Chapter

FDI and Its Impact on Trade in the East Asian Transition Economies

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Abstract

As globalization and trade liberalization have increased integration of the world economy through financial and trade flows, the role of FDI and trade on economic growth is becoming more influential. This paper investigates the impact of FDI on trade of the East Asian economic transition countries, namely the China, Cambodia, Lao PDR, and Vietnam, employing FDI flow and FDI stock data separately. The data from these four countries during the period 1990–2019 have been collected, and OLS and panel within fixed effect estimators are utilized. The main findings show that, first, when estimated using FDI flow as independent variable, there exists complementary effect between FDI and trade, and the coefficients are significant except for Cambodia. Second, when estimated using FDI stock as independent variable, the impact of FDI decreases and even substitutability effect is found in China at significant level. Third, in both cases, the coefficient of FDI is shown positive and significant in Vietnam. In addition, the paper finds the effects of human capital, GDP, and WTO accession on trade are positive, while the effects of exchange rate, financial development, and tariff rate vary among the East Asian economic transition countries.

Keywords: foreign direct investment, trade, East Asian transition economies, panel within fixed effect, China, Cambodia, Lao PDR, Vietnam

1. Introduction

In the last decade, global trade increased more than twice as fast as the global GDP and growth of FDI (foreign direct investment) outpaced the growth of global exports [1, 2]. According to WDI, Global trade volume accounted for 51% of global GDP in 2000, but as in 2019, it accounts for 60% of global GDP. Global FDI stock invested by global economies in 2019 were US$34 trillion at current price, which increased at significant pace considering that it was US$7.4 trillion in 2000.

This increase in global trade accompanied by a rapid growth of FDI intrigued a number of studies to investigate the role of FDI and trade on economic growth and the relationship between the FDI and trade. Most empirical studies find complementary relationship, while few find substitute effect of FDI on trade [2–6]. Some studies suggest the effect of FDI on trade depends on the type of FDI, type of industry, or income level of recipient countries [3, 7, 8]. While [3] finds complementary relationship between FDI and trade in most cases, he argues the impact of FDI on import is greater than export in developing countries in short term.

Despite the effect of FDI on export can be negative (or relatively smaller than on import) for developing countries, FDI inflow enables transfer of technology and managerial skills from developed countries, hence leading to positive spillover [9]. Hence, role of FDI and trade are particularly important for emerging countries and transition countries who opened its economy quite recently.

A number of literatures classify the transition into three types: Germany, Former Soviet Union, and East-Asian types [10, 11]. This study is interested in East-Asian type in specific, covering China, Vietnam, Cambodia, and Lao PDR. These countries transformed the economic system to capitalistic market system through reform and opening up. However, they maintain their political system of one-party communist system. This type is often referred to economic transition countries.

The case of the East Asian economic transition countries is interesting as they have shown fast economic growth soon after they transited their economic system from socialist regime to market-oriented regime. China, Cambodia, Lao PDR, and Vietnam initiated economic reforms in 1979, 1989, 1986, and 1986, respectively. However, most of existing empirical studies investigate the trade determinants of specific country or countries in same geographical area or in similar development level. There is limited empirical evidence about the determinants of East Asian economic transition countries' regional trade development.

By examining the impact of FDI on trade of these East Asian economic transition countries, this paper provides more insight into the regional and global implications of FDI and trade in East Asian economic transition countries. Policy implications can be derived for the countries that have been experiencing economic transition such as Myanmar, Cuba and the country such as North Korea in the future. Therefore, through utilizing the panel fixed effect regression, this study investigates the impact of FDI on trade.

Empirical results show complementary effect between FDI and trade when estimated using FDI flow variable. To be specific, the effect of FDI on trade is shown the highest in the order of Vietnam, China, Cambodia, and Lao PDR although the coefficient of FDI is insignificant in Cambodia. When estimated using FDI stock variable, the complementary relationship between FDI and trade weakens, and even substitutability effect is found in China at significant level. Interestingly, the coefficient of FDI is positive and significant in Vietnam in both cases.

The rest of the paper is organized as follows. In Section 2, the paper briefly investigates the role, trend and relationship between the global trade and FDI with providing a related literature review. In Section 3, terminology related to economic transition and performance of trade and FDI of East Asian economic transition countries (China, Cambodia, Laos, and Vietnam) are reviewed. In addition, FDI policies of these countries are thoroughly analyzed. In Section 4, the paper provides empirical analysis and results in Section 5. Finally, Section 6 concludes the study with a discussion of our findings.

2. Global trade and FDI

2.1 The relationship between trade and FDI

Globalization and trade liberalization have increased integration of the world economy through financial and trade flows [12]. Global trade increased more than twice as fast as the global GDP in the last decade and growth of FDI outpaced the growth in global exports [1, 2]. **Figures 1** and **2** present the global FDI and trade trends from 1970 to 2019, former expressed in current billion US$ and latter

Figure 1.
Trends of global FDI and trade (current billion US$). Source: World Bank.

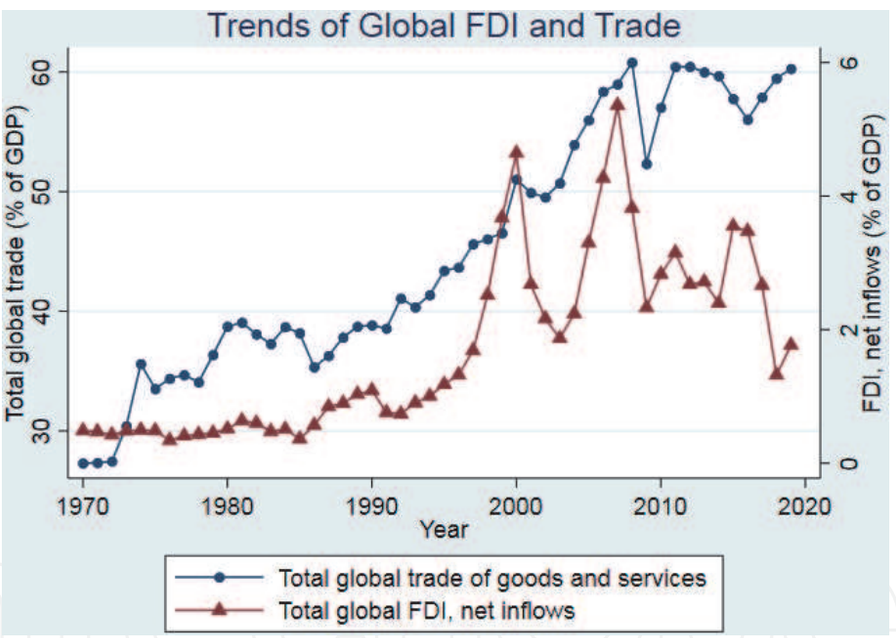

Figure 2.
Trends of global FDI and trade (% of GDP). Source: World Bank.

expressed in a ratio of GDP. Global trade volume accounted for 27% ($767 billion) of global GDP in 1970, 38% ($8.7 trillion) in 1990, and 51% ($15.8 trillion) in 2000. But as in 2019, it accounts for 60% ($49 trillion) of global GDP. Total global FDI net inflow was $12 billion in 1970, passing $100 billion in 1987, reaching $1.4 trillion in 2000, and $2.1 trillion in 2016.

