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The Role of Logistic Performance on Foreign Direct Investment-Growth Link: Evidence from Asian Countries

Nurnaddia Nordin, **Nurhaiza Nordin**, **Nur Ilyana Amiiraa Nordin, and Nur Faiz Nordin**

Abstract The main objective of this paper is to determine the role of logistic performance as an absorptive capacity in moderating the FDI on economic growth in Asian countries. By applying panel data from 29 selected Asian countries over the 2007 to 2018 period. The main finding of this study indicates that logistic performance is contingent on FDI-growth link in Asian countries, however, based on the marginal effect calculated as proposed by Brambor et al. (2006), logistics performance shows a significant positive impact on inward FDI instead of outward FDI. Finally, the finding shows the role of the institution on logistic performance, the results indicated that a higher quality of regulation will support the performance of the logistic system which can boost economic growth.

Keywords Foreign direct investment · Logistic performance · Growth · Institution

1 Introduction

Economic growth becomes an important issue addressed by the economist. In the past sixth decades, the sources of economic growth have been explored. Solow (1956) introduced the neoclassical growth model, the main determinant to sustained economic growth, in the long run, is technological progress. To support the Solow model, economists introduce the endogenous growth model, where they stated that the role of technological progress on economic growth is through the accumulation of capital and labor (Romer 1986, 1987; Lucas 1988). The growth model had to be expanded to provide a better explanation of how there are countries that have grows faster than the others. Past growth literature had identified several major sources of economic growth, like Romer (1996), Gross and Helpman (1991), and

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Aghion and Howit (1992) among many other had explained the roles of innovation on economic growth. Besides that Howitt (2000) and Jones (1995) indicated that research and development (R&D) is a determinant for a country's economic growth. The other economic factors like trade openness, international trade (export and import), FDI, financial market, labor market, total factor productivity also found as a determinant of economic growth and non-economic sources that affect the growth as stated by Acemoglu (2009), like institutions, government efficiency, political and administrative system, geography, cultural, social factors and demography.

Past literature has given more attention to the FDI channel as a major source of economic growth. Pan (2003) indicates that FDI is an important economic indicator worldwide which is consistent with the growing trend of FDI inflows in the last few decades. One of the earliest theories developed for FDI spillovers was by Findlay (1978). According to the model, FDI is among the important channels for technology spillover. The model also predicts that the technological gap will influence the degree of FDI spillovers.

The effect of FDI on country growth rate may also be enlightened by the endogenous growth model through the dissemination of technology (Barro 1990). Romer (1990), emphasizes the possible role of FDI in the growth process as technology dissemination and its relationship to economic growth. Romer (1986) introduced the theory of technological change into the production process, where the specified the technological progress as a function of R&D investment in knowledge that generates positive externalities. According to Grossman and Helpman (1991), the long-run economic growth was a result of an increase in competition and innovation that influenced technological progress and increased the country's productivity.

Based on the World Development Indicators database, the global FDI flows increase significantly especially in developed countries starting from 1995, and in 2012 developing countries become an important destination for FDI flows as they received more FDI than developed countries. As reported in the World Investment Report (2021), as benefited of FDI to host countries, rather than imposing restrictions and regulation on investments, most countries choose to liberalize and promote investment to sustained economic growth (Table 1).

The results from the implementation of investment policy measures had caused a substantial increase in world FDI, which directly affects economic growth. Figure 1 shows the flows of FDI and world GDP. As illustrates in Fig. 1, the inflows of FDI have increased from $1,242.99 million in 1970 to $1,227,501.35 million in 2019, and GDP in 1970 is $870.45 million increase to 11,433.21 million in 2019. Thus, is seen that FDI has become a vital source of economic growth. The existence of different channels of FDI spillovers leads to mixed findings in previous literature. Most of the positive spillovers were found in Sjoholm (1999). However, not all countries benefited from FDI. The negative spillover effect was found in Aitken and Harrison (1999), and Konings (2001), whereas the ambiguous spillover effect was noted in Harris and Robinson (2002), Kathuria (2000), Kokko et al. (1996, 2001), and Kugler (2001).

