

FOREIGN DIRECT INVESTMENT AND EXPORT SOPHISTICATION IN ASEAN-5 DURING THE ASEAN PLUS THREE COOPERATION PERIOD

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ABSTRACT

Export sophistication is widely regarded as a channel through which trade contributes to sustained growth, yet evidence on its relationship with foreign direct investment (FDI) in Southeast Asia during the period of deepening ASEAN Plus Three (ASEAN+3) cooperation remains limited. This study examines trade with China, Japan, and the Republic of Korea (South Korea) and the relationship between FDI inflows and export sophistication in five ASEAN economies (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) over the period of the ASEAN Plus Three Cooperation Work Plan 2007-2017. Export sophistication is measured by the EXPY index and FDI by inflows per capita with one- to five-year lags, controlling for population, inflation, human capital, trade openness, and institutional quality. The relationship is estimated with the Arellano-Bond difference Generalized Method of Moments (GMM) estimator and examined further with fixed-effects specifications and an alternative FDI measure, FDI inflows as a share of GDP. Trade with China grew faster than trade with Japan and South Korea in all five countries. In the GMM estimation, lagged FDI per capita is positively and significantly associated with EXPY at the one-, two-, three-, and five-year lags, and institutional quality is also positively associated with EXPY. This association, however, is limited to the 2013-2017 estimation sample. It is not observed when the sample is extended to 2007-2017 or when FDI is measured relative to GDP, and the small number of countries limits the validity of the GMM instruments and standard errors. Because the FDI data cover total inflows rather than investment from ASEAN+3 partners, the findings do not identify an effect of ASEAN+3 cooperation. The results indicate that evidence of FDI-related export upgrading in ASEAN-5 remains fragile and call for analysis with broader country coverage.

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1. INTRODUCTION

Among the many strategies proposed for achieving sustainable and rapid economic growth, export orientation has been widely identified as a fundamental catalyst. Although import substitution industrialization managed to spur a considerable amount of growth in 1965-1980, growth propelled by such inward-looking policies quickly dissipated after these policies were rolled back.

More outward-looking policies, those oriented towards incentivizing exports, led to sustained growth, as can be seen in the Asian Miracles. However, as is apparent from the Asian Miracles, the type and caliber of exports matter in spurring economic growth. Thus, other than merely increasing the volume of exports, a transformation of the export structure is needed to achieve such growth. Exports dominated by primary sectors or sectors with low productivity, for instance, will not produce the desired results (Iwamoto & Nabeshima, 2012). A move up the “quality ladder” is therefore important. By increasing the productivity of the goods exported, a country is able to introduce new goods to its production basket and utilize new and advanced technology, which supports sustainable growth (Aghion & Howitt, 1992; Lucas Jr., 1993). This transition towards more productive export bundles is called export sophistication.

Though a rapidly growing intra-regional cooperation, ASEAN’s experience with the sophistication of its exports greatly varies between its members. For instance, its largest member both in terms of its population and territorial size, Indonesia, still predominantly exports consumer goods and intermediate goods, making up 38.05% and 27.42% of its total exports in 2018. Its capital goods exports remain limited, as such goods only make up 8.63% of its total exports. On the other side, there exist countries such as Singapore and Malaysia whose exports are dominated by capital goods (48.56% of Singapore’s exports and 43.67% of Malaysia’s exports are capital goods). However, a uniform trend of progress can be spotted in most of its members’ export sophistication. For instance, in the case of Indonesia’s capital goods exports, a stable trend of incline can be seen as in 2015 such exports only amounted to \$14.2 billion. That number grew to \$15.5 billion in 2018. The same trend can be spotted at the opposing end of the spectrum as Singapore’s capital goods exports also experienced stable growth from \$179.5 billion in 2015 to \$199.9 billion in 2019.

ASEAN, as a regional cooperation, promotes open regionalism to enhance intra-regional trade and investment integration. One way to achieve this goal is to establish cooperation with particular non-members that have a strong interest in investing in ASEAN (Verico, 2013). In the wake of the Asian financial crisis of 1997-1998, efforts to establish ASEAN Plus Three Cooperation began. The cooperation is viewed as a vehicle to achieve the long-term goal of building an East Asian Community, with ASEAN as its driving force. The first decade of the cooperation laid its foundations, including the broadening and deepening of the sectors of cooperation.

As noted in the ASEAN Plus Three Cooperation Work Plan 2007-2017, the enhancement of trade and investment is one of the focuses of the economic and financial cooperation section. The points of cooperation it lists to further boost trade and investment in the region include (1) continuing efforts to promote and strengthen economic cooperation in the East Asian region, including the idea of a region-wide free trade area, (2) phasing out tariffs and non-tariff barriers to ensure the free flow of goods among ASEAN Plus Three countries, and (3) providing regional support to foster an attractive investment climate through the sharing of best practices. It is therefore expected that during the second decade of ASEAN Plus Three Cooperation (2007-2017), improvements in trade and investment may be observed, as targeted by the work plan.

Such improvements in trade and investment may in turn generate spillovers to other parts of the economy. Export sophistication, regarded as an important source of sustainable growth, is one of the areas expected to benefit from such spillovers through increased investment. Although several previous studies have examined export sophistication, its determinants, and the channels through which investment may raise it, empirical work on export sophistication during periods of formal regional economic cooperation remains scarce, particularly in Southeast Asia.

Hausmann et al. (2007) pointed out human capital and labor force size as two key determinants of export sophistication. They argued that while human capital extends the range of discoverable goods during the cost-discovery processes of an economy, the size of the labor force would promote cost-discoveries through the availability of cheap labor. Further, the authors also mentioned GDP per capita as highly correlated with EXPY, and rule of law as other determinants.

Export sophistication is also related to investment activities. Thus, FDI is often viewed as an important determinant (Iwamoto & Nabeshima, 2012; Weldemicael, 2012), as it could impact export sophistication through increase in likelihood of exporting goods to the international market by joint ventures of domestic and foreign firms (direct effect) and spillovers on productivity and innovativeness of domestic firms (indirect effect). The differences among the two references are that while Iwamoto and Nabeshima use a time-lagged FDI per GDP, Weldemicael uses FDI per Capita (not time-lagged). Nevertheless, both generate positive relationships among FDI and EXPY. Iwamoto and Nabeshima described inflation as a proxy for macroeconomic stability that could eventually impact FDI, and used inflation as a control variable.

The expected link between regional economic cooperation and export sophistication can be described as a sequence of channels. Cooperation frameworks such as ASEAN Plus Three aim to reduce barriers to trade and to improve the investment climate through policy coordination and the sharing of best practices, which may raise the attractiveness of member economies to foreign investors (Verico, 2013). Higher FDI inflows may then affect export sophistication directly, through the export activities of foreign affiliates and joint ventures, and indirectly, through technology transfer and productivity spillovers to domestic firms (Iwamoto & Nabeshima, 2012; Weldemicael, 2012). Because building production capacity and diffusing technology take time, these effects are expected to appear with a lag (Zhang et al., 2019). This study does not test the full sequence. Its empirical analysis focuses on the final link, the relationship between lagged FDI inflows and export sophistication, and uses total FDI inflows because data on FDI originating from China, Japan, and South Korea are not available for the full study period. ASEAN Plus Three cooperation is therefore treated as the context of the study, and developments during the cooperation period are described through trade between the ASEAN-5 economies and the Plus Three countries.