The figures show that increase in global trade has been accompanied by a rapid growth of FDI. While trade gradually increases during the period both in terms of GDP or current US$, FDI shows a more volatile trend than trade with more fluctuations. Both trade and FDI fell significantly during the global financial crisis in 2008, seemed to recover, but are slowing down and decreasing in recent years. In particular, current FDI inflow ($1.6 trillion in 2019) is far below the highest record point of $3.1 trillion in 2007.

Before investigating the relationship between FDI and trade, the role of trade and FDI in economic growth is briefly explained. In general, FDI and trade development are both regarded to positively contribute to economic growth although the trends of FDI and global trade are not always correlated [3]. Theoretically, FDI is considered as an important exogenous source that enables capital accumulation of recipient countries. Inflow of FDI enables the recipient country to create new job opportunities, improve infrastructure, increase productivity, and therefore promote economic growth. Especially for developing countries, FDI inflow enables transfer of technology and managerial skills from developed countries, hence leading to positive spillover [9].

A number of studies have investigated the casual relationship between the FDI and trade flows. **Figure 3** presents the trend of the relationship between global FDI inflows and global trade volume during the period 1970–2019, both expressed in current billion US$. Clearly, the fitted line shows the complementary (positive) relationship between the two with some outliers. It is interesting that the lower the values of FDI and trade, more concentrated and fitted the values are to the fitted line. Referring from **Figures 1** and **2**, the low values are likely to present the early periods, therefore it can be implied that the variation increased over periods thus is harder to predict the relationship as time passes.

According to [3], global trade seems to generate FDI until the mid-1980s, but after this period, this cause-and-effect relationship reversed with FDI influencing the trade significantly. In addition, [3] finds that FDI outflow increases export of originating countries, and in recipient countries, import increases in short term, and export increases in long term. Nevertheless, he addresses that although FDI inflow can increase import rather than export, recipient country can still benefit from FDI by technology transfers, job creation, local subcontracting, and etc.

Likewise, the relationship between trade and FDI can be either complementary or substitute. Dinh and Hoai [4] investigate the impact of FDI and trade openness on economic growth in 22 Asia-Pacific developing countries from 1990 to 2011 using System GMM. They find that both FDI and trade openness positively contribute to economic growth in these countries and show complementary

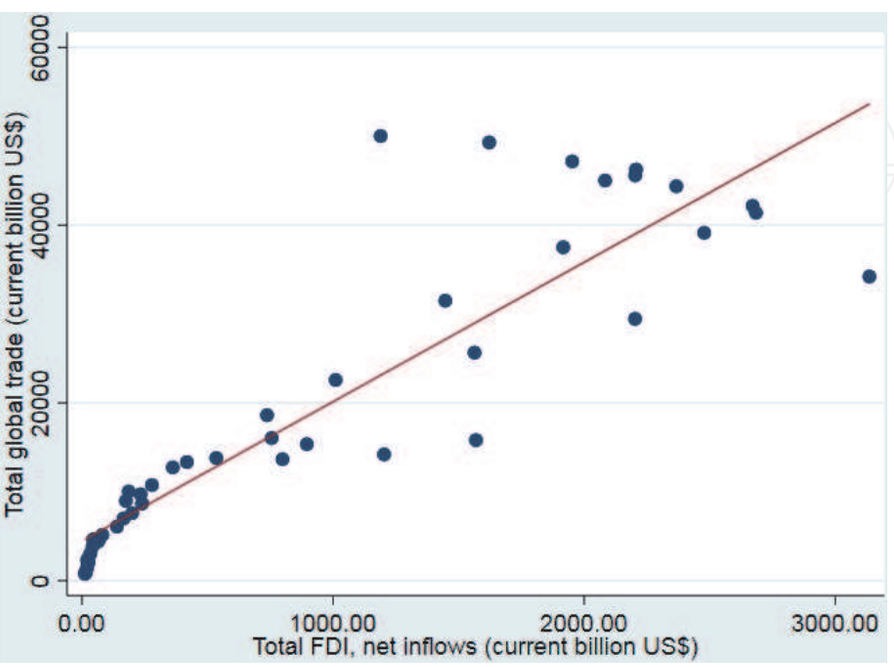

Figure 3.
Relationship between global FDI and trade (% of GDP). Source: World Bank.

relationship. Further, [5] examine the effect of FDI on trade in Vietnam from 1990 to 2007 utilizing a gravity model. They show that there exists a complementary relationship between FDI and trade although the impact is not significant. Cantwell and Bella (2000) argue there is a complementary relationship between FDI and trade with a growing influence of MNCs in international trade. Cantwell and Bellak [6] investigate 21 empirical studies on impact of FDI on trade in emerging countries, and conclude trade and FDI work as a complement in emerging countries.

On the other hand, utilizing system GMM estimators, [13] argue the combined effect of FDI inflow with trade openness negatively affect the economic growth, while they positively contribute when taken separately. They also address the importance of role of economic institutions on FDI and trade openness. Strengthening the argument, using gravity model, [2] also find the substitutability relationship between trade and FDI inflow in Portugal during 2000 and 2013. Interestingly, some studies suggest the effect of FDI on trade depends on the type of FDI, type of industry, or income level of recipient countries [3, 7, 8].

2.2 Literature review on determinants of trade

Global trade, a key economic indicator to examine a nation's health, is vital for developing countries, especially for the transition countries who opened its economy relatively recently, to attract investment, enhance competitiveness, and promote economic growth. It is influenced by various factors including factor endowments (land, labor, and capital), productivity, trade costs, trade policy (barriers to trade), exchange rate, inflation, tastes, and etc. Among the determinants of trade, productivity and factor endowments gained the most attention in the trade literature [14].

