cent)	1.82 (0.30)	2.40 (0.38)	2.49 (0.18)	1.07 (0.32)	1.29 (0.52)

Note: Standard deviations in parentheses.

Source: UNCTAD Handbook of Statistics.

Fig. 1 plots the scatter matrix and Table 2 presents the correlation matrix of the variables for India, where all variables are expressed in logarithms. From Fig. 1 and Table 2, it is observed that the variables GDP, FDI, exports, and infrastructure are highly, positively, and significantly related to each other, while population growth rate is negatively related with other variables. Further, the same results are obtained from the scatter matrix and correlation matrix of the variables in the other four countries.

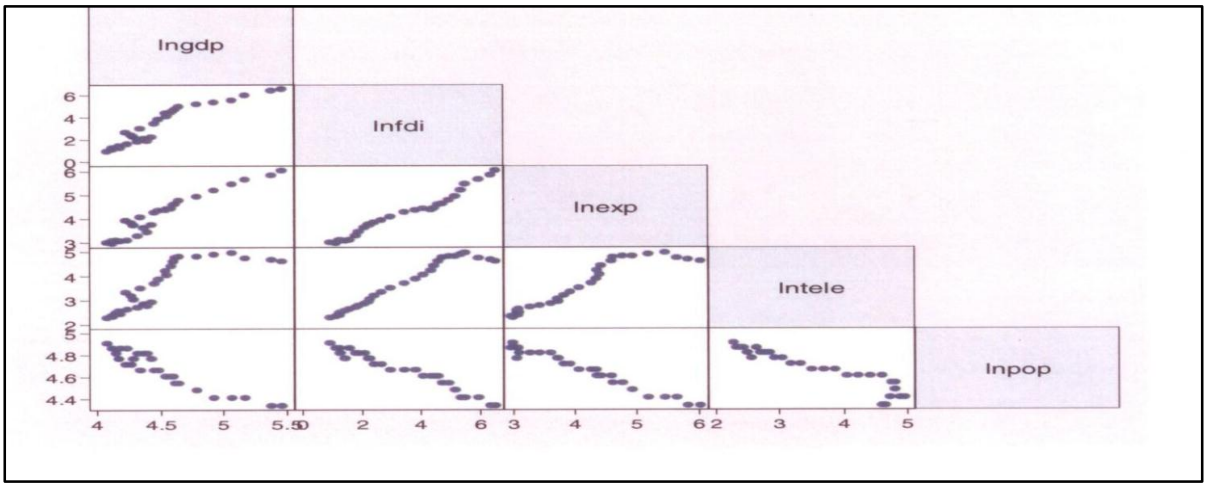

Fig. 1: Scatter Matrix of VAR Variables for India

Table 2: Correlation Matrix of VAR Variables for India

Variable	*GDP*	*FDI*	*Exports*	*Infrastructure*
FDI	0.931*	-	-	-
Exports	0.956*	0.933*	-	-
Infrastructure	0.830*	0.970*	0.933*	-
Population growth rate	−0.941*	−0.980*	−0.983*	−0.938*

Note: Significant at 1% level.

Vector Autoregression (VAR) Method: The VAR analysis of the causal relationship between the economic variables requires initial testing for the presence of unit root and cointegration. Granger (1988) states that long-run

equilibrium exists when two or more non-stationary time-series [integrated of order 1 or I (l)] are integrated of order I(0). With the presence of unit root, stationarity is achieved by trend stationarity. Then, by applying the VAR approach of Johansen and Juselius (1990), a test for cointegration can be performed, and if cointegration is present, the Granger causality test with an error correction term can be applied. If there is no cointegration, the VAR model can be used for estimation.

