FDI, TRADE AND GROWTH, A CAUSAL LINK?

By

Mayang Pramadhani, Rakesh Bissoondeeal and Nigel Driffield[♣]

Abstract

This paper examines the causal relationships between inward direct investment, growth and trade in Indonesia for the period 1990 – 2004. We seek to establish whether there were strong/weak positive or negative associations between the presence of multinational enterprises and Indonesian exports and imports activity and to determine the causal links between the variables. We show that there are indeed causal links between FDI and trade, and that these are sensitive to growth effects, something that is generally ignored in the literature.

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Keywords, FDI exporting, growth, causality

1. Introduction

A large body of literature exists on the direct and indirect effects of foreign direct investment (FDI), with a substantial number of studies concerned with the apparent relationship between foreign direct investment and trade. While some studies have concluded that there is a substitution effect between inward direct investment and trade (Gopinath et al., 1999; Ramstetter, 1991; Svensson, 1996), other studies have concluded there is a complementary effect (Bayoumi and Lipworth, 1997; Blomström et al., 1988; Eaton and Tamura, 1994; Fontagné and Pajot, 1997; Marchant et al., 2002; Mekki, 2005; Pfaffermayr, 1996).

Similarly, the empirical evidence on the causal relationships between FDI investment and trade is equally contradictory, with results ranging from unidirectional causality, bidirectional causality, or even no causality between FDI and trade. Recently, Pacheco-López (2005) finds a two-way relationship between FDI and exports and FDI and imports in Mexico using a Granger causality test. Another study by Liu et al. (2001) concludes that there were interlinkages between FDI, exports, and imports in China. They suggest that a growth of imports results in a growth of FDI inflows. In turn, the growth of FDI causes the growth of exports. Then, the growth of exports further leads to the growth of imports. Hence, synergy between the three variables (imports, FDI and exports) was observed in the Chinese economy. This is of particular interest for a country such as Indonesia that has attracted a high proportion of export-orientated inward investment, which is, theoretically at least also associated with an increase in imports, in the form of capital goods and components. While the relationships between imports, exports and FDI have been explored in the past, many studies tend to ignore growth effects. Both trade and FDI are also associated with growth, though the extent which these causal links feed through to the relationships between FDI and trade remain largely unexplored.

This paper proceeds as follows; section two outlines some background information on Indonesia, while section three presents the previous theoretical and empirical evidence on the relationships between FDI and trade. Section four presents the data and some preliminary analysis, while section five outlines our econometric approach to the problem, and presents the analysis of the data. Section six concludes.

2. Some Background on FDI and, trade in Indonesia.

Indonesia attracted huge inflows of FDI, from the liberalisation in trade and foreign investment in 1985 up to the onset of economic crisis in 1997. The liberalisation in trade and foreign investment in Indonesia in the mid 1980s through a series of trade reforms was intended to change the import-substituting pattern of industrialisation during the 1970s oil boom period towards an export-promoting one (Thee, 2006).

These inflows of FDI happened in two waves, following a relatively familiar pattern for the region. Firstly, the textile and textile products industries received a huge amount of export-oriented FDI between 1988 and 1990. Thee (2006) suggests that as a result of this, the exports of textile and textile products increased dramatically in the four years to 1992/1993. Following this, Indonesia experienced a second increase in inward direct investment in early 1995. This was also due to the further liberalisation and deregulation in foreign investment that also sought to encourage export-oriented FDI in the country. This policy included the removal of the limitation on foreign ownership, the lowering tariff barriers, and the opening up of ten previously closed sectors to foreign investment (Kuncoro and Resosudarmo, 2002).

However, more recently, during the Asian crisis Indonesia suffered huge capital outflows from the country. FDI fell drastically during the economic crisis from 1997, experiencing

continuous net FDI outflows from 1998 to 2003, and only regained a small net positive level in 2002. This is illustrated by figure 1.

