Asymmetric Real Exchange Rate and Foreign Direct Investment Determinants: An Empirical Study of Malaysia

Hock Tsen Wong[1*]
[1]*Faculty of Business, Economics & Accountancy, Universiti Malaysia Sabah, Malaysia.*

Abstract: Research Question: This study examines the impact of macroeconomic variables and also the asymmetric impact of the real exchange rate on foreign direct investment (FDI) by country in Malaysia, namely Japan, the United States of America, Singapore, Germany Taiwan, Korea, Australia, the United Kingdom, Hong Kong and India. Moreover, this study investigates macroeconomic determinants of FDI of those countries as a group in Malaysia. **Motivation:** The promotion of FDI shall consider potential heterogeneous of FDI from different country as the source or type of FDI likely different from country. **Idea:** There are not many studies investigate the asymmetric impact of the real exchange rate on FDI. **Data:** The data is yearly from 1980 to 2017, except for Korea the data is from 1981 to 2017 due to the availability of the data begins from 1981. **Method/Tools:** The importance of macroeconomic variables as FDI determinants by country in Malaysia is examined by the autoregressive distributed lag model (ARDL) approach. Conversely, the importance of macroeconomic variables as FDI determinants of those countries as a group in Malaysia is estimated by the system generalized method of moments (GMM) of the Arellano-Bond estimator. **Findings:** The results of the autoregressive distributed lag model (ARDL) approach show the determinants of each country are not the exactly the same. The results of the non-linear autoregressive distributed lag model (NARDL) approach shows that there is some evidence of the asymmetric impact of the real exchange rate on FDI in the long run and short run. The results of the system generalized method of moments (GMM) of the Arellano-Bond estimator reveal that the real exchange rate, positive real exchange rate, negative real exchange rate, real national income, trade openness and real average wage are found to be the main macroeconomic determinants of FDI from Japan, the United States of America, Singapore, Germany Taiwan, Australia, the United Kingdom, Hong Kong and India. **Contributions:** The implications for policymakers are to promote a dynamic competitive

* Corresponding author: Hock Tsen Wong. Tel.: +6088-320000.
Email: htwong@ums.edu.my
Acknowledgements: The author would like to thank the reviewers of the journal for their constructive comments on an early version of the paper. The author would like to thank Universiti Malaysia Sabah for financial assistance of this study through the *SKIM GERAN PENYELIDIKAN* UMS (SPGUMS) 2017 – *Skim Penyelidikan Bidang Keutamaan* (SPBK) (SBK0328-2017). The author would like to express acknowledgement to Malaysian Investment Development Authority (MIDA) for providing some FDI information. The author would like to acknowledge MPWS Rich Proofreading and Translation Services for the services of proofreading.

Received 25 Jan 2021; Final revised 12 July 2022; Accepted 19 July 2022; Available online 15 August 2022.
To link to this article: https://www.mfa.com.my/cmr/v30_i2_a2/

advantage in the home country and therefore policymakers need to pay more attention to their macroeconomic policies to reduce production and transaction costs of FDI.
Keywords: Foreign direct investment, real exchange rate, asymmetric real exchange rate, Malaysia.
JEL Classification: F21, F31

1. Introduction

Foreign direct investment (FDI) is a significant area of research in economics not only in-depth but also in breadth (Paul and Feliciano-Cestero, 2021). The globalisation of the world economy increases FDI (Chen *et al.*, 2019; Van Cauwenberge *et al.*, 2019). FDI enhances economy activities in the host country (Li and Tanna, 2019). Malaysia is a hub of FDI in the Asian region. In the period of 1980-2017, Japan, the United States of America, Singapore, Germany, Taiwan, Korea, Australia, the United Kingdom, Hong Kong and India were the main sources of FDI in Malaysia. The inflow of FDI from those countries was among the most important source of FDI. In 2017, FDI from those countries was about Malaysian Ringgit (RM) 1,311 million, RM1,107 million, RM2,307 million, RM1,517 million, RM755 million, RM659 million, RM1,270 million, RM500 million, RM1,494 million and RM38 million, respectively (Table 1). The inflow of FDI fluctuated over time. Hence, there was no permanent trend or pattern in FDI. Also, there was no dominant inflow of FDI in Malaysia over time. The sum of the inflow of FDI from the selected countries was quite substantial and can give a pattern of the inflow of FDI in Malaysia. Moreover, those countries represent an important source of FDI from the European, Western and Asia regions. There are positive correlations between the logarithm of FDI by country and the logarithms of real national income in Malaysia, respectively. The coefficients of correlation of logarithm of FDI by country, namely Japan, the United States of America, Singapore, Germany, Taiwan, Korea, Australia, the United Kingdom, Hong Kong and India with logarithm of real national income in Malaysia were 0.54, 0.59, 0.77, 0.75, 0.30, 0.73, 0.32, 0.26, 0.24 and 0.35, respectively. This may indicate that FDI promotes real national income. Figure 1 exhibits the upward trend pattern of FDI and also the close movements of the logarithm of FDI by individual countries and the logarithm of real national income in Malaysia over time. FDI moves towards the same direction, that is, an upward trend. The literature on FDI demonstrates a positive impact of FDI on the economy. FDI is not only a way for a country to jump into new technology and to restructure its economy and also FDI can help to reduce economic inequality between and within country (Ascani *et al.*, 2020).

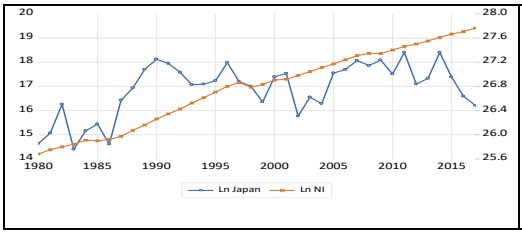
Thus, every country competes to attract FDI. Many policies have been implemented to attract FDI like attractives investment incentive, good institutional landscape, bilateral investment protection agreement and flexible ownership in the foreign company (Belloumi, 2014; Lucke and Eichler, 2016; Nielsen *et al.*, 2017; Ascani *et al.*, 2020; Hoshi and Kiyota, 2019). FDI is said driven by possibilities for global market exploitation, the pursuit of advantageous localisations and the need to rival the sourcing efficiency of its competitors (Bolivar *et al.*, 2019).

Table 1: FDI in Malaysia by Country, 1980-2017 (RM Million)

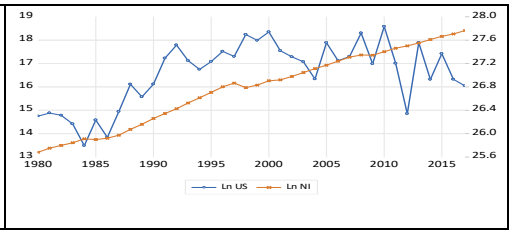
	1980	1990	2000	2010	2015	2016	2017
Japan	94	4,213	2,881	4,029	4,009	1,862	1,311
	(12.9)	(23.9)	(14.5)	(13.9)	(18.3)	(6.8)	(6.1)
The United States of America	105	567	7,492	11,739	4,150	1,413	1,107
	(14.4)	(3.2)	(37.7)	(40.4)	(18.9)	(5.2)	(5.1)
Singapore	117	895	1,778	2,157	1,395	2,114	2,307
	(16.1)	(5.1)	(9.0)	(7.4)	(6.4)	(7.7)	(10.7)
Germany	38	127	1,656	1,937	1,161	2,645	1,517
	(5.2)	(0.7)	(8.3)	(6.7)	(5.3)	(9.6)	(7.0)
Taiwan	24	6,339	916	1,256	1,275	549	755
	(3.3)	(36.0)	(4.6)	(4.3)	(5.8)	(2.0)	(3.5)
Korea	-	650	723	199	1,353	2,169	659
		(3.7)	(3.6)	(0.7)	(6.2)	(7.9)	(3.1)
Australia	9	54	130	69	255	71	1,270
	(1.3)	(0.3)	(0.7)	(0.2)	(1.2)	(0.3)	(5.9)
The United Kingdom	48	867	772	329	147	2,575	500
	(6.6)	(4.9)	(3.9)	(1.1)	(0.7)	(9.4)	(2.3)
Hong Kong	18	375	345	2,766	3,181	265	1,494
	(2.4)	(2.1)	(1.7)	(9.5)	(14.5)	(1.0)	(6.9)
India	6	219	3	50	26	1,334	38
	(0.9)	(1.2)	(0.0)	(0.2)	(0.1)	(4.9)	(0.2)

Notes: Values in the parentheses are percentages of total FDI in Malaysia.

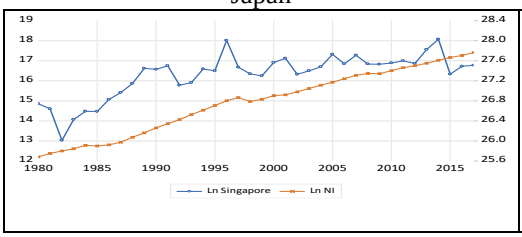
Source: Malaysian Investment Development Authority.