Unit Root Test: The common test of stationarity (or non-stationarity) is the unit root test. A stochastic process is stationary if its mean and variance are constant over time, i.e. they are time-invariant and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. A non-stationary time-series will have a time-varying mean or a time-varying variance or both. The unit root test consists of testing for significance the term ρ in the equation:

$$y_t = \rho y_{t-1} + u_t \quad (1)$$

Where, u_t is the white noise or purely random error term. The error term u_t is white noise if the stochastic process has zero mean, constant variance, and is serially uncorrelated. If $|\rho| < 1$, then y_t is stationary, i.e. y is having short memory influence of y_{t-1} and tends to zero; as t increases, finite variance (time-independent) and autocorrelation function decay fast. y_t is non-stationary if $|\rho| = 1$, i.e. y_t has infinite memory influence of y_{t-1}, which persists as t increases, with unbounded variance, grows with t, and autocorrelation function persists. If $|\rho| > 1$, y_t is non-stationary and explosive. Under the null hypothesis (i.e. $\rho = 1$), the t-value of the estimated coefficient of y_{t-1} does not follow the t-distribution even in large samples, i.e. it does not have an asymptotic normal distribution. Dickey and Fuller (1979) have shown that under the null hypothesis that $\rho = 1$, the estimated t-value of the coefficient of y_{t-1} follows the τ (tau) statistic. When $\rho = 1$ is rejected, i.e. time-series is stationary, the t-test can be used.

A random walk process may have no drift, or it may have drift, or it may have both deterministic and stochastic trends. To allow various possibilities, Dickey-Fuller test is estimated in three different forms, that is under three different null hypotheses.

y_t is a random walk: $\Delta y_t = \delta y_{t-1} + u_t$ (2)

y_t is a random walk with drift: $\Delta y_t = \beta_1 + \delta y_{t-1} + u_t$ (3)

y_t is a random walk with drift around a stochastic trend:

$$\Delta y_t = \beta_0 + \beta_1 t + \delta y_{t-1} + u_t \quad (4)$$

Where $\delta = (\rho - 1)$ and Δ is the first difference operator. In each case, the null hypothesis is that $\delta = 0$, i.e. there is a unit root and the time-series is non-stationary. The alternative hypothesis is that $\delta < 0$, i.e. the time-series is stationary with zero mean or with a non-zero mean or around a deterministic trend, respectively. Under the assumption that the error term u_t is uncorrelated, the Dickey and Fuller test is applied to the time-series. When the error term u_t is correlated, the Augmented Dickey-Fuller (ADF) test is used. The ADF test consists of estimating the regression.

$$\Delta y_t = \beta_0 + \beta_1 t + \delta y_{t-1} + \sum \alpha_i \Delta y_{t-i} + \varepsilon_t \quad (5)$$

Where, ε_t is a pure white noise error term. The number of lagged difference terms to be included is determined empirically. Thangavelu and Rajaguru (2004) show that the ADF test corrects for higher-order serial correlations by adding differenced terms of the lagged variables on the right side of the equation. If the ADF test shows the presence of unit root, the series is transformed to a difference stationary process or trend stationarity.

In this paper, all variables in the VAR model are tested for stationarity by applying the ADF test for both the level and trend stationarity, and the results are presented in Table 3. The ADF test results show that FDI and GDP of all the five countries are stationary after transformation, and significant at 1% level. For India, exports are stationary at the level and significant at 5%, while it is significant at 1% level in trend in all the other four countries. Infrastructure also exhibits stationarity at the level for Malaysia and Sri Lanka, and for other countries it is trended.

Table 3: ADF Unit Root Test for Stationarity of VAR Variables

Variable		*India*	*Malaysia*	*Pakistan*	*Sri Lanka*	*Thailand*
GDP	Level	2.61	0.39	0.64	2.05	−0.45
	Trend	11.21*	14.23*	8.79*	29.75*	11.32*
FDI	Level	2.17	−0.39	0.69	−0.87	−0.78
	Trend	34.14*	17.65*	19.42*	24.71*	33.65*
Exports	Level	3.06**	0.31	0.04	−0.06	−0.06
	Trend	-	29.26*	24.98*	25.88*	25.50*
Infrastructure	Level	−1.09	−6.01*	−1.47	−4.64*	1.08
	Trend	21.70*	-	25.59*	-	4.34*
Population growth rate	Level	0.22	1.52	−1.53	−1.98	−0.50
	Trend	−21.77*	−7.43*	−13.43*	−4.45*	−8.37*

*Note: *, **Significant at 1% and 5% levels.*

Cointegration Test: The cointegration analysis captures the dynamic relationship among the variables. The multivariate cointegration test based on Johansen and Juselius (1990) is used to determine the long-run relationship. Two variables are cointegrated if they have a long-term or equilibrium relationship between them, and such a cointegrated series leads to a spurious regression situation. The test procedure for cointegration is: Determine whether y_t and x_t are I(l), which is equivalent to determining whether or not they contain unit roots, and if they are both I(1), then estimate the parameters of the cointegrating regression ($y_t = \beta_0 + \beta_1 x_{t-1} + u_t$), and test whether the estimated residual u_t is I(0) or not using ADF test statistics. If the null hypothesis of unit root u_t is rejected, it may be inferred that there exists cointegration between y_t and x_t, denoted as CI(l,1) [cointegrated of order 1,1].