Figure 1 about here

The economic reforms via deregulation and liberalisation in trade and foreign investment directed the country's trade and investment policy away from an import substitution one towards an export promotion one. The former was characterised by capital intensive manufacturing in upstream and resource-based industries whilst the latter focused on labour intensive export oriented industries. FDI inflows contributed significantly to the increase in exports diversification specifically in the manufacturing sector such as textile and textile products, processed woods, and electronics (Kuncoro and Resosudarmo, 2002).

3. The relationships between trade, FDI and growth.

3.1 Theories of foreign direct investment and international trade

The traditional Heckscher-Ohlin-Samuelson framework, suggests that international trade and FDI are substitutes assuming labour and capital can move freely between countries and no transportation costs apply. The implication is that international trade involves an indirect exchange of production factors between countries (Liu et al., 2001). Mundell (1957) also holds that international mobility of factors of production, including FDI, may be a substitute for international trade if production functions are identical across countries. However, Kojima (1975) asserts that if the mobility of factors moves towards a country with a shortage, then FDI may have a positive impact on trade.

Several more recent papers develop theories which argue that trade and foreign direct investment are substitutes. Horsmann and Markusen (1992) and Brainard (1993) posit that

the decision for a firm to engage in horizontal FDI as opposed to engaging in exporting is a function of the relationship between proximity and concentration.

Helpman (1984) and Helpman and Krugman (1985) seek to explain the complementarity relationship between foreign direct investment and trade. Their theory is valid for vertical FDI in which a multinational enterprise has its headquarters located in the home country and several production sites located in the host country where cheaper costs of production and input resources are available. If the differences in factor endowments are significant between countries, the headquarters tend to export capital equipment and factor services, such as R&D, to the host country, and in return the host country exports input resources to the home country. A classical example for this type of FDI is direct investment in the mining industry.

As countries display different characteristics such as in factor endowments and technological capabilities, Markusen and Venables (1996, 1998) expand the nature of the relationship between trade and foreign direct investment concerning these differences among countries. They conclude that trade and FDI coexist when countries are very different; however, multinational firms play an increasingly more dominant role than trade as countries become similar in size, relative endowments, and as world income grows (Markusen and Venables, 1998). Also, Pain and Wakelin (1998) note that when countries are similar and transportation costs are high, multinational (multi-plant) firms tend to be substitutes for national (single-plant) firms since they have lower marginal costs per market providing they acquire knowledge based assets. Thus, the tendency for countries to move towards similarities incurs intra-industry trade to be replaced by horizontal FDI, meaning that substitution relationship arises between FDI and trade.

The concept of trade and FDI being substitutes is also strongly embedded in the theory of FDI. Dunning's (1988) eclectic paradigm theory implies that FDI and trade are substitutes, in

that a firm moves from exporting to FDI when both transaction costs and manufacturing costs conditions dictate that this is rational for the firm. The analysis here is similar to that based on Vernon's (1966) product life cycle theory, which suggests that there are two possible causal links between foreign direct investment and trade, investment and trade. Initially, trade may lead to FDI in Vernon's analysis, but over time foreign direct investment into a particular location changes in nature, from initially being motivated by the desire to capture new markets, (market seeking) to being attracted to locations with successful investments and infrastructure (efficiency seeking).

In a similar vein, Gray (1998) suggests that the relationship between FDI and trade is a function of motives of the firm to undertake FDI. If the motive is for market-seeking, FDI and trade tend to replace each other; therefore, substitution relationship occurs. However, if the motive is for efficiency-seeking, the relationship between FDI and trade is complementary in that an increase in the amount of foreign direct investment leads to an increase in the level of trade.

The new trade theory identifies two major determinants of the FDI-trade relationship (Fontagné and Pajot, 2000). Firstly, the way a firm is organised is a key determinant. A vertically arranged firm which locates its production processes in different foreign affiliates will experience a complementary relationship between its foreign trade and investment, with each reinforcing the other. A horizontally arranged firm will produce a given commodity at one location, probably close to the market if transport costs are relatively high and the minimum plant size is not too large. Secondly, economies of scale reduce the number of plants to achieve greater efficiency, yet at the same time transportation costs and trade barriers provide an incentive to increase the number of plants. If a firm has high fixed costs

and each plant has limited fixed costs, a firm is provided an incentive to locate production close to its markets and FDI will substitute for trade if transport costs are a significant factor.