To examine the impact of FDI on trade, empirical studies on determinants of trade are investigated. Goswami [15] uses panel FMOLS (Fully Modified OLS) to examine the determinants of trade development of 5 South Asian countries (India, Pakistan, Bangladesh, Sri Lanka, and Nepal) from 1980 to 2010. Trade as a ratio of GDP is utilized as the dependent variable, while per capita income, average year of schooling (proxy for human capital), bank credit to private sector (proxy for financial development), tariff rate, FDI stock, exchange rate, and infrastructure index are utilized as explanatory variables. Effect of per capita income growth, human capital, infrastructure and financial development have shown significant positive on trade of South Asian countries, while the effect of exchange rate has shown significant negative.

Dauti [16] investigates the relationship between FDI and trade in the European region based on country characteristics, classifying into two groups of ten new members of EU and five South East European countries. Gravity model is utilized with FDI stock, GDP, skill and capital endowments and trade distances. Employing various static and dynamic panel estimation models, he finds positive impact of FDI on import, and negative impact of FDI on export. The coefficients of labor and capital endowments are shown positive and significant on both export and import. Interestingly, the impact of GDP per capita on export is shown negative and significant.

In the same line, [17] examine the trade determinants of 23 transition countries in Central and Eastern Europe countries using fixed effects, random effect, IV and GMM models from 2000 to 2015. FDI, GDP, investments (gross capital formation in a ratio of GDP), trade liberalization index (TLI), exchange rate are utilized as the trade determinants. FDI, investments, and TLI have shown positive impact on trade, while exchange rate and GDP have shown no significant effect. Using the result, they suggest transition countries to promote policies to improve human resources, business environment, governance, and infrastructure to increase export.

In addition, using ARDL (Autoregressive Distributed Lag) model, [18] analyze the determinants of trade in Finland for short-run and long-run from 1990 to 2019. Without using FDI as explanatory variable, they find the impacts of inflation, urbanization and exchange rate on trade balance are negative and significant, while the impacts of unemployment and GDP on trade balance are positive and significant for both for short-run and long-run.

Moreover, recent literature includes institutional factors as major determinants of trade balance [19, 20]. Employing GMM method, [19] investigate determinants of trade of 36 Sub-Saharan Africa (SSA) countries from 1996 to 2017. Not only FDI, but also regulatory quality, rule of law, inflation, population growth and access to sea are utilized as explanatory variables. Empirical result reveals that institutional determinants and FDI and access to sea lagged by one period enhances trade openness in SSA countries during the sample periods.

Furthermore, [21] studies the impact of FDI, exchange rate and trade openness on trade balance, which is measured by subtracting volume of import from volume of export. Using sample data covering over period during 2005 and 2018 in Vietnam, he finds the impact of FDI and trade openness on trade balance is negative and significant, while the exchange rate insignificantly influences trade balance.

Including the studies mentioned in this section, most empirical studies investigate the trade determinants of specific country or countries in same geographical area or in similar development level. There is limited empirical evidence about the determinants of East Asian economic transition countries' regional trade development.

3. East Asian economic transition countries

3.1 Concept of economic transition and performance

Transition generally implies a conversion of political • economic system into reformation • open-door system [10]. Political system transition refers to a transformation from communism system, where only 1 party is admitted, to a democratic system, where bases on a multi-party system. Economic system transition refers to a transformation from socialism system, where every economic decision is determined by the planned economy of the central government, to a capitalistic market system, where bases on a market mechanism.

However, it is not easy to clearly distinguish which form the transitions the countries in reality are following. A number of literatures classify the transition into three types: Germany, Former Soviet Union, and East-Asian types [10, 11]. This study is interested in East-Asian type in specific, covering China, Vietnam, Cambodia, and Lao PDR. These countries transformed the economic system to capitalistic market system through reform and opening up. However, they maintain their political system of one-party communist system. This type is often referred to economic transition countries.

Going through economic transition, these countries initiated trade liberalization and market-oriented reform process in late 1980s, intensifying further in 1990*s. china*, Cambodia, Lao PDR, and Vietnam started economic reform in 1978, 1989, 1986, and 1986, respectively. They have shown a fast economic growth soon after they transited to socialist market economy system, which is shown in **Figure 4**.

Figure 4 shows the trends of GDP per capita (in constant 2010 US$) of four East Asian economic transition countries and the data was collected from the World Bank WDI (World Development Indicators). Among four countries, China has shown the fastest growth, increasing from $720 in 1990 to $8,254 in 2019. GDP per

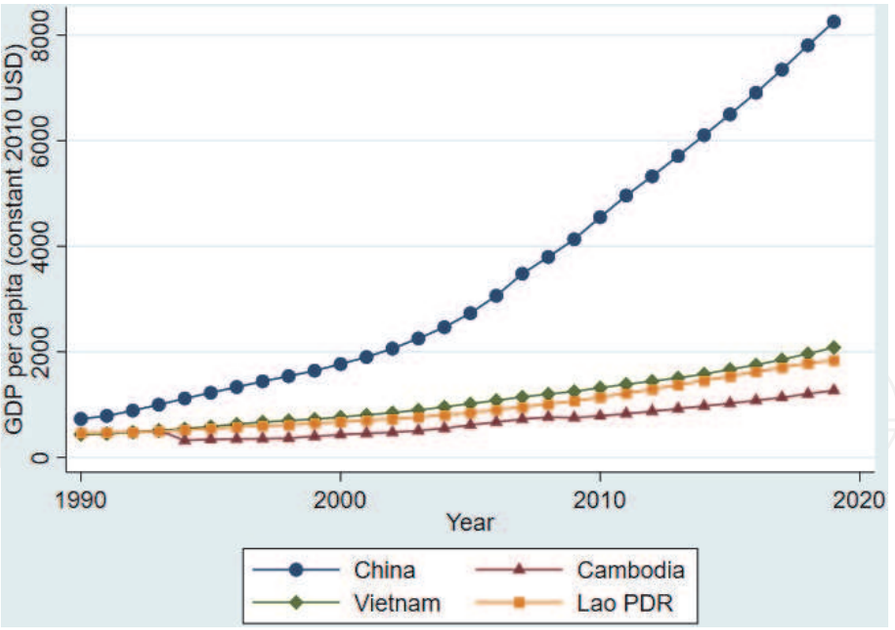

Figure 4.
GDP trends of east Asian transition countries. Source: World Bank.

capita of China almost doubled in the last 10 years. In case of Cambodia, GDP per capita increased from $321 in 1994 to $1,269 in 2019 with a small decrease in 2009. GDP per capita of Lao PDR increased from $462 in 1990 to $1,840 in 2019. In Vietnam, it increased from $433 in 1990 to $2,082 in 2019. Although Cambodia, Lao PDR, and Vietnam had similar starting point in early 1990s, Vietnam shows the highest improvement in GDP per capita, followed by Lao PDR and Cambodia, respectively.