Error Correction Mechanism: When the variables are cointegrated, there is a long-run relationship between the variables, while there may be disequilibrium in the short run, and the error term may not be treated as the equilibrium error. In fact, this error term can be used to tie the short-run behaviour to its long-run value. The Engle and Granger (1987) error correction mechanism (ECM) corrects for disequilibrium. The notion of error correction is that a part of the disequilibrium from one period is corrected with the next period, and therefore, the cointegrated series can be represented by the error correction model. In essence, under the restriction that the variables are CI (1,1), showing that an error correction is needed, for any set of I(1) variables, error correction and cointegration are equivalent. The error correction model (ECM) is a more comprehensive test of causality because, in addition to the standard causality between the cointegrated variables, the ECM captures yet another causal linkage between the two variables – the impact of long-run equilibrium on the short-run dynamics.

Thus, cointegration explains the extent of deviation from the long-run equilibrium relationship by a non-stationary series. If the series of variables are not cointegrated, i.e. no long-run equilibrium, the usual VAR model can be applied. When the variables are cointegrated, an error correction term in the VAR framework, vector error correction mechanism (VECM), is to be included to study the dynamic relationship among the cointegrated variables. In the empirical analysis of this paper, GDP and FDI are not cointegrated for India, Malaysia, Pakistan, and Thailand; it is cointegrated only for Sri Lanka. For Sri Lanka, since the variables are cointegrated, a proper VAR framework to study the dynamic relationship among them must include an error correction term; for the other countries, since there is no cointegration among the variables, we can estimate it by the usual VAR model.

Vector Autoregressive Regression Model: In the vector autoregressive modelling (VAR), several endogenous variables are considered together with each endogenous variable is explained by its lagged and the lagged values fall other endogenous variables in the model. That is, a vector of variables is explained by the own lagged or past values of the dependent variables themselves. Hence, there is autoregression of the variables together. A vector autoregressive process of order p [VAR(p)] for a system of M variables $y_t = (y_{1t}, y_{2t}, \ldots, y_{mt})$ may be defined as:

$$y_t = v + \Lambda_1 y_{t-1} + \cdots + \Lambda_p y_{t-p} + u_t \quad (6)$$

In this system of M equations, v = (v_1, …..,v_m) is an M-dimensional vector; the Λ_i are (MxM) coefficient matrix; and u_t = (u_{1t}, ….., u_{mt}) is the stochastic error term called impulses or innovations or shocks. The u are white noise with mean zero, E[u_t] = 0, and non-singular covariance matrix, Σ_v = E [u_t,u_s] for all t, and u_t and u_s are uncorrelated for t ≠ s. In estimating the model by VAR, the maximum lag length k is usually decided by the lowest values of the Akaike or Schwarz information criteria, defined as:

$$AIC(n) = \ln \det(\Sigma_n) + 2M^2 n / N \quad (7)$$

$$SIC(n) = \ln \det(\Sigma_n) + M^2 n \, lnN / N \quad (8)$$

Where, M is the number of variables in the system, N is the sample size, and Σ_n is an estimate of the residual covariance matrix Σ_v obtained with a VAR(n) model. The elements of Σ_n are computed as:

$$\sigma_{ij} = \left[(y_i - x\beta_i)'(y_j - x\beta_j)\right] N \quad (9)$$

that is, the sum of squares or cross-products divided by the sample size.