Many of these arguments are summed up by Pacheco-López (2005), who points out that there are two possible causal linkages between FDI and imports. Firstly, an increase in imports in a country leads to a rise in FDI inflows to the same country. She argues that imports show the existence of a demand for a commodity. As a result, multinational enterprises might be attracted to carry out direct investment in the same country in order to produce the product domestically. Secondly, the presence of multinational enterprises in the host country stimulates an increase in imports through a rise in demands for imported supplies, such as raw materials and intermediate products, as well as capital goods from the home country.

3.2 Previous empirical evidence

The bulk of empirical work so far has focused on the establishing the relationship between FDI and trade in the home country as opposed to the host country. However, work on China (Liu et al., 2001), Mexico (Alguacil et al., 2002; Pacheco-López, 2005), and Turkey (Mekki, 2005) all focus on the host country. These studies take a range of methodological approaches, and find conflicting results concerning the relationships between trade and FDI.

Blomstrom and Kokko (1994) present a survey of the early literature, and argue that outward FDI replaces exporting, but also stimulates intra-firm trade in intermediate goods. An UNCTAD (2002) report summarises many of these arguments. An increase in the quantity of inward FDI boosts exports in host countries through the accumulation of capital, introduction of new technology, and improvement in management and marketing strategies which are brought and practised by the multinational enterprises. Thus, according to the UNCTAD, one of the key determinations of exports in a country is its inward direct investment. This is

particularly true for the situation where the country is used as an exports platform or base by multinational firms.

However, other papers incorporating time series analysis suggest that there is a negative relationship between outward direct investment and exports from the investing countries. Blake and Pain (1994) for example suggest that net outward direct investment resulted in the deterioration of exports, with net inward direct investment having a significant positive impact on UK exports.

3.3. Causal links between FDI and trade

While there is a wealth of literature on the nature of the relationship between FDI and trade, there are relatively few which seek to explain the causal links between FDI and trade. For example, using a time series approach for Austrian quarterly data for outward FDI and trade from 1969 to 1990, Pfaffermayr (1994) surmises that there were significant bidirectional causalities between Austrian outward FDI and exports. A later study by Bajo-Rubio and Montero-Muñoz (2000) using Spanish quarterly data between 1977 and 1998 finds that exports and outward FDI were cointegrated, and the relationship between both variables was positive and statistically significant.

The evidence of causal links between trade and FDI is limited, with much of the work in this area is based around Granger (1969) causality testing, see for example, Pfaffermayr (1994) or Bajo-Rubio and Montero-Muñoz (2000). Pacheco-López (2005) based on Mexican data shows that the causality between FDI and exports occurs in both ways, in that exports encourage foreign direct investment to the country, and in turn, FDI inflows boosts the country's exports. This result is consistent with the one concluded in the previous research by Alguacil et al. (2002).

However, the analysis of Fontagné and Pajot (2000), Markusen and Venables (1998), and Pain and Wakelin (1998) suggests that much of the time series analysis of the relationships between trade and FDI is over simplified. A simple bivariate approach will ignore these development or growth effects – mechanisms suggested by theories of export led growth, or indeed import led growth for example, tend to be ignored in many bivariate time series studies, leading to potentially misleading results. Thus in this study in addition to widely used bivariate models, multivariate models are also constructed to investigate whether there are significant differences in the performance of the models.

4. Data and preliminary analysis

The data used here are Indonesian quarterly data between 1990 and 2004. This offers an opportunity to study a transition economy, from the liberalisation of capital flows of the late 1980s, through the Asian crisis of 1997 and beyond, when FDI inflows in Indonesia started to recover in 2002. Data on GDP were obtained from Datastream and data on FDI, Imports, Exports and producer price index (PPI) were collected from the International Financial Statistics (IFS) account produced by the IMF mid Asian report[1]. FDI, Imports, Exports and GDP are in US dollar figures and have been adjusted for inflation using the PPI.

