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**Working Paper**

## Spatial estimation of the nexus between the PRC's foreign direct investment and ASEAN's growth

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**ADB Working Paper Series**

**SPATIAL ESTIMATION OF THE  
NEXUS BETWEEN THE PRC'S  
FOREIGN DIRECT INVESTMENT  
AND ASEAN'S GROWTH**

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**Abstract**

Forging closer economic relations between the People's Republic of China (PRC) and the Association of Southeast Asian Nations (ASEAN) over the last 2 decades has contributed to building a stronger ASEAN economy. It is particularly important to know how the PRC's foreign direct investment responds to ASEAN's economic performance. This study investigates the causal relationship between the PRC's foreign direct investment and economic growth among the 10 ASEAN member countries from 1995 to 2013. Panel unit root tests, a spatial panel vector autoregressive model, and spatial Granger causality are employed as empirical techniques for spatial panel estimation. The empirical results reveal that the PRC's direct investment in ASEAN caused economic growth in ASEAN, and economic growth in ASEAN resulted in the PRC's direct investment in ASEAN. This finding raises potentially interesting external investment policy implications.

**JEL Classification:** O47, F23, C33

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## 1. INTRODUCTION

From 2002 to 2015, Asia saw a series of regional integration initiatives and rapid dispersion of investment from the People's Republic of China (PRC) to Southeast Asian economies. Some key regional economic agreements between the Association of Southeast Asian Nations (ASEAN) and the PRC were concluded and implemented during this period, particularly the Framework Agreement on Comprehensive Economic Cooperation between ASEAN and the PRC in 2002, the ASEAN–PRC Investment Agreement in 2009, the ASEAN–PRC Free Trade Area in 2010, and the Regional Comprehensive Economic Partnership in 2015. In 2009, at the time of the global financial crisis, the PRC's foreign direct investment (FDI) also started to increase. ASEAN FDI inflows from the PRC increased from \$1,965 million in 2009 to \$8,869 million in 2014, a compound annual increase of 35.17% (ASEAN 2015). However, at the time of the 2012 eurozone crisis, there was a modest (but insignificant) decline in the PRC's direct investment in ASEAN.

Deepening regional economic integration, a transformation of external policy, and connectivity improvements contributed to a boom in the PRC's direct investment in ASEAN. In 2007, the declaration on the ASEAN Economic Community (AEC) Blueprint was signed to establish ASEAN as a single market and production base, a highly competitive economic region, a region of equitable economic development, and a region fully integrated into the global economy (ASEAN 2008). In the implementation of AEC, foreign investment is crucial as a catalyst to enhance economic growth and foster equality in ASEAN countries. Moreover, the PRC government has utilized its external economic policy to shift development patterns. In 2000, the PRC transformed its economic development strategy from an export promotion and foreign capital utilization strategy to a "Go Global" strategy based on import promotion and outward investment (Ohashi 2015). In 2012, the PRC announced the "One Belt, One Road" strategy, which has two components: One Belt is a land route linking the PRC with Europe through Central and Western Asia; and One Road is a maritime Silk Road connecting the PRC with Southeast Asia, Africa, and Europe. The "One Belt, One Road" strategy results in more opportunities for PRC multinationals to expand or embark on operations abroad. Likewise, building and improving physical connectivity between the PRC and ASEAN is a critical element of an investment attraction strategy. Currently, the transnational economic corridors project under the Greater Mekong Subregion (GMS) Economic Cooperation Program helps to increase connectivity of economic activities among the GMS countries. These factors have contributed to the PRC becoming a major investor in ASEAN economies in recent years. In 2014, annual growth of the PRC's direct investment in ASEAN increased by 30.85% compared with that in 2013 (ASEAN 2015).

A number of studies investigated the relationship between FDI inflows and economic performance, e.g., economic growth, productivity, and employment. Some researches confirmed the significant relationship between FDI and economic performance, e.g., economic growth and productivity (Pegkas 2015, Ahmed 2015, Iamsiraroja and Ulubaşoğlu 2015). Other studies found insignificant linkages between FDI, economic growth, and trade (Belloumia 2014, Temiz and Gökmen 2014). Opinions are strongly divided on this issue. In one camp are those who believe FDI is a major catalyst for increasing the capacity of horizontal and vertical linkages, which contributes to the development of the regional value chain. Therefore, the FDI attractiveness of ASEAN is commonly used as a strategy for improving the industrialization of the region and lifting the regional value chain in ASEAN. In the other camp are those who favor a slow development of FDI flows, as they believe a gradual increase in FDI may be helpful for

effective and sustainable industrial development. That is because domestic firms can, in time, improve their capacity through horizontal and vertical spillovers. In other words, it is possible that the surge in the PRC's direct investment in ASEAN results in unbalanced economic gains for domestic firms in ASEAN. In short, the possible results of huge foreign investment flows are ambiguous, which means internal and external policies and synchronizing these policies are key to balancing foreign investment flows.

The first opinion implicitly assumes that domestic firms in a recipient country have high resilience in the face of foreign capital mobility. Consequently, an influx of FDI would boost economic growth and prosperity in the region. The second opinion implicitly assumes that recipient countries have little resilience to absorb huge FDI inflows, and that this obstructs economic growth. This leads us to wonder how ASEAN countries can adapt themselves to the PRC's trade and investment dynamics. It is always assumed that ASEAN's economic growth will improve according to the PRC's economic growth. And if this is true, it means that ASEAN's economic growth will undoubtedly be negatively affected when the PRC economy slows down.