The ambiguous effects of the FDI-growth link were explained by researchers as the "absorptive capacity", where absorptive capacity is the capacity to internalize and

Table 1 National investment policies, 2003–2020

Item	Countries introduced policy changes	Regulatory changes	Liberalization /promotion	Restriction /regulation	Neutral/ indeterminate
2003–2007	67	128	107	20	1
2008	40	68	51	15	2
2009	46	89	61	24	4
2010	54	116	77	33	6
2011	51	86	62	21	6
2012	57	92	65	21	3
2013	60	87	63	21	3
2014	41	74	52	12	10
2015	49	100	75	14	11
2016	59	125	84	22	19
2017	65	144	98	23	23
2018	55	112	65	31	16
2019	54	107	66	31	16
2020	67	152	72	50	30

Source World Investment Report (2021)
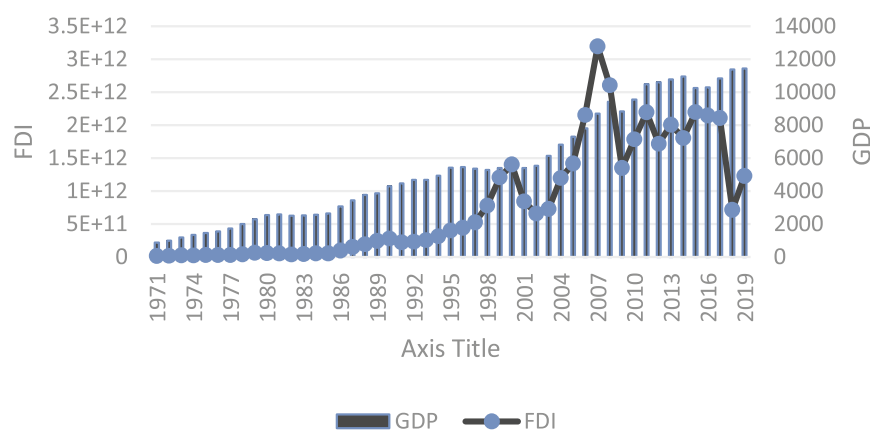
Fig. 1 The inflows of FDI and total gross domestic product. *Source* Data from WDI database

modifying it with other indicators for their specific objectives (Narula and Marin 2003). In previous studies, several factors were identified as absorptive capacity factors, such as financial market, Azman-Saini et al. (2010), human capital, Noor-bakhsh et al. (2001), trade policy (Balasubramanyam et al. 1996), economic freedom (Azman-Saini et al. 2010) and institutional quality (Esew and Yaroson 2014). The

present study debate that, the effect of FDI on economic growth is possibly influenced by logistic performance. This factor is expected to benefit more to host countries because logistics is one important key of investment. Available literature has focused on the effect of logistic performance on trade, Study by Gani (2017) has indicated that logistic performance plays a significant role in general in international trade activities and specifically in exports. Tang and Abosedra (2019) proved that logistic performance level becomes the main factor for export-led growth in Asian economies. However, there is a lack number of empirical studies that focus on the role of logistic performance on FDI-growth links. Thus, this factor (logistic performance) should be scrutiny investigates and examine. In contrast to recent studies (Soh et al. 2021) that investigate the role of logistic performance and institutions on FDI, this paper will provide different empirical findings on the role of logistic performance on the FDI-growth link. The findings of our study are expected to provide new empirical findings and contribute to the body of knowledge and have significant implications for policymakers to formulation an effective policy on FDI-growth link. By utilizing panel data of 29 selected Asian countries from 2007 to 2018, Panel Dynamic Ordinary Least Square (DOLS) is employed. The analysis is also extended by investigating the role of logistic performance on outward FDI and the different measures of institutional quality impact logistic performance on FDI-growth links in Asian countries.

This paper is organized as follows. Section 2 covers a review of relevant literature on the review of FDI-growth studies, logistic performance and growth studies, and reviews of the role of absorptive capacity in FDI-Growth Link. Section 3 is methodology and data, presents the conceptual framework, empirical model, data, and econometric method. Detailed discussion on empirical findings is reported in Sect. 4. Finally in Sect. 5 presents the conclusion and discusses the policy implication.

2   Literature Review

2.1   Studies on Foreign Direct Investment and Growth Link

Discussion on FDI and growth relationship has been explored by many researchers (Ma 2009). A recent study by Bhattarai (2016) supported the important role of FDI on economic growth. By using panel data, Bhattarai (2016) estimated 30 OECD countries for the period 1990–2004. The finding established economic growth is significantly influenced by FDI, whereas the size of a country serves as an important factor. For a newly industrial economy to step up with the world's most modern countries, Yao and Wei (2007) stressed that FDI is a potent driver of economic development. Consistent with Chakraborty and Basu (2002), they began evaluating India from the year 1974–1996 in the short and long run then found out that FDI had a positive and important impact on growth.