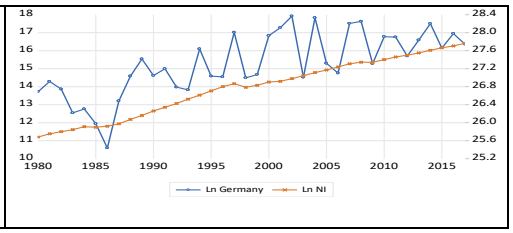
Japan



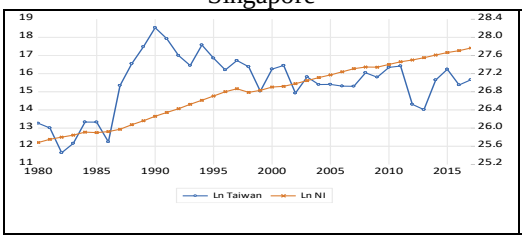
The United States of America



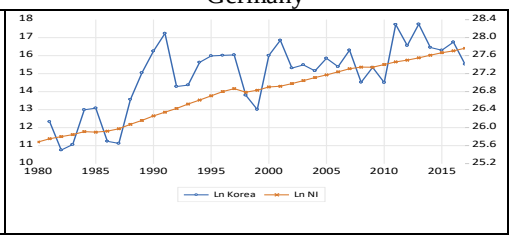
Singapore



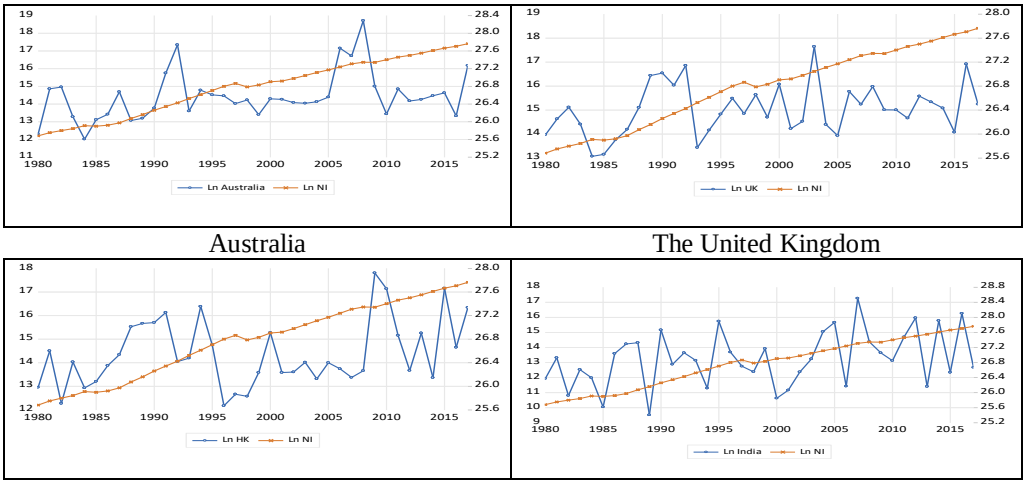
Germany



Taiwan



Korea



Australia | The United Kingdom

Hong Kong | India

Figure 1: Logarithm of FDI by Individual Country and Logarithm of Real National Income in Malaysia, 1980-2017

There is no single theory for FDI determinants (Dunning, 2009), which implies that there are many sources or determinant factors for FDI. The book written by Dunning (2009) is a comprehensive book on the determinants of FDI. Country-specific characteristics may be important FDI determinants. Additionally, FDI determinants may not be the same for every country (Kinuthia and Murshed, 2015; Ly *et al.*, 2018; Magnier-Watanabe and Lemaire, 2018; Bolivar *et al.*, 2019). Petri (2012) shows that FDI in Asia counties follows the pattern of the flying geese model of technological development, that is, transfers of technology from more advanced economies to less advanced ones. Hence, the importance of determinants of FDI are not the same for more advanced economies and the less advanced ones. Kinuthia and Murshed (2015) also report that Malaysia's success in attracting FDI compared to Kenya is due to differences in macroeconomic stabilisation, trade policies, infrastructure, and institutional factors. Exchange rate depreciation could influence FDI in either direction. When the exchange rate depreciates, export-oriented FDI profits from more export for relatively cheaper export rate. This attracts more export-oriented FDI to the host country. On the other hand, domestic- oriented FDI may experience an increase in cost of imported inputs and thus a decline in their profits. This discourages domestic oriented FDI (Boateng *et al.*, 2015; Bahmani-Oskooee and Saha, 2016). Hence, the overall impact of exchange rate depreciation on FDI could be asymmetric, that is, the impact of the real exchange rate depreciation is different from the impact of the real exchange rate appreciation. Bahmani-Oskooee and Saha (2016) exhibit the impact of exchange rate asymmetry on the stock prices of companies. However, the same principle can be applied to exchange rate asymmetry and FDI companies. The exchange rate could have a different impact on FDI.

The present study investigates the importance of macroeconomic variables as FDI determinants by country in Malaysia, namely Japan, the United States of America, Singapore, Germany, Taiwan, Korea, Australia, the United Kingdom, Hong Kong and India. FDI determinants may likely not be the same for every country as location comparative advantage for FDI from a country may not be the same for FDI from another country. The promotion of FDI shall consider potential heterogeneous on FDI from different countries as the source or type of FDI likely different from the country. FDI in the manufacturing sectors can be categorised into different categories such as science-based (such as electronics and

chemicals), supplier dominated (such as textiles and food products), scale-intensive (such as automotive and plastics) and specialised supplier (such as machinery and equipment) (Ascani *et al.*, 2020). Different FDIs seek different attractions. Therefore, strategic policy to attract FDI may to be better to be applied by the country. The knowledge of FDI determinants by country can assist to identify the global network structure of FDI. This would help the relevant authority to negotiate and to foster FDI policy in the country (Bolivar *et al.*, 2019; Nguyen *et al.*, 2020). Moreover, this study examines the importance of macroeconomic variables as FDI determinants of those countries as a group in Malaysia, namely Japan, the US, Singapore, Germany, Taiwan, Australia, the United Kingdom, Hong Kong and India. Also, there are not many studies on FDI determinants by country (Brada *et al.*, 2019). Furthermore, there are not many studies investigating the asymmetric impact of the real exchange rates on FDI. Petri (2012), and Nguyen *et al.* (2020), among others, inspect the determinants of bilateral FDI in Asia but the focus is not on the exchange rate. The impact of the real exchange rate appreciation on FDI is likely not the same as the impact of the real exchange rate depreciation on FDI. Hence, the different policies in FDI shall be implemented when the real exchange rate is strong than when the real exchange rate is weak (Bahmani-Oskooee and Saha, 2016). Bahmani-Oskooee and Saha (2016) reported that changes in exchange rate have an asymmetric impact on firms and therefore the same conclusion can be applied for FDI. Ding *et al.* (2022) report that financial constraints and information asymmetry are two underlying mechanisms for FDI. Constrained firms are unlikely to invest in areas in which they have less experience. Country-specific experience is particularly important in countries with poor information transparency. Certainly, an export-oriented FDI prefers to invest in a country with a weak currency. Contrary, a domestic-oriented FDI that wishes to have more sales in the domestic market would prefer a country with a stable or strong currency. The importance of macroeconomic variables as FDI determinants by country in Malaysia is examined by the Autoregressive Distributed Lag Model (ARDL) approach and the asymmetric impact of the real exchange rate is examined by the Non-Linear Autoregressive Distributed Lag Model (NARDL) approach. Conversely, the importance of macroeconomic variables as FDI determinants of those countries as a group in Malaysia is estimated by the system generalized method of moments (GMM) of the Arellano-Bond estimator. Therefore, this study provides some empirical evidence of the important determinants of FDI in the group, which is likely may not be the same by country.

2. Literature Review

There are a few studies on FDI determinants in Malaysia (Wong, 2005; Ang, 2008; Tang *et al.*, 2014; Kinuthia and Murshed, 2015). However, the impact of the asymmetric impact of the real exchange rate is not examined. Ang (2008) reports that real gross domestic product (GDP), the growth rate of GDP, financial development, infrastructure development, trade openness and higher macroeconomic uncertainty promote FDI in Malaysia. Macroeconomic uncertainty is expressed by inflation uncertainty. Tang *et al.* (2014) show that GDP, real effective exchange rate, financial development and macroeconomic uncertainty are found to have a positive impact whilst corporate income tax and social uncertainty are found to having detrimental impact on FDI in the electrical and electronic (E&E) industry in Malaysia in the long run. All explanatory variables are found to Granger cause FDI in the E&E industry in the long run. Macroeconomic and social uncertainties are found to Granger cause FDI in the E&E industry in the short run. Kinuthia and Murshed (2015) demonstrate that macroeconomic stabilisation, trade policies, infrastructure and institutional factors are the key determinants to attracting FDI in Malaysia. As a whole, these studies examine FDI

determinants for the whole country and not FDI determinants for the bilateral country, which is important for policy implication to promote FDI by country.