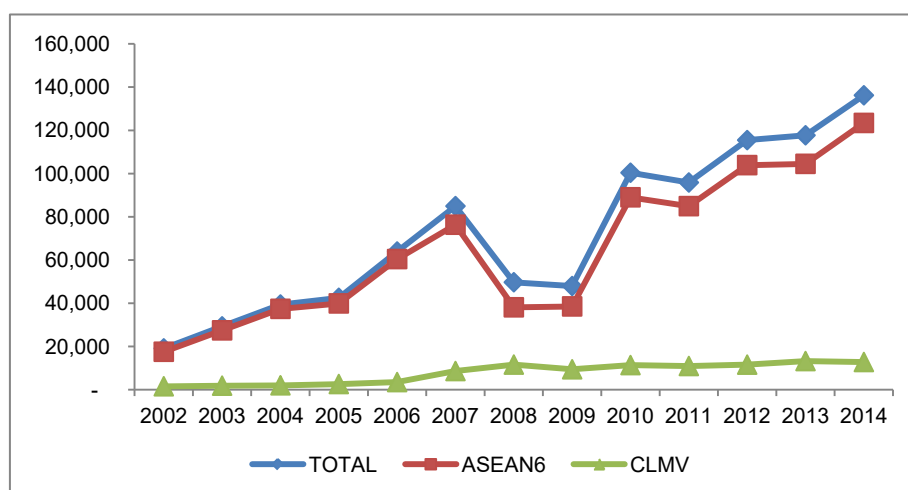
Therefore, the question of how FDI affects the recipient country's economic growth and economic activities lies at the heart of the debate, and has important policy implications. This motivates us to study this issue in greater depth. In this paper, we examine the impact of the PRC's FDI on ASEAN's gross domestic product (GDP) growth rate, international trade, domestic investment, employment, and economic geography. We look at these factors in the ASEAN member countries (Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic [Lao PDR], Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam). The main question is whether ASEAN economies are elastic to the PRC's FDI. And if they are elastic, are ASEAN economies influenced to the same degree by the PRC's FDI? The empirical results reveal that the spatial Granger causality test is unable to capture a geographic scale of causality, and the causality between the PRC's FDI and ASEAN's economic growth is sensitive to the model specification. The PRC's direct investment in ASEAN causes economic growth in ASEAN as a whole, and in any ASEAN country, economic growth causes FDI from the PRC. These findings have interesting external economic policy implications.

The remainder of the paper is structured as follows. Section 2 presents stylized facts on the PRC's direct investment in ASEAN. Section 3 gives a brief overview of recent empirical contributions regarding the relationship between FDI and economic performance. Section 4 discusses data sources, methodology, and empirical results. Conclusions and policy implications are provided in Section 5.

## 2. THE PEOPLE’S REPUBLIC OF CHINA’S DIRECT INVESTMENT IN THE ASSOCIATION OF SOUTHEAST ASIAN NATIONS: STYLIZED FACTS

The closer economic relationship between the PRC and ASEAN began when the framework agreement on comprehensive economic cooperation between ASEAN and the PRC was signed in 2002. This agreement led to the creation of the ASEAN–PRC Investment Agreement in 2009, the ASEAN–PRC Free Trade Area in 2010, and the Regional Comprehensive Economic Partnership in 2015. As closer economic relations between the PRC and ASEAN have been forged over the last 2 decades, the PRC has become a major investor in ASEAN economies.

**Figure 2-1: Foreign Direct Investment Inflows in the Association of Southeast Asian Nations, 2002–2014 (\$ million)**



ASEAN = Association of Southeast Asian Nations; CLMV = Cambodia, Lao People’s Democratic Republic, Myanmar, and Viet Nam.

Source: ASEAN (2015).

FDI inflows in ASEAN rose from \$19,085 million in 2002 and peaked at \$136,181 million in 2014, with the compound annual growth rate at 17.79% (Figure 2-1). FDI growth in Cambodia, the Lao PDR, Myanmar, and Viet Nam (CLMV countries) was higher than in Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand (ASEAN6). The reason may be that the CLMV countries have more abundant natural resources and they are emerging markets offering great opportunities for foreign investors and traders.

The PRC’s FDI in ASEAN, which surged during the period of regional integration from 2002 to 2015, rose from \$1,965 million in 2009 to \$8,869 million in 2014 (ASEAN 2015). This amounted to an annual average growth rate of 35.17% from 2009 to 2014 (Figure 2-2) despite a modest decline in the PRC’s FDI to ASEAN due to the 2012 eurozone crisis. Singapore was an outlier; it ranked first with \$20,452 million FDI from the PRC during 2009–2014, amounting to an annual average growth of 35.73%. Of the ASEAN5 countries (Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Thailand), Thailand ranked first with \$3,126 million, or 111.72% average annual growth, followed by Indonesia. Of the CLMV countries, the Lao PDR ranked first with



76.23%, followed by Cambodia. However, a slowdown of the PRC economy in 2014 led to a rapid reduction in the PRC’s FDI in CLMV countries, from \$2,027 million in 2013 to \$1,448 million in 2014. In sum, the PRC’s FDI to ASEAN increased continuously, except to Brunei Darussalam, Myanmar, and Viet Nam.

The PRC has become a major investor in ASEAN economies. In 2014, the PRC accounted for 6.51% of all FDI inflows in ASEAN. This was a share smaller than that of the European Union (19.29%), intra-ASEAN (17.90%), Japan (9.83%), and the United States (9.58%) (Figure 2-3). But the PRC’s direct investment in ASEAN rose by 30.85% in 2014 compared with that in 2013.