Theoretically, a previous study supported the endogenous growth model, where FDI was viewed as a foreign capital that complements the domestic capital and contributes to the investment and domestic growth. This finding showed that the effect of FDI inflows at the microeconomic level, as channeled by the multinational corporations (MNCs). By using an uncertainty approach (Dixit and Pidyck 1994), the model indicated that FDI inflows were driven by the profit-maximizing objective of the MNCs. Although the investment objective was focused on profit-maximizing, host countries also benefited from the FDI inflows through technology transfer, diffusion, and spillover effects, in which spillovers occurred when indigenous firms gained in terms of efficiency and productivity from the entry or presence of the MNCs. By focusing on the developed and developing countries, Li and Liu (2005) provide empirical findings that FDI is a positive and significant impact on economic growth and supported by Lensik and Morrisey (2006). However study by De Vita and Kyaw (2009), the contingency positive impact of FDI on growth is found a positive effect on certain economic sectors but not the whole economy.

2.2 Studies of Logistic Performance on FDI and Growth

The existence of different channels of FDI spillovers, FDI by MNCs has always been associated with new technologies and provides a better integration into the world markets (Babic and Strucka 2001). Based on these optimistic outlooks, numerous countries have lifted several investment restrictions (World Investment Report 2021). However, the establishment of MNC in the host countries need to be complement with the better logistic infrastructure (Tang and Abosedra 2019; Luttermann et al. 2020; Saidi et al. 2020; Soh et al. 2021). Using panel OLS (POLS) on 31 Asian countries, Saidi et al. (2020), find that logistic performance is a positive and significant impact on FDI by incorporating the institutional quality.

Logistic performance is an indicator of country logistic performance. The level of national competitive power is determined by the logistic performance index (Soh et al. 2011). The past study had discovered a few channels of logistic development which is possible to provide linkages on economic growth. The first channel capitalization is found by Roller and Waverman (2001), where this channel is crucial for building and improving national logistic performance. Secondly, by using an efficient logistic system, Shirley and Winston (2004) stated that it will reduce the cost of production by firms which will encourage firms to increase the quantity of production. Hong (2007) determines the well organize logistic system at the host country as the other logistic development channel will attract additional inflows of FDI and increase the country's economic growth. Lastly, the firm productivity will increase through the utilization of logistic systems (Ciccone and Hall 1996). Therefore, the Logistic Performance (LP) index has been published by World Bank as a measure of the logistic performance of each country.

2.3 The Role of Absorptive Capacity

Past study has stated that financial market, human capital, trade policy, regulation, and institution are among the factors as an absorptive capacity in moderating the impact on FDI-growth link. The financial market is among the important factors in mediating the impact of FDI on growth. The important role of the financial market on productivity and growth was proven through empirical studies conducted by Beck et al. (2000) and King and Levine (1993). Several studies treated the financial market as an absorptive capacity factor and their findings showed that countries with better financial markets gain positive FDI spillovers. Hermes and Lensink (2003) establish that the positive impact of the financial market on FDI-growth in countries with well-functioning financial markets contributes to the technology diffusion allied with FDI. Azman-Saini et al. (2010) used a new econometric approach and employed a threshold regression model. This model suggested that the role of the financial market in promoting the impact of FDI on economic growth is enhanced at a certain level of threshold.

Another important aspect discussed in previous studies is the impact of trade policy on the FDI-growth relationship. According to Blomstrom and Sjoholm (1999), trade policy is one of the factors that influenced spillovers. Spillovers occurred when there are open trade regimes towards imports, where domestic firms benefit from embodied technology in capital goods and intermediate goods, and through the transfer of foreign technology to domestic firms. This finding was similar to Marino (2000), who studied the impact of trade regimes in developing countries. Countries were classified either as open economies or as closed economies. Estimation results indicated that an open trade regime has a significant positive influence on the FDI-growth nexus, whereas the relationship was found to be negative in closed economies.

Other studies highlighted the influence of human capital on the FDI-growth link. They suggested that the role of human capital as an enhancer in attracting FDI inflows. Human capitals with highly skilled workers were more productive and attracted the flow of desirable investments. Measurement of human capital was based on the schooling rate based on Barro and Lee (1993). A few explanatory variables used in this study, human capital based on school enrolment, trade openness, democracy, and risk. The results indicated that human capital was important and statically significant as a determinant of the FDI-growth link.