There are many essential FDI determinants reported in the literature of FDI. However, these studies focus on FDI determinants for the whole country and not FDI determinants for the bilateral country. Also, the influence of the real exchange rate is not examined. (Zhai, 2014; Nielsen *et al.*, 2017; Ly *et al.*, 2018; Raff *et al.*, 2018; Yan *et al.*, 2018). Paul and Feliciano-Cestero (2021) provide an excellent overview of FDI, that is, the most commonly used theories, variables, statistical methods and so forth. The empirical evidence of FDI from the country level or industry level is good for policy-makers to bring FDI. There had been an extensive rise in FDI research and publication in the past years. Macroeconomic variables can influence location advantage for FDI. Boateng *et al.* (2015) report that the real GDP, sector GDP, exchange rate and trade openness are found to have a significant positive impact whilst money supply, inflation, unemployment and interest rate are found to have a significant negative impact on FDI in Norway. Macroeconomic variables are argued to explain the changing pattern of FDI in Norway. Macroeconomic factors are key elements of locational specific advantage that exert a significant influence on FDI in recent years (Dunning, 2009). However, these studies do not examine the asymmetric impact of the real exchange rate on FDI.

Macroeconomic policies can reduce the production and transaction costs of FDI and therefore macroeconomic policies are important for FDI. Fan *et al.*, (2018) demonstrate that an increase in minimum wage will lead to an increase in outward FDI from China. Moreover, outward FDI is found to be stronger for more productive firms, foreign ownership firms, labour-intensive firms, coastal FDI firms and production-oriented FDI firms. Nguyen *et al.* (2020) report that unskilled labour-cost advantages are an important channel that drives FDI within Asia. This is supported by facts on the movements of FDI from China to other low-wage Asian countries as rising wages in China. Hence, policies lowing trading costs such as China's belt and road initiative significantly attract FDI. Uddin *et al.* (2019) reveal that good institutional environment attracts FDI such as government size, legal environment, trade openness and form of government. Villaverde and Maza (2015) reveal that the important FDI determinants are economic potential, labour market characteristics, technological progress and competitiveness. Nonetheless, market size and labour regulation are found to be insignificant FDI determinants. Desbordes and Wei (2017) show that country's financial development (SFD) and destination country's financial development (DFD) affect positively FDI. The economic impacts of SFD and DFD are about the same, but their effects vary across margins and types of FDI. The impact of the real exchange rate on FDI is not investigated. Vo (2018) uses the panel data and exposes that FDI in Vietnam depends on the market size, inflationary risk and the stock market volatility of the source country and the bilateral trade link and distance between the source and the host country. Nonetheless, the influence of the real exchange rate and also of the asymmetric impact of the real exchange rate on FDI are not examined.

Bolivar *et al.* (2019) report that country features such as size, openness, skill levels and institutional stability influence FDI and the network structure and the power positions of each country. Ascani *et al.* (2020) show that inter-sectoral linkages of FDI alter local innovative activity. The link between FDI and local innovation is positive but does not surpass local administrative boundaries on aggregate. Brada *et al.* (2019) report that an increase in the level of corruption in the host country or the level of the difference between corruption in the host country and the home country will lead to a decrease in FDI, is affected. Therefore, a clean institution is good for promoting FDI. FDI from a country with, better institutional quality shows greater investment efficiency than FDI from a country with, weaker institutions (Chen *et al.*, 2019). Li and Tanna (2019) show that institutional

quality is relatively more important than human capital development for developing countries to absorb total factor productivity gain from FDI. Li *et al.* (2019) reveal that negative sentiment influences is strong on FDI than positive sentiment and the accumulated sentiment is strong than transient sentiment. National sentiment affects FDI. FDI can be sensitive to macroeconomic issues. Therefore, macroeconomic variables could strongly affect FDI.

Overall, there is a huge literature on FDI determinants but there is no consensus on a set of determinants. Regularly, the key macroeconomic FDI determinants are real income, real wage, the real exchange rate, trade openness, financial development, and macroeconomic and social stability. FDI determinants may not be the same for all countries. Petri (2012), Nguyen *et al.* (2020), among others, investigates the macroeconomic determinants of FDI by country but do not examine the impact of the real exchange rate and also the asymmetric impact of the real exchange rate on FDI. The impact of the real exchange rate on FDI can be asymmetric and therefore a different policy for FDI shall be implemented to promote FDI (Bahmani-Oskooee and Saha, 2016). FDI can promote the economy and economy expansion might stimulate FDI (Wong, 2003). The ARDL approach is widely used to estimate FDI determinants in the literature. There are not many studies examining the impact of the real exchange rate asymmetric effects on FDI. It is important as the effect of the real exchange rate depreciation and the effect of the real exchange rate appreciation may not be the same. Therefore, its impact on the economy is not the same.

3. Methodology

Real FDI (FDI_t) is expressed as $FDI_t = \frac{NFDI_t}{CPI_t}$, where $NFDI_t$ is FDI in approved projects in the manufacturing sector (RM million) and $CPI_{,t}$ is consumer price index (CPI) in Malaysia (2010 = 100). The real exchange rate (RER_t) is expressed as real effective exchange rate (REER, 2010 = 100, based on CPI). REER is a measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper. Consequently, an increase indicates a loss in trade competitiveness (International Monetary Fund, 2022). Real national income (NI_t) is expressed as$RNI_t = \frac{NI_t}{GDPD_t}$, where NI_t is gross national income in Malaysia (RM million) and $GDPD_t$ is GDP deflator in Malaysia (2010 = 100). Real average wage (RAW_t) is expressed as, $RAW_t = \frac{\frac{SW_t}{TN_t}}{CPI_t}$, where SW_t is salary and wage paid in the manufacturing sector in Malaysia (RM million) and TN_t is the total number of persons engaged in the manufacturing sector. Trade openness (TO_t) is expressed as $TO_t = \frac{XM_t}{GDP_t}$, where XM_t is total exports and imports in Malaysia (RM million) and $GDP_t$is GDP in Malaysia. Inflation (INF_t) is inflation in Malaysia ($INF_t = \frac{CPI_t - CPI_{t-1}}{CPI_t} \times 100$). A dummy variable ($D_t$) is used to capture the Asian financial crisis, 1997-1998, that is, 1 for the years 1997-1998 and 0 for the rest of the years. During the Asian financial crisis, the Malaysian economy was strongly affected (Ariff and Abu Bakar, (1999). Financial development (FD_t) is expressed as $FD_t = \frac{BM_t}{GDP_t}$, where BM_t is broad money in Malaysia (RM million). Real infrastructure ($INFRA_t$) is expressed as $INFRA_t = \frac{NINFRA_t}{CPI_t}$, where $NINFRA_t$ is development expenditure of the Malaysian federal government in transport, communication, electricity and water and trade and industry (RM million). Autocracy (AC_t) is institutionalised autocracy in Malaysia, which is the institution freedom index for a measure of governance or how the government is run. Polity (PO_t) is a polity revised combined polity score in Malaysia, which is a measure of how a government is

formed and elected. FDI data were obtained from the Malaysian Investment Development Authority. Infrastructure data were obtained from *Economic Report*, Ministry of Finance Malaysia. Trade openness, financial development and inflation data were obtained from World Development Indicators Data Bank, The World Bank. Exchange rate, gross national income, GDP deflator and CPI data were obtained from *International Financial Statistics*, International Monetary Fund. Institutionalised autocracy and polity data were obtained from PolityTM IV Project, Center for Systemic Peace, 2017. All data were transformed into the natural logarithms before estimation, except inflation, institutionalised autocracy and polity. The data is yearly from 1980 to 2017, except for Korea the data is from 1981 to 2017 due to the availability of the data begins from 1981. The data is subject to the available during the time of collecting the data for estimation.