**Figure 2-2: The People’s Republic of China’s Direct Investment Flows to the Association of Southeast Asian Nations, 2009–2014 (\$ million)**

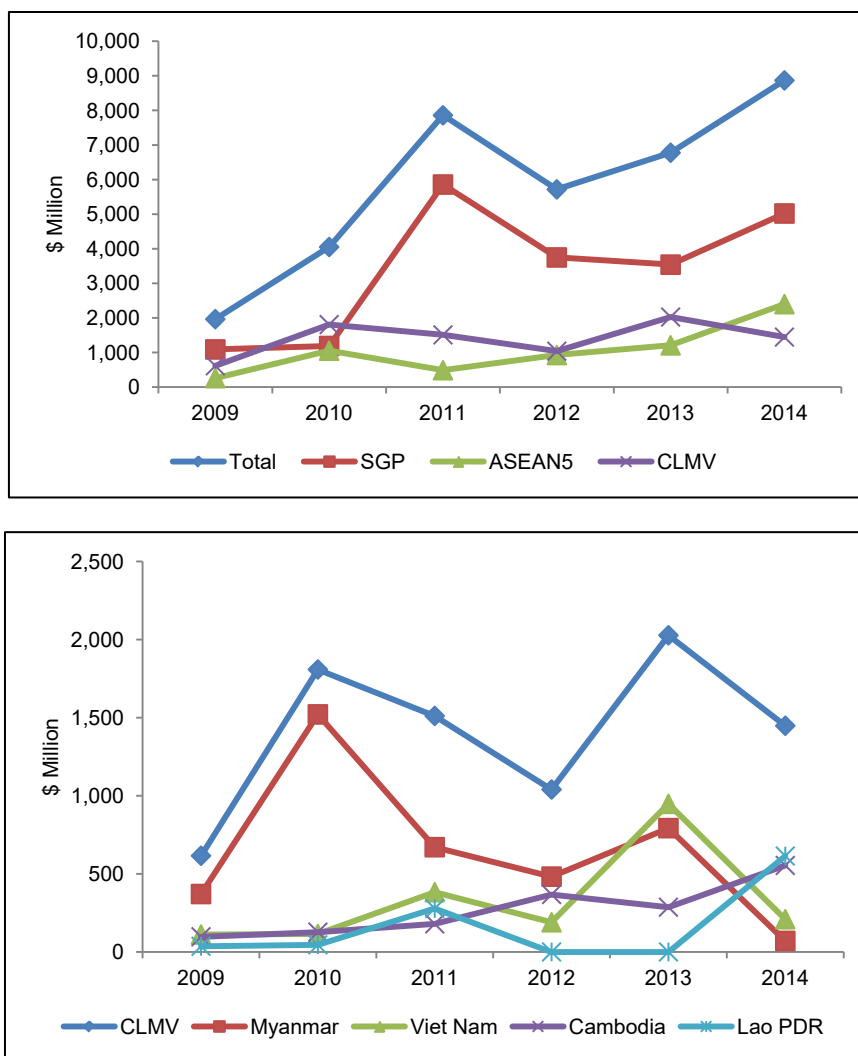
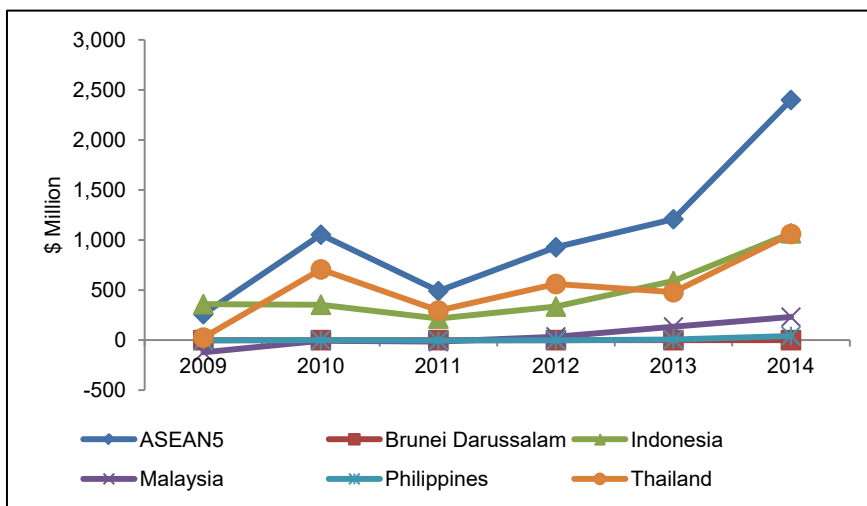