A separate and smaller strand of literature examines how trade liberalization and regional integration relate to export sophistication. Whereas the studies above treat investment inflows as the explanatory variable, this strand treats trade and integration policies as its explanatory focus. Nguyen (2016) examines the relationship between Vietnam's trade liberalization policies and its export sophistication from 2001 to 2010. Using a generalized method of moments (GMM) estimator, Nguyen found that the trade liberalization policies undertaken by Vietnam, such as opening up markets and vertical FDI, had positive impacts on the level of sophistication of the export basket.

Taken together, the two strands leave a gap. Studies of FDI and export sophistication have rarely focused on Southeast Asian economies during a period of formal regional cooperation, while studies of trade liberalization and regional integration have rarely examined the investment channel through which such cooperation is expected to operate. This study therefore addresses the following research question: are FDI inflows associated with higher export sophistication in the ASEAN-5 economies during the period of the ASEAN Plus Three Cooperation Work Plan 2007-2017? Based on the mechanism described above, the study tests the hypothesis that lagged FDI inflows are positively associated with export sophistication. The study contributes in three ways. First, it documents trade between each ASEAN-5 economy and all three Plus Three partners over 2002-2017. Second, it examines the relationship between FDI and export sophistication across one- to five-year lags. Third, it assesses how sensitive this relationship is to the estimation sample, the estimator, and the measurement of FDI, which is particularly relevant given the small number of countries in the ASEAN-5 panel.

The remainder of this paper is organized as follows. The next section describes the data, the construction of the variables, and the estimation strategy. The following section presents the trade and investment characteristics of the ASEAN-5 economies, their trade with the Plus Three countries, the development of export sophistication over the ASEAN Plus Three Cooperation Work Plan period, and the econometric results together with their robustness. The final section concludes and discusses the limitations of the study.

2. RESEARCH METHODS

This study uses annual panel data for five ASEAN economies, namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand, over 2007-2017. The period corresponds to the ASEAN Plus Three Cooperation Work Plan 2007-2017, during which the enhancement of trade and investment was one of the stated focuses of economic cooperation between ASEAN and China, Japan, and South Korea. Export sophistication data are obtained from the World Integrated Trade Solution (WITS) of the World Bank. FDI, population, trade openness, and inflation data are obtained from the World Development Indicators (WDI) of the World Bank, and institutional quality is measured using the Index of Economic Freedom published by the Heritage Foundation. FDI inflows for 2002-2006 are also collected so that lagged FDI values are available for the robustness analysis, and trade between each ASEAN-5 economy and China, Japan, and South Korea over 2002-2017 is obtained from WITS for the descriptive analysis. The definitions, transformations, and sources of all variables are summarized in Table 1. The FDI variable measures total FDI inflows from all source countries, because data on FDI originating specifically from China, Japan, and South Korea into each ASEAN-5 economy are not available for the full study period. The empirical analysis therefore examines the relationship between total FDI and export sophistication during the ASEAN Plus Three cooperation period, and it does not estimate the effect of investment from the Plus Three countries or of ASEAN Plus Three cooperation itself.

Table 1. Variable Definitions and Data Sources

Variable	Definition	Transformation	Source
EXPY	Export sophistication index (Hausmann et al., 2007)	Natural logarithm	WITS, World Bank
FDIPC	Foreign direct investment, net inflows (BoP, current US\$) divided by total population	Natural logarithm; lagged one to five years	WDI, World Bank
FDIGDP	Foreign direct investment, net inflows (% of GDP); used in the robustness analysis	Percent; lagged one to five years	WDI, World Bank
POP	Total population	Base-10 logarithm	WDI, World Bank
OPEN	Sum of exports and imports of goods and services divided by GDP	Percent	WDI, World Bank
INF	Inflation, consumer prices	Annual percent	WDI, World Bank
HCAP	Mean years of schooling	Years	World Bank
INST	Overall score of the Index of Economic Freedom	Index (0-100)	Heritage Foundation

Note: WITS = World Integrated Trade Solution; WDI = World Development Indicators; BoP = balance of payments

Source: Authors' compilation (2026) based on WITS (World Bank), World Development Indicators (World Bank), and the Heritage Foundation

Export sophistication is measured using the EXPY index developed by Hausmann et al. (2007), which captures the productivity level associated with a country's export basket. The construction of EXPY begins with PRODY, the income level associated with a given product, defined as the weighted average of the per capita GDP of the countries exporting that product, as shown in Equation (1).

$$PRODY_k = \sum_j \frac{x_{jk}/X_j}{\sum_j (x_{jk}/X_j)} Y_j \dots \dots \dots (1)$$

In Equation (1), x_{jk}/X_j is the share of product k in the total exports of country j, the denominator aggregates these shares across all countries exporting product k, and Y_j is the per capita GDP of country j. EXPY is then calculated as the weighted average of the PRODY values of the products exported by a country, using each product's share in the country's total exports as the weight, as shown in Equation (2).

$$EXPY_j = \sum_k \left(\frac{x_{jk}}{x_j} \right) PRODY_k \dots\dots\dots (2)$$

A higher PRODY indicates a product that is mainly exported by higher-income countries and is therefore regarded as more sophisticated, and a higher EXPY indicates that a country's export basket resembles that of higher-income countries. This measure has been used widely as the basis for calculating a country's export sophistication (Iwamoto & Nabeshima, 2012; Lin et al., 2017; Nguyen, 2016; Weldemicael, 2012). In this study, EXPY values are obtained directly from WITS rather than calculated manually and are expressed in natural logarithms.

FDI is measured as net FDI inflows divided by total population and is expressed in natural logarithms. The per capita measure is used to make the scale of FDI comparable between large and small economies, since large economies would otherwise automatically record larger FDI values. Singapore, for example, has by far the largest FDI per capita among the ASEAN-5 economies in every year of the study period. FDI enters the model with lags of one to five years, following the mechanism described in the Introduction. The effects of FDI on export sophistication operate through the establishment of production capacity by foreign affiliates and through the gradual diffusion of technology and productivity to domestic firms, and both processes take time to materialize (Zhang et al., 2019). Iwamoto and Nabeshima (2012) similarly use lagged FDI in their analysis of export sophistication. The lag length of one to five years is set in advance and all five lags are included jointly in the same model, so that the lag structure is not selected on the basis of statistical significance.