The stationarity properties of the deflated variables are checked using the Augmented Dickey-Fuller (ADF) (1979) test. The results, reported in Table 1, indicate that the variables nonstationary I(*1*) variables.

[Table 1 around here]

5. Econometric modelling of trade, growth and FDI

[1] http://www.imfstatistics.org/imf/output/484E4534-8A85-4CD4-A0D0-D757FB815C22/IFS_Table_26521.1417135.xls

We follow and build on the approach of Pacheco-López (2005) to investigate the causal relationships between FDI, exports, and imports. Pacheco-López (2005) investigated the direction of causality between FDI and imports and FDI and exports using bivariate error-correction models. The first step was to establish whether there exist any long-run relationships between the variables in a bivariate analysis, subsequently to test for long-run and short run causality using the error-correction models. Our analysis, in addition to investigating the causal relationship between FDI and imports and FDI and exports in a bivariate framework, also investigates the causality relationship between these variables in multivariate framework including GDP. Such a formulation also allows us to investigate the existence of all linkages in the model and thus the analysis should provide us an insight into hypotheses such as the export-led growth (ELG) hypothesis, (Balassa, 1978; Edwards, 1998); the import-led growth hypothesis (ILG) and the developmental effects of FDI (Aitken et al, 1997, Aitken and Harrison, 1999).

5.1 Cointegration analysis

For bivariate models relating to FDI and imports and FDI and exports, we investigate whether there exist long-run relationships of the following forms:

(1) $fdi_t = \beta_{11} + \beta_{12} m_t$

(2) $fdi_t = \beta_{21} + \beta_{22} x_t$

and for our multivariate model we search for long-run relationships of the following form:

(3) $fdi_t = \beta_{31} + \beta_{32} x_t + \beta_{33} m_t + \beta_{34} y_t$

where fdi represents FDI, m represents imports, x represents exports and y represents GDP.

Since the variables under consideration are nonstationary I(*1*) variables, we employ a cointegration approach to determine the nature of the long-run relationships. Since the

pioneering work of Engle and Granger (1987) on cointegration analysis, a number of researchers have sought to extend the work, see for example, Stock and Watson (1988) and Johansen (1988). In this paper we test for the presence of cointegrating relationships between the variables using the Johansen (1988) maximum likelihood method within a vector autoregressive (VAR) framework as it is most commonly used procedure and, for example, Gonzalo (1994) has demonstrated that the Johansen (1988) procedure has superior properties to other methods of testing for cointegration. A brief outline of the Johansen (1988) procedure is given below[2].

Let z_t denote a $p \times 1$ vector of variables which are not integrated of an order higher than one, then z_t can be formulated as a VAR model of order *k*:

(4) $z_t = \Pi_1 z_{t-1} + \Pi_2 z_{t-2} + \cdots + \Pi_k z_{t-k} +$ deterministic components + ε_{1t}

where ε_{1t}, is independently and normally distributed and $\Pi_1, \Pi_2, \cdots, \Pi_{t-k}$ are coefficient matrices. The model can be reparameterized to yield a vector error correction model of the form

(5) $\Delta z_t = \Gamma_1 \Delta z_{t-1} + \cdots + \Gamma_{k-1} \Delta z_{t-(k-1)} + \Gamma z_{t-1} +$ deterministic components + ε_{2t}

where ε_{2t}, is independently and normally distributed and $\Gamma_1, \Gamma_2, \cdots, \Gamma_{t-(k-1)}$ and Γ are coefficient matrices. Let $r = rank(\Gamma)$, then if $0 < r < p$ the matrix Γ can be partitioned into $p \times r$ matrices α and β such that $\Pi = \alpha\beta'$ and $\beta' z_t$ is I(0) (Johansen and Juselius, 1990). r is the number of cointegrating relationships and each column of β is the cointegrating vector. In this study the trace test (see, Johansen (1995)) is used to determine the number of cointegrating relationships between the variables in our bivariate models and in our multivariate model.