This study begins with the unit root tests. The Dickey and Fuller generalization least square (DF-GLS) and Ng and Perron (NP) unit root test statistics are used to examine the stationary of the data. The NP unit root test statistics are demonstrated to have more power in small samples than the Dickey and Fuller and Phillips and Perron unit root tests. The ARDL approach is used to examine the long-run relationship of the variables in the FDI models. This study estimates the following long-run FDI models:

$$ln\, FDI_t = \beta_{10} + \beta_{11}\, ln\, RER_t + \beta_{12}\, ln\, NI_t + \beta_{13}\, ln\, RAW_t + \beta_{14}\, ln\, TO_t + \beta_{15}\, INF_t + u_{1,t} \quad (1)$$

$$\ln FDI_t = \beta_{20} + \beta_{21}\, RER_t^+ + \beta_{22}\, RER_t^- + \beta_{23} \ln NI_t + \beta_{24}\, \ln RAW_t + \beta_{25}\, ln\, TO_t + \beta_{26}\, INF_t + u_{2,t} \quad (2)$$

where ln is logarithm, RER_t is the real exchange rate at time *t*, NI_t is real national income at time *t*, RAW_t is real average wage at time *t*, TO_t is trade openness at time *t*, INF_t is inflation at time *t*, $RER_t^+ = \sum_{j=1}^{t} \Delta\, ln\, RER_j^+ = \sum_{j=1}^{t} max\, (\Delta\, ln\, RER_j\, , 0)$, $RER_t^- = \sum_{j=1}^{t} \Delta\, ln\, RER_j^- = \sum_{j=1}^{t} min\, (\Delta\, ln\, RER_j\, , 0)$ and $u_{i,t}$ (i = 1, 2) *is* a disturbance term, respectively (Shin *et al.*, 2014; Bahmani-Oskooee and Saha, 2015; 2016). RER_t^+ and RER_t^- are the partial sum process of positive and negative variation, respectively in *ln* RER_t. The coefficient of real national income is expected to be positive whilst the coefficient of the real exchange rate, real average wage and inflation is expected to be negative. The coefficient of trade openness can be either positive or negative (Kinuthia and Murshed, 2015). Model (2) is used to explore the asymmetric impact of the real exchange rate on FDI as exchange rate depreciation can lead to more or less in FDI in the host country (Boateng *et al.*, 2015; Bahmani-Oskooee and Saha, 2016). The asymmetric effect of a series is available in Eviews software. The test of asymmetric effect can be carried out using the Wald statistic. The coefficients estimated are said to be the long-run coefficients.

The error correction models of the FDI models (1) and (2), respectively are as follows:

$$\Delta\, ln\, F\, DI_t = \beta_{30} + \beta_{31} D_t + \sum_{i=0}^{p} \beta_{32i}\, \Delta\, ln\, R\, ER_{t-i} + \sum_{i=0}^{q} \beta_{33i}\, \Delta\, ln\, N\, I_{t-i} + \sum_{i=0}^{r} \beta_{34i}\, ln\, R\, AW_{t-i} + \sum_{i=0}^{s} \beta_{35i}\, \Delta\, ln\, T\, O_{t-i} + \sum_{i=1}^{v} \beta_{36i}\, \Delta INF_{t-i} + \beta_{37} ec_{t-1} + u_{3,t} \quad (3)$$

$$\Delta \ln FDI_t = \beta_{40} + \beta_{41} D_t + \sum_{i=0}^{p} \beta_{42i} \Delta RER^{+}_{t-i} + \sum_{i=0}^{q} \beta_{43i} \Delta RER^{-}_{t-i} + \sum_{i=0}^{r} \beta_{44i} \Delta \ln NI_{t-i} + \sum_{i=1}^{s} \beta_{45i} \Delta \ln RAW_{t-i} + \sum_{i=0}^{v} \beta_{46i} \Delta \ln TO_{t-i} + \sum_{i=1}^{w} \beta_{47i} \Delta INF_{t-i} + \beta_{48} ec_{t-1} + u_{4,t} \quad (4)$$

where Δ is the first difference operator, D_t is the dummy variable to capture the influence of the Asian financial crisis, 1997-1998 and ec_{t-1} is an error correction term and $u_{i,t}$ (i = 3, 4) is a disturbance term. The sum of the coefficients of $\sum_{i=0}^{p} \beta_{42i} \Delta RER^{+}_{t-i}$ and sum of the coefficients of $\sum_{i=0}^{q} \beta_{43i} \Delta RER^{-}_{t-i}$ are not the same implies the asymmetric impact of the real exchange rate in the short run. This can be tested using the Waldstatistic (Bahmani-Oskooee and Saha, 2016). The ordinary least squares (OLS) estimator with Newey-West standard error (Huber-White standard error) is used when there is autocorrelation (heteroscedasticity) in the disturbance term. The coefficients estimated are called be the short-run coefficients. The advantages of the ARDL approach are that the approach does not need all the explanatory variables in the same order, that is, variables can be an $I(1)$ variable, $I(0)$ variable or fractionally integrated variable but not $I(2)$ variable. Moreover, the ARDL approach is relatively more efficient in the case of small and finite sample data sizes. Furthermore, the ARDL approach can obtain unbiased estimates of the long-run model (Belloumi, 2014). Shin *et al.* (2014) demonstrate that Pesaran *et al.* (2001) bounds testing approach could be applied to judge short-run symmetry or asymmetry. The introduction of the asymmetry effect in the estimation and thus it is called the non-linear ARDL model.

The autoregressive distributed lag model (ARDL) approach is used to estimate the importance of macroeconomic variables as FDI determinants by country in Malaysia. The non-linear autoregressive distributed lag model (NARDL) approach is used to estimate the asymmetric effect of the real exchange rate. Contrary, the system GMM of the Arellano-Bond estimator is also used to examine bilateral FDI of Malaysia with Japan, the US, Singapore, Germany, Taiwan, Australia, the United Kingdom, Hong Kong and India as a group in the study. The system GMM of the Arellano-Bond estimator gives more robust inferences as compared to the single estimated GMM estimator and is comparable a better instrument then the conventional one and remove simultaneity from the set of regressors by appropriate instrumental list. The system GMM of the Arellano-Bond estimator enables to exploit the time series dynamics and the pooled country characteristics of the data and to control of endogeneity, namely unobserved heterogeneity, simultaneity and dynamic heterogeneity (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998; Doytch and Uctum, 2011; Khan *et al.*, 2019). The main aim is to identify the main FDI determinants of Malaysia with those countries. In the estimation of the system GMM of the Arellano-Bond estimator, Korea is excluded to allow all the data are strictly balanced, that is from 1980 to 2017. The instruments used for the estimation of the system GMM of the Arellano-Bond estimator are financial development, lag one period of real infrastructure, the Asian financial dummy variable, autocracy and polity (Griebeler and Wagner, 2017; Mourao, 2018; Chen *et al.*, 2019; Uddin *et al.*, 2019).

4. Findings and Discussion

Table 2 displays the results of the DF-GLS and NP unit root test statistics. The lag length used to estimate the DF-GLS and NP unit root test statistics is mainly based on the Schwarz information criterion (SIC). Overall, the DF-GLS and NP unit root test statistics show the same conclusion, that is, all variables are non-stationary in levels and become stationary after taking the first differences, except inflation.

Table 2: The Results of the DF-GLS and NP Unit Root Test Statistics

	DF-GLS	MZa	MZt	MSB	MPT
$ln\ FDI_{j,t}$	-1.4890(1)	-4.2177(5)	-1.4508	0.3440***	5.8108***
$ln\ FDI_{us,t}$	-1.3617(2)	-3.1129(1)	-1.2463	0.4004***	7.8683***
$ln\ FDI_{s,t}$	-1.4497(1)	-5.1699(0)	-1.5577	0.3013***	4.8664***
$ln\ FDI_{g,t}$	-1.0706(2)	-2.5467(2)	-1.0518	0.4130***	9.2522***
$ln\ FDI_{t,t}$	-1.5407(5)	-5.2074(0)	-1.5914	0.3056***	4.7625***
$ln\ FDI_{k,t}$	-1.0329(3)	-2.0877(3)	-0.9640	0.4617***	11.1947***
$ln\ FDI_{a,t}$	-1.3592(4)	-4.2973(5)	-1.2803	0.2979***	5.9656***
$ln\ FDI_{uk,t}$	-1.0949(7)	-1.8838(7)	-0.9369	0.4973***	12.5833***
$ln\ FDI_{hk,t}$	-1.3384(0)	-3.9972(5)	-1.2189	0.3049***	6.3055***
$ln\ FDI_{in,t}$	-1.4319(3)	-2.9293(3)	-1.2101	0.4131***	8.3635***
$ln\ RER_t$	-0.3112(0)	-0.0355(0)	-0.0216	0.6080***	24.7479***
$ln\ NI_t$	0.0531(3)	-3.2032(3)	-1.0098	0.3152***	7.3460***
$ln\ TO_t$	-1.2028(1)	-2.3692(1)	-1.0883	0.4594***	10.3409***
$ln\ RAW_t$	0.3512(1)	1.2924(1)	0.8067	0.6242***	32.7687***
INF_t	-1.7404*(2)	-8.8466***(3)	-2.1001**	0.2374***	2.7811***
$\Delta\ ln\ FDI_{j,t}$	-7.8473***(0)	-16.5410***(0)	-2.8582***	0.1728***	1.5463
$\Delta\ ln\ FDI_{us,t}$	-10.223***(0)	-13.5054***(0)	-2.5940***	0.1921***	1.8320***
$\Delta\ ln\ FDI_{s,t}$	-7.4109***(0)	-17.0808***(0)	-2.9213***	0.1710***	1.4383
$\Delta\ ln\ FDI_{g,t}$	-7.4648***(1)	-38.2272***(1)	-4.3648***	0.1142	0.6610
$\Delta\ ln\ FDI_{t,t}$	-5.7117***(1)	-31.8362***(1)	-3.9868***	0.1252	0.7786
$\Delta\ ln\ FDI_{k,t}$	-5.4185***(0)	-17.1957***(0)	-2.9250***	0.1701***	1.4514
$\Delta\ ln\ FDI_{a,t}$	-4.6550***(0)	-16.7386***(0)	-2.8562***	0.1706***	1.5986
$\Delta\ ln\ FDI_{uk,t}$	-6.5751***(1)	-31.1518***(1)	-3.8884***	0.1248	0.9630
$\Delta\ ln\ FDI_{hk,t}$	-7.1249***(0)	-17.2672***(0)	-2.9248***	0.1694**	1.4682
$\Delta\ ln\ FDI_{in,t}$	-12.6405**(0)	-9.9447***(0)	-2.1264**	0.2138***	2.8579***
$\Delta\ ln\ RER_t$	-4.5652***(0)	-16.8135***(0)	-2.8986***	0.1724***	1.4603
$\Delta\ ln\ NI_t$	-4.4000***(0)	-16.4711***(0)	-2.8695***	0.1742***	1.4885
$\Delta\ ln\ TO_t$	-3.6233***(0)	-14.4135***(0)	-2.6455***	0.1835***	1.8473***
$\Delta\ ln\ RAW_t$	-4.0926***(0)	-15.4452***(0)	-2.7772***	0.1798***	1.5930
$\Delta\ INF_t$	-1.7698*(3)	-8.0812*(1)	-2.0050**	0.2481***	3.0510***