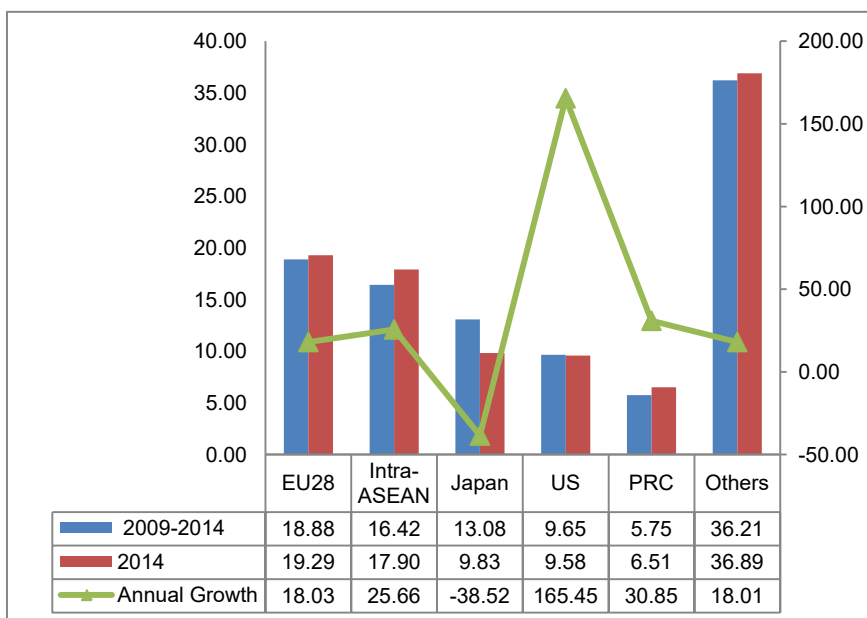
Figure 2-2 continued



ASEAN = Association of Southeast Asian Nations; CLMV = Cambodia, Lao PDR, Myanmar, and Viet Nam; Lao PDR = Lao People’s Democratic Republic; SGP = Singapore.

Source: ASEAN (2015).

Figure 2-3: Share of Foreign Direct Investment Inflows in the Association of Southeast Asian Nations by Major Investors, 2009–2014 (%)



ASEAN = Association of Southeast Asian Nations, EU = European Union, PRC = People’s Republic of China, US = United States.

Source: ASEAN (2015).

### 3. LITERATURE REVIEW

There have been a number of recent studies on the impact of FDI on host countries. According to Navaretti and Venables (2004), host-country effects of FDI are transmitted through three main channels: product market effects, factor market effects, and spillover effects.

First, product market effects occur when the entry of multinational firms leads to product market competition and crowding out of domestic firms. For example, Pilbeam and Oboleviciute (2012) showed a significant crowding out effect of FDI on domestic investment. Salike (2010) found a high degree of crowding out of Japan's FDI from the PRC's direct investment in other Asian countries. But a study by You and Solomon (2015) demonstrated a significantly positive influence of the PRC's outward FDI on domestic investment in the PRC. Besides, government support had an important role in terms of the impact of the PRC's overseas FDI on domestic investment in the PRC. Resmini and Siedschlag (2013) also examined the effect of FDI in the PRC on the PRC's direct investment in other countries. They showed that the surge of FDI in the PRC during 1990–2004 encouraged both horizontal and vertical direct investment by the PRC in other countries. Thus, the complementarity of FDI played a crucial role in FDI decisions, which implies that FDI inflows directly affected domestic investment.

Second, factor market effects occur when the entry of multinational firms leads to employment creation. Liu, Tsai, and Tsay (2015) explored the impact of outward FDI from Taipei, China on domestic employment, production, investment, and income distribution. As is commonly known, outward FDI to high-wage countries is horizontal FDI, and outward FDI to low-wage economies is vertical FDI. Their findings revealed that horizontal FDI from Taipei, China did indeed have a strong impact on domestic employment, production, and investment; whereas vertical FDI from Taipei, China led to job losses and industrial hollowing out in Taipei, China. Likewise, Cozza, Rabellotti, and Sanfilippo (2015) studied the effects of PRC outward direct investment in advanced European countries. They found a strongly positive impact of the PRC's outward FDI on domestic productivity and scales of operation.

Third, spillover effects occur when the entry of multinational firms leads to horizontal and vertical spillovers. Horizontal spillovers are regarded as technological externalities associated with specific knowledge such as a superior production techniques, know-how, and management strategy. The entry of multinational firms leads to an increase in the productivity of domestic firms in the same industry. The horizontal spillover effect is referred to as intra-industry spillover. Vertical spillovers are recognized to be pecuniary externalities from FDI via backward and forward linkages to input market transactions. They take place when multinational firms enter into transactions between local suppliers and customers, and provide them with technology transfer and know-how to improve the quality of intermediate goods. The entry of multinationals can raise demand for local output as backward linkage to intermediate goods suppliers, and improve productivity levels of domestic firms. Also, domestic producers that purchase intermediate goods from multinational suppliers gain benefits from the supply of more sophisticated inputs as forward linkages. The findings of Newman et al. (2015) indicated that inward FDI in Viet Nam was more likely to generate vertical spillovers than horizontal spillovers. In particular, they found evidence of positive spillovers from downstream FDI firms, i.e., joint ventures between multinational companies and domestic input suppliers. They also found negative spillovers from upstream FDI firms to downstream domestic producers. Moreover, they suggested that policies aimed at attracting FDI should be continued, whereas policies and measures on the direct transfer of knowledge between firms should be focused. Seyoum, Wu, and Yang (2015) explored the presence of technology spillovers from the PRC's outward FDI in the Ethiopian manufacturing sector and found that the PRC's direct investment in Ethiopia was positively associated with increases in productivity. The ownership of superior productive assets such as technological know-how and management skills induced higher productivity in Ethiopia. In sum,

product market effects and factor market effects are a direct impact of a surge of FDI in host economies, whereas spillover effects are an indirect effect of a surge in FDI.