Table 1 demonstrates current (2019) social and economic situations of the sample countries. Although they are all economic transition countries having same economic and political systems in common, they differ in development level, population growth, unemployment rate, and etc. First of all, except Lao PDR, rest of the countries have access to sea. In addition, Lao PDR has the highest population growth rate, following by Cambodia, Vietnam, and China, respectively. Furthermore, four countries show similar level of income inequality shown as Gini index score. Moreover, China has the highest unemployment rate of 4.6%, following by Vietnam of 2.04%, Lao PDR of 0.62%, and Cambodia of 0.13%, respectively. Last but not least, although China has the highest GDP per capita, Cambodia and Vietnam show higher GDP growth rate than China.

	China	Cambodia	Lao PDR	Vietnam
GDP per capita, PPP (current international $)	16,830	4,583	8,173	8,397
GDP growth rate (%)	6.11	7.05	4.65	7.02
Inflation rate, consumer prices (%)	2.90	2.46	3.32	2.80
Unemployment rate (%)	4.6	0.13	0.62	2.04
Gini index	38.5	37.9	36.4	35.7
Population growth rate (%)	0.46	1.49	1.55	0.99
Access to sea	O	O	X	O

Source: World Bank World Development Indicators (WDI).

Table 1.
Country characteristics of China, Cambodia, Lao PDR, and Vietnam.

3.2 Trends of trade and FDI

A number of studies investigate the major contributors of economic growth in East Asian economic transition countries, and often FDI inflows and trade liberalization are suggested as the main determinants [22–27]. Nevertheless, the relationship between FDI and trade remains one of the hottest debates as was argued in Section 2.1.

Figure 5 shows the trend of FDI net inflows in current billion US$ of China, Cambodia, Lao PDR, and Vietnam, and **Figure 6** shows the trend of trade in current billion US$ of the countries during the period 1990–2019. There are two y-axis in the figure, where left axis describes the status of China, while right axis describes

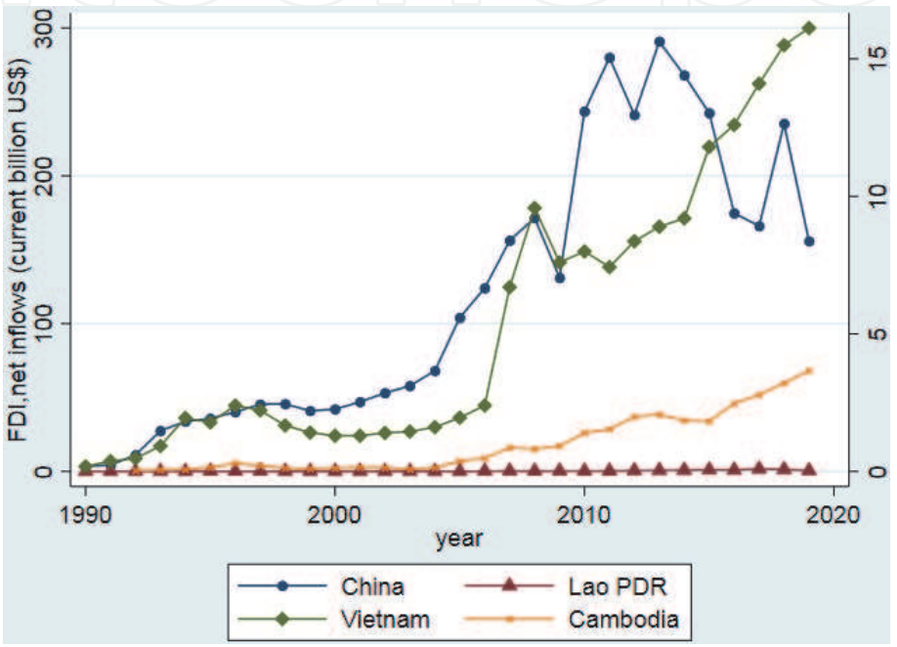

Figure 5.
Trends of FDI net inflows. Source: World Bank.

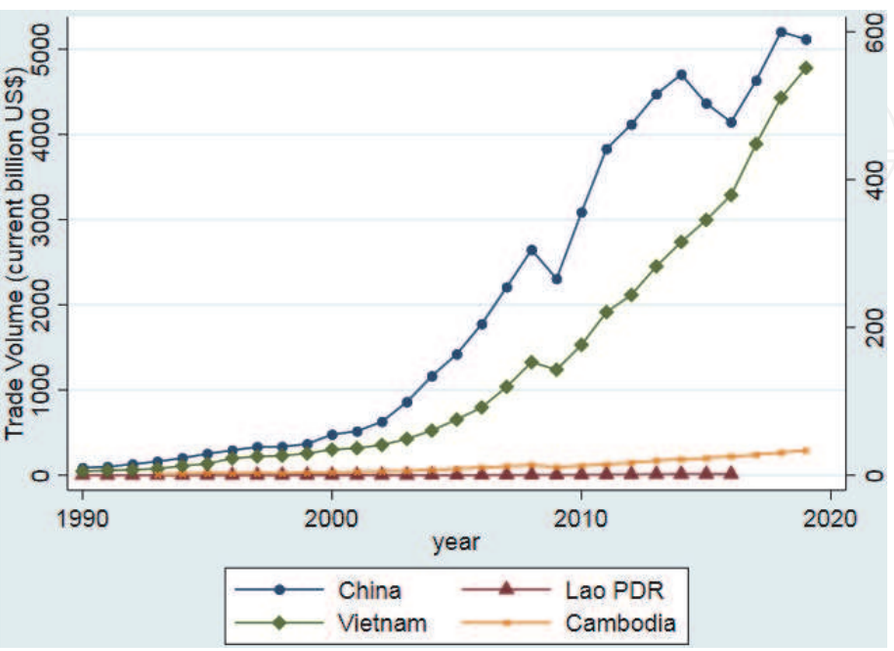

Figure 6.
Trends of trade volume. Source: World Bank.

the rest of the countries in both figures. Also, both figures are presented in the unit of current billion US$.