[2] For further information on the statistical analysis of cointegrated systems, see, for example, Hansen and Juselius (1995), Johansen (1995) and Johansen and Juselius (1990)

The sequential modified likelihood ratio (LR) test (see Lutkepohl, 1991) is used for determining the lag length of the VAR models. However, the lag length selection is combined with misspecification tests, in particular Lagrange multiplier (LM) tests for autocorrelation, to ensure that the residuals from the VAR models are white noise. For the bivariate models the lag length suggested by the LR test did not result in any cointegrating relationships, however, for a lag length of 8, cointegrating relationships were found in both cases and thus were employed for further investigation. The lag length employed for each model and the LM statistics are reported in Table 2. The LM test statistics do not suggest any misspecification problems with our specified VAR models.

[Table 2 around here]

Our tests for the existence cointegration vectors for each of the systems are presented in Table 3. The null hypothesis of *r* cointegration vectors is noted in column 1. On the basis of a 95% significance level, we find evidence of one cointegrating vector for each system. The normalized cointegrating vector from each system is presented in Table 4.

[Table 3 around here]

[Table 4 around here]

5.2 Granger Causality

In this section we investigate the causal relationships between FDI, imports and exports in both bivariate frameworks and a multivariate framework. It is now well established that if a set of I(1) variables is cointegrated, causality tests conducted in first difference VAR framework will be misspecified unless the error correction term is also included in the VAR specification. For example, if one wishes to investigate the causal relationship between FDI and exports in a multivariate model, the tests are conducted on error correction equations of the following forms:

$$(6) \qquad \Delta fdi_t = \sum_{i=1}^{k} \alpha_{1i} \Delta fdi_{t-i} + \sum_{j=1}^{k} \alpha_{2j} \Delta x_{t-j} + \sum_{p=1}^{k} \alpha_{3p} \Delta m_{t-p} + \sum_{q=1}^{k} \alpha_{4q} \Delta y_{t-q} + \delta_1 ECT_{t-1} + \varepsilon_{3t}$$

$$(7) \qquad \Delta x_t = \sum_{i=1}^{k} \beta_{1i} \Delta fdi_{t-i} + \sum_{j=1}^{k} \beta_{2j} \Delta x_{t-j} + \sum_{p=1}^{k} \beta_{3p} \Delta m_{t-p} + \sum_{q=1}^{k} \beta_{4q} \Delta y_{t-q} + \delta_2 ECT_{t-1} + \varepsilon_{4t}$$

where ECT is the error correction term derived from the long run cointegration relationship between FDI, exports, imports and GDP. Given such a specification short and long run causality can be tested. Looking at Equation 6, for example, significance of the α_{2j} terms implies exports "Granger causes" FDI in the short-run. The significance of the α_{2j} terms can be tested using a Wald test. Long-run causality, on the other hand can be investigated by testing the significance of the δ_1 by a *t*-test. A similar reasoning is applied for examining whether FDI Granger causes exports, and the causal relationships between other variables in the model.

If one wishes to investigate the causal relationship between FDI and exports in a bivariate framework, then the terms $\alpha_{3p}, \alpha_{4q}, \beta_{3p}$ and β_{4q} are set to zero, and the ECT would consist of residuals from the cointegration relationship between FDI and exports.

To maintain consistency with the cointegration rank estimation, we use the same lag length in the VAR models in testing for Granger causality. We begin with discussions on causality results from the bivariate frameworks which are given in Panel A and Panel B of Table 5. From these results it appears that there exists bidirectional causality between FDI and imports in the short run as the *p*-value associated with the Wald test in each equation is less than 0.05. The error correction terms are also significant which is indicative of bidirectional causality between FDI and imports in the long run. Similarly, we find the existence of bidirectional causality between FDI and exports in the long-run as well as the short-run. Our findings

corroborate the findings of, for example, Pacheco-López (2005) who carried out a similar analysis with Mexican data.

5.3 Comparing the bivariate and multivariate approach

The causal relationships indicated by the multivariate model, are somewhat different from those implied by the bivariate framework. Imports and exports do not Granger-cause FDI in the short-run within the multivariate framework. However, imports and exports appear to Granger-cause FDI in the long-run.

