China's global value chain linkage and logistics performances in emerging ASEAN economies

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Abstract

This paper aims to evaluate the extent of China's forward linkage of global value chains (GVCs) with emerging market economies of the Association of Southeast Asian Nations (ASEAN) compared to those with the US and Japan, and also to examine the nexus of China's forward GVC linkage with logistics performances in emerging ASEAN economies as China's trade partners. This study uses the UNCTAD-Eora Database and applies a structural gravity trade model for the empirical analysis. The statistical observations identified the major position of China's GVC, which has transformed from a backward linkage to a forward linkage since the mid-2000s. The empirical estimation verified there is less linkage in China's forward GVC with emerging ASEAN economies than with the US and Japan, and demonstrated that the lack of logistics performances in emerging ASEAN economies has been a significant factor in explaining the less linkage in China's forward GVC with them.

Keyword: Global Value Chains; Forward Linkage; Logistics Performances; China; Emerging ASEAN Economies.
JEL Classification Codes: F12, F14, O53

1. Introduction

The Chinese economy has shown a robust performance in its economic growth during the previous decades. The economy joined a middle-income group in the late 1990s and has stepped up to an "upper" middle-income group since 2010, according to income classification by the World Bank[1]. One of the driving forces behind China's economic growth is considered to be its integration with "global value chains (GVCs)". The economic effects of GVC integration were, for instance, estimated by the World Bank (2020): a 1 percent increase in GVC participation would boost per capita income by more than 1 percent, or cause a much more than 0.2 percent income gain from standard trade.

The GVCs themselves, however, do not necessarily guarantee a high level of value added in an economy. A typical example had been the value composition of Apple iPods and iPhones exported by China. Previous studies (e.g., Koopman et al., 2012; Backer, 2011; Xing and Detert, 2010; and Linden et al., 2009) showed that, in the production and export of these items in China, the domestic value added that had been created by the pure assembly accounted for only a small fraction of the selling price to foreign markets, and that the dominant value added had originated from foreign economies such as South Korea, Japan and the United States (the US) in terms of imported parts and components.

Since the mid-2000s, however, China's GVC integration has demonstrated different patterns with industrial upgrading towards a "forward linkage" in its contribution to GVCs. Chinese industries have raised their domestic value-added shares in their exports, through productivity growth, technological progresses and development of supporting industries (e.g., Zhu, 2019; Peng and Zhang, 2020; Taguchi and Li, 2018). At the same time, China's GVC position has been upgraded from the buyers' side, as a facilitator of a "backward" GVC linkage, to the sellers' side, as a promoter of a "forward" linkage. Thus, the Chinese economy has played an increasingly significant role as a supply hub in its GVC activities (e.g., Li et al., 2019; World Bank, 2020).

From a geographical perspective, the Chinese economy has strengthened its GVC linkage with economies in the Association of Southeast Asian Nations (ASEAN). Since the 2000s, China has taken over the positions of Japan, Taiwan, and the US, becoming a supply hub of value-added exports for ASEAN economies, while ASEAN economies have depended more on China for intermediate inputs for their exporting products, as will be shown in Section 2. China concluded its free trade agreement with ASEAN (ACFTA) and put it into force in 2005. ACFTA also seems to have contributed to the reinforcement

[1] See the website: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519. (Accessed January 14, 2021)

of the GVC linkage between China and ASEAN economies. In addition, the Regional Comprehensive Economic Partnership Agreement, containing China and ASEAN economies as the targeted members, was signed in November 2020, and it is expected to further tighten GVC integration.

Considering the aforementioned backgrounds, this paper aims to evaluate the extent of China's forward GVC linkage with the emerging market economies of ASEAN (emerging ASEAN economies) compared to those with the US and Japan, and also to examine the connection of China's forward GVC linkage with the logistics performances in emerging ASEAN economies as China's trade partners. The emerging ASEAN economies in this study refer to eight countries: Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand and Vietnam.[2] The hypothesis of this study is that there would be much more room to deepen China's forward GVC linkage with emerging ASEAN economies under the improvements in logistics performances in emerging ASEAN economies. The GVC data are retrieved from the UNCTAD-Eora Global Value Chain Database (UNCTAD-Eora Database). [3] For the analytical methodology, this study applies a "structural" gravity trade model for the specification of estimated equations.

The contributions of this study to the literature are summarized as follows. First, this study discusses the GVC linkage in relation to a logistics performance, while few previous studies have dealt with this relationship. The GVC phenomena, characterized by vertical specialization, has often been explained by the "fragmentation" model in the context of intra-industry trade, as in Jones and Kierzkowski (1990, 2005), Deardorff (2001), and Kimura (2006). Jones and Kierzkowski (1990, 2005) argued that a firm's decision on whether to fragment production processes depends on the differences in location advantages (e.g., the differences in factor prices such as wages) and the levels of the service-link costs. They define the service-link costs as bundles of activities to connect fragmented production blocks, comprising coordination, administration, transportation, and financial services. Thus, the service-link costs are composed of not only bilateral trade costs such as transportation costs, but also country-specific costs such as logistics costs for operating in a given country. For expressing the service-link costs, previous studies such as Kimura et al. (2007) used the geographical distance between exporters and importers in their gravity trade model estimation. This study, however, focuses on the

[2] Brunei Darussalam and Singapore are excluded from this study's sample, because they belong to the high-income group according to the World Bank classification.

[3] See the website: https://worldmrio.com/unctadgvc/. (Accessed January 14, 2021) The property of this database will be explained in Section 2.

logistics performance of a trading country as a component of the service links.[4] This is because the harmonization of logistics policies has been a crucial field for trade facilitation in analyzing ASEAN economies (e.g., Nguyen et al., 2016).

The second contribution is that this study applies the UNCTAD-Eora Database (compiling value-added-trade data) for analyzing the GVC linkage. The GVCs that are characterized by vertical trade could be expressed by trade in terms of value added as well as ordinary gross trade values. Previous studies such as Kimura et al. (2007) examined the vertical trade of the fragmented manufacturing products in an intra-industry by using their gross trade values in terms of parts and components in their gravity trade model. The gross trade values, however, do not necessarily express the vertical trade accurately, because the traded parts and components could also be used for fulfilling domestic final demands, not exclusively for processing them for exports. The value-added-trade data, on the other hand, stand precisely for the vertical trade in the GVC linkage. However, these data are difficult to focus on in terms of intra-industry trade, because the value-added contains all kinds of inputs, such as raw materials and services, that manufacturing industries usually use. Thus, both indicators, the value-added trade and the gross trade values, have pros and cons, and this study, by using the value-added-trade data, would contribute toward enriching diverse evidence on the GVC linkage.

The third contribution is that this study applies a "structural" gravity trade model setting for the GVC analysis. The traditional gravity trade model had explained bilateral trade flows by the economic size of two countries and the distance between them. Piermartini and Yotov (2016), however, argued that the traditional model would lead to biased and even inconsistent estimates, and so presented a comprehensive and theoretically consistent econometric specification of a gravity trade model setting with the following six suggestions: (i) use panel data, (ii) use interval data to allow for adjustment in trade flows, (iii) include intra-national trade flows, (iv) use directional time-varying fixed effects, (v) employ pair fixed effects, and (vi) estimate gravity model with the Poisson Pseudