DEPARTMENT OF ECONOMICS

ISSN 1441-5429

DISCUSSION PAPER 11/07

NEW EVIDENCE ON THE CAUSAL LINKAGES BETWEEN FOREIGN DIRECT INVESTMENT, EXPORTS AND IMPORTS IN MALAYSIA

Koi Nyen Wong[*] and Tuck Cheong Tang[†]

ABSTRACT

By extending Wong and Tang's (2007) study, this study aims to further explore the causal relations between FDI (foreign direct investment), exports and imports. There is a unique long-run causal relationship running from exports as well as imports to FDI. A bi-directional causal relationship exists between exports and imports. These findings provide useful policy implications for sustaining FDI inflows on one hand and promoting links between multinational corporations (MNCs) and local firms on the other.

Keywords: Causality; exports; imports; foreign direct investment

JEL classification codes: C22; F21

* School of Business, Monash University Malaysia, 2 Jalan Universiti, Bandar Sunway, 46150 Petaling Jaya, Selangor Darul Ehsan, Malaysia.
† Corresponding author, E-mail: tang.tuck.cheong@buseco.monash.edu.my

NEW EVIDENCE ON THE CAUSAL LINKAGES BETWEEN FOREIGN DIRECT INVESTMENT, EXPORTS AND IMPORTS IN MALAYSIA

1. Introduction

Since the adoption of a series of industrialization programs e.g. import-substituting industrialization policy in the 1960s, export-oriented industrialization policy in the 1970s and the Industrial Master Plans of the 1980s and 1990s, the foreign direct investment (FDI) has contributed to the Malaysian economy through expanding exports, creating employment and also providing an important channel for global integration and technology transfer. A large part of the manufacturing sector has been dominated by multinational corporations (MNCs), which use Malaysia as a production base for exports to their home countries or third markets. Thus, FDI inflows are highly concentrated in this sector. In 2006, the contribution to total proposed capital investment by foreign firms in the manufacturing sector was 36%, and Japan accounted for 21.8% of the total foreign investment in approved projects followed the Netherlands (16.2%), Australia (12.7%), the United States (U.S.) (12.2%), and Singapore (9.3%)(MIDA, 2007). In this regard, they not only play an important role in industrialization process but also have the prospect of moving up the industrialization scale for Malaysia such as providing investment in new and advanced technologies, which are an important source of total factor productivity (TFP) growth.

Conceptually, the causal relationship between FDI and exports could run both ways. For instance, foreign firms may choose to serve foreign markets through FDI by setting up a production base in the host country according to the country's comparative cost advantage (Pugel and Lindert, 2000). Over time, the exports of the host country increase because MNCs have good access to international marketing networks, which implies FDI inflows promote exports. After some period, MNCs might add new financial capital to existing capital stock when their exports become competitive and profitable in the international markets, which supports the reverse causation i.e. exports stimulate FDI

inflows. In addition to the causal links between FDI inflows and exports, the former also induces backward linkages i.e. inputs are being imported from abroad or the home countries of MNCs for value added in the host country; thus, FDI inflows promotes imports. If the imports of the host country are large enough to justify the establishment of production bases by foreign firms for import substitution, then the reverse causation might also occur; therefore imports stimulate FDI inflows.

The contributions of the present paper are twofold: Firstly, this paper examines the possible causality relationships between FDI, exports and imports since the available evidence on this study is limited. For an example, Pacheco-López (2005) found there exists a bi-directional causality between FDI and exports as well as imports in Mexico. Moreover, this paper is an extension of previous study by Wong and Tang (2007), which only examined the causality between FDI and exports using the Malaysian electronics exports as a case study. Secondly, the findings provide important policy implications for sustaining FDI inflows in order to enhance Malaysia's export competitiveness in the international markets in the light of most Southeast Asian nations have witnessed the bulk of FDI drift towards People's Republic of China (PRC) since the Asian financial crisis in 1997. The findings can also be used to design appropriate policies to increase local industrial linkages and content.

The rest of this paper is organized as follows. Section 2 describes the data and the results of unit root tests and, the Granger non-causality approach (Toda and Yamamoto, 1995). Section 3 illustrates the empirical findings, and concluding remarks are summarized in Section 4.

2. Data and Causality test

Data

All the time-series data are quarterly spanning from the first quarter of 1999 to the third quarter of 2006, which give 31 observations. The choice of this sample period is based on the availability data, which were obtained from the *International Financial Statistics* of International Monetary Fund (IMF). The variables FDI, exports (EX), and imports (IM)

are expressed in real terms (deflated by GDP deflator, i.e. 2000 = 100) before they are transformed into natural logarithmic (*ln*) forms.