For the FDI net inflows presented in **Figure 5**, every countries show improving trends with some fluctuations. Starting economic reforms in 1978, China's FDI inflows gradually increased from $3.49 billion in 1990 to $235.36 billion in 2018, and reaching its record high of $290.928 billion in 2013.

While China shows fall in FDI inflow in recent years, FDI inflow in Vietnam has gradually increased since the implementation of the *Doi Moi* in 1986. Starting from $180 million in 1990, FDI inflows consistently increased, reaching $9.579 billion in 2008 with a small fluctuation during the global financial crisis, and continues to increase achieving new record every year. In the figure, Vietnam stays in higher point than China in recent years, but it should be noted that China is presented in different axis and it's about 15 times larger than it is shown in the graph compared to other East Asian economic transition countries.

In the case of Cambodia, who started the reform the last in 1989, FDI inflow was $33 million in 1992, remaining stable until the early 2000s, and rapidly increased since 2004 from $131 million to $3.663 billion in 2019.

Compared to other East Asian economic transition countries, FDI inflows in Lao PDR has shown relatively slow increase in the figure. Initiating economic reforms in 1986, FDI net inflows in Lao PDR started low as -$1.62 million in 1985, rising to $159.8 million in 1996, reaching the highest in 2017 of $1,693 million, and sharply decreased in 2019 of $557.2 million.

Compared to **Figure 5**, trends of trade volume of East Asian economic transition countries in **Figure 6** increase in stable pace with less fluctuation and small volatility. Every countries has shown significant increase in trade volume over the period although the trends of Cambodia and Lao PDR seem not improved notably relative to China or Vietnam in the figure. Trade volume of Lao PDR started at $310 million in 1990, surpassing $1 billion in 1994, reached the highest of $13 billion in 2014, and shows a decrease afterwards.

In case of Cambodia, trade volume shows a consistently increasing trend from $1.2 billion in 1993 to $33 billion in 2019. During the period, trade volume decreased only in 2009 from $13.8 billion in 2008 to $10.9 billion in 2009 attributed to the global financial crisis, but recovered afterwards by increasing its volume by $2 billion each year.

Although Lao PDR, Cambodia, and Vietnam had similar start in 1990, Vietnam shows the highest growth in trade volume from $5.26 billion in 1990 to $551 billion in 2019. Shown in the figure, it rapidly increases since 2009 similar to the case of Cambodia. Interestingly, major trading partners of Vietnam are the main foreign investors [7]. Although Vietnam shows rapid growth of trade compared to Cambodia and Lao PDR, the growth of import is faster than the export thus widening the gap between the import and export.

China's trade volume started at $87.6 billion in the initial stage in 1990, has speed up its growth since 2000s with a decrease in 2009, 2015, 2016, and 2019. Both export and import decreased during the fluctuations, and the fluctuations are more significantly shown if demonstrated in a ratio of GDP. Interestingly, export volume accounted for 36% of GDP in 2006, but only 18.4% in 2019 although the volume increased from $991 billion in 2006 to $2,641 billion in 2019.

Trade and FDI data that were collected for **Figures 5** and **6** are now presented in relationship in **Figure 7** as FDI net inflows in x-axis, and trade volume in y-axis during 1990–2019. Similar to **Figure 3**, trade and FDI show proportional relationship for every four East Asian economic transition countries. Cambodia shows the best fit, following by Vietnam, and Lao PDR, respectively. China shows the worst fit with some significant outliers as the value of FDI increases.

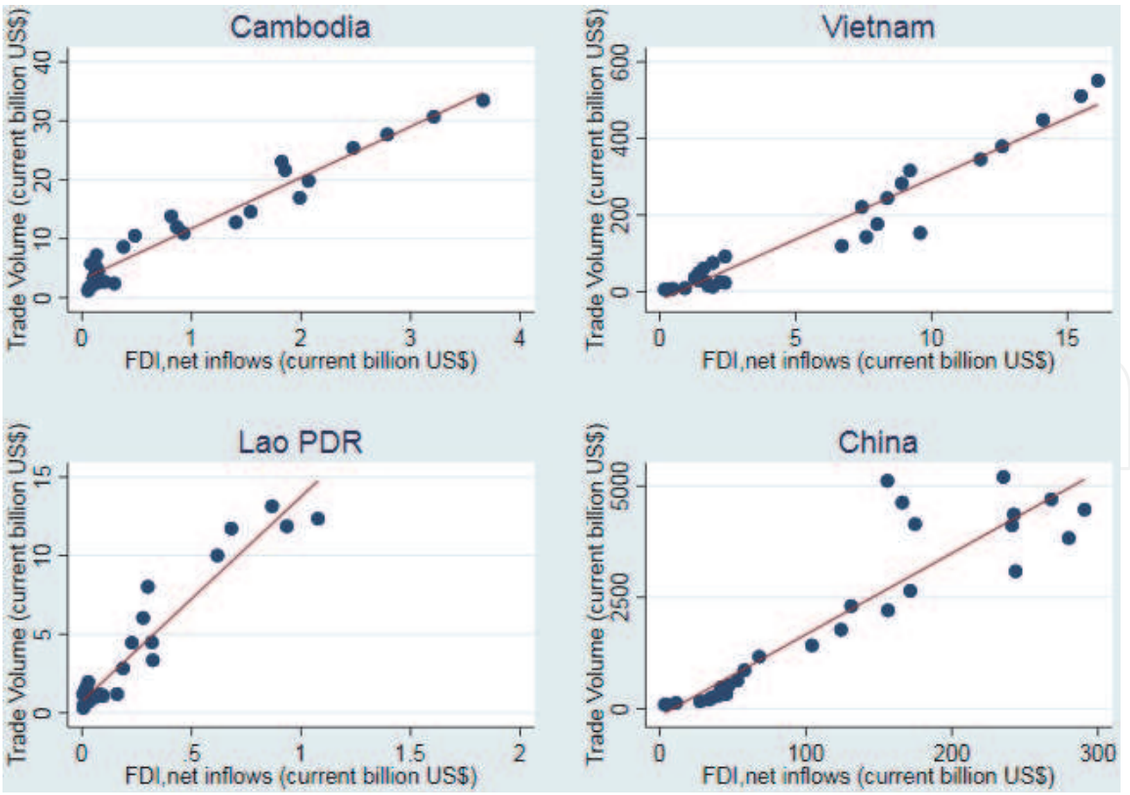

Figure 7.
Relationship between FDI and trade. Source: World Bank.