Several studies highlighted the importance of institutions in the FDI-growth link. The indicators of institution used in previous literature included government efficiency, rule of law, and regulation quality. A previous study by Alguacil et al. (2011) using GMM estimation analysis, showed there was a positive impact of institutional environment on FDI-growth relation in developing countries. Other indicators of institution used by Azman-Saini et al. (2010) investigated the role of economic freedom on the FDI-growth link in 85 countries by using a GMM technique and the findings indicated that FDI alone has no direct impact on growth.

By using the quality of institutional infrastructure, Slesman et al. (2015) showed that there was a positive effect of institutions on the relationship of foreign capital

inflows and economic growth. A study by Jude and Levieuge (2017) using threshold analysis in developing countries showed FDI has a positive effect on growth only beyond a certain threshold of institutional quality which is consistent with Agbloyor et al. (2016) study in Sub Saharan Africa. Using political development, Elkomy et al. (2016) confirmed the above results and indicated that the influence of FDI on economic growth was positive only in countries that achieve a certain level of political development. A study by Nordin et al. (2019) indicates the role of labor market flexibility as an absorptive capacity on FDI and growth relationship.

3 Methodology

3.1 Conceptual Framework

The common understanding holds that economic growth is connected with the accumulation of capital. However, there is no automatic connection between these two, because economic growth requires supports for this relationship. One of them is through the FDI channel, where the theory shows that FDI helps augment capital stock and it also serves as a significant source of human capital accumulation and technological progress. In addition, FDI is expected to promote knowledge transfer and labor skills which is important for economic growth. FDI might also affect growth with a better logistic performance. However empirical study states that FDI spillovers depend on the absorptive capacity in the host country and are not an automatic process (Borensztein et al. 1998).

3.2 Empirical Model

To examine the role of logistic performance impact on FD-growth link, this study follows a model which is similar to others (Ramirez 2000; Fedderke and Romm 2006). The externality associated with the FDI is modeled as follows:

$$GDP_{i,t} = \beta_0 + \beta_1 FDI_{i,t} + \beta_1 LP_{i,t} + \beta_3 X_{i,t} + \mu_{i,t} \tag{1}$$

where X is a control variable. Equation (1) serves as a baseline model for estimation purposes.

   The objective of the study is also to report whether the FDI-growth link in Asian countries is dependent on logistic performance, Eq. (1) presented the integrating model with the interaction terms of (LPI $\times$ FDI).

$$GDP_{i,t} = \beta_0 + \beta_1 FDI_{i,t} + \beta_1 LP_{i,t} + \beta_3 X_{i,t} + \theta_1 (LPxFDI)_{i,t} + \mu_{i,t} \tag{2}$$

where θ_1 is the coefficient of the interaction term between logistic performance and FDI, which will show the effect of FDI on economic growth depend on the level of logistic performance. If the coefficient of the interaction term is positive, it will indicate that an increase in the logistic performance in Asian countries, will attract more FDI inflows and increase the country's economic growth. Otherwise, if the interaction coefficient is negative, it will indicate that an increase in logistic performance reduces the contribution to FDI and economic growth. Specifically, with partial derivative, the marginal effect of FDI on economic growth contingent on logistic performance can be calculated, $\frac{\partial GDP_{it}}{\partial FDI_{it}} = \beta_1 + \theta_1 LP_{it}$.

3.3 Data

The data set is based on 29 selected Asian countries over the 2007–2018 periods. The dependent variable is measure with per capita real GDP. FDI data is expressed as a ratio of net inflows, and a net outflow of foreign direct investment to GDP. As explained in endogenous growth theory, FDI is a factor that tends to contribute to the growth rate. The importance of physical capital and human capital on economic growth is stated in the endogenous growth theory. In this study, the ratio of gross fixed capital formations to GDP is used as a proxy of physical capital which is stated by Zhang (2008). By referring to Davies and Quinlivan (2006), life expectancy at birth is an indicator of human capital. The population growth is computed as the growth rate of the number of population. The data were extracted from the World Development Indicators database (WDI). Data of institution of government efficiency, rule of law, and regulatory quality are extracted from Worldwide governance indicators (WGI). The data are in natural logarithm for standardization. Table 2 provides a summary of all data. Tables 3 and 4 report the summary of descriptive statistics and cross-correlation matrix respectively.