The theory of the new economic geography has attempted to explain how firms behave in the context of economic agglomeration (or dispersion) in geographical space (Fujita and Krugman 2004). Theoretically, increasing returns to scale, monopolistic competition, transaction costs, and the occurrence of external economies underpin firms' and workers' location behavior (agglomeration or dispersion). Ascani, Crescenzi, and Iammarino (2012) reviewed the contributions to new economic geography focusing on the effects of economic integration on spatial development. In brief, firms' location behavior is driven by trade costs as a proxy for economic integration. That is, dispersion forces prevail over agglomeration forces when trade costs are high (a proxy for a low level of economic integration), whereas agglomeration forces prevail over dispersion forces when trade costs are lower (a proxy for a high level of economic integration). However, economic geography is commonly used as an important determinant of economic activities such as international trade and FDI. There was little evidence to support a spatial effect. Baltagi, Egger, and Pfaffermayr (2007) revealed that third-country effects were significant for FDI; in particular they lent support to the existence of various modes of complex FDI. But Chou, Chen, and Mai (2011), examining the impact of third-country effects and economic integration on the PRC's outward FDI using a spatial econometric approach, found that the PRC's outward FDI was not due to third-country effects.

Based on theoretical and empirical benchmark specifications, this paper aims to test the following hypotheses:

**Hypothesis 1:** FDI flows are directly related to economic performance, i.e., economic growth, international trade, domestic investment, and employment.

**Hypothesis 2:** Spatial interaction on FDI is indirectly related to economic performance, i.e., economic growth, international trade, domestic investment, and employment.

The study of the nexus between foreign investment and economic performance could help to shed light on the role of the PRC's foreign investment in ASEAN's economic performance.

## 4. EMPIRICAL ANALYSIS

This paper analyzes the long-run impacts of the PRC's foreign investment on ASEAN's economic performance with spatial interaction. This section starts with data collection, then tests for the causal relation between FDI, spatial interaction on FDI, and economic performance (economic growth, trade, investment, and employment), and finally empirical results are presented.

### 4.1 Data

In this study, panel data sets for 10 ASEAN member countries are collected for the period 1995–2013. The data comprise the PRC's direct investment to ASEAN, GDP, GDP per capita, export and import volumes, domestic investment, and employment. All data are used in real terms. For the analysis, all data are transformed into logarithm. The spatial interaction on FDI (WFDI) is built up through spatially weighted averages based on the distance between the capitals of the PRC (home country) and ASEAN

(host country). The spatially weighting matrix is used in its row-normalized form. The sources and descriptive statistics of the variables are given in Table 4-1.

**Table 4-1: Data Source and Descriptive Statistics of the Variables**

Variable	Description	Source	Obs.	Mean	Std. Dev.	Min.	Max.
fdi	PRC's FDI to ASEAN (in \$)	ASEAN Secretariat	190	2.344	2.631	-4.605	8.675
gdp	ASEAN's real GDP (in \$)	UNCTAD	90	10.537	1.619	7.300	13.022
gdppc	ASEAN's real per capital (in \$)	UNCTAD	190	7.507	1.640	4.560	10.492
trade	ASEAN's imports plus exports (in \$)	UNCTAD	190	10.060	2.867	0.000	13.577
iit	Intra-industry trade between PRC and ASEAN (index)	UNCTAD	190	-0.624	1.091	-6.688	0.000
gcf	ASEAN's gross capital formation (in \$)	UNCTAD	190	9.070	1.740	5.914	11.733
employ	Total employment to population in ASEAN (in %)	World Bank	190	4.224	0.110	4.044	4.411

ASEAN = Association of Southeast Asian Nations, FDI = foreign direct investment, GDP = gross domestic product, Max. = maximum, Min. = minimum, Obs. = observations, PRC = People's Republic of China, Std. Dev. = standard deviation, UNCTAD = United Nations Conference on Trade and Development.

Note: All variables are in natural log form.

Source: Author's estimates.

## 4.2 Testing

Testing for a causal relationship between the PRC's FDI and ASEAN's economic performance in a panel context is usually conducted in three steps. First, the order of integration in the time series variable is tested. Second, a spatial panel cointegration test is used to investigate the existence of a long-run relationship between sets of integrated variables. The last step is to evaluate the causal relation among the variables examined.

### A. Panel Unit Root Test

A panel unit root test is used to check for the existence of panel stationarity. In this paper, the panel unit root test by Levin, Lin, and Chu (LLC), the Im–Pesaran–Shin (IPS) W-test, and the augmented Dickey–Fuller (ADF)–Fisher (ADFF) Chi-square test (Levin, Lin, and Chu 2002; Maddala and Wu 1999; Im, Pesaran, and Shin 2003) are used to examine the degree of integration between Lfdi, Lgdp, Lgdppc, Ltrade, Liit, Lgcf, and Lemploy. The results for the panel unit roots are given in Table 4-2.