Notes: $FDI_{z,t}$ is FDI in approved projects of country *z* in Malaysia at time *t* (*z* = Japan (j), the United States of America (*us*), Singapore (*s*), Germany (*g*), Taiwan (*t*), Korea (*k*), Australia (*a*), the United Kingdom (*uk*), Hong Kong (*hk*), India (*in*)). The DF-GLS and NP unit root statistics are estimated based on the model including an intercept. Values in the parentheses are the lags used in the estimations. The critical values of the NP unit root test statistics, namely MZa, MZt, MSB and MPT at the 1% (5%, 10%) are -13.80 (-8.10, -5.70), -2.58 (-1.98, -1.62), 0.17 (0.23, 0.28) and 1.78 (3.17, 4.45), respectively. *** (**, *) denotes significance at the 1% (5%, 10%) level.

The ARDL bounds testing approach and the long-run coefficients of the ARDL approach are given in Table 3 whereas the ARDL bounds testing approach and the long-run coefficients of the ARDL approach with the asymmetric impact of the real exchange rate are given in Table 4. The Wald statistics are found to be statistically significant. Therefore, there are long-run relationships between FDI and their determinants. The coefficients of the real exchange rate are found to be negative and statistically significant for FDI from the

United States of America, Taiwan, the United Kingdom and Hong Kong. The coefficients of real national income are found to be positive and statistically significant for FDI from Japan, Singapore, Korea, Hong Kong, and India. The coefficients of trade openness are found to be positive and statistically significant for FDI from the United States of America whilst negative for FDI from Taiwan, the United Kingdom, Hong Kong and India. The coefficients of real average wage are found to be negative and statistically significant for FDI from Japan, Singapore, Taiwan, the United Kingdom, Hong Kong and India. The coefficients of inflation are found to be negative and statistically significant for FDI from Singapore, Korea, and Australia. The results of the ARDL approach with the asymmetric impact of the real exchange rate exhibit about the same conclusion as the results of the ARDL approach without the asymmetric impact of the real exchange rate. Moreover, the coefficients of positive real exchange rate are found to be negative and statistically significant for FDI from Singapore, the United Kingdom, Hong Kong, and India. The coefficients of negative real exchange rate are found to be negative and statistically significant for FDI from Japan, the United States of America, Taiwan, the United Kingdom, Hong Kong, and India. Nonetheless, the asymmetric impact of the real exchange rate is found to be significant for FDI from Singapore, Korea, and India. This implies that the fall in the real exchange rate promotes FDI from Singapore, Korea, and India.

Table 3: The Results of Bounds Testing Approach for Cointegration and the Long Run Coefficients of the ARDL Approach

	$ln\ FDI_{j,t}$	$ln\ FDI_{us,t}$	$ln\ FDI_{s,t}$	$ln\ FDI_{g,t}$	$ln\ FDI_{t,t}$
ln RER$_t$	6.9273	-3.4316**	-0.4777	-4.4248	-10.4770***
	(1.0107)	(-1.8559)	(-0.2360)	(-1.2998)	(-3.4205)
ln NI$_t$	7.5494***	1.0140	4.4067***	1.2920	1.5222
	(3.7557)	(0.9677)	(4.1149)	(0.7243)	(0.7293)
ln TO$_t$	1.8851	2.2022**	-0.4804	-0.4541	-3.9138*
	(0.7481)	(2.2468)	(-0.5041)	(-0.2521)	(-1.9615)
ln RAW$_t$	-12.2480***	-2.6845	-7.0681***	-1.3626	-8.2623*
	(-5.2282)	(-1.3033)	(-2.9888)	(-0.4000)	(-1.9057)
INF_t	-0.4748	0.0468	-0.4154***	-0.0986	0.0790
	(-1.7362)	(0.6067)	(-3.5249)	(-0.5651)	(0.3859)
constant	-333.0639**	-28.6599	-156.8084***	-7.4289	-27.7582
	(-3.0611)	(-0.6522)	(-3.4825)	(-0.0955)	(-0.3136)
W1	8.7055***	5.5731***	5.6841***	6.0317***	3.4373***

	$ln\ FDI_{k,t}$	$ln\ FDI_{a,t}$	$ln\ FDI_{uk,t}$	$ln\ FDI_{hk,t}$	$ln\ FDI_{in,t}$
ln RER$_t$	-2.9712	-4.8236	-8.4531***	-6.6772***	-3.8047
	(-0.7706)	(-1.3498)	(-3.9139)	(-2.8011)	(-1.4553)
ln NI$_t$	4.6166*	0.7766	0.5561	3.8145**	3.8271**
	(1.9840)	(0.3673)	(0.5478)	(2.3305)	(2.3516)
ln TO$_t$	-0.3276	-0.5176	-2.4306**	-5.6691***	-3.2377**
	(-0.1572)	(-0.2672)	(-2.4886)	(-3.7054)	(-2.0528)
ln RAW$_t$	-7.9510	-3.0067	-4.6227**	-8.9642**	-7.1635**
	(-1.5756)	(-0.7092)	(-2.1049)	(-2.6017)	(-2.1493)
INF_t	-0.5032*	0.3673*	0.0611	-0.1946	-0.0151
	(-1.9814)	(1.9479)	(0.7853)	(-1.6517)	(-0.1191)
constant	-161.4986	-7.7014	12.2092	-103.9513	-116.3580*
	(-1.6160)	(-0.0864)	(0.2835)	(-1.527533)	(-1.7058)
W	4.0950***	5.1248***	7.137233***	6.9270***	11.1441***

Notes: See also Table 2 for explanations. W1 is the Wald statistic for the ARDL bounds testing approach of cointegration. *** (**, *) denotes significance of the t-statistic at the 1% (5%, 10%) level.