3.3 FDI promotion policies

To promote economic growth, all four East Asian economic transition countries have put significant efforts to attract FDI in various ways. Countries provide various investment incentives to foreign investors, equally treat foreign and domestic investors, and established special economic zones for further engagement. In addition, apart from Lao PDR, rest of the countries have one unified central government agency responsible for promoting FDI. For foreign investors to begin investment in these countries, they should contact the administrative control tower for FDI that are summarized in **Table 2**.

China first started to open up its economy by enacting the law for joint ventures in 1979 that granted a legal status for foreign investment and establishing four special economic zones (SEZs) in 1980. FDI promotion policies were modified several times and SEZ status were gradually extended to other industrial cities in 1984, 1985, 1990, and 1992 [29]. The *Provisions of the State Council of the People's Republic of China for the Encouragement of Foreign Investment* (22 Article Provisions) and the *Law of the People's*

	Organization(s)
China	• The Ministry of Commerce (MOFCOM)
Cambodia	• The Council of the Development of Cambodia (CDC)
Lao PDR	• The Ministry of Planning and Investment (MPI) • The Ministry of Industry and Commerce (MoIC)
Vietnam	• The Ministry of Planning and Investment

Source: author's summary modified from [28].

Table 2.
Administrative control towers for FDI.

Republic of China on Enterprises Operated Exclusive with Foreign Capital launched in 1986 enabled foreign investors to enter China as a wholly foreign-owned enterprise in some circumstances and provided strong incentives for FDI [30]. Inward FDI slowed down during the Asian financial crisis in late 1990s, but China's WTO accession in 2001 and amendment of laws to comply with WTO commitments acted as a catalyst for rapid growth in FDI inflow and expansion of types of FDI from manufacturing to tertiary sectors. The new Foreign Investment Law (FIL) was enacted in 2020 that replaced the existing investment laws on joint ventures and wholly foreign owned enterprises. The FIL includes foreign IP (intellectual property) rights and equal treatment of foreign and domestic companies regarding tax exemptions, licensing, government funds, and so on [31].

In Lao PDR, FDI promotion law was enacted in 1988 and was reformed several times, in 1994, 2004, 2009, and 2016 by the Investment Promotion Department (IPD) [28]. Reformation in 2009 has improved the foreign investment environment by equally treating domestic and foreign investors. Further, Special and Specific Economic Zones (SSEZ), where have independent investment procedures and provides one-stop-services for investors, was established in 2003 to attract more FDI in the country. The Ministry of Industry and Commerce (MoIC) and the Ministry of Planning and Investment (MPI) are the administrative control towers responsible for promoting FDI. Former operates administration process for general business activities, and the latter operates administration process for concession business activities and investment in SSEZ.

After devastating war in Cambodia, FDI promotion law was first initiated in 1994 to attract FDI to rehabilitate the destroyed infrastructure and enhance growth. The Council of the Development of Cambodia (CDC) plans, operates, inspects, evaluates, and also rehabilitates national investment system and projects. In 2005, the CDC established Cambodian Special Economic Zone Board (CSEZB) to plan and launch special economic zones that offer one-stop service, similar to Lao PDR's SSEZ [32].

	Legislations and Decrees	Year of Enactment (Amendment)
Cambodia	Law on Investment of the Kingdom of Cambodia	1994 (2003)
	Sub-decree on the Implementation of the Law on the Amendment to the Law on Investment on the Kingdom of Cambodia	2005
	Sub-decree on the Organization and Functioning of the Council for the Development of Cambodia	2005
Lao PDR	Law on Investment Promotion	2009
	Decree on the Implementation of the Investment Promotion Law	2011
Vietnam	Law of Foreign Investment	1987 (2014)
	Law on Enterprises	2005 (2014)
	Decree on Guidelines for Some Articles of the Law on Investment	2015
	Decree on Investment in the Form of Public-Private Partnership	2015
China	Law on Joint Ventures using Chinese and Foreign Investment	1979 (1990)
	Law on Enterprises Operated Exclusive with Foreign Capital	1986
	The Foreign Investment Law (FIL)	2020

Source: author's summary modified from [28].

Table 3.
FDI-related laws in China, Cambodia, Lao PDR, and Vietnam.

Vietnam started to attract FDI since enacting the Law of Foreign Investment in 1987. The law was reformed several times and was lastly revised in 2014. Export processing zones that provide special incentives were established in 1991 in accordance with the amended law of foreign investment. Anwar and Nguyen [5] argue FDI was a major factor that contributed the country transform from an agricultural based economy to an industrialized based economy. Similar to Lao PDR, MPI is responsible for promoting FDI in Vietnam, but more extensively. MPI in Vietnam not only plans, manages, and operates the national investment system, but also inspects overall investments in Vietnam. Major FDI related legislations and decrees of East Asian economic transition countries are summarized in **Table 3**.

4. Empirical model specification

The empirical analysis presented in this paper is based on a long panel data set which involves four East Asian economic transition countries over the period 1990–2019. In order to examine the effect of FDI on trade in East Asian economic transition countries (China, Cambodia, Lao PDR, and Vietnam) from 1990 to 2019, this paper utilizes OLS and panel within fixed effect model to take account of unobserved time invariant country-specific effects such as languages, trade distances, and geographical borders. Referring from reviewed literatures in Section 2.2, the general panel regression equation is as follows.

$$\ln(TRADE)_{it} = \beta_0 + \beta_1 \ln(FDI)_{it} + \beta_2 \ln(GDP)_{it} + \beta_3 \ln(HUM)_{it} + \beta_4 \ln(EXC)_{it} + \beta_5 \ln(TAR)_{it} + \beta_6 \ln(FINA)_{it} + \beta_7(\mathrm{WTO})_{it} + \alpha_i + \varepsilon_{it}, \tag{1}$$

where $(TRADE)_{it}$ is the dependent variable which is measured by the sum of exports and imports of goods and service of country i at time t, expressed in a ratio of GDP. FDI is the inward FDI stock, expressed in current million $US, HUM is the variable for human capital proxied by tertiary school enrollment, EXC is the official exchange rate, expressed in local currency per US$, and TAR is the weighted tariff rate of all products. FINA measures bank credit to private sector as a proxy for financial development, expressed in a ratio of GDP, WTO is a dummy variable for country's WTO compliance, values 1 for country's accession, or 0 otherwise, α_i is a time invariant error, and ε_{it} is an idiosyncratic error. The issue of this general equation is that there exists a time invariant component and individual-specific components of the error term that are correlated with the independent variables.