Table 1 reports the results of unit root tests, which are based on the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test statistics. Both test results suggest *I*(1) (i.e. non-stationary) for all the variables under study; except for the FDI variable, which is *I*(0) and exhibits two structural breaks in the fourth quarter of 2001 and the first quarter of 2003 over the sample period by the time-series plot. Hence, a unit root test with an unknown break date (Lanne, *et al*., 2002) is further applied on *ln*FDI. The suggested break date is in line with the earlier structural break that is at the fourth quarter of 2001. The computed test statistic of -2.6629 (with impulse dummy and four lags as suggested by SIC), which cannot reject the null hypothesis of a unit root with unknown break date at the 10 per cent level of significance with a critical value of -2.86 (with sample size of 50) concluding that *ln*FDI is *I*(1).

Table 1: Unit root tests

	ADF	PP
$Ln\text{FDI}_t$	-4.824 [0] (0.0028)***	-4.820 [1] (0.0029)***
$\Delta Ln\text{FDI}_t$	-	-
$Ln\text{EX}_t$	-2.550 [0] (0.3038)	-2.55 [0] (0.3038)
$\Delta Ln\text{EX}_t$	-7.264 [0] (0.000)***	-7.862 [10] (0.000)***
$Ln\text{IM}_t$	-3.152 [0] (0.1132)	-1.977 [1] (0.2948)$^{\#}$
$\Delta Ln\text{IM}_t$	-7.502 [0] (0.000)***	-8.765 [8] (0.000)***

Notes: For the data in levels, constant and trend were included, while constant only was imposed on the data in first differences. [.] denotes the lag(s) suggested by Schwarz information criterion (SIC) for ADF tests and by Newy-west using Bartlett Kernel for PP tests. (.) is p-value. ***, **, and * denote the rejection of the null hypothesis of a unit root at 1%, 5%, and 10%, respectively.
$^{\#}$ the PP equation was estimated without trend variable.

Causality test

The Granger non-causality approach (Toda and Yamamoto, 1995) is used to test for the (long-run) causal relationships between FDI, EX and IM. The advantage of using this approach is that the test does not depend on whether y_t is stationary (around a linear trend), *I*(1), or *I*(2), or on whether y_t is cointegrated or not. More specifically, the test has a limiting chi-squared distribution even if there is no cointegration or the stability and rank conditions are not satisfied as long as the order of integration of the process does not exceed the true lag length of the model (Toda and Yamamoto, 1995, p. 225). The test has

an asymptotic chi-squared distribution when an augmented VAR, VAR($k+d_{max}$), is estimated, where d_{max} is the maximum order of integration suspected to occur in the system. This is an alternative approach to the Granger (1969; 1988) causality methodology, which is based on a modified Wald test for restrictions on the parameters of a VAR(k), where k is the lag length in the VAR system.

A maximum of 4 lags is being imposed on the VAR specification because of the degrees of freedom problem. Since all the variables are $I(1)$, thus, VAR(4+1) is specified. In addition, a dummy variable, *Dum*, is included in the VAR specification. It takes on the values of one for the fourth quarter of 2001 and the first quarter of 2003, which indicate the break dates and zero otherwise. The VAR specification for non-causality analysis can be written as follows:

$$LnFDI_t = b_0 + \sum_{j=1}^{5} b_1 LnFDI_{t-j} + \sum_{j=1}^{5} b_{2j} LnEX_{t-j} + \sum_{j=1}^{5} b_{3j} LnIM_{t-j} + b_4 Dum + c + u_t \qquad (1)$$

$$LnEX_t = \alpha_0 + \sum_{j=1}^{5} \alpha_1 LnFDI_{t-j} + \sum_{j=1}^{5} \alpha_{2j} LnEX_{t-j} + \sum_{j=1}^{5} \alpha_{3j} LnIM_{t-j} + \alpha_4 Dum + c' + u_t' \qquad (2)$$

$$LnIM_t = c_0 + \sum_{j=1}^{5} c_1 LnFDI_{t-j} + \sum_{j=1}^{5} c_{2j} LnEX_{t-j} + \sum_{j=1}^{5} c_{3j} LnIM_{t-j} + c_4 Dum + c'' + u_t'' \qquad (3)$$

For example, in equation (1), the null hypothesis of non-causality from EX to FDI ($b_{21} = b_{22} = b_{23} = b_{24} = 0$) can be tested using a Wald test. The null is rejected if the b_{2j} are jointly significantly different from zero.

3. Non-Causality results

It is interesting to note that only the estimated dummy variable, *Dum*, in equation (1) is statistically significant (with a p-value of 0.000), which supports the analysis of the previous time-series properties that the FDI has experienced structural breaks. The results of non-causality tests are summarised in Table 2.

Table 2 Causality tests

Direction of causation	Test statistics (p-value)
*Ln*EX =/=> *Ln*FDI	7.971 (0.0926)*
*Ln*FDI =/=> *Ln*EX	4.654 (0.3247)
*Ln*IM =/=>*Ln*FDI	7.592 (0.0177)*

*Ln*FDI =/=> *Ln*IM	6.5541 (0.1614)
*Ln*IM =/=> *Ln*EX	12.159 (0.0162)**
*Ln*EX =/=> *Ln*IM	16.650 (0.0023)***

Notes: =/=> denotes 'does not Granger-cause'. The reported test statistics are based on a Wald test with a chi-square distribution. ***, **, and * denote the rejection of the null hypothesis of a unit root at 1%, 5%, and 10%, respectively.