3.4 Panel Data Estimation Procedures

There are three steps of analysis. First, assess the stationary properties of all variables. Second, test whether these variables are cointegrated. In the final stage, we obtain reliable estimates of slope parameters using the dynamic OLS (DOLS) estimator. To examine the unit root test, this study uses two-panel unit root tests namely, Im-Pesaran-Shin (henceforth IPS) test and Levin-Lin-Chu (henceforth LLC) test. Kao's (1999) cointegration test was examined to examine a cointegration relationship among the variables. To obtain reliable estimates of long-run coefficients for each of the variables, this study uses dynamic ordinary least squares estimators (DOLS) proposed by Kao and Chiang (1999). This approach is an extension of Stock and Watson's (1993) procedure. The estimated dynamic OLS was obtained by:

Table 2 Summary of data

Variable	Measurement	Source of data
Growth	GDP per capital	World Development Indicator (WDI)
Foreign direct investment	Net inflows of FDI as a ratio to GDP	WDI
	Net Outflow of FDI as a ratio to GDP	
Institution	1. Government Effectiveness 2. Rule of Law 3. Regulatory Quality	Worldwide Governance Indicator (WGI)
Population growth	Population growth rates	WDI
Physical capital	Gross fixed capital formation to GDP	WDI
Human capital	Life expectancy at birth	WDI
Logistic performance index	Overall score of logistic performance	WDI

$$y_{it} = \alpha_i + x'_{it}\beta + \sum_{j=-q_i}^{j=q_i} c_{ij}\Delta x_{it+j} + \dot{v}_{it} \tag{3}$$

The dynamic OLS estimator can be applied to Eq. (2) as follows:

$$GDP_{it} = \alpha + \beta_1 FDI_{it} + \beta_2 LP_{it} + \theta_1 LP_{it} \times FDI_{it} + \beta_4 X_{it}$$
$$+ \sum_{j=-q}^{q} c_{ij}\Delta FDI_{i,t+j} + \sum_{j=-q}^{q} c_{ij}LP_{i,t+j} \times FDI_{i,t+j} + \sum_{j=-q}^{q} c_{ij}\Delta X_{i,t+j}\varepsilon_{it} \tag{4}$$

$$GDP_{it} = \alpha + \beta_1 FDI_{it} + \beta_2 LP_{it} + \theta_2 LP_{it} \times INS_{it} + \beta_4 X_{it}$$
$$+ \sum_{j=-q}^{q} c_{ij}\Delta FDI_{i,t+j} + \sum_{j=-q}^{q} c_{ij}LP_{i,t+j} \times INS_{i,t+j} + \sum_{j=-q}^{q} c_{ij}\Delta X_{i,t+j} + \varepsilon_{it} \tag{5}$$

where GDP is Gross Domestic Product, FDI is Foreign Direct Investment (inward and outward), LP is the index of logistic performance, LP × FDI is the interaction term between logistic performance and FDI, X are other control variables (i.e. physical capital, human capital, population growth and institutions), $LP \times$ INS is the interaction term between logistic performance with institutions. $\sum_{j=-q}^{q} c_{ij}\Delta FDI_{i,t+j}$ comprises of the leads and lags of the first difference of FDI (inward and outward),

Table 3 Summary of descriptive statistics

	GDP	FDI	OFDI	PC	HC	PG	ROL	RQ	GE	LPI
Mean	3.6933	0.6047	7.2445	0.8739	1.8692	0.3172	0.3819	0.4295	0.5103	0.4731
Median	3.7456	0.5051	0.7657	0.9322	1.8718	0.2323	0.2583	0.3258	0.3418	0.4770
Maximum	4.8207	2.4473	301.249	1.6943	1.9290	1.7456	2.4509	2.4415	2.8082	0.6222
Minimum	0.0068	0.0036	0.0000	0.0239	1.8090	5.30E−05	0.0016	0.0008	0.0075	0.3086
Std. dev.	0.8111	0.4759	33.1836	0.3635	0.0288	0.2770	0.4332	0.4106	0.5294	0.0795

Note: *GDP* gross domestic product, *FDI* inward FDI, *OFDI* outward FDI, *PC* physical capital, *HC* human capital, *ROL* rule of law, *RQ* regulatory quality, *GE* government efficiency, *LPI* logistic performance index

Table 4 Cross-correlation matrix

	GDP1	FDI	OFDI	GFCF	HC	PG	ROL	RQ	GE	LPI
GDP1	1									
FDI	0.2394	1								
OFDI	0.1888	0.5639	1							
GFCF	−0.0676	0.0174	0.0116	1						
HC	0.5495	0.3321	0.2560	−0.3007	1					
PG	0.1676	−0.0535	−0.1243	−0.0582	0.2543	1				
ROL	−0.2766	−0.2173	−0.1215	−0.0645	−0.0523	−0.08427	1			
RQ	−0.1557	−0.1033	−0.1381	−0.0281	−0.0936	−0.0316	0.3289	1		
GE	−0.0803	−0.1193	−0.1288	−0.0159	−0.0864	−0.0785	0.4212	0.5690	1	
LPI	0.4058	0.1628	0.1294	−0.3213	0.7161	0.1364	0.1743	0.01469	0.0425	1