The model includes five control variables that may affect both FDI and export sophistication. Population captures the size of the labor force, which Hausmann et al. (2007) identify as a determinant of export sophistication, and is expressed as a base-10 logarithm. Trade openness is measured as the sum of exports and imports divided by GDP. Inflation, measured as the annual change in the consumer price index, serves as a proxy for macroeconomic stability (Iwamoto & Nabeshima, 2012). Human capital is measured by the mean years of schooling, and institutional quality is measured by the overall score of the Index of Economic Freedom. The baseline model is the dynamic panel model in Equation (3).

$$EXPY_{it} = \alpha EXPY_{i,t-1} + \sum_{k=1}^5 \beta_k FDIPC_{i,t-k} + \gamma_1 POP_{it} + \gamma_2 OPEN_{it} + \gamma_3 INF_{it} + \gamma_4 HCAP_{it} + \gamma_5 INST_{it} + \mu_i + \varepsilon_{it} \dots\dots\dots (3)$$

In Equation (3), i denotes the country, t denotes the year, μ_i is the unobserved country-specific effect, and ε_{it} is the error term. The lagged dependent variable captures the persistence of export structures, and the coefficients β_1 to β_5 capture the association between FDI in the previous one to five years and export sophistication in the current year. The hypothesis of the study is that these coefficients are positive.

Estimating Equation (3) with ordinary least squares, fixed effects, or random effects produces biased and inconsistent estimates, because the lagged dependent variable is correlated with the country-specific effect (Baltagi, 2008; Nickell, 1981). This study therefore uses the difference Generalized Method of Moments (GMM) estimator developed by Arellano and Bond (1991), which removes the country-specific effect by taking first differences of Equation (3), as shown in Equation (4).

$$\Delta EXPY_{it} = \alpha \Delta EXPY_{i,t-1} + \sum_{k=1}^5 \beta_k \Delta FDIPC_{i,t-k} + \gamma_1 \Delta POP_{it} + \gamma_2 \Delta OPEN_{it} + \gamma_3 \Delta INF_{it} + \gamma_4 \Delta HCAP_{it} + \gamma_5 \Delta INST_{it} + \Delta \varepsilon_{it} \dots\dots\dots (4)$$

The differenced lagged dependent variable is correlated with the differenced error term and is treated as endogenous, and it is instrumented with the levels of EXPY lagged two periods and earlier. The lagged FDI variables and the control variables are treated as strictly exogenous and enter as their own instruments in first differences. The model is estimated with the one-step estimator, with standard errors that are robust to heteroskedasticity and to serial correlation within countries. Blundell and Bond (1998) later extended this approach into the system GMM estimator by adding equations in levels, whereas the present study uses the difference estimator. Because Equation (3) includes FDI lags of up to five years and the data begin in 2007, the first differences in Equation (4) can be formed only from 2013 onward, so the estimation sample consists of five countries over 2013-2017, giving 25 observations.

The validity of the instruments is assessed with the Arellano-Bond tests for first-order and second-order serial correlation in the differenced residuals, AR(1) and AR(2), and with the Sargan and Hansen tests of overidentifying restrictions, and the number of instruments is reported alongside these tests. The consistency of GMM estimators relies on a large number of cross-sectional units, and when the number of instruments is large relative to the number of units, the instruments may overfit the endogenous variable and weaken the Hansen test (Roodman, 2009). With only five countries, the GMM results in this study are therefore interpreted with caution.

The sensitivity of the results is assessed through three robustness checks. The first estimates Equation (3) without the lagged dependent variable using the fixed-effects estimator, with FDI data for 2002-2006 included so that lagged FDI values are available for every year from 2007 and the estimation sample covers 2007-2017. This fixed-effects model is estimated with and without year dummies, and with each FDI lag entered separately. The second repeats the fixed-effects estimation for the 2013-2017 sample used in the GMM estimation, in order to separate the role of the estimator from that of the sample period. The third replaces FDI per capita with FDI inflows as a share of GDP. Standard errors in the fixed-effects models are robust to heteroskedasticity, and standard errors clustered by country are not used, because five clusters are too few for reliable clustered inference.

3. RESULTS AND DISCUSSION

Trade Characteristics of ASEAN-5 Countries

Though in close proximity to each other and being founders of the same organization, each ASEAN-5 country has distinct characteristics in multiple aspects, trade being one of them. To gauge each member's trade characteristics, this section examines each country's openness, measured by dividing the sum of its imports and exports by its GDP, and the composition of its export basket.

Before delving deeper into the types of goods each country trades, it is important to gauge each country's participation in international trade. Following Iwamoto and Nabeshima (2012), who utilize the openness indicator, each country's level of openness is derived by dividing the sum of its imports and exports by its GDP in the respective years. Figure 1 visualizes the development of each ASEAN-5 country's trade openness over 2007-2017. All five countries recorded lower openness in 2017 than in 2007. Singapore leads the group by a wide margin, as its openness ranges from 303.95 to 437.33, reaching its highest point in 2008, one year after the start of the ASEAN Plus Three Cooperation Work Plan, before declining in the following years. This result is not surprising, as Singapore is highly connected with the international market, with total trade amounting to 324.40% of its GDP in 2019 (World Integrated Trade Solution, 2019). Malaysia records the second highest openness throughout the period, ranging from 126.90 to 192.47, followed by Thailand, which ranges from 119.27 to 140.44. The Philippines ranges from 55.82 to 73.64, with its openness declining until 2013 and rising thereafter, while Indonesia records the lowest openness, ranging from 37.42 to 58.56.

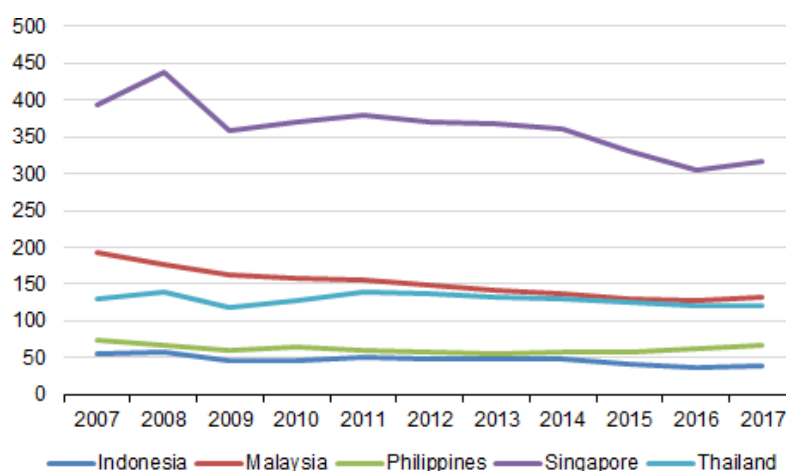


Figure 1. ASEAN-5 Countries' Trade Openness
Source: World Bank, (2025a)

The decline in openness ratios should not be read as a decline in trade. As shown later in this section, the value of trade between each ASEAN-5 country and the Plus Three countries increased over the same period. A falling openness ratio therefore indicates that GDP grew faster than the sum of exports and imports, rather than that trade contracted. The large differences in openness across the five countries also show that participation in the same regional cooperation is accompanied by very different degrees of integration into international markets.

To further comprehend the distinct characteristics of each member, each country's export basket is dissected into four categories based on its stage of processing (referring to the UNCTAD Stages of Processing classification in WITS), namely capital goods, consumer goods, intermediate goods, and raw goods. Goods categorized as capital goods are viewed as the most sophisticated because of the high productivity needed to produce them, and raw goods are viewed as the least sophisticated. Figure 2 shows each country's export basket in 2007 and 2017. Two general patterns can be observed. First, each country's export value rises over time. Second, although the overall size of the export basket increases, its structure is largely maintained throughout the period.