Hausman's specification test was conducted to distinguish if there is a significant bias in a random effects or fixed effects. Based on the results of Hausman test, fixed effect model is consistent and favored over the random counterpart, hence, this study uses fixed effects transformation from the above equation by subtracting off the mean over time for each country so that demeaning transformation eliminates the α_i term and only demeaned idiosyncratic error term is left. Also, within fixed effect model was utilized as within variation of variables were greater than between variation. This modified model specification is as follows:

$$\ddot{\ln}(TRADE)_{it} = \beta_0 + \beta_1 \ddot{\ln}(FDI)_{it} + \beta_2 \ddot{\ln}(GDP)_{it} + \beta_3 \ddot{\ln}(HUM)_{it} + \beta_4 \ddot{\ln}(EXC)_{it} + \beta_5 \ddot{\ln}(TAR)_{it} + \beta_6 \ddot{\ln}(FINA)_{it} + \beta_7(\mathrm{WTO})_{it} + \ddot{\varepsilon}_{it} \tag{2}$$

Variable	Definition	Expected sign	Source
TRADE	Sum of exports and imports of goods and services (current $US)	Dependent variable	WDI
FDI	Inward FDI stock / FDI net inflows (current $US)	+	UNCTAD
GDP	GDP per capita (constant 2010 US$)	+	WDI
HUM	Expected years of schooling (of children) (years)	+	UNESCO
EXC	Real effective exchange rate (CPI based)	+/−	Brugel Datasets
TAR	Tariff rate, weighted mean, all products (%)	−	WDI
FINA	Domestic bank credit to private sector (% of GDP)	+	WDI
WTO	WTO accession (1 for country's WTO accession, 0 otherwise)	+	WTO

Table 4.
Variable description.

where $(\ddot{TRADE})_{it}$ is $TRADE_{it} - \overline{TRADE_{it}}$, and same for other variables as well. For this fixed effect estimator to be consistent, independent variables and the error term should not be correlated to prevent endogeneity problem and reverse causality effect [33, 34].

Table 4 describes the utilized variables, its source and expected signs. TRADE data is collected from WDI (World Development Indicators), and is the sum of exports and imports of goods and services. FDI data has been sourced from the UNCTAD (United Nations Conference on Trade and Development). FDI stock variable was utilized instead to FDI flows to avoid time lag and multicollinearity problems between trade and investment [3].

GDP, HUM, TAR, and FINA data are sourced from WDI, and EXC data are collected from the Brugel Datasets. Country's WTO accession date is searched from the member information section of WTO website [35]. As countries have to refine its policies to comply with WTO trade principles, expected sign of WTO is positive. Further, expected impacts of FDI, GDP, HUM, and FINA on TRADE are also positive, while the expected sign of TAR is negative, and EXC can have both positive and negative impact on trade.

Table 5 presents summary statistics of collected variables for China, Cambodia, Lao PDR, and Vietnam from 1990 to 2019. Missing values of data are replaced with

Variable	Obs	Mean	S.D.	Min	Max
$\ln(TRADE)_{it}$	120	24.2179	2.6335	19.553	29.2805
$\ln(FDI\_flow)_{it}$	120	21.2765	2.8609	15.3087	26.3963
$\ln(FDI\_stock)_{it}$	120	9.205	2.8042	2.6064	14.3862
$\ln(GDP)_{it}$	120	6.991	.7608	5.7754	9.0186
$\ln(HUM)_{it}$	120	2.2338	.9369	.506	4.003
$\ln(EXC)_{it}$	120	4.7187	.1635	4.3531	5.0839
$\ln(TAR)_{it}$	120	2.3418	.6133	.5481	3.5016
$\ln(FINA)_{it}$	120	3.4407	1.2227	.5197	5.11
$(WTO)_{it}$	120	.4583	.5004	0	1

Table 5.
Summary statistics (1990–2019).

imputed values, where missing values between the collected values are replaced by its mean and missing values before and after the collected values are replaced by the first and last collected data.

5. Empirical results

Before performing the estimations, F parameter test for fixed effects was conducted, which resulted in F statistic ($F(3,109) = 112.25$, $P > \chi^2 = 0.00$) large enough to show there is significant group effect, thus fixed effect model is preferred over OLS. In addition, fixed and random effect models are compared based on the Hausman test. Hausman test resulted in p-value ($\chi^2(3) = 84.61$, $P > \chi^2 = 0.00$) small enough to reject the null hypothesis and favors fixed effect over random counterpart. Further, Breuch-Pagan LM test favored OLS over random effect, thus results of OLS and fixed effect estimation are presented in **Tables 6** and 7, former using FDI flow, and latter using FDI stock as independent variable.

In **Table 6**, the results of the OLS and fixed effect estimation for the Eq. (1) and (2) are presented utilizing FDI inflow as independent variable. Models (1) are (2) estimated regarding every four East Asian economic transition countries using OLS, and fixed effect, respectively, while Models (3), (4), (5), and (6) are estimated for each country.

Variables	(1) OLS	(2) FE	(3) China	(4) Lao PDR	(5) Vietnam	(6) Cambodia
lnFDI_flow	0.611***	0.157***	0.197***	0.125***	0.217***	0.152
	(0.0490)	(0.0365)	(0.0527)	(0.0290)	(0.0277)	(0.119)
lnHUM	0.147	0.501***	0.315	0.345*	0.307***	0.0887
	(0.124)	(0.0898)	(0.244)	(0.189)	(0.0464)	(0.197)
lnGDP	0.714***	0.693***	1.168***	1.281*	2.276***	−0.708**
	(0.155)	(0.144)	(0.270)	(0.619)	(0.216)	(0.268)
lnFINA	0.286***	0.155**	−1.063***	0.276***	−0.158	1.227***
	(0.108)	(0.0601)	(0.307)	(0.0870)	(0.0953)	(0.191)
lnEXC	−1.394***	0.231	0.0104	0.280	−0.373*	−3.346***
	(0.383)	(0.235)	(0.331)	(0.301)	(0.186)	(0.785)
lnTAR	0.0203	−0.225**	−0.170	0.187	−0.154**	0.418
	(0.166)	(0.102)	(0.117)	(0.196)	(0.0564)	(0.279)
WTO	0.0133	0.0313	0.144	0.185	−0.0936	0.0743
	(0.162)	(0.107)	(0.106)	(0.136)	(0.0633)	(0.235)
Constant	11.43***	13.81***	17.94***	7.539	6.524***	35.48***
	(2.226)	(1.410)	(1.580)	(4.999)	(0.696)	(4.090)
Observations	120	120	30	30	30	30
R-squared	0.969	0.967	0.996	0.993	0.999	0.978
Number of countries	—	4	1	1	1	1

*Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 6.
Estimation results using FDI inflows.