Note: *GDP* gross domestic product, *FDI* inward FDI, *OFDI* outward FDI, *PC* physical capital, *HC* human capital, *ROL* rule of law, *RQ* regulatory quality, *GE* government efficiency, *LPI* logistic performance index

$\sum_{j=-q}^{q} c_{ij} LP_{i,t+j} \times FDI_{i,t+j}$ comprise of the leads and lags of the first differ-
ence for the interaction term of logistic performance and FDI, $\sum_{j=-q}^{q} c_{ij} \Delta X_{i,t+j}$
is the leads and lags of the first difference of other explanatory variables, $\sum_{j=-q}^{q} c_{ij}$,
$LP_{i,t+j} x INS_{i,t+j}$ is the leads and lags of the first difference for the interaction term
of logistic performance and indicator of institutions. The lags of the models were
selected according to the Akaike information criterion (AIC).

4 Empirical Results

4.1 Descriptive and Correlation Analysis

In the last section, we have discussed the model specification, variables used, and
sources of data, and the econometric techniques that will be employed to examine
and estimate the impact of logistic performance on the FDI-growth link in Asian
countries. The finding of the estimation is present in Tables 3, 4, 5 and 6. As a
preliminary analysis, Table 3 provides summary statistics for all variables used in
this analysis. The statistics presented in the table are based on annual data over the
2007–2018 periods across 29 selected Asian countries.

Table 4 presents the cross-correlation analysis for all variables. The results show
that the interest variable of this study shows positive correlations between FDI,
logistic performance with economic growth. According to UNCTAD (2006), the
increase of growth performance of Asian countries is due to the policy changes
towards greater openness that increase the number of establishments of Asian MNCs
which they make investments abroad.

Table 5 Result of dynamic OLS estimation

Variables	Coefficient
FDI	0.0633***(0.000)
OFDI	−0.0002(0.2032)
PC	−0.0177***(0.000)
PG	8.9781***(0.000)
HC	0.0513***(0.000)
ROL	0.0597***(0.000)
RQ	−0.0846***(0.000)
GE	−0.0183***(0.000)
LPI	0.1877***(0.000)

Note: *GDP* gross domestic product, *FDI* inward FDI, *OFDI*
outward FDI, *PC* physical capital, *HC* human capital, *ROL* rule of
law, *RQ* regulatory quality, *GE* government efficiency, *LPI* logistic
performance index

Table 6 Estimate of long run coefficients

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
FDI	0.3091***(0.0000)	0.0629***(0.000)	0.0306**(0.0104)	0.1653***(0.0000)	0.0605***(0.0010)
OFDI		−0.0057**(0.0243)			
GFCF	0.0515***(0.0000)	−0.0201***(0.000)	−0.0070(0.4740)	−0.1701***(0.0000)	−0.0064(0.6000)
PG	16.6655***(0.0000)	8.9870***(0.000)	14.9812***(0.0000)	19.8768***(0.0000)	13.8944***(0.0000)
HC	0.0277*(0.0702)	0.0524***(0.000)	0.0894***(0.0000)	0.2545***(0.0000)	0.1448***(0.0000)
ROL	−0.017551(0.2226)	0.0598***(0.000)	0.0562***(0.0000)	0.1608***(0.0000)	0.7729***(0.0000)
RQ	−0.2533***(0.0000)	−0.0812***(0.000)	−0.3034***(0.0000)	−0.8041***(0.0000)	−0.2813***(0.0000)
GE	−0.0176(0.1514)	−0.0176***(0.000)	0.1679***(0.0357)	−0.0599***(0.0000)	−0.0038(0.8285)
LPI	0.375547***(0.0000)	0.1515***(0.000)	1.3895***(0.0000)	−0.1497(0.2648)	1.9882***(0.0000)
LPI × FDI	0.859302***(0.0000)				
LPI × OFDI		0.0111**(0.0293)			
LPI × GE			−0.2653(0.1133)		
LPI × RQ				1.7256***(0.0000)	
LPI × ROL					−1.3405***(0.0000)
Marginal effects of LP_{it}					
$\beta_0 + \theta_1 LP_{Mean}$	0.7156***	0.1749**	−0.1431*	0.5132***	0.1387*
$\beta_0 + \theta_1 LP_{Max}$	0.8437***	0.0012***	0.0046*	0.7705***	−0.0611*
$\beta_0 + \theta_1 LP_{Min}$	0.5742***	−0.0022*	0.0878*	−0.0611*	0.3592*