Figure 2. ASEAN-5 Countries' Export Baskets by Stages of Processing
Source: World Bank (2025b)

The Indonesian export basket predominantly consists of consumer goods, whose share increased from 32.62% in 2007 to 39.39% of total exports in 2017. The contribution of raw goods consistently exceeds that of capital goods. In 2007 capital goods amounted to only 10.84% of total exports whereas raw goods contributed 26.39%, and a similar pattern is apparent in 2017, when capital goods made up 8.88% and raw goods 24.99% of total exports. Malaysia's export basket is dominated by capital goods, which contributed 46.76% of the nation's exports in 2007 and 41.81% in 2017, while raw goods contributed the least, at 8.12% in 2007 and 6.23% in 2017. The Philippines' total exports were valued at US\$68.7 billion in 2017, more than five times less than Singapore's total exports in the same year. Its export basket is nonetheless dominated by capital goods, which contributed 66.85% of total exports in 2007 and 62.88% in 2017, while raw goods contributed 5.06% in 2007 and 6.75% in 2017. Singapore's export basket also predominantly consists of capital goods, at 53.93% of total exports in 2007 and 49.93% in 2017, while raw goods contributed only 0.75% and 0.92% respectively. In Thailand, capital goods remained the dominant category, rising slightly from 38.22% of total exports in 2007 to 38.78% in 2017, while raw goods declined from 7.79% to 6.53%.

These figures show that the composition of the export baskets changed little over the period. The share of capital goods declined in Indonesia, Malaysia, the Philippines, and Singapore and rose slightly only in Thailand, while the share of raw goods declined in Indonesia, Malaysia, and Thailand and rose slightly in the Philippines and Singapore. Indonesia stands out as the only member whose raw goods exports consistently exceed its capital goods exports. Although this can be attributed partly to Indonesia's abundance of natural resources, it is consistent with the argument of Iwamoto and Nabeshima (2012) that exports dominated by primary sectors or sectors with low productivity are less likely to support sustained growth. The classification by stage of processing is, however, a broad one. It does not capture differences in sophistication within each category, which is what the EXPY index measures by weighting each product by the income level of the countries that export it (Hausmann et al., 2007). The development of EXPY is therefore examined separately later in this section.

Investment Characteristics of ASEAN-5 Countries

Another characteristic that may differentiate the ASEAN-5 countries is their openness to investment from outside countries. The analysis covers 2002-2012, the five years before and the first years of the ASEAN Plus Three Cooperation Work Plan, to account for the time-lagged effects of FDI. Figure 3 presents FDI as a proportion of GDP across the ASEAN-5 countries. Indonesia, relative to the other countries, has a small proportion of FDI to GDP. In 2002, FDI accounted for only 0.07% of Indonesian GDP, and Indonesia experienced a net capital outflow in 2003, when the figure stood at -0.25% of GDP. Apart from 2003, Indonesia experienced consistent inflows of FDI, including during the global financial crisis of 2008, with FDI averaging 1.44% of GDP over 2002-2012.

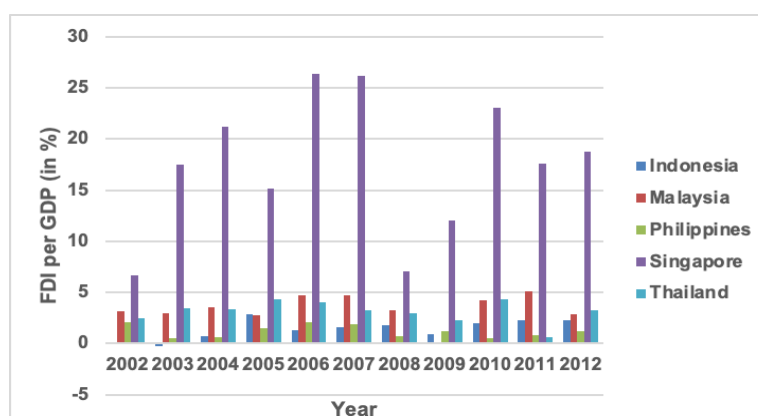


Figure 3. FDI per GDP across ASEAN-5 Countries (2002-2012)
Source: World Bank (2025a)

Singapore has by far the highest proportion of FDI to GDP among the ASEAN-5, averaging 17.40% over the period, and its FDI exceeded 10% of GDP in every year apart from 2002 and 2008. The decline in 2008 coincided with the global financial crisis. Malaysia has the second highest FDI to GDP ratio, averaging 3.39%, followed closely by Thailand, which averaged 3.13% and stayed above 2% in every year except 2011. The Philippines has the lowest average, at 1.21%. All five countries recorded a decline in FDI relative to GDP in 2008 or 2009.

These differences reveal the varying attractiveness of the ASEAN-5 countries to global investors, with Singapore the most attractive and the Philippines the least. If FDI raises export sophistication through spillovers from multinational companies to local firms, as argued by Weldemicael (2012) and Iwamoto and Nabeshima (2012), countries with higher FDI would be expected to show higher export sophistication. The descriptive evidence is only partly consistent with this expectation. Singapore combines the highest FDI to GDP ratio with the highest EXPY, but the Philippines, which has the lowest FDI to GDP ratio, records the largest increase in EXPY over 2007-2017, as shown later in this section. Such cross-country comparisons cannot isolate the relationship between FDI and export sophistication from other country characteristics, which motivates the econometric analysis presented below.

Trade with the Plus Three Countries

This section examines how trade between the ASEAN-5 countries and the Plus Three countries developed before and during the ASEAN Plus Three Cooperation Work Plan 2007-2017, using data from the World Integrated Trade Solution (WITS) of the World Bank. Data on FDI originating specifically from the Plus Three countries are not available for the full period, so this section focuses on trade. Figures 4 to 8 present total trade, defined as the sum of exports and imports, between each ASEAN-5 country and China, Japan, and South Korea over 2002-2017.

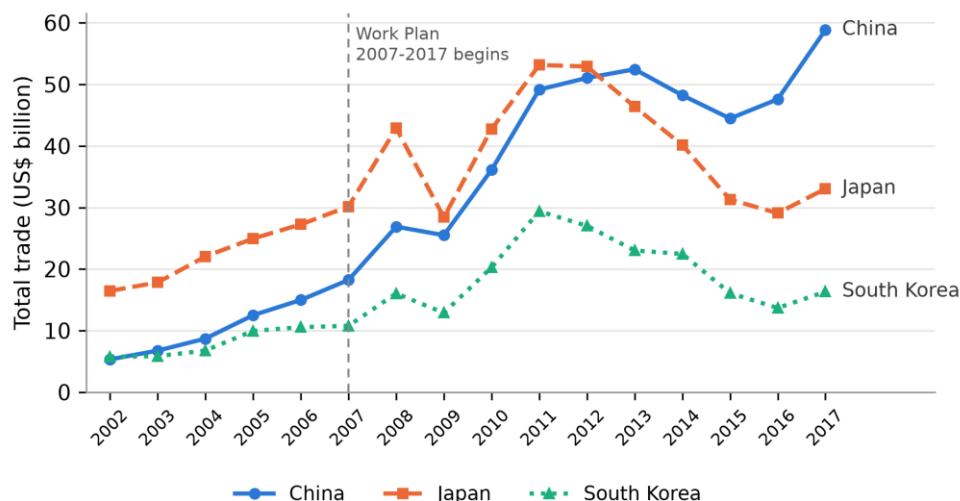


Figure 4. Indonesia's Trade with Plus Three Countries (2002-2017)
Source: World Bank (2026)

In 2002, Indonesia traded far more with Japan (US\$16.5 billion) than with China (US\$5.3 billion) or South Korea (US\$5.8 billion). Trade with China grew faster than trade with Japan, and from 2013 onward Indonesia traded more with China than with Japan. After 2013, Indonesia's trade with China continued on an upward trajectory, reaching US\$58.8 billion in 2017, while trade with Japan declined from its peak of US\$53.2 billion in 2011 to US\$33.0 billion in 2017. Trade with South Korea also peaked in 2011, at US\$29.4 billion, and declined to US\$16.3 billion in 2017.