**Table 4-2: Panel Unit Root Tests**

Variables	In Level			First Differentiation			Second Differentiation		
	LLC	IPS	ADFF	LLC	IPS	ADFF	LLC	IPS	ADFF
fdi	-6.465* (0.000)	-6.900* (0.000)	84.573* (0.000)	-6.692* (0.000)	-9.812* (0.000)	117.80* (0.000)	-	-	-
gdp	3.371 (0.996)	-2.603* (0.004)	34.900** (0.020)	3.731 (0.999)	-7.860* (0.000)	94.430* (0.000)	-1.011 (0.155)	-14.69* (0.000)	170.65* (0.000)
gdppc	0.800 (0.788)	-6.300* (0.000)	76.202* (0.000)	2.648 (0.999)	-7.855* (0.000)	94.37* (0.000)	-1.623** (0.052)	-8.656* (0.000)	102.97* (0.000)
trade	-1.212	-2.559**	34.933*	-2.259*	-5.892*	71.444*	-	-	-

Variables	In Level			First Differentiation			Second Differentiation		
	LLC	IPS	ADFF	LLC	IPS	ADFF	LLC	IPS	ADFF
	(0.112)	(0.005)	(0.020)	(0.011)	(0.000)	(0.000)			
iit	-2.402* (0.008)	-3.325* (0.000)	43.247* (0.001)	-7.469* (0.000)	-9.111* (0.000)	109.82* (0.000)	-	-	-
gcf	2.246 (0.987)	-2.184* (0.014)	31.248** (0.052)	3.762 (0.999)	-5.947* (0.000)	71.680* (0.000)	1.328 (0.907)	-11.53* (0.000)	135.46* (0.000)
employ	3.942 (1.000)	-2.588* (0.004)	34.837** (0.021)	3.029 (0.998)	-5.723* (0.000)	69.023* (0.000)	1.363 (0.913)	-10.05* (0.000)	119.14* (0.000)

- = not applicable; ADFF = augmented Dickey–Fuller (ADF)–Fisher; IPS = Im–Pesaran–Shin; LLC = Levin, Lin, and Chu.

Notes: a. The *p* values are in parentheses. b. \* and \*\* denote rejection of null hypothesis: The panel series has a unit root at the 1% and 5% level of significance, respectively.

Source: Author’s estimates.

The IPS and ADF panel unit root tests for all variables reject the null hypothesis at the 1% and 5% significance level, respectively, in the level form. However, the LLC panel unit root test (except for Lgdp, Lgcf, and Lemploy) can reject the null hypothesis at the 1% and 5% significance level in the first difference and the second difference. Based on the LLC test, Lfdi and Liit are integrated of order zero or I(0) process; Ltrade is integrated of order one or I(1) process; and Lgdp, Lgdppc, Lgcf, and Lemploy are integrated of order two or I(2) process.

### B. Panel Cointegration Test

The second step is to estimate the long-run relationship between the PRC’s FDI and ASEAN’s economic performance with spatial interaction. The variables in the spatial panel are estimated using a spatial panel vector autoregressive (SpVAR) model. Theoretically, SpVAR is able to justify spatial cross-section dependence in the data (LeSage and Pan 1995, Beenstock and Felsenstein 2007). The SpVAR equations are as follows:

$$\Delta gdp_{i,t} = \alpha_0 + \sum_{k=1}^p \beta_k \Delta gdp_{i,t-k} + \sum_{k=1}^p \theta_k \Delta fdi_{i,t-k} + \sum_{k=1}^p \theta_k w \Delta fdi_{i,t-k} + u_{i,t} \quad (3-1)$$

$$\Delta trade_{i,t} = \alpha_0 + \sum_{k=1}^p \beta_k \Delta trade_{i,t-k} + \sum_{k=1}^p \theta_k \Delta fdi_{i,t-k} + \sum_{k=1}^p \theta_k w \Delta fdi_{i,t-k} + u_{i,t} \quad (3-2)$$

$$\Delta gcf_{i,t} = \alpha_0 + \sum_{k=1}^p \beta_k \Delta gcf_{i,t-k} + \sum_{k=1}^p \theta_k \Delta fdi_{i,t-k} + \sum_{k=1}^p \theta_k w \Delta fdi_{i,t-k} + u_{i,t} \quad (3-3)$$

$$\Delta employ_{i,t} = \alpha_0 + \sum_{k=1}^p \beta_k \Delta employ_{i,t-k} + \sum_{k=1}^p \theta_k \Delta fdi_{i,t-k} + \sum_{k=1}^p \theta_k w \Delta fdi_{i,t-k} + u_{i,t} \quad (3-4)$$

where  $i = 1, 2, \dots; N$  is the country index; and  $t = 1, 2, \dots, k$  is the time index. All estimations are conducted with the panel fixed effect estimator. The results for the spatial panel vector autoregressive model are given in Table 4-3.

**Table 4-3: Spatial Vector Autoregressive Results**

	Base Case				Alternative Case	
	gdp	trade	gcf	employ	gdppc	iit
fdi(t-1)	0.186** (2.903)	0.437* (4.710)	0.239* (3.615)	0.014* (3.178)	0.052 (0.809)	-0.091* (-2.557)
Spatial fdi(t-1)	0.175 (0.679)	0.642** (2.200)	0.310 (1.311)	0.031 (1.543)	0.404*** (1.671)	0.043 (0.701)
gdp(t-1)	0.012 (0.179)					
trade(t-1)		0.274* (4.513)				

	Base Case				Alternative Case	
	gdp	trade	gcf	employ	gdppc	iit
gcf(t-1)			0.170* (2.612)			
gdppc(t-1)				-0.069 (-0.969)	-0.074 (-1.047)	
iit(t-1)				-0.069 (-0.969)		0.110 (1.500)
Rho	0.743* (17.808)	0.411* (4.504)	0.587* (8.926)	0.963* (160.005)	0.632* (10.719)	-0.518* (-2.864)
Obs.	190	190	190	190	190	190
R-square	0.629	0.475	0.529	0.984	0.414	0.123
Log-likelihood	-385.956	-454.673	-388.991	89.258	-38.546	-275.864
Moran's I	1.105 <sup>†</sup>	0.675 <sup>†</sup>	1.212 <sup>†</sup>	0.675 <sup>†</sup>	1.033 <sup>†</sup>	0.781 <sup>†</sup>

Notes: a. t-stats are in parentheses. b. \*, \*\*, and \*\*\* are significant at 1%, 5%, and 10%, respectively. c. † denotes rejection of null hypothesis: no spatial correlation at the 1% level of significance.