Note: *GDP* gross domestic product, *FDI* inward FDI, *OFDI* outward FDI, *PC* physical capital, *HC* human capital, *ROL* rule of law, *RQ* regulatory quality, *GE* government efficiency, *LPI* logistic performance index

4.2   Panel Cointegration Test

Having established that each of the variables is integrated of order one I(1), the cointegration test suggested by Kao and Chiang (1999) is employed for the panel cointegration test. The results show that there is strong evidence to support the conclusion made earlier as the null of no cointegration can be rejected at the 1% level in all cases.

4.3   Long-Run Elasticities

As the variables are integrated of order one I(1) and cointegrated, the next step is to examine the long-run relationship between variables using a dynamic OLS estimator. The results of estimating the baseline model which includes all variables are reported in Table 5. The result shows that the growth elasticities for Asian countries with respect to logistic performance and FDI is a positive relationship. This result is consistent with Bhattarai (2016), Bengoa and Sanchez-Robles (2003), Dees (1998) among many others. The logistic performance is a positive and significant impact on economic growth. This finding indicates that a country's economic growth is influence by a well-organized logistic system. This finding is consistent with Maparu and Mazumder (2017).

The role of human capital is also positively significant on economic growth, which means that human capital that is the labor market is one of the sources of economic growth. This indicates labor market will promote output growth and this is consistent with the findings in Besley et al. (2004) and Nickell and Layard (1999). The estimated coefficient on population growth also indicates a positive impact on economic growth. The other two variables physical capital and human capital are positively related to economic growth and statistically significant at the 1% level. This is in line with previous studies by Yan and Yudong (2003), among many others.

However, the impact of outward FDI on economic growth in Asian countries indicates a negative sign. This happens because, as a host MNC located their production facilities abroad, it will reduce domestic production and direct effect on economic growth. This finding is similar to (Stevens and Lipsey 1992; Wong 2010). A study by Denzer (2011) stated that to capture the impact of outward FDI on economic growth, the role of absorptive capacity should be incorporated in the estimation analysis.

The next step of analysis is to examine the role of absorptive capacity in FDI-growth links because the impact of logistic performance on growth depends on the level of logistic performance at host countries (Hong 2007). Specifically, the main objective of this study is to examine the role logistic performance plays in moderating the impact of FDI on economic growth. To test this hypothesis, interaction specification is estimated. Five models are estimated and the results are presented in Table 6. Based on the computed R-square, for all estimation models, it indicates that approximately 70–90% of GDP growth in Asia is possible to be predicted by the

explanatory variable used in the model estimation. The result of model 1 indicates that the coefficient of inward FDI and logistic performance is positive and highly significant on economic growth with 0.3091 and 0.3754. Having the interaction specification in the estimation between logistic performance and inward FDI, the result shows that logistic performance plays a significant role to attract the inflows of FDI in Asia countries and boost the Asian economic growth with the coefficient of the interaction term is 0.8593 with 1% significant level.

The second model estimate the outward FDI, the coefficient of outward FDI remains as reported in Table 6. The logistic performance indicates a positive and significant impact on economic growth, which indicated that, for outward FDI, the well-organized logistic system is important. To examine the role of absorptive capacity, and interaction between logistic performance and outward FDI was estimated. Interestingly, the coefficient of the interaction term indicates a positive sign. Thus, the results indicate that either inward FDI or outward FDI, logistic performance plays a vital role in FDI spillovers on economic growth.

According to Wong and Tang (2018), the logistic performance could be affected by institutional quality, thus, by using three indicators of institutions (government efficiency, rule of law, and regulation quality), we estimate the interaction term between these institutions' indicators with logistic performance. Results are shown in model 3 of interaction logistic performance with government efficiency (LP × GE), model 4 of interaction logistic performance with regulation quality (LP × RQ), and model 5 of interaction logistic performance with rule of law (LP × ROL). Going straight to the estimation of the interaction of the impact of logistic performance that supporting by institutions on economic growth, the estimation results show that only regulation quality is positive influence logistic performance is in tandem with finding by Tang and Abosedra (2019). However, the coefficient of the interaction of the other two indicators of institutions (LP × ROL) and (LP × GE) is negative. The estimation coefficient indicates that logistic performance concerning the institutions does not have a direct impact on economic growth in Asian countries.