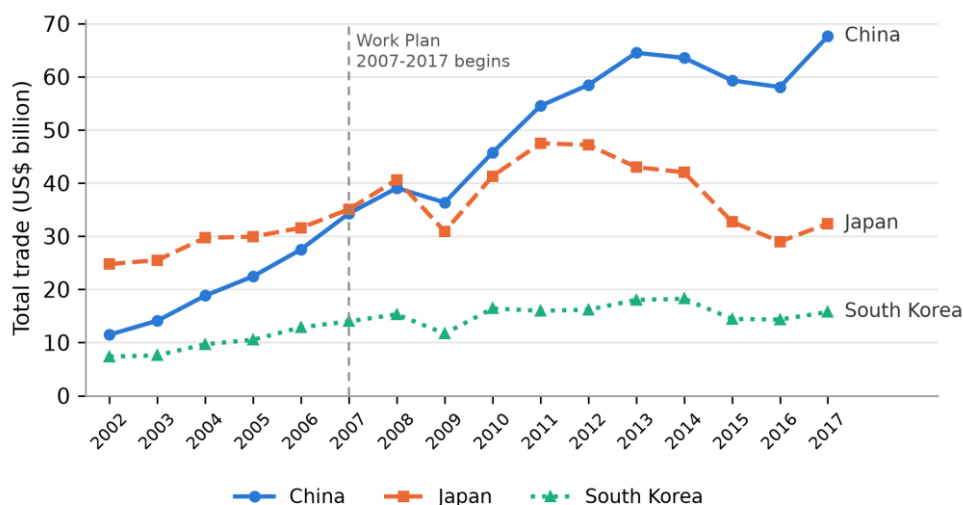


Figure 5. Malaysia's Trade with Plus Three Countries (2002-2017)
Source: World Bank (2026)

Malaysia also traded more with Japan than with China at the beginning of the period, at US\$24.8 billion and US\$11.5 billion respectively in 2002. Trade with China grew more rapidly and reached a level similar to trade with Japan by 2007 (US\$34.3 billion and US\$35.1 billion), and from 2009 onward China became Malaysia's larger trading partner of the two. In 2017, Malaysia's trade with China reached US\$67.6 billion, while trade with Japan had declined from its peak of US\$47.5 billion in 2011 to US\$32.4 billion. Trade with South Korea grew from US\$7.3 billion in 2002 to a peak of US\$18.2 billion in 2014 and stood at US\$15.8 billion in 2017.

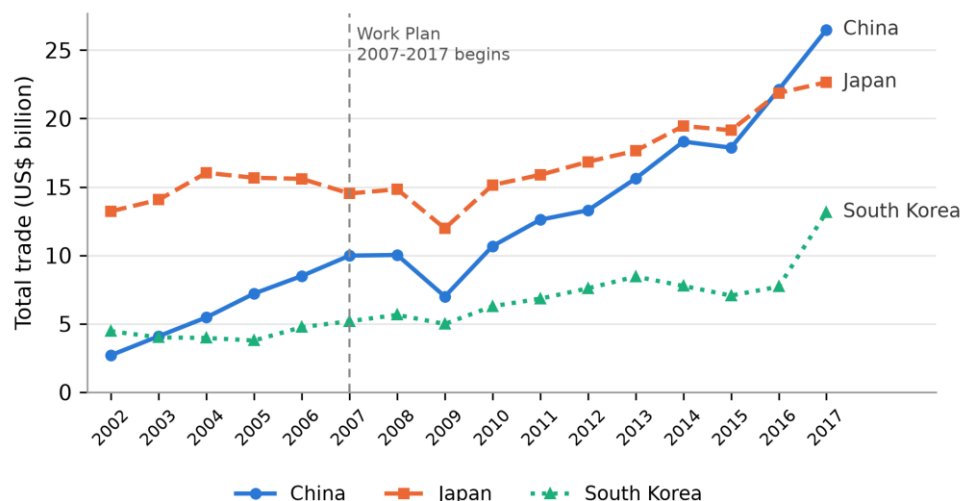


Figure 6. The Philippines' Trade with Plus Three Countries (2002-2017)
Source: World Bank (2026)

The Philippines' trade characteristics differ from those of Indonesia and Malaysia. The Philippines traded more with Japan than with China until 2015, and China became the larger partner only in 2016, considerably later than in the other ASEAN-5 countries. The Philippines' trade values with the Plus Three countries are also the smallest among the ASEAN-5. Its largest trade value over the period, with China in 2017, is US\$26.5 billion. Trade with China grew from US\$2.7 billion in 2002 to US\$26.5 billion in 2017, trade with Japan from US\$13.2 billion to US\$22.7 billion, and trade with South Korea from US\$4.5 billion to US\$13.2 billion, with a sharp increase in trade with South Korea in 2017.

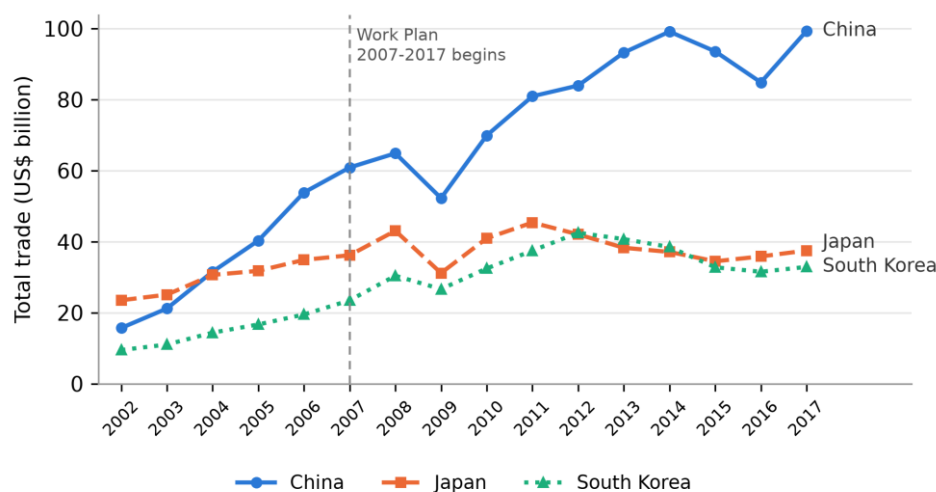


Figure 7. Singapore's Trade with Plus Three Countries (2002-2017)
Source: World Bank (2026)

Singapore differs from the other ASEAN-5 countries in two respects. First, it has the largest trade value with China, which grew from US\$15.7 billion in 2002 to US\$99.3 billion in 2017. Second, China became Singapore's largest Plus Three trading partner as early as 2004. Singapore's trade with Japan rose from US\$23.5 billion in 2002 to a peak of US\$45.4 billion in 2011 and stood at US\$37.5 billion in 2017. Its trade with South Korea grew from US\$9.5 billion in 2002 to a peak of US\$42.5 billion in 2012, exceeding its trade with Japan in 2012-2014, before declining to US\$32.9 billion in 2017.