Variables	(7) OLS	(8) FE	(9) China	(10) Lao PDR	(11) Vietnam	(12) Cambodia
lnFDI_stock	0.0102	0.0165	−0.278*	−0.0525	0.202***	−0.114
	(0.107)	(0.0466)	(0.155)	(0.105)	(0.0564)	(0.134)
lnHUM	5.825***	5.251***	2.663***	8.276*	4.124**	13.64***
	(1.351)	(0.770)	(0.823)	(4.792)	(1.752)	(3.843)
lnGDP	0.368	0.731***	2.093***	1.182	2.676***	0.0875
	(0.358)	(0.133)	(0.232)	(0.878)	(0.303)	(0.334)
lnFINA	1.198***	0.422***	−1.041***	0.206	−0.348**	0.544*
	(0.0962)	(0.0518)	(0.327)	(0.128)	(0.146)	(0.264)
lnEXC	−0.815	0.906***	−0.211	1.949***	−0.126	−0.122
	(0.606)	(0.241)	(0.338)	(0.611)	(0.316)	(0.838)
lnTAR	0.151	−0.0583	0.00835	0.258	0.00273	0.144
	(0.233)	(0.109)	(0.137)	(0.236)	(0.107)	(0.207)
WTO	0.275	0.128	0.0749	0.0838	0.121	0.183
	(0.237)	(0.109)	(0.111)	(0.182)	(0.0878)	(0.174)
Constant	9.927***	3.550*	12.84***	−11.43**	0.203	−2.854
	(3.679)	(1.876)	(3.168)	(4.823)	(3.210)	(9.533)
Observations	120	120	30	30	30	30
R-squared	0.937	0.966	0.996	0.988	0.998	0.987
Number of countries	—	4	1	1	1	1

*Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 7.
Estimation results using FDI inward stocks.

Except Model (6), the impact of FDI_flow on TRADE is shown positive and significant in every model at the .01 level. For Model (1), one unit increase in FDI_flow is expected to increase TRADE by 0.611 units, holding all other variables constant. When time invariant effects are controlled in Model (2), the coefficient of FDI_flow decreases to 0.157, but stay at the .01 significance level. Among the four East Asian economic transition countries, the impact of FDI_flow on TRADE is show the highest in Vietnam, followed by China, Cambodia, and Lao PDR, respectively.

In Model (1), the sign of the coefficients of explanatory variables are shown as the study expected except for TAR. Although the coefficient of TAR is negative, it is insignificant. Also, when the time-invariant effects are controlled, the impact of TAR on TRADE is shown negative and significant in Models (2) and (5). This implies that increase in tariff rate negatively affects trade development of the country, especially in the case of Vietnam.

In addition, the coefficients of HUM are shown positive and significant in Models (2), (4) and (5) and positive but insignificant in other models. This indicates that human capital, proxied by the expected years of schooling, is important to improve trade development of the country. Interestingly, while the coefficients of GDP and FINA are shown positive and significant in most of the models, the coefficient of GDP is negative in Cambodia at the .05 level and the coefficient of FINA is negative and significant in China at the .01 level. This result suggest that

GDP growth or financial development does not always promote trade in the economy.

Moreover, the coefficients of EXC are shown negative and significant in Models (1), (5), and (6), particularly high in Cambodia. This implies that increase in exchange rate deteriorates the trade of the economy in Cambodia by decreasing export volume as the price of domestic goods and services rises relatively to other foreign competitors. The impact of WTO accession is shown positive in every model except for Vietnam, but the coefficients are not significant.

Utilizing FDI stock as independent variable, the results of the OLS and fixed effect estimation are presented in **Table 7**. Contrary to the estimation results in **Table 6**, the coefficients of FDI_stock are positive but insignificant in Models (7) and (8). Even, it is shown negative and significant at .1 level in China, while it is positive at the 0.01 level in Vietnam. This result suggests that the relationship between the trade and FDI may significantly differ in empirical studies by the unit they are utilizing, and substitutability relationship could be found when FDI stock is used as explanatory variable.

In addition, the coefficients of HUM are shown positive and significant in every model, and the coefficients of GDP are also shown positive and significant in most models. Similar to Models (3) and (5) in **Table 6**, in Models (9) and (11), the coefficients of FINA are shown negative and significant in China and Vietnam. However, contrast to **Table 6**, the impact of exchange rate on trade is shown positive and significant in fixed effect model and in Lao PDR. This implies that the increase in exchange rate in Lao PDR is likely to increase imports in large amount. Last but not least, the coefficients of TAR and WTO are insignificant in every model in **Table 7**.

6. Conclusion

This study aims to investigate the relationship between trade and FDI in four East Asian economic transition countries, namely the China, Cambodia, Lao PDR and Vietnam. Complementary effect between FDI and trade is found when estimated using FDI flow variable. To be specific, the effect of FDI on trade is shown the highest in the order of Vietnam, China, Cambodia, and Lao PDR although the coefficient of FDI is insignificant in Cambodia. When estimated using FDI stock variable, the complementary relationship between FDI and trade weakens, and even substitutability effect is found in China at .1 significance level. Interestingly, the coefficient of FDI is positive and significant in Vietnam in both cases.

Other explanatory variables are also considered, which are human capital proxied by expected years of schooling, GDP, Domestic bank credit to private sector as a proxy for financial development, exchange rate, tariff rate, and WTO accession. Effects of GDP and human capital on trade are shown positive and significant in most cases except in Cambodia when FDI flow is utilized. Moreover, impact of financial development, tariff and exchange rate varies by model and country. Finally, the impact of WTO accession on trade is shown positive but insignificant, except for Cambodia, which shows negative coefficient when FDI stock is utilized.

These findings provide more insight into the regional and global implications of FDI and trade in East Asian economic transition countries. First, as impact of FDI on trade is shown positive, these countries should carefully promote FDI policies to maximize the benefits of FDI on trade and economic growth. Moreover, policy implications can be derived for the countries that have been experiencing economic transition such as Myanmar, Cuba and the country such as North Korea in the future.

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Conflict of interest

The authors declare no conflict of interest.

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