To identify the most effective role of logistic performance on the FDI-growth link, it can be determined based on the value of marginal effects. At the margin, the total effect of logistic performance can be calculated by examining the partial derivative of GDP with respect to the FDI/institutions, and standard error of the marginal impact are computed following Brambor et al. (2006).[1] The marginal effect of (i) inward FDI is $\frac{\partial GDP_{it}}{\partial IFDI_{it}} = \beta_0 + \theta_1 LP_{it}$ (ii) outward FDI $\frac{\partial GDP_{it}}{\partial OFDI_{it}} = \beta_0 + \theta_1 LP_{it}$; (iii) government efficiency is $\frac{\partial GDP_{it}}{\partial GE_{it}} = \beta_0 + \theta_1 LP_{it}$; (iv) regulation quality is $\frac{\partial GDP_{it}}{\partial RQ_{it}} = \beta_0 + \theta_1 LP_{it}$; (v) Rule of Law is $\frac{\partial GDP_{it}}{\partial ROL_{it}} = \beta_0 + \theta_1 LP_{it}$. The marginal effect of inward FDI, outward FDI, and different measures of institutions on economic growth can be calculated at the mean (LP_{mean}), maximum (LP_{Max}), and minimum (LP_{Min}) level of logistic performance. Table 6 report the estimation results of marginal effect and standard error of estimation models.

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[1] For example, in the case of the model is $Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ + \varepsilon$, the marginal effect is $\frac{\partial Y}{\partial X} = \beta_1 + \beta_3 Z$ and the standard error is $\widehat{\sigma}_{\frac{\partial y}{\partial x}} = \sqrt{var\left(\widehat{\beta}_1 + Z^2 var(\widehat{\beta}_3)\right) + 2Z cov\left(\widehat{\beta}_1 \widehat{\beta}_3\right)}$.

Based on the estimation marginal effect in Table 6, interestingly the results indicate that the marginal effect is statistically positive significant at value LP_{Mean} and LP_{Max} of inward FDI and outward FDI. The results indicate that the growth effect of outward FDI is slightly lower than the impact of inward FDI. From the value of mean for logistic performance, it shows that a 10% increase in inward FDI and outward FDI, will increase 7.156% and 1.749% increase economic growth in Asian countries. Besides that, the marginal effect shows that the effect of inward FDI on growth is at an increasing rate when logistic performance achieves a maximum level. More specifically, the effect of logistic performance on growth is 8.437% for every 10% increase in inward FDI. However, for outward FDI, the results show as maximum logistic performance reduces the impact on economic growth in Asian countries.

The result of marginal the effect of logistic performance through FDI on growth for the regulation quality shows that only this institution indicator when reaches a maximum level it will positive and significant impact on economic growth. This finding indicates that the high quality of governance can speed up logistics performance which in turn leads to economic growth (Koh et al. 2018; Wong and Tang 2018).

5 Conclusion and Its Implication to Policy

This paper examined the effects of logistic performance on FDI-growth links in Asian countries using panel data of 29 selected countries over the period 2007–2018. The findings revealed there is a positive correlation between logistic performance on economic growth. The empirical analysis using panel dynamic OLS reveals that logistic performance and FDI are important to growth for the Asian countries examined. The other important findings of this study are that the effect of FDI on economic growth in Asian countries is conditional on the level of the logistic performance at host countries. Besides that, the findings also indicated that the effects of the logistic performance on economic growth are depending on the institutional quality also, but the marginal effect is only positive and significant when regulation quality is greater than its maximum level. Thus, these findings are consistent with the growing view in the need of absorptive capacity to reap maximum benefit from logistic performance.

Further, logistics performance is contributed by both economic and non-economic factors. Therefore, non-economic factors such as an institution should not be neglected by the policymaker as an increase on the institutional quality, by control the corruption, political stability, economic freedom, and better governance could better impact the logistic performance. Therefore, Asian countries should learn from advanced economies like developed countries or OECD countries in their pursuit to improve the interactions of quality institutions along with logistic performance in better ways.

This study provides two major contributions. In the theoretical aspects, the logistic performance should complement the new endogenous growth model. Centered by a new endogenous growth model, this paper shows the relationship impact of logistic

performance through FDI on economic growth, and the level of institutional quality provides a contingent role to the level of logistic performance. The limitation of this study is data and indicators for logistic performance and institutions. Different indicators of logistics performance and institution would be more potential findings for future study on FDI and logistic performance on economic growth.

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