Although, in the long-run, FDI only causes exports, it appears to have a causal effect on the remaining three variables of the model in the short-run. Moreover, FDI is the only variable which seems to have a causal relationship on GDP. This suggests that, in contrast to those results reported elsewhere, there is little support for growth models based on import-led growth or export-led growth. We do, however, find evidence for bidirectional causality between FDI and GDP, suggesting that inward FDI is required in order to stimulate the development process, at least for countries such as Indonesia. Further, these results suggest that economic growth attracts FDI.

[Table 5 around here]

5.3 Impulse Response Functions

Following studies such as Pfaffermayr (1994), we also employ impulse response functions (IRFs) to further examine the impact of FDI on imports, exports and GDP. IRFs trace out the expected responses of imports, exports and GDP to a shock in FDI. IRFs enable characterization of the dynamic interactions among variables and allow the speed of adjustment of the variables to be observed. IRFs from many of the traditional methods,

however, are not unique and can change as the ordering of the model variables changes (see, for example, Sims (1982), Akbostanci (2004)). Thus, in this study we employ the generalised impulse responses method, developed by Koop et al., (1996) and Pesaran and Shin (1998). The generalised impulse responses are unique and invariant to the reordering of the variables in the VAR. The IRFs of imports and exports to a one standard deviation shock in FDI within a bivariate framework are presented in Figure 2 and the IRFs of imports, exports and GDP to a one standard deviation shock in FDI within a multivariate framework are presented in Figure 3.

Figures 1 and 2 around here

Within the bivariate framework FDI appears to have a positive initial effect on both imports and exports, which lasts for approximately one year. Subsequently, a downward trend is observed which lasts for approximately three years, followed by a three-year upward trend, after which the shocks to imports and exports appear to stabilise. Figure 2 suggests the response of Imports and Exports can be considered largely negative. This seems rather implausible, and highlights the arguments of Fontagné and Pajot (2000), Markusen and Venables (1998), and Pain and Wakelin (1998) on the flaws in conducting bivariate analysis. Stock and Watson (2001), for example, suggest that such findings are indicative of omitted variable bias, and indeed this is what these results suggest when compared with the multivariate case. The responses of imports, exports and GDP from the multivariate analysis are more in line with the theoretical predictions discussed above. Following a shock in FDI, imports, exports and GDP all show a positive response which appear to stabilize after a period of three years.

Figure 3 here

6. Conclusions and implications

The conclusion that inward direct investment in Indonesia leads to increased trade concurs with the general theories of development, and is indicative of vertical foreign direct investment.

The decline in trade and investment barriers in mid 1980s as well as the abolition of foreign ownership restriction in mid 1994 resulted in massive FDI inflows to the country up to the onset of the economic crisis in mid 1997. These FDI inflows to Indonesia were particularly focused in three manufacturing industries: textile and textile products, chemicals, and fabricated metal and machinery (Dhanani and Hasnain, 2002). According to UNCTAD (1998), Indonesia was ranked among the top twelve recipients of FDI inflows among developing and transition economies.

After liberalisation and deregulation in trade and foreign investment in 1985, new foreign firms entered mainly export-oriented and labour-intensive industries. Between 1990 and 1996, FDI contributed from 19 to 27 percent of total value added and from 20 to 35 percent of exports (Dhanani and Hasnain, 2002). An increase in inward FDI, therefore, had led to a rise in exports. Dhanani and Hasnain (2002) find that foreign firms in Indonesia imported 55 percent of their raw materials, inputs and components, more than double that of domestic firms. The increasing reliance of foreign firms on suppliers outside the host country was evident in all industries with a significant foreign presence, suggesting that inward FDI does indeed generate imports.

The results of our causality testing are largely consistent with results reported for Mexico by Alguacil et al. (2002) and Pacheco-López (2005). FDI and exports were found to have bilateral causalities in Indonesia during the analysed period, in that inward FDI is followed

by an increase in exports and an increase in exports leads to a rise in FDI inflows. However, the results also imply that the relationships are rather more complicated than suggested by earlier work, in that the growth effects of FDI are important, both in explaining the nature of causality, but more importantly what the long-run effects of inward FDI into developing or transition economies may be.