Source: Author's estimates.

The estimated results confirm that the PRC's direct investment in ASEAN is a strongly positive significant autoregressive parameter. Higher FDI results in a strong increase in economic growth, trade, investment, and employment in ASEAN countries. Moreover, spatial interaction on FDI has a positive significant relationship with trade. To check the stability of the long-run relationship between FDI and economic growth and trade, we therefore use GDP per capita as a proxy for economic growth, and intra-industry trade between the PRC and ASEAN as a proxy for trade. Surprisingly, the alternative results reveal that FDI has a negative significant relationship with intra-industry trade, whereas spatial interaction on FDI has a positive significant relationship with economic growth. However, these findings confirm the long-run relationship between the PRC's foreign investment and ASEAN's economic performance with spatial interaction.

### C. Panel Causality Test

The final step is to estimate the causal relationship between the PRC's foreign investment and ASEAN's economic performance with spatial effect. Granger causality test technique is used to evaluate the nexus between FDI and GDP (Model 1), FDI and Trade (Model 2), FDI and investment (Model 3), and FDI and employment (Model 4) in ASEAN countries. According to the results of panel unit root tests and panel cointegration test, the series employed in testing the causality is series I(1) and cointegrated. For causality analysis, the optimal lag lengths of the models are provided. Given the standard information criteria—Akaike Information Criterion, Schwarz Bayesian Information Criterion, and Hannan–Quinn Information Criterion—the numbers of optimal lag length of the model are shown in Table 4-4.

**Table 4-4: Spatial Granger Causality Test Results**

Null Hypothesis	VAR*	F-Stat.	p-value	Results
<b>Model 1A:</b>				
$\Delta fdi$ no Granger cause $\Delta gdp$	8	9.459	0.000	Reject
$\Delta gdp$ no Granger cause $\Delta fdi$	8	4.665	0.000	Reject
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta gdp$	8	1.505	0.140	Accept
$\Delta gdp$ no Granger cause $\Delta wfdi$	8	0.794	0.609	Accept
<b>Model 1B:</b>				

Null Hypothesis	VAR*	F-Stat.	p-value	Results
$\Delta fdi$ no Granger cause $\Delta gdppc$	8	14.027	0.000	Reject
$\Delta gdppc$ no Granger cause $\Delta fdi$	8	2.725	0.011	Reject
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta gdppc$	8	1.385	0.217	Accept
$\Delta gdppc$ no Granger cause $\Delta wfdi$	8	0.777	0.623	Accept
<b>Model 2A:</b>				
$\Delta fdi$ no Granger cause $\Delta trade$	7	8.610	0.000	Reject
$\Delta trade$ no Granger cause $\Delta fdi$	7	1.886	0.082	Accept
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta trade$	2	0.182	0.833	Accept
$\Delta trade$ no Granger cause $\Delta wfdi$	2	1.458	0.235	Accept
<b>Model 2B:</b>				
$\Delta fdi$ no Granger cause $\Delta iit$	5	4.323	0.001	Reject
$\Delta iit$ no Granger cause $\Delta fdi$	5	4.658	0.000	Reject
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta iit$	8	1.703	0.107	Accept
$\Delta iit$ no Granger cause $\Delta wfdi$	8	0.810	0.595	Accept
<b>Model 3:</b>				
$\Delta fdi$ no Granger cause $\Delta gcf$	8	12.761	0.000	Reject
$\Delta gcf$ no Granger cause $\Delta fdi$	8	5.425	0.000	Reject
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta gcf$	8	0.810	0.595	Accept
$\Delta gcf$ no Granger cause $\Delta wfdi$	8	1.606	0.137	Accept
<b>Model 4:</b>				
$\Delta fdi$ no Granger cause $\Delta employ$	7	1.900	0.079	Accept
$\Delta employ$ no Granger cause $\Delta fdi$	7	6.141	0.000	Reject
<b>Spatial effect:</b>				
$\Delta wfdi$ no Granger cause $\Delta employ$	8	0.645	0.736	Accept
$\Delta employ$ no Granger cause $\Delta wfdi$	8	1.304	0.255	Accept

Notes: The  $p$ -value statistics indicate a statistical significance at 1%. \* represents the optimal lag order selection.

Source: Author's estimates.

The estimations of F-statistics for the common coefficient of the panel causality analysis (Table 4-4) indicate that all estimations *without* spatial effect are significant at the 1% significance level and reject the null hypothesis that there is no causality among the variables. There are unidirectional causalities from FDI to trade and from FDI to employment, and bidirectional causalities between FDI and GDP, FDI and GDP per capita, FDI and intra-industry trade, and FDI and domestic investment. Moreover, all estimations *with* spatial effect accept the null hypothesis: there is no causality among the variables. There is limited support for causality between spatial interaction on FDI and economic performance in ASEAN.

In sum, the spatial Granger causality test is unable to capture a geographic scale of causality, but it gives strong evidence that the PRC's direct investment in ASEAN countries causes economic growth, international trade, investment, and employment in ASEAN. Hence, attractive foreign investment policies in ASEAN must be formulated and implemented.