In the empirical estimation, the VAR model for the dependent variables (GDP, FDI, exports, infrastructure, and population) are specified as a function of k lag values of all the variables.

$$y_t = \beta_0 + \sum \beta_i y_{t-i} + \sum \gamma_i x_{t-i} + \varepsilon_{1t} \quad (10)$$

$$x_t = \beta_0 + \sum \theta_i y_{t-i} + \sum \gamma_i x_{t-i} + \varepsilon_{2t} \quad (11)$$

Empirical Analysis

Effects of FDI on Economic Growth: The estimated VAR results are not the same for all the countries, as each country is at a different level of development and has followed different policies to attain its goal of development. The VAR estimates presented in Table 4 show that in all the countries the one-period lagged GDP is positively and significantly associated with the current level of GDP. A unit increase in the previous year's GDP increases the current year's GDP by 0.47, 2.13, 0.77, 1.30, and 0.64 units in India, Malaysia, Pakistan, Sri Lanka, and Thailand, respectively. However, the effect of the two-period lagged GDP is not the same on GDP in these countries. It has no significant impact on the current GDP in most countries, except Malaysia, where it has a significant negative effect on GDP. There is a positive relationship between the previous year's FDI in all countries. A unit increase in the previous year's FDI increases the current year's GDP by 0.28 units for India, 0.44 units for Malaysia, 0.40 units for Thailand, and 0.13 units for Sri Lanka. In the case of India, Pakistan, and Thailand, there is a significant negative relationship between the two-period lag of FDI and the current GDP. The previous exports of India, Malaysia, Sri Lanka, and Thailand have a positive relationship with the current year's GDP. A unit increase in the exports will lead to a 0.198, 0.89, 0.15, and 0.413 unit increase in GDP of these countries, respectively. The lagged effects of infrastructure and population growth are mixed in these countries. For India, the lagged effects of infrastructure and population growth rate on current GDP are negative. Two noteworthy results are that, in the case of Pakistan, almost all the lagged effects are statistically insignificant, and in the case of Sri Lanka, the variables are cointegrated.

Table 4: VAR Estimates of GDP-Dependent Variable: ln(GDP)

Variable	*India*		*Malaysia*		*Pakistan*		*Sri Lanka*		*Thailand*	
	Lag1	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*
GDP	0.47* (0.15)	0.23 (0.16)	2.13* (0.46)	−2.58* (0.99)	0.77* (0.20)	−0.12 (0.22)	1.30* (0.26)	0.23 (0.25)	0.64* (0.15)	−0.26 (0.17)
FDI	0.28* (0.08)	−0.21** (0.11)	0.44*** (0.26)	0.34 (0.49)	0.03 (0.08)	−0.20* (0.070	0.13** (0.14)	−0.02 (0.26)	0.40* (0.06)	−0.34* (0.06)
Exports	0.19*** (0.11)	−0.48* (0.13)	0.03 (0.34)	0.89*** (0.54)	0.02 (0.13)	0.01 (0.16)	0.15** (0.13)	−0.10 (0.12)	0.41* (0.13)	0.05 (0.15)
Infrastructure	−0.51* (0.12)	0.48* (0.11)	2.06* (0.69)	−2.22* (0.74)	0.05 (0.18)	0.11 (0.18)	−0.24*** (0.12)	0.23*** (0.11)	0.88* (0.19)	−1.09* (0.21)
Population growth rate	−0.53*** (0.25)	−0.97* (0.22)	−0.44 (0.79)	0.07 (0.66)	−0.65 (0.49)	0.10 (0.47)	−0.04 (0.04)	0.03 (0.04)	−0.09 (0.12)	0.13 (0.09)

Variable	*India*		*Malaysia*		*Pakistan*		*Sri Lanka*		*Thailand*	
	Lag1	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*
ECM	-	-	-	-	-	-	0.30 (0.32)	0.12 (0.14)	-	-
AIC	−14.91		−15.11		−11.93		−48.93		−4.17	
SIC	−12.26		−12.47		−9.29		−44.55		−1.53	
R-square	0.97		0.96		0.95		0.97		0.98	
N	27		27		27		26		27	

Note: Standard errors in parentheses. Lag1 and Lag2 are lags of 1 and 2 periods.