However, while these results highlight the undoubted benefits of FDI, they also point to an increased dependence on foreign investors for future development, and the concentration of resources in the foreign owned sector. Comparisons with Mexico are apposite here. In the case of Mexico, a series of reforms led to a significant increase in exports and imports in the country. However, as Pacheco-López (2005) asserts, if Mexico were to have a stable long-run economic growth, it is necessary for the government to better integrate the domestic industry and the export oriented sector aimed at strengthening local industries. Similarly, in the case of Indonesia, where foreign investments are also highly dependent on imported raw and/or intermediate inputs of production from international supply chains, it is thus important for the government to build an effective bridge between the domestic industry and the foreign export-oriented firms in order to make the most of the multinational presence in the country.

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Figure 1 Net FDI flows to Indonesia, 1987—2004

(Millions of USD)

Source: International Financial Statistics online service account, IMF website.

Table 1: ADF unit root tests

Variables	ADF test statistics	Specifications	Unit root?
fdi_t	-2.033	[T, 1]	Yes
Δfdi_t	-11.096	[C, 0]	No
m_t	-1.784	[T, 0]	Yes
Δm_t	-6.182	[C, 0]	No
x_t	-2.176	[T, 0]	Yes
Δx_t	-8.14	[C, 0]	No
y_t	-2.532	[T, 1]	Yes
Δy_t	-4.025	[C, 0]	No

Notes:
1. T: represents constant and trend, C: represents constant.
2. [, n], n: the number of lags used. The lag length is chosen in such a way to ensure the residuals from the models are white noise.
3. The critical values for the ADF test are approximately -4.121 (1% level) and -3.546 (1% first difference).
4. Critical values are from MacKinnon (1991).

Table 2: Lag length and misspecification tests

		FDI and Imports	FDI and Exports	FDI, Exports, Imports and GDP
Lag length		8	8	7
Autocorrelation Test	LM(1)	5.908 (0.21)	0.690 (0.95)	13.00 (0.67)
	LM(4)	4.884 (0.30)	7.396 (0.12)	10.19 (0.86)

Note:
Values in parentheses are *p*-values.

Table 3: Trace tests (Johanssen, 1995) for existence of cointegration vectors

Panel A: Test for the existence of *r* cointegration vectors between FDI and Imports and FDI and Exports

$H_0 : r$	Trace test statistics		*Trace 95*
	FDI and Imports	FDI and Exports	
0	21.580	20.796	*19.993*
1	**2.507**	**1.932**	*9.133*

Panel B: Test for the existence of *r* cointegration vectors between FDI, Exports, Imports and GDP

$H_0 : r$	Trace test statistics	*Trace 95*
	FDI, Imports, Exports and GDP	
0	77.144	*53.423*
1	**33.777**	*34.795*
2	16.436	*19.993*
3	4.645	*9.133*

Table 4: Cointegration vectors

	FDI	Exports	Imports	GDP	Constant
FDI, Imports model	1	-	-0.102	-	15.360
FDI, Exports model	1	-0.110	-	-	19.804
FDI, Exports, Imports, GDP model	1	0.614	-0.303	-0.096	-10.218

Table 5: Causality tests

Panel A: Causality tests for the FDI and Imports model

Dep. var / Ind. var	FDI	Imports
FDI	-	36.768*** (0.000)
Imports	14.530*** (0.0425)	-
ECT	-0.726*** [-3.567]	-1.681*** [-2.808]

Panel B: Causality tests for the FDI and Exports model

Dep. var / Ind. var	FDI	Exports
FDI	-	26.346*** (0.0004)
Exports	15.699*** (0.0280)	-
ECT	-0.566*** [-3.385]	-1.365*** [-2.362]