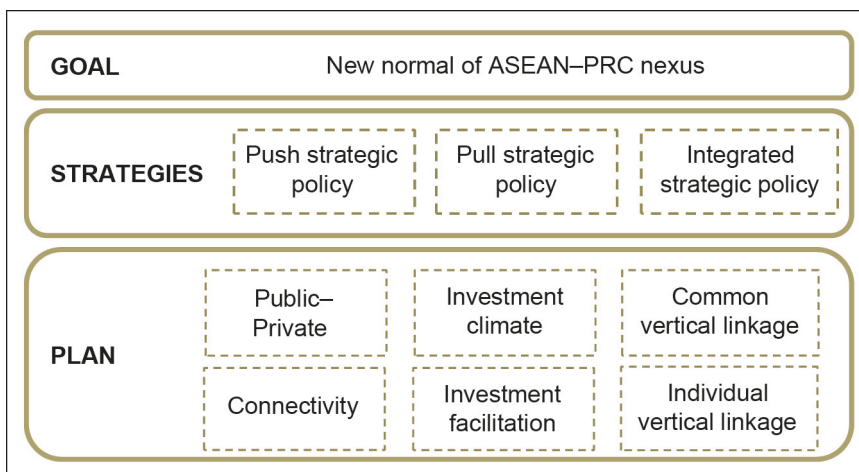
## 5. CONCLUSION AND POLICY IMPLICATIONS

This paper investigates the long-run relationship between the PRC's direct investment flows to ASEAN economies and ASEAN's economic performance (measured by economic growth, trade, domestic investment, employment) using the Granger causality test. The test for causal relationship in a panel context is conducted in three steps. First, the order of integration in the time series variable is tested. Second, a spatial panel cointegration test is used to investigate the existence of a long-run relationship between the sets of integrated variables. The last step is to evaluate the causal relation among the variables examined. Panel data sets of 10 ASEAN member countries over the period 1995–2013 are arranged. The panel unit root test results for all variables show the series in the panel are integrated of the order one. The panel cointegration test results using a spatial vector autoregressive model show that there is a long-run positive relationship between the PRC's FDI and ASEAN's economic growth, trade, investment, and employment. But the results also show that there is no long-run relationship between spatial interaction on FDI and ASEAN's economic performance. The Granger causality test results reveal that the PRC's direct investment in ASEAN causes economic growth, international trade, and investment in ASEAN, whereas ASEAN's economic growth, investment, and employment cause growth in the PRC's FDI.

This evidence suggests that ASEAN's external investment policy should be continued, with improvement of strategic investment policies, in both an intra- and extra-ASEAN context. In this paper, policy implications for ASEAN policy makers are shaped under the investment policy framework for a sustainable economy, the influence of the PRC's "One Belt, One Road" strategy, and the ultimate goal of the ASEAN Economic Community (AEC). First, the investment policy framework for a sustainable economy is constructed to facilitate the development of a new generation of investment policies (UNCTAD 2015). These new generation investment policies are meant to contribute to the achievement of the Sustainable Development Goals, e.g., relating to sustainable and inclusive growth, infrastructure, renewable energy, water and sanitation, food security, health, and education. To attract and maximize gains from investment, innovative investment promotion and facilitation mechanisms at the national and international levels should be incorporated. Second, the PRC's "One Belt, One Road" initiative is a strategic policy that aims to strengthen connectivity through interactions between regions. There are two aspects: One Belt is a land route linking the PRC with Europe through Central and Western Asia; and One Road is a maritime Silk Road connecting the PRC with Southeast Asia, Africa, and Europe. This policy focuses on building a new network of global partnerships and improving connectivity in five areas—policy consultation, infrastructure connectivity, free trade, free circulation of local currencies, and people-to-people connectivity. Moreover, it attempts to build a large and multilayered platform for all countries along "One Belt, One Road" to maximize mutual advantages and benefits. Third, the ultimate goals of the AEC are to establish ASEAN as a single market and production base, a highly competitive economic region, a region of equitable economic development, and a region fully integrated into the global economy (ASEAN 2008). The AEC is expected to be fully implemented by 2020.

Under all these aspects, ASEAN's strategic investment policies should be initiated based on the goal of the new normal of the PRC economy and ASEAN economy nexus. A push and pull investment strategy and an integrated investment strategy are appropriate for improving the strategic investment policies, in both intra- and extra-ASEAN contexts (Figure 5-1).

**Figure 5-1: Association of Southeast Asian Nations’ Strategic Investment Policy**



ASEAN = Association of Southeast Asian Nations, PRC = People’s Republic of China.

Source: Author.

External investment policy should aim to create a better investment environment for foreign investors and to help domestic investors open up new markets abroad. It might be called push-pull strategic investment policy. Under the new normal of the PRC’s economy, capacity building through investment innovation in ASEAN is a priority. Indeed, innovation paves the way for future change. The public-private partnership between the PRC and ASEAN and their connectivity are the key factors for successful strategic investment measures of the push type, whereas the investment climate and facilitation are still the main factors for successful strategic investment measures of the pull type. Moreover, external investment policies should be designed and implemented in conjunction with the PRC’s external investment policy. It might be called common strategic investment policy. The PRC’s “One Belt, One Road” strategy aims to build connectivity and cooperation among countries along the Silk Road. And as part of the AEC road map, ASEAN has been attempting to develop the region into a well-developed and prosperous one. Hence, capacity building through improving vertical linkages between the PRC and ASEAN, and within ASEAN, is vital for sustainable investment development.

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