**, **, ***Significant at 1%, 5%, and 10% levels.*

Table 5: VAR Estimates of FDI-Dependent Variable: ln(FDI)

Variable	*India*		*Malaysia*		*Pakistan*		*Sri Lanka*		*Thailand*	
	Lag1	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*	*Lag1*	*Lag2*
GDP	0.51* (0.31)	−0.41 (0.31)	−0.49 (0.42)	2.61* (0.91)	0.85** (0.40)	0.17 (0.42)	0.59*** (0.34)	0.53 (0.33)	−1.54* (0.41)	0.87*** (0.47)
FDI	1.05* (0.15)	−0.67* (0.20)	0.31 (0.24)	−1.56* (0.45)	0.91* (0.16)	−0.44* (0.14)	−0.01 (0.18)	0.78** (0.34)	0.62* (0.17)	0.03 (0.18)
Exports	0.06 (0.21)	0.47*** (0.25)	0.61** (0.30)	−0.32 (0.52)	−0.80* (0.25)	0.20 (0.32)	0.09 (0.15)	0.005 (0.15)	1.73* (0.36)	−0.65 (0.410
Infrastructure	0.55** (0.26)	−0.05 (0.21)	1.57* (0.630	−0.47 (0.68)	1.46* (0.36)	−0.75** (0.35)	0.08 (0.15)	0.28** (0.14)	0.18 (0.55)	−0.49 (0.61)
Population growth rate	0.41 (0.47)	−1.17* (o.43)	−0.63 (0.73)	−1.31* (0.60)	−3.37* (0.96)	−0.12 (0.92)	0.13** (0.06)	−0.04 (0.05)	0.17 (0.34)	−0.04 (0.27)
ECM	-	-	-	-	-	-	1.48* (0.42)	0.33*** (0.19)	-	-
AIC	−14.91		−15.11		−11.93		−48.03		−4.17	
SIC	−12.26		−12.47		−9.29		−44.55		−1.53	
R-square	0.97		0.96		0.97		0.98		0.97	
N	27		27		27		26		27	

Note: Standard errors in parentheses. Lag1 and Lag2 are lags of 1 and 2 periods.

**, **, ***Significant at 1%, 5%, and 10% levels.*

The VAR estimates presented in Table 5 show that there is a significant and positive effect of the previous year's GDP on the current year's FDI in India and Sri Lanka, while in Malaysia, Pakistan, and Thailand, the relationship between one-period lagged GDP and FDI inflows is negative. A unit increase in the GDP of the previous year leads to an increase in the current year's FDI by 0.51, −0.49, 0.85, 0.59, and −1.54 units for India, Malaysia, Pakistan, Sri Lanka, and Thailand, respectively. For the countries India, Pakistan, and Thailand, a unit increase in the previous year's FDI will significantly increase the current year's FDI by 1.05, 0.91, and 0.62 units, respectively. For India, Malaysia, and Pakistan, there is a significant negative relationship between the second-period lag of FDI and current year's FDI by −0.67, −1.56, and −0.44 units, respectively. Similarly, the other variable lagged effects are interpreted. The VAR estimates for exports, infrastructure, and population growth have similar results, but are not presented here.

FDI and Domestic Investment: This section empirically estimates the impact of FDI on domestic investment by national investors of India using time-series data for the period 1991-2008 by the OLS method. Table 6 presents the description of explanatory variables along with summary values used in the analysis of the effect of FDI on domestic investment. The FDI can promote domestic investment through the backward and linkage effects

with the domestic industries. Further, foreign borrowing can be used as a source of funds for investment. The relative effectiveness of foreign borrowing and FDI inflows in promoting investment have to be analysed. An improvement in terms of trade can increase investment by increasing real income and by making capital goods cheaper relative to domestic goods. An increase in the real exchange rate would increase the price of imported capital and intermediate goods, and result in a contraction of investment. The real lending rate is critical for domestic borrowings; a decrease in it will promote investment. The gross fixed domestic investment includes foreign direct investment. Therefore, the nationally owned gross fixed investment is defined as gross fixed domestic investment minus the net FDI inflows. In the empirical analysis, the dependent variable is defined as the ratio of nationally owned gross fixed investment to GDP.

Table 6: Descriptive Statistics of the Variables

Variable	*Description*	*Mean*	*Std. Dev.*
INV_{ni}	Nationally owned gross fixed investment − net FDI inflows	581448.2	461980.9
FDI	FDI inflows as a share of GDP (FDI / GDP)	25438.61	36937.21
FB	Total foreign borrowing as share of GDP (FB / GDP)	13.99	2.42
TOT	Terms of trade (unit price of exports / unit price of imports)	139.0	25.9
RER	Real exchange rate (nominal prime-lending rate of the banks − average of current and next year's inflation rates)	39.21	7.79
RLR	Real lending rate (domestic interest rate)	13.66	2.42

Source: RBI: Handbook of Statistics on the Indian Economy.