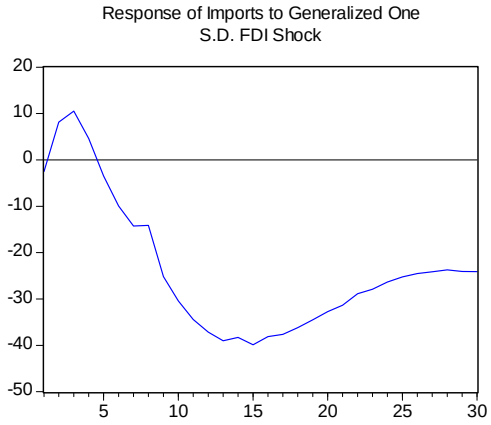
Panel C: Causality tests for the FDI, Exports, Imports and GDP model

Dep. var / Ind. var	FDI	Exports	Imports	GDP
FDI	-	23.387*** (0.0007)	14.958*** (0.0206)	15.427*** (0.0172)
Exports	4.047 (0.6704)	-	13.946*** (0.0302)	10.388 (0.1092)
Imports	3.385 (0.7593)	14.257*** (0.0269)	-	10.250 (0.1145)
GDP	19.459*** (0.0035)	18.260*** (0.0056)	5.667 (0.4615)	-
ECT	-0.623*** [-2.101]	-3.144*** [-3.839]	-1.424 [-1.709]	-1.891 [-0.675]

Notes:
(1) Dep. var = Dependent variable, Ind. var = Independent variable
(2) Values in brackets are *t*-statistics
(3) Values in parentheses are *p*-values associated with Wald test statistics
(4) *** denotes statistical significance at the 5% level

Figure 2: Impulse response functions of Imports and Exports to a shock in FDI within a bivariate framework.

Panel A:



Panel B:

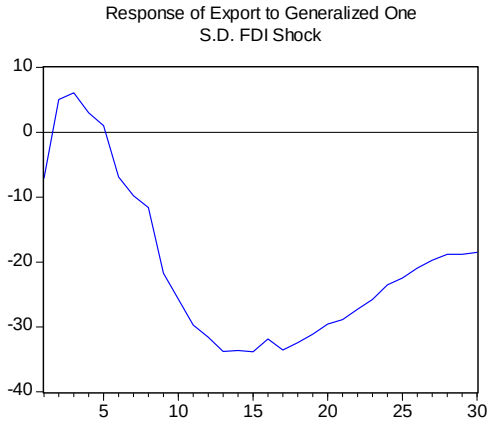
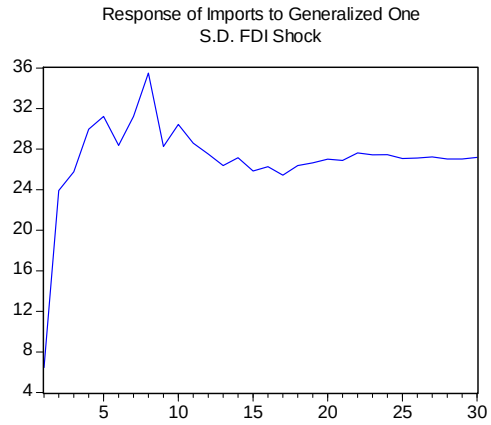
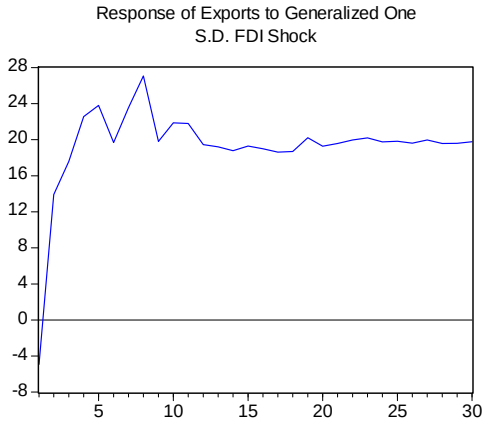


Figure 3: Impulse response functions of Imports, Exports and GDP to a shock in FDI within a multivariate framework

Panel A



Panel B



Panel C