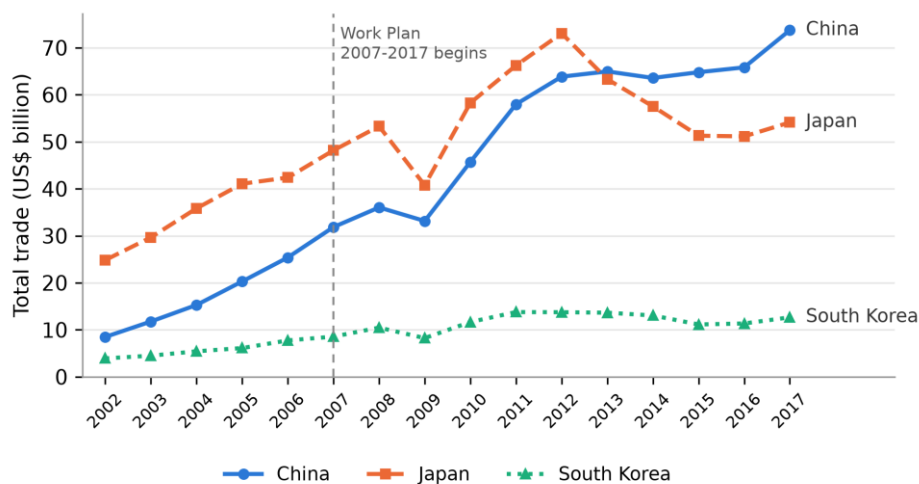


Figure 8. Thailand's Trade with Plus Three Countries (2002-2017)
Source: World Bank (2026)

Thailand's pattern is similar to that of Indonesia. Prior to the Work Plan, Thailand traded significantly more with Japan than with China. In 2002, trade with Japan (US\$24.8 billion) was about three times larger than trade with China (US\$8.5 billion). Trade with both countries increased until 2012, with a slump in 2009 during the global financial crisis. After 2012, trade with Japan declined from its peak of US\$73.1 billion to US\$54.1 billion in 2017, while trade with China continued on an upward trajectory, more than doubling from US\$31.9 billion in 2007 to US\$73.7 billion in 2017, and exceeding trade with Japan from 2013 onward. Trade with South Korea is much smaller, rising from US\$3.9 billion in 2002 to a peak of US\$13.8 billion in 2011 and standing at US\$12.7 billion in 2017.

In short, trade between every ASEAN-5 country and each of the Plus Three countries was higher in 2017 than in 2002. Trade with China grew more rapidly than trade with Japan and South Korea in all five countries, both in 2002-2007 and in 2007-2017, and China's trade with each member eventually surpassed that of Japan, in 2004 for Singapore, 2009 for Malaysia, 2013 for Indonesia and Thailand, and 2016 for the Philippines. Trade with all three partners also fell in 2009 in every ASEAN-5 country.

These developments are consistent with the objective of the Work Plan to enhance trade among ASEAN Plus Three countries and with the view that ASEAN's cooperation with non-members is directed at deepening economic ties with partners that have a strong interest in the region (Verico, 2013). However, they should not be interpreted as evidence that ASEAN Plus Three cooperation caused the increase in trade. Trade with China was already growing faster than trade with Japan and South Korea before 2007, the common decline in 2009 shows that trade over this period was also shaped by global conditions, and the descriptive data cannot separate the cooperation from other factors that affected trade during the same years. In this respect, the evidence relates to the literature on trade liberalization and regional integration, such as Nguyen (2016), only at the descriptive level, and the trade patterns describe the context in which the relationship between FDI and export sophistication is examined rather than an effect of the cooperation.

Export Sophistication

Figure 9 shows the EXPY index of each ASEAN-5 country in 2007 and 2017. Two members showed no change in EXPY between 2007 and 2017, namely Indonesia and Singapore, although their circumstances differ greatly. Indonesia's EXPY remained at a relatively low level, at 9.54 in both years, while Singapore led the group at 10.15 in both years. The remaining three members recorded increases. The largest increase is observed in the Philippines, whose EXPY rose from 9.57 to 9.98, an increase of 0.41 log points or about 51% in the level of the index, making it the second highest in the group in 2017. Malaysia's EXPY rose by 0.08 log points (about 8%) and Thailand's by 0.03 log points (about 3%). Year to year changes in EXPY are generally small.

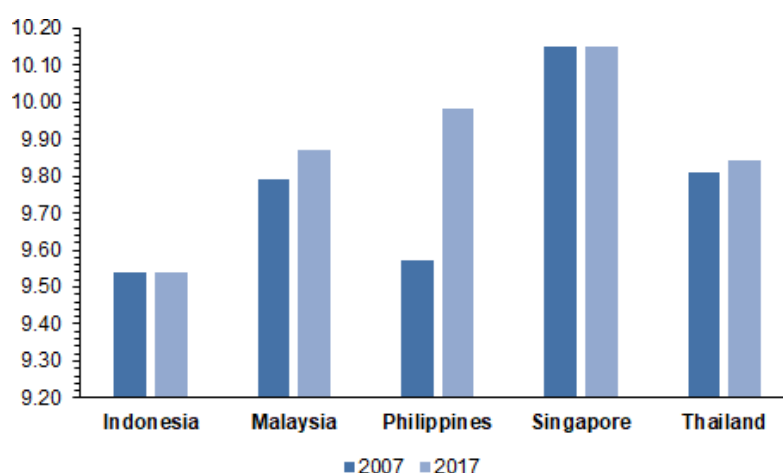


Figure 9. EXPY Index of ASEAN-5 Member Countries, 2007 and 2017
Source: World Bank (2025b)

The lack of change in Indonesia's EXPY is consistent with the lack of transformation in its export basket from raw and intermediate goods towards capital goods, as discussed above. The lack of change in Singapore's EXPY, by contrast, occurs at the highest level in the group, which is consistent with the strong association between EXPY and per capita income noted by Hausmann et al. (2007). The case of the Philippines shows that EXPY and the stage of processing classification capture different aspects of an export basket. The Philippines recorded the largest increase in EXPY even though the share of capital goods in its exports declined, which indicates that its export basket

shifted towards products exported by higher-income countries within the broad categories rather than towards a larger share of capital goods. It also shows that the country with the lowest FDI to GDP ratio among the ASEAN-5 recorded the largest gain in export sophistication, which underlines that descriptive comparisons alone are not sufficient to assess the role of FDI.