Table 4: The Results of Bounds Testing Approach for Cointegration and the Long Run Coefficients of the ARDL Approach – The Asymmetric Impact of the Real Exchange Rate

	$ln\ FDI_{j,t}$	$ln\ FDI_{us,t}$	$ln\ FDI_{s,t}$	$ln\ FDI_{g,t}$	$ln\ FDI_{t,t}$
RER_t^+	-2.4607	0.8549	-14.1559***	-8.0115	-17.4195
	(-0.4043)	(0.1333)	(-2.8092)	(-0.9284)	(-1.1496)
RER_t^-	-6.9770***	-3.6690*	0.0063	-4.3094	-9.7667***
	(-3.3855)	(-1.9585)	(0.0038)	(-1.3681)	(-2.8454)
$ln\ NI_t$	2.0873	0.1220	6.7604***	1.5032	3.4465
	(1.2356)	(0.0728)	(4.5515)	(0.4849)	(0.7490)
$ln\ TO_t$	-3.5048***	2.3280**	-0.3035	-0.6147	-4.2193*
	(-3.7647)	(2.3512)	(-0.3904)	(-0.3713)	(-1.9537)
$ln\ RAW_t$	-7.8734***	-2.8170	-6.8964***	-0.5242	-8.7659*
	(-4.5272)	(-1.3739)	(-3.6119)	(-0.1724)	(-1.9296)
INF_t	-0.0683	0.0855	-0.5257***	-0.1486	0.0564
	(-0.8070)	(0.8966)	(-4.6900)	(-0.6464)	(0.2654)
constant	-92.1328*	-25.4437	-217.2375***	-26.0470	-132.5827
	(-1.7546)	(-0.4929)	(-4.5812)	(-0.2725)	(-0.9463)
W1	5.1849***	4.8433***	5.2032***	6.0365***	2.9385
W2	0.5240	0.4714	7.7442**	0.1085	0.2245

	$ln\ FDI_{k,t}$	$ln\ FDI_{a,t}$	$ln\ FDI_{uk,t}$	$ln\ FDI_{hk,t}$	$ln\ FDI_{in,t}$
RER_t^+	-28.9366	-0.7000	-15.5107**	-19.7575*	-28.6492**
	(-1.6318)	(-0.0549)	(-2.7009)	(-1.8281)	(-2.4608)
RER_t^-	1.4118	-5.0801	-8.7682***	-8.2222***	11.6078**
	(0.4165)	(-1.3695)	(-3.7197)	(-2.8900)	(2.6433)
$ln\ NI_t$	12.7959***	-0.1056	1.7757	5.5941*	14.9667***
	(3.6121)	(-0.0308)	(1.1058)	(2.0054)	(4.9577)
$ln\ TO_t$	-0.9676	-0.3963	-2.9997**	-6.5284***	0.6956
	(-0.4799)	(-0.1979)	(-2.5707)	(-3.9538)	(0.4007)
$ln\ RAW_t$	-10.5632**	-3.1182	-4.2144*	-9.0718**	-9.1257***
	(-2.2606)	(-0.7243)	(-2.0094)	(-2.7169)	(-3.0552)
INF_t	-0.7941**	0.4047*	-0.0290	-0.3056*	-0.2826
	(-2.5469)	(1.7948)	(-0.2541)	(-1.8933)	(-1.5342)
constant	-402.787***	-11.57945	-55.1504	-179.1303**	-454.145***
	(-3.9085)	(-0.1081)	(-1.1026)	(-2.119871)	(-4.8258)
W1	4.2933***	4.3564***	6.8525***	5.8069***	12.0137***
W2	3.9181*	0.1136	0.6618	1.2918	10.1875***

Notes: See also Table 3 for explanations. W2 is the Wald statistic to test the asymmetric impact of the real exchange rate.

The results of the error correction models are reported in Table 5 whilst the results of the error correction models with the asymmetric impact of the real exchange rate is disclosed in Table 6. The coefficients of the one lag of error correction terms are that many cases found to be less than one and to have the expected negative signs and are statistically significant for the error correction models and the error correction models with the asymmetric impact of the real exchange rate. Nonetheless, there are several cases where the coefficients of the one lag of error correction terms are found to be more than one with the expected negative signs and statistically significant for the error correction models and the error correction models with the asymmetric impact of the real exchange rate. This implies the validity of an equilibrium relationship among the variables in the estimated model. The estimated models mostly fulfil the diagnostic tests of no autocorrelation, no heterogeneous disturbance term and stability of the estimated models in terms of passing the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests. Generally, the coefficients of the real exchange rate or positive real exchange rate and

negative real exchange rate, real national income, trade openness, real average wage, inflation, and the Asian financial crisis are found to be statistically significant for FDI. The asymmetric impact of the real exchange rate is found to be significant for FDI from Japan, the United States of America, Singapore, Germany, Taiwan, the United Kingdom, and India.

Table 5: The Results of the Error-Correction Models

	$\Delta\ ln\ FDI_{j,t}$	$\Delta\ ln\ FDI_{us,t}$	$\Delta\ ln\ FDI_{s,t}$	$\Delta\ ln\ FDI_{g,t}$	$\Delta\ ln\ FDI_{t,t}$
$\Delta\ ln\ RER$	Yes	Yes	Yes	Yes	Yes
$\Delta\ ln\ NI$	Yes	No	No	Yes	Yes
$\Delta\ ln\ TO$	Yes	No	Yes	Yes	No
$\Delta\ ln\ RAW$	Yes	Yes	Yes	No	Yes
ΔINF	Yes	Yes	Yes	No	No
D_t	Yes	No	Yes	Yes	Yes
constant	No	Yes	No	Yes	No
$\Delta\ ln\ FDI_{t-i}$	Yes	Yes	-	Yes	-
ec_{t-1}	-0.8469***	-1.1786***	-0.9213***	-0.9343***	-0.4603***
	(-11.2061)	(-7.0873)	(-7.0992)	(-6.0898)	(-4.1991)
Adj. R^2	0.9184	0.6425	0.7238	0.6998	0.6602
LM	0.6514	0.3990	0.1996	0.5238	0.3137
HETERO	0.6878	1.0803	1.1432	1.6138	0.2193
RESET	0.0033	0.1744	0.1002	0.0649	0.1756
CUSUM	S	S	S	S	S
CUSUMSQ	S	U	S	S	S

	$\Delta\ ln\ FDI_{k,t}$	$\Delta\ ln\ FDI_{a,t}$	$\Delta\ ln\ FDI_{uk,t}$	$\Delta\ ln\ FDI_{hk,t}$	$\Delta\ ln\ FDI_{in,t}$
$\Delta\ ln\ RER$	Yes	Yes	Yes	Yes	Yes
$\Delta\ ln\ NI$	Yes	Yes	No	Yes	No
$\Delta\ ln\ TO$	No	Yes	Yes	No	Yes
$\Delta\ ln\ RAW$	Yes	Yes	Yes	-	Yes
$\Delta\ INF$	Yes	Yes	No	Yes	No
D_t	Yes	Yes	No	Yes	No
constant	No	Yes	No	No	No
$\Delta\ ln\ FDI_{t-i}$	-	-	Yes	-	-
ec_{t-1}	-0.8643***	-0.9202***	-1.6843***	-1.0538***	-1.4701***
	(-8.2583)	(-5.5067)	(-6.8228)	(-6.2527)	(-9.8139)
Adj. R^2	0.7570	0.5744	0.6478	0.6438	0.7591
LM	2.0321	0.5908	1.2386	1.2625	0.7135
HETERO	1.2166	0.5512	0.1427	1.3344	0.3869
RESET	0.2933	0.6728	0.0528	5.0934**	0.0303
CUSUM	S	S	S	S	S
CUSUMSQ	S	S	U	U	S

Notes: See also Table 2 for explanations. Yes (No) indicates at least one coefficient (none of coefficient) is statistically significant. Adj. R^2 is the adjusted R^2. LM is the Lagrange multiplier test of disturbance serial correlation. HETERO is the test of heteroscedasticity. RESET is the test of functional form. CUSUM denotes the cumulative sum test of stability. CUSUMSQ denotes the cumulative sum of squares test of stability. S denotes stable. U denotes unstable. The OLS estimator with Newey-West standard error is used when the Lagrange Multiplier test of disturbance serial correlation is found to be statistically significant. The OLS estimator with Huber-White standard error is used when the test of heteroscedasticity is found to be statistically significant. *** (**, *) denotes significance of the t-statistic at the 1% (5%, 10%) level.

Table 6: The Results of the Error-Correction Models – The Asymmetric Impact of the Real Exchange Rate

	$\Delta \ln FDI_{j,t}$	$\Delta \ln FDI_{us,t}$	$\Delta \ln FDI_{s,t}$	$\Delta \ln FDI_{g,t}$	$\Delta \ln FDI_{t,t}$
ΔRER^{+}	Yes	Yes	Yes	No	Yes
ΔRER^{-}	No	Yes	No	Yes	No
$\Delta \ln NI$	Yes	Yes	No	Yes	Yes
$\Delta \ln TO$	Yes	Yes	Yes	Yes	No
$\Delta \ln RAW$	Yes	Yes	Yes	No	Yes
ΔINF	No	Yes	Yes	Yes	No
D_t	Yes	No	Yes	Yes	No
constant	No	Yes	Yes	Yes	Yes
$\Delta \ln FDI_{t-i}$	-	Yes	-	-	-
ec_{t-1}	-0.5573***	-0.8761***	-0.8970***	-0.9620***	-0.5440***
	(-3.6074)	(-4.8712)	(-7.6737)	(-6.9296)	(-5.1816)
Adj. R^2	0.7129	0.7372	0.7087	0.7751	0.6841
LM	1.8944	0.3354	0.3874	0.3228	0.3551
HETERO	0.2676	0.9115	1.1301	1.2730	0.7592
RESET	0.7158	5.8456**	1.4086	0.4694	0.1107
CUSUM	S	S	S	S	S
CUSUMSQ	U	S	S	S	S
W3	5.6453**	4.3205*	15.7405***	18.3743***	6.1759**