The first set of regression results indicate there is a causal relationship that runs from EX to FDI, which implies that the performance of Malaysian exports can stimulate more FDI inflows in the long run. However, there is no evidence of long-run reverse causality from FDI inflows to EX because FDI has been increasingly directed to non-tradables and services in tandem with the progressive liberalization of the financial and retail sectors in Malaysia. For example, foreign banks are expanding their banking and financial services through out Malaysia and the outlets of foreign-owned hypermarkets are being set up in major townships.

The second set of regression results show a unidirectional causality from IM to FDI i.e. import stimulate FDI inflows in the long run, which is supported by the theoretical analysis that a rise in imports in the host country justifies investment and production by MNCs (Pacheco-LÓpez, 2005). On the other hand, the findings do not support the argument of backward linkages in the long run, i.e. FDI does not promote imported inputs, because most MNCs produce manufactured goods that are highly dependent on generic inputs with the exception for products that require high technology e.g. electronics (Sieh-Lee and Yew, 1997). So, at the input end, the local industry has links with multinational trade and investment activities.

Finally, the causation from exports to imports can be explained by the high import contains of exports which produced by MNCs such as imported raw materials, investment goods, and intermediate goods. Meanwhile, the causality from imports to exports can be related to the supply-side view that imports especially those as inputs for exports production do stimulate exports. By and large, the finding of bi-directional causality between exports and imports further supports the sustainability of the Malaysian trade balances as found by Tang (2003).

4. Concluding remarks

This paper provides new evidence on the causal linkages between FDI, exports and imports for Malaysia. The major findings indicate that there is a unique long-run causal relationship running from exports as well as imports to FDI, which clearly support the theoretical argument that trade liberalization in Malaysia can attract FDI inflows, which can foster technology transfer and lead Malaysia's transition towards high-technology industrialization. With reference to the non-causality from FDI to exports in the long-run, it implies that FDI is increasingly directed to the non-tradables and services sectors as evidenced by the expansion of braches of foreign banks and the retail outlets of foreign-owned hypermarkets as a result of progressive liberalization of financial and retail sectors by the Malaysian government.

Although the findings do not advocate the hypothesis of backward linkages in the long run, to some extent, we have instances of MNCs importing the more sophisticated parts and components from overseas because they are either not available locally or are being sourced abroad by preference according to a survey being studied on Malaysian manufacturing linkages by O'Brien (1993). To mitigate the high important content of electronics exports, the Malaysian government should establish manpower training programs as an integral part of the industrial development, which is crucial to acquisition of core and emerging technology.

References

Granger, C.W.J. (1969) "Investigating causal relations by econometric models and crossspectral methods" *Econometrica*, **37**, 424-438.

Granger, C.W.J. (1988) "Some recent developments in a concept of causality" *Journal of Econometrics*, **39**, 199-211.

Lanne, M., Lütkepohl, H. and Saikkonen, P. (2002) "Comparision of unit root tests for time series with level shifts" *Journal of Time Series Analysis*, **23**, 667-685.

MIDA (2007) "Approved manufacturing projects with foreign participation by source, 2006 and 2005" (http://www.mida.gov.my/).

O'Brien, L. (1993). Malaysian Manufacturing Sector Linkages, in K.S. Jomo (eds), *Industrialising Malaysia: Policy, Performance, Prospects*, London: Routledge, p. 147-162.

Pacheco-LÓpez, P. (2005) Foreign Direct Investment, Exports and Imports in Mexico, Department of Economics, *Studies in Economics*, University of Kent, no. 0404, 1-24 (http://www.kent.ac.uk/economics/papers/papers-pdf/2004/0404.pdf)

Pugel, T.A. and Lindert, P.H. (2000). *International Economics*, McGraw-Hill, International Edition.

Sieh-Lee, M.L. and Yew, S.Y. (1997). Malaysia: Electronics, Automobiles, and the Trade-Investment Nexus, in W. Dobson and S.Y. Chia (eds), *Multinationals and East Asia Integration*, Singapore: Institute of South-East Asian Studies.

Tang, T. C. (2003). "Are imports and exports of the five ASEAN economies co-integrated? An empirical study" *International Journal of Management*, **20**, 88-91.

Toda, H.Y. and Yamamoto, T. (1995) "Statistical inference in vector autoregressions with possibly integrated processes" *Journal of Econometrics*, **66**, 225-250.

Wong, K.N. and Tang, T.C. (2007) "Foreign direct investment and electronics exports: exploratory empirical evidence from Malaysia's top five electronics exports", *Economics Bulletin*, Vol. 6, No. 14, 1-8.