Econometric Results

Table 2 presents the difference GMM estimates of Equation (3). Lagged FDI per capita is positively and significantly associated with EXPY at the one-, two-, and three-year lags at the 1% level and at the five-year lag at the 5% level, while the four-year lag is not significant. The largest coefficient is found at the two-year lag. Because both variables are in logarithms, the coefficients can be interpreted as elasticities. A 10% higher FDI per capita is associated with an EXPY that is about 0.3% higher one year later, 0.4% higher two years later, and 0.3% higher three years later. In terms of the variation in the data, a change in log FDI per capita equal to its within-country standard deviation (0.78) two years earlier is associated with an EXPY about 3% higher, which is comparable to the within-country standard deviation of EXPY in the estimation sample (about 4%). Among the control variables, institutional quality is positively and significantly associated with EXPY at the 1% level, with a one-point higher Index of Economic Freedom score associated with an EXPY about 1.3% higher. Human capital has a negative coefficient that is significant only at the 10% level, while population, trade openness, and inflation are not significant. The coefficient of lagged EXPY is negative and not significant, which does not indicate the persistence in export structures that motivated the dynamic specification.

Table 2. Difference GMM Estimation Results

Variable	Coefficient	Robust Std. Error	z	p-value
L.EXPY	-0.466	0.367	-1.27	0.205
L1.FDIPC	0.031***	0.007	4.29	0.000
L2.FDIPC	0.040***	0.010	4.09	0.000
L3.FDIPC	0.030***	0.009	3.27	0.001
L4.FDIPC	0.013	0.009	1.46	0.144
L5.FDIPC	0.012**	0.006	2.05	0.041
POP	-0.364	1.512	-0.24	0.810
OPEN	0.000	0.000	0.32	0.748
INF	-0.008	0.005	-1.63	0.103
HCAP	-0.187*	0.102	-1.82	0.068
INST	0.013***	0.005	2.88	0.004
Observations	25			
Countries	5			
Number of instruments	45			
AR(1)	z = -2.03 (p = 0.043)			
AR(2)	z = 0.81 (p = 0.420)			
Sargan test	chi2(34) = 17.13 (p = 0.993)			
Hansen test	chi2(34) = 5.00 (p = 1.000)			

Notes: Dependent variable is the natural logarithm of EXPY. One-step difference GMM estimator; standard errors are robust to heteroskedasticity and to serial correlation within countries. Estimation sample 2013-2017. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation (2026)

The diagnostic tests must be read together with the size of the panel. The AR(1) test indicates first-order serial correlation in the differenced residuals, as expected, and the AR(2) test does not reject the absence of second-order serial correlation, which is the condition required for the lagged levels of EXPY to be valid instruments. However, the number of instruments (45) exceeds both the number of observations (25) and the number of countries (5). In this situation the instruments span the full set of observations, so the estimates are numerically equivalent to a generalized least squares estimation of the first-differenced equation, and the lagged dependent variable is not effectively instrumented. The Hansen test p-value of 1.000 is a known symptom of such instrument proliferation and therefore cannot be taken as evidence that the instruments are valid (Roodman, 2009). In addition, the robust standard errors are computed from only five countries, so they are likely to be imprecise and the significance levels reported in Table 2 should be interpreted with caution.

The positive association between lagged FDI and EXPY is in line with previous studies that find a positive relationship between FDI and export sophistication, including Hüseyini and Çakmak (2019), Iwamoto and Nabeshima (2012), Weldemicael (2012), and with the channels through which FDI may raise export sophistication, namely the export activities of joint ventures between domestic and foreign firms and spillovers on the productivity of domestic firms. The pattern of coefficients across lags, with significant associations from the first year and the largest at the second year, is consistent with the view that FDI needs time to affect economic outcomes (Zhang et al., 2019). Given the limitations of the GMM estimation described above, however, these coefficients indicate an association rather than a causal effect. Rehman and Ding (2020) report a bidirectional relationship between outward FDI and export sophistication in China, which illustrates that the direction of causality between investment and export sophistication cannot be assumed, and the present estimation does not rule out that foreign investors were attracted to countries whose export sophistication was already improving. The estimates also cannot attribute the association to investment from the Plus Three countries, since the FDI variable covers inflows from all source countries.

The positive association between institutional quality and EXPY is consistent with the view that institutions strongly affect economic development in developing countries (Ferrini, 2012) and that institutions can reduce the costs of economic activity, particularly transaction costs such as search and information costs, bargaining and decision costs, and policing and enforcement costs (Coase, 1992; Dahlman, 1979). Economies with institutions that support economic freedom may thus provide a more favorable environment both for foreign investment and for the production of more sophisticated exports, although the estimation does not identify through which of these channels the association operates.

Robustness Analysis

Table 3 presents the robustness checks. When the fixed-effects model is estimated over 2007-2017, using FDI data for 2002-2006 to construct the lags (column 1), none of the lagged FDI per capita coefficients is significant and their signs are mixed. The same result is obtained when year dummies are added (column 2). When the fixed-effects model is estimated over 2013-2017, the same period as the GMM estimation (column 3), the one-, two-, and three-year lags of FDI per capita are positive and significant at the 5% level, and institutional quality is also positive and significant. Replacing FDI per capita with FDI as a share of GDP over 2007-2017 (column 4) produces no positive association, and the two-year and four-year lags are negative and significant at the 5% level. Over 2013-2017, none of the lags of FDI as a share of GDP is significant (column 5). When each FDI lag is entered separately in the fixed-effects model over 2007-2017, none is positive and significant, and the only significant coefficients are negative, namely the five-year lag of FDI per capita at the 10% level (-0.010) and the two-year lag of FDI as a share of GDP at the 5% level (-0.003). Institutional quality remains positive across the specifications but is significant only in the 2013-2017 sample.

Table 3. Robustness Checks: Fixed-Effects Estimation

Variable	(1)	(2)	(3)	(4)	(5)
L1.FDIPC	-0.001 (0.008)	0.011 (0.011)	0.027** (0.012)		
L2.FDIPC	-0.006 (0.006)	-0.006 (0.009)	0.062** (0.026)		
L3.FDIPC	0.004 (0.006)	0.007 (0.010)	0.058** (0.025)		
L4.FDIPC	-0.006 (0.006)	-0.011 (0.007)	0.006 (0.010)		
L5.FDIPC	-0.006 (0.005)	-0.010 (0.007)	0.009 (0.006)		
L1.FDIGDP				0.000 (0.002)	0.015 (0.009)
L2.FDIGDP				-0.005** (0.002)	0.015 (0.016)
L3.FDIGDP				-0.001 (0.003)	0.013 (0.012)
L4.FDIGDP				-0.004** (0.002)	0.001 (0.006)
L5.FDIGDP				-0.002 (0.003)	0.000 (0.005)
POP	3.095** (1.331)	2.755 (1.777)	-4.860 (3.034)	3.387*** (1.170)	-1.550 (4.456)
OPEN	0.001 (0.000)	0.001 (0.001)	-0.001 (0.001)	0.000 (0.001)	0.001 (0.001)
INF	-0.009** (0.004)	-0.006 (0.006)	0.005 (0.008)	-0.006* (0.004)	-0.003 (0.007)
HCAP	-0.099** (0.048)	-0.145*** (0.051)	0.089 (0.176)	-0.141*** (0.055)	0.157 (0.264)
INST	0.008 (0.006)	0.009 (0.007)	0.020** (0.009)	0.007 (0.005)	0.016 (0.014)
Year dummies	No	Yes	No	No	No
Sample	2007-2017	2007-2017	2013-2017	2007-2017	2013-2017
Observations	53	53	25	55	25