The estimating equation is specified as:

$$\ln(INV_{ni})_t = \beta_0 + \beta_1 \ln FDI_t + \beta_2 \ln FB_t + \beta_3 \ln TOT_t + \beta_4 \text{inRER}_t + \beta_5 \text{inRLR}_t + u_t \quad (12)$$

Theoretically, the coefficient of FDI / GDP should be zero, if FDI has no impact on investment by national sources. If FDI is associated with a decline in domestic investors, it should be negative, while if FDI inflows are associated with an increase in investment by local investors, it should be positive. The estimated OLS results are presented in Table 7.

Table 7: OLS Estimates of the Effect of FDI on Domestic Investment Dependent Variable: $\ln(INV_{ni})$

Variable	*Coefficient*
lnFDI	2.63* (3.50)
lnFB	0.35 (0.21)
lnTOT	0.010* (0.001)
lnRER	−0.007* (0.002)
lnRLR	−0.01 (0.01)
R-square	0.80
F-value	9.33
N	18

*Note: Standard errors in parentheses. *Significant at 1% level.*

It is seen that most of the variables have the expected sign. The crucial variable, the ratio of net FDI inflows to GDP, has a strong positive effect on the investment by national investors and is statistically significant. The elasticity of domestic investment with respect to FDI increases is 2.63, implying that investment by national investors more than doubles when there is significant FDI inflows. The impact on domestic investment of total foreign borrowings (FB) and terms of trade (TOT) are positive. The effect of the real lending rate (RLR) on national investment is negative by 0.01 units. Similarly, an increase in the real exchange rate (RER) has a significant negative effect on investment by national investors.

Conclusion

The experience of the East-Asian financial crisis that resulted in the volatility of the short-term capital flow has forced economies to shift their policies towards attracting foreign direct investments. However, the FDI inflows have not been the same; they differ depending on the national incentives and opportunities. There is overwhelming evidence that FDI inflows promote growth in developing economies. At the same time, economic development attracts FDI. Further, FDI inflows may induce investment by national investors. To analyse the effect of FDI inflows on economic growth and domestic investment in developing countries, this paper has adopted a time-series analysis of a vector autoregressive model for five Asian countries – India, Malaysia, Pakistan, Sri Lanka, and Thailand – for the period 1980-2020. In the VAR framework, it is possible to examine whether it is FDI that promotes GDP or GDP that promotes FDI. In the

VAR framework of this paper, the relationship between GDP, FDI, exports, infrastructure, and population growth are estimated endogenously by taking two-period lags of each of these variables.

The estimated VAR results are not the same for all the countries, since each country is at a different level of development and has followed different policies to attain the present level of development. The results point that for India, Malaysia, Sri Lanka, and Thailand there is a positive impact of FDI on growth, whereas Pakistan does not show any relation at all. Exports and infrastructure have a positive impact on the GDP for all the countries except Pakistan. Further, from the analysis, it is observed that the infrastructure facility is an important factor for attracting FDI. To study the impact of FDI inflows on domestic investment, this paper applied OLS estimation to a time-series data on India for the period 1991-2008. The estimated results suggest that an increase in FDI inflows in India is associated with a more-than-two-fold increase in investment by the national investors.

The estimated empirical results provide some support for more liberal policies towards FDI. Identifying the FDI impacts and its mechanisms can help governments develop effective policies to promote greater investment activities in the domestic economy. However, it should be remembered that FDI is not beneficial under all conditions. Just like high import tariffs, excessive concessions to attract FDI could harm domestic investors as they may not be able to compete with MNCs, and may even eliminate national investors. Therefore, developing countries need to negotiate hard to ensure that they do not give unreasonable concessions under the multilateral investment agreement under the WTO negotiations, especially unlimited access to domestic markets, at least not without getting adequate concessions in return from developed countries. Instead, developing countries should focus on developing their own human capital, skilled and trained labour, and develop infrastructure networks that will encourage domestic investment by national investors.

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