	$\Delta \ln FDI_{k,t}$	$\Delta \ln FDI_{a,t}$	$\Delta \ln FDI_{uk,t}$	$\Delta \ln FDI_{hk,t}$	$\Delta \ln FDI_{in,t}$
ΔRER^{+}	Yes	Yes	Yes	Yes	Yes
ΔRER^{-}	No	No	Yes	Yes	Yes
$\Delta \ln NI$	Yes	No	Yes	Yes	Yes
$\Delta \ln TO$	Yes	Yes	Yes	Yes	Yes
$\Delta \ln RAW$	Yes	No	Yes	Yes	No
ΔINF	Yes	Yes	Yes	No	Yes
D_t	Yes	No	Yes	No	Yes
constant	No	No	No	No	No
ec_{t-1}	-0.8010***	-0.8961***	-1.0948***	-0.7200***	-1.3092***
	(-5.3750)	(-4.4373)	(-8.1151)	(-4.0474)	(-8.2446)
Adj. R^2	0.6424	0.4567	0.7913	0.8073	0.6534
LM	2.0860	0.3975	1.0743	1.9489	0.8659
HETERO	0.4111	1.2027	0.3592	0.8551	0.5360
RESET	0.0064	0.7872	0.0091	2.6368	0.0022
CUSUM	S	S	S	S	S
CUSUMSQ	S	S	S	S	S
W3	0.0076	2.7594	21.4702***	0.3061	8.4295***

Notes: See also Table 4 for explanations. W3 is the Wald statistic to test the asymmetric impact of the real exchange rate in the short run.

The results of the system GMM of the Arellano-Bond estimator are given in Table 7. The Arellano-Bond tests for AR(1) in the first differences are all rejected. Moreover, the Arellano-Bond tests for AR(2) in the first differences are all not rejected. This supports the model specification is appropriate. Sargan's test over-identifying restrictions in testing instrumental variables are valid, but are not rejected. This indicates that the model has valid instrumentation. The Wald statistic (W3) is to test the asymmetric impact of the real exchange rate in the short run in many cases is significant. The null hypothesis is the coefficient of the positive real exchange rate is equal to the coefficient of the negative real exchange rate. Therefore, the asymmetric impact of the teal exchange rate is not in the long run. Generally, real national income is found to have a positive impact on FDI whereas the

real exchange rate, positive real exchange rate or negative real exchange rate, trade openness and real average wage are found to have negative impact on FDI.

Table 7: The Results of the System GMM of the Arellano-Bond Estimator

	$ln\ FDI_{i,t}$	$ln\ FDI_{i,t}$
$ln\ RER_t$	-4.4598***	-
	(-5.39)	
RER_t^+	-	-6.5001**
		(-2.07)
RER_t^-	-	-4.2614***
		(-4.84)
$ln\ NI_t$	2.7513***	3.2285***
	(5.40)	(3.70)
$ln\ TO_t$	-1.4551***	-1.5135***
	(-3.05)	(-3.11)
$ln\ RAW_t$	-6.1281***	-6.0742***
	(-5.90)	(-5.82)
INF_t	-0.0355	-0.0555
	(-0.91)	(-1.13)
constant	-82.4626***	-116.397***
	(-3.84)	(-4.35)
AR1	-7.25***	-7.25***
AR2	0.05	0.03
Sargan	35.80	35.32
W4	-	0.45

Notes: See also Table 2 for explanations. AR1 is the Arellano-Bond test for AR(1) in first differences. AR2 is the Arellano-Bond test for AR(2) in first differences. Sargan is the Sargan's test of over identification of restrictions. W4 is the Wald statistic for testing the symmetric of the coefficient of positive real exchange rate and the coefficient of negative real exchange rate in the short run. *** (**, *) denotes significance of the t-statistic at the 1% (5%, 10%) level.

There are some remarks from this study. Depreciation of the real exchange rate attracts FDI. Contrarily, appreciation of the real exchange rate hinders FDI as the cost of investment increases for foreign investors (Ang, 2008; Tang *et al.*, 2014). Real national income attracts FDI seeking the domestic market. Bekhet and Al-Smadi (2015), among others, present that GDP promote FDI in Jordan. On the other hand, Villaverde and Maza (2015), Bolivar *et al.* (2019) among others, reveal insignificance of GDP on FDI. Trade openness can encourage or discourage FDI. Trade openness comforts FDI oriented export whilst deters FDI seeking domestic market as trade openness leads to more competition. This study found that trade openness decreases FDI. Contrarily, Boateng *et al.* (2015) discovered that trade openness increases FDI in Norway. Inflation discouraged businesses including FDI (Ang, 2008; Tang *et al.*, 2014). A relatively low labour cost produces a conducive environment to attract FDI in the long run and short run. Kinuthia and Murshed (2015), among others, indicate real average wage is a significant FDI determinant in Malaysia. High labour cost deters FDI, especially labour-intensive FDI. High labour cost increases overall production cost and reduces the profit of the firm. This would lead the firm to search for an alternative location advantage in terms of production cost (Fan *et al.*, 2018). Inflation is an indication of economic stability. High inflation reduces real income in domestic currency for FDI whereas low inflation is a result of economic stability and stimulates FDI. Overall, inflation is not a significant FDI determinant may be due to inflation that is low in Malaysia for an average of about 3 per cent over the period from 1979 to 2015 (International Financial Statistics, International Monetary Fund). The Asian financial crisis, 1997-1998 is found to have an influential impact on FDI for a certain country in the short run only.

Boateng *et al.* (2015) address macroeconomic variables are key elements of location-specific advantage that exert a significant influence on FDI. The dynamic of macroeconomic policy is notably to foster FDI. The macroeconomic policies shall be directed to stabilise the exchange rate as an appreciation of the exchange rate hinders FDI. In the short run, fluctuation of exchange rate could have a asymmetric impact on FDI, that is, depreciation of the exchange rate may discourage FDI from some countries. Price stability is an indication of macroeconomic stability. High inflation results in high labour costs, which discourages FDI. FDI may seek an alternative location advantages in terms of lower production costs. Trade openness discourages FDI, especially domestic-oriented FDI. Conversely, trade openness encourages FDI oriented export. A right level of trade liberalisation would sustain a maximum level of FDI. FDI determinants are not the same for all countries. Therefore, additional incentives shall be given to attract FDI from some countries. Good quality of government institutions and political stability are also crucial to promoting FDI (Brada *et al.*, 2019; Chen *et al.*, 2019; Li and Tanna, 2019). The authority shall assist foreign companies to reduce their production costs. FDI may promote economic development, but FDI is no beneficial per se. Therefore, a policy to attract FDI shall be given to attract FDI that is beneficial to the host country. Identifying the heterogeneous composition of FDI is an important step to design can effective FDI policy (Ascani *et al.*, 2020).

Bolivar *et al.* (2019) report that country features such as size, openness, skill levels and institutional stability influence FDI and the network structure and the power positions of each country. Ascani *et al.* (2020) show that inter-sectoral linkages of FDI alter local innovative activity. The link between FDI and local innovation is positive but does not surpass local administrative boundaries on aggregate. Brada *et al.* (2019) report that an increase in the level of corruption in the host country or the level of the difference between corruption in the host country and the home country will lead to a decrease in FDI is affected. Therefore, a clean institution is good for promoting FDI. FDI from a country with better institutional quality shows greater investment efficiency than FDI from a country with weaker institution (Chen *et al.*, 2019). Li and Tanna (2019) show that institutional quality is relatively more important than human capital development for developing countries to absorb total factor productivity gain from FDI. Li *et al.* (2019) reveal that negative sentiment influences more strongly on FDI than positive sentiment and the accumulated sentiment is stronger than transient sentiment. National sentiment affects FDI. Hence, the asymmetric impact of real exchange is rate more influential in the long run.

5. Conclusion

This study explores the importance of macroeconomic variables as FDI determinants by country in Malaysia, namely Japan, the USA, Singapore, Germany Taiwan, Korea, Australia, the United Kingdom, Hong Kong and India and the importance of macroeconomic variables as FDI determinants of those countries as a group in Malaysia, except Korea. Macroeconomic variables can be an important role as location decision variables for FDI. FDI determinants are not the same by country as different investments from different countries Macroeconomic variables are important for FDI. FDI determinants are not the same in the long run and short run. The asymmetric impact of the real exchange rate on FDI is found more in the short run than in the long run. Macroeconomic policies can influence location comparative advantage as many macroeconomic determinants are found to be statistically significant. Thus, different FDI policy is better being implemented for a different country. The evidence of FDI determinants by country benefits the policymaker to identify good and appropriate policies in supporting FDI and to cope with the increasingly difficult monitoring of FDI, which is less home-country centric but global. The real

exchange rate, positive real exchange rate, negative real exchange rate, real national income, trade openness and real average wage are found to be the main FDI determinants of those countries as a group in Malaysia. There is no evidence of the asymmetric impact of the real exchange rate in those countries as a group in Malaysia in the long run. A successful FDI policy may not be successful for all countries. Hence, it shall be creative in promoting FDI. Attractive Macroeconomic factors are one of the key elements of location-specific advantage that strive a significant influence on FDI decisions in recent years. The importance of FDI determinants is not the same across the country and the implications for policymakers are to promote a dynamic competitive advantage in the home country, therefore policymakers need to pay more attention to their macroeconomic policies to reduce production and transaction costs of FDI. The dynamic of macroeconomic policy is notably to nurture FDI.