Notes: Dependent variable is the natural logarithm of EXPY. All models include country fixed effects. Heteroskedasticity-robust standard errors in parentheses below the coefficients. Columns (1) and (2) have 53 observations because FDI per capita is negative for Indonesia in 2003 and its logarithm is undefined. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation (2026)

The robustness checks indicate that the positive association between lagged FDI and EXPY depends on the sample period rather than on the estimator. The fixed-effects estimator reproduces the GMM result when it is applied to 2013-2017 but not when it is applied to the full 2007-2017 period, and the association does not appear when FDI is measured relative to GDP. The positive relationship reported in previous studies (Hüseyini & Çakmak, 2019; Iwamoto & Nabeshima, 2012; Weldemicael, 2012) is therefore not robustly confirmed for the ASEAN-5 over the study period. With only five countries, the data provide limited information to distinguish a stable relationship from one that holds only in particular years, and the results do not establish whether the absence of a robust association reflects the absence of a relationship or the limited size of the panel. Hence, the hypothesis that lagged FDI inflows are positively associated with export sophistication is supported only in the 2013-2017 sample.

From the perspective of regional cooperation, the Asian Development Bank (2016) argues that ASEAN needs to improve its comparative advantage by increasing productivity and that its members should increase investment inflows and collaboration in research and development to support sustainable production and regional prosperity. The results of this study are consistent with

continued attention to the investment climate and to institutional quality, which shows the most consistent positive sign across the specifications. However, given that the association between FDI and export sophistication is not robust and that the FDI data do not distinguish investment from the Plus Three countries, the results do not establish that further opening to investment, or deeper ASEAN Plus Three cooperation, will by itself raise the export sophistication of the ASEAN-5 countries.

4. CONCLUSION

Being members of the same intra-regional cooperation and neighboring geographically do not warrant similar economic characteristics, especially in the trade and investment department, as shown in this research paper. Though endowing distinct levels of openness, every country tended to decline in unison in terms of their trade openness with Singapore leading the pack. Further scrutiny on each country's export baskets reveals that Indonesia failed to show any significant progress on export sophistication during the 10 year period of the ASEAN Plus Three Cooperation Work Plan of 2007-2017. This can be seen from the relatively miniscule contribution of capital goods to its exports when compared to raw goods, and from its EXPY, which remained unchanged between 2007 and 2017. Singapore's EXPY was also unchanged, but at the highest level among the ASEAN-5, whereas Malaysia, the Philippines, and Thailand recorded increases in EXPY during said tenure. Investment wise, it may be inferred that during the period of 2002-2012 (portraying 5 year lagged FDI numbers), Singapore has been the most attractive country in the ASEAN-5 to invest in, as portrayed by its large FDI per GDP statistic. On the other side of the spectrum, the Philippines' investment attractiveness is relatively low, as during said period it only managed to attain an average FDI per GDP of 1.2%. Honing in on trade with the Plus Three countries, it may be observed that trade values between the ASEAN-5 members and China, Japan, and South Korea increased during the period of the ASEAN Plus Three cooperation, although these descriptive developments do not by themselves show that the cooperation caused the increase. Trade with China grew more rapidly than trade with Japan and South Korea in all ASEAN-5 members, and China's trade value with each member eventually surpassed that of Japan, in 2004 for Singapore, 2009 for Malaysia, 2013 for Indonesia and Thailand, and 2016 for the Philippines.

Moreover, the difference GMM estimation reveals a significant and positive relationship between export sophistication (as denoted by EXPY) and lagged values of FDI per capita at the one-, two-, three-, and five-year lags (with the largest coefficient at the 2-year lag), as well as a country's institutional quality (as denoted by its institutional rate). This result is consistent with the argument that FDI may aid countries in achieving export sophistication through spillovers from MNCs to local companies. However, this relationship should be read as an association rather than a causal effect, and it is limited to the 2013-2017 estimation sample. When the sample is extended to 2007-2017 or when FDI is measured as a share of GDP, the positive relationship between lagged FDI and EXPY is no longer observed. Thus, the econometric evidence in this study does not establish that enrollment in inter-regional cooperation such as ASEAN Plus Three improves its members' export sophistication through investment. The link from regional cooperation to investment and from investment to export sophistication remains a proposed mechanism that the present data can only partly examine.

Given that the evidence is associational and not robust across specifications, the following policy implications are presented as implications consistent with the findings rather than as effects established by this study. First, in pursuing sustainable and rapid economic growth through export sophistication, member countries may benefit from increasing their investment attractiveness and incentivizing FDI, which may generate positive spillovers from MNCs to local firms. Second, a more dynamic and empowering relationship between the ASEAN Plus Three member countries, especially members of ASEAN, may support economic convergence both in terms of trade and investment. Last, it is important for each country to develop an environment which not only entices FDI, but also fosters the capacity and knowledge spillovers resulting from said FDI.

Thus, improving a nation's institutional quality, which is positively associated with export sophistication in the estimation, deserves attention. This can be pursued through the removal of policies which limit countries' economic freedom and hinder ease of doing business.

This study is subject to several limitations. Firstly, and most importantly, this paper utilizes FDI inflows from all source countries rather than FDI originating from the Plus Three countries, because data on FDI from China, Japan, and South Korea into each ASEAN-5 member are not available for the full study period. As a result, the study cannot identify the effect of ASEAN Plus Three cooperation or of investment from the Plus Three countries on export sophistication, and the role of the cooperation is limited to the context in which the relationship between FDI and EXPY is observed. Secondly, the panel consists of only five countries. This small number limits the validity of the GMM instruments, as the number of instruments exceeds the number of observations, and limits the reliability of standard errors that are clustered by country. Thirdly, the positive association between lagged FDI and EXPY is found only in the 2013-2017 estimation sample and is not observed in the extended sample or with the alternative FDI measure, so the findings cannot be interpreted as causal. Lastly, the study uses aggregate country-level data, so the spillover channels from MNCs to local firms that underlie the proposed mechanism are not observed directly.

These limitations point to several directions for future research. Further research should strive to utilize bilateral FDI data from the Plus Three countries once a sufficiently long series is available, as that would allow the relationship between investment from the Plus Three countries and export sophistication to be examined directly. Extending the analysis to a larger group of countries, such as all ASEAN members, and to a longer period would increase the number of cross-sectional units and allow dynamic panel estimators to be applied with fewer concerns about instrument validity. Future studies may also use firm-level or sector-level data to examine whether foreign affiliates and their linkages with local firms are associated with the production of more sophisticated exports, which would provide a more solid basis for the conclusions inferred from this study.

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