References

Alvarado, R., Iniguez, M., & Ponce, P. (2017). Foreign direct investment and economic growth in Latin America. *Economic Analysis and Policy*, *56*, 176-187.

Ang, J. B. (2008). Determinants of foreign direct investment in Malaysia. *Journal of Policy Modeling*, *30*, 185-189.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, *58*, 277-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*, 29-51.

Ariff, M., & Abu Bakar, S. Y. (1999). The Malaysian financial crisis: Economic impact and recovery prospects. *Developing Economies*, *37*(4), 417-438.

Ascani, A., Balland, P. A., & Morrison, A. (2020). Heterogeneous foreign direct investment and local innovation in Italian Provinces. *Structural Change and Economic Dynamics*, *53*, 388-401.

Bahmani-Oskooee, M., & Saha, S. (2015). On the relation between stock prices and exchange rates: A review article. *Journal of Economic Studies*, *42(4)*, 707-732.

Bahmani-Oskooee, M., & Saha, S. (2016). Do exchange rate changes have symmetric or asymmetric effects on stock prices? *Global Finance Journal*, *31*, 57-72.

Bekhet, H. A., & Al-Smadi, R. W. (2015). Determinants of Jordanian foreign direct investment inflows: Bounds testing approach. *Economic Modelling*, *46*, 27-35.

Belloumi, M. (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. *Economic Systems*, *38*, 269-287.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of* Econometrics, *87*, 115-143.

Boateng, A., Hua, X., Nisar, S., & Wu, J. (2015). Examining the determinants of inward FDI: Evidence from Norway. *Economic Modelling*, *47*, 118-127.

Bolivar, L. M., Casanueva, C., & Castro, I. (2019). Global Foreign Direct Investment: A network perspective. *International Business Review*, *28*, 696-712.

Brada, J. C., Drabek, Z. Mendez, J. A., & Perez, M. F. (2019). National levels of corruption and foreign direct investment. *Journal of Comparative Economics*, *47*, 31-49.

Chan, M. W. L., Hou, K., Li, X., & Mountain, D. C. (2014). Foreign direct investment and its determinants: A regional panel causality analysis. *The Quarterly Review of Economics and Finance*, *54*, 579-589.

Chen, D. Yu, X., & Zhang, Z. (2019). Foreign direct investment comovement and home country institutions. *Journal of Business Research*, *95*, 220-231.

Chen, G. S., Yao, Y., & Malizard, J. (2017). Does foreign direct investment crowd in or crowd out private domestic investment in China? The effect of entry mode. *Economic Modelling*, *61*, 409-419.

Desbordes, R., & Wei, S. J. (2017). The effects of financial development on foreign direct investment. *Journal of Development Economics*, *127*, 153-168.

Ding, H., Fan, H., Jin, Y., & Qi, T. (2022). Talented overseas returnees and outward foreign direct investment. *European Economic Review*, 104210.

Doytch, N., & Uctum, M. (2011). Does the worldwide shift of FDI from manufacturing to services accelerate economic growth? A GMM estimation study. *Journal of International Money and Finance*, *30*, 410-427.

Dunning, J. H. (2009). Location and the multinational enterprise: A neglected factor?. *Journal of International Business Studies*, *40*, 5-19.

Fan, H., Lin, F., & Tang, L. (2018). Minimum wage and outward FDI from China. *Journal of Development Economics*, *135*, 1-19.

Griebeler, M. D. C., & Wagner, E. M. (2017). A signaling model of foreign direct investment attraction. *EconomiA*, *18*, 344-358.

Hoshi, T., & Kiyota, K. (2019). Potential for inward foreign direct investment in Japan. *Journal of The Japanese and International Economies*, *52*, 32-52.

Iamsiraroj, S. (2016). The foreign direct investment–economic growth nexus. *International Review of Economics and Finance*, *42*, 116-133.

International Monetary Fund. (2022). *What is real effective exchange rate (REER)?*. International Monetary Fund. http://datahelp.imf.org/knowledgebase/articles/537472-what-is-real-effective-exchange-rate-reer)

Khan, H. U. R., Islam, T., Yousaf, S. U., Zaman, K., Shoukry, A. M., Sharkawy, M. A., Gani, S., Aamir, A., & Hishan, S. S. (2019). The impact of financial development indicators on natural resource markets: Evidence from two-step GMM estimator. *Resources Policy*, *62*, 240-255.

Kinuthia, B. K., & Murshed, S. M. (2015). FDI determinants: Kenya and Malaysia compared. *Journal of Policy Modeling*, *37*, 388-400.

Li, C., & Tanna, S. (2019). The impact of foreign direct investment on productivity: New evidence for developing countries. *Economic Modelling*, *80*, 453-466.

Li, M. Y., Makino, S., & Jiang, C. (2019). Does national sentiment affect foreign direct investment, and if so, how? Additional evidence. *International Business Review*, *28*(5), 101586.

Lucke, N., & Eichler, S. (2016). Foreign direct investment: The role of institutional and cultural determinants. *Applied Economics*, *48*(11), 935-56.

Ly, A., Esperança, J., & Davcik, N. S. (2018). What drives foreign direct investment: The role of language, geographical distance, information flows and technological similarity. *Journal of Business Research*, *88*, 111-122.

Magnier-Watanabe, R., & Lemaire, J. P. (2018). Inbound foreign direct investment in Japan: A typology. *International Business Review*, *27*, 431-442.

Mourao, P. R. (2018). What is China seeking from Africa? An analysis of the economic and political determinants of Chinese outward foreign direct investment based on stochastic frontier models. *China Economic Review*, *48*, 258-268.

Nguyen, A. T. N., Haug, A. A., Owen, P. D., & Genç, M. (2020). What drives bilateral foreign direct investment among Asian economies?. *Economic Modelling*, *93*,125-141.

Nielsen, B. B., Asmussen, C. G., & Weatherall, C. D. (2017). The location choice of foreign direct investments: Empirical evidence and methodological challenges. *Journal of World Business*, *52*, 62-82.

Paul, J., & Feliciano-Cestero, M. M. (2021). Five decades of research on foreign direct investment by MNEs: An overview and research agenda. *Journal of Business Research*, *124*, 800-812.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*, 289-326.

Petri, P. A. (2012). The determinants of bilateral FDI: Is Asia different?. *Journal of Asian Economics*, *23*, 201-209.

Raff, H., Ryan, M., & Stahler, F. (2018). Financial frictions and foreign direct investment: Evidence from Japanese microdata. *Journal of International Economics*, *112*, 109-122.

Shin, Y., Yu, B. C., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In Sickles, R. C. and Horrace, W. C. (Eds.), *Festschrift in honor of Peter Schmidt: Econometric methods and applications*, Springer New York, 281-314.

Tang, C. F., Yip, C. Y., & Ozturk, I. (2014). The determinants of foreign direct investment in Malaysia: A case for electrical and electronic industry. *Economic Modelling*, *43*, 287-292.

Uddin, M., Chowdhury, A., Zafar, S., Shafique, S., & Liu, J. (2019). Institutional determinants of inward FDI: Evidence from Pakistan. *International Business Review*, *28*(2), 344-358.

Van Cauwenberge, A., Vancauteren, M., Braekers, R., & Vandemaele, S. (2019). International trade, foreign direct investments, and firms' systemic risk: Evidence from the Netherlands. *Economic Modelling*, *81*, 361-386.

Villaverde, J., & Maza, A. (2015). The determinants of inward foreign direct investment: Evidence from the European regions. *International Business Review*, *24*, 209-223.

Vo, X. V. (2018). Determinants of capital flows to emerging economies – Evidence from Vietnam. *Finance Research Letters*, *27*, 23-27.

Wong, H. T. (2003). Foreign direct investment and economic growth: An empirical study on ASEAN-4 and China. *Labuan Bulletin of International Business and Finance*, *1*(1), 65-78.

Wong, H. T. (2005). The determinants of foreign direct investment in manufacturing industry of Malaysia. *Journal of Economic Cooperation*, *26*(2), 91-110.

Yan, B., Zhang, Y., Shen, Y., & Han, J. (2018). Productivity, financial constraints and outward foreign direct investment: Firm-level evidence. *China Economic Review*, *47*, 47-64.

Zhai, W. (2014). Competing back for foreign direct investment. *Economic Modelling*, *39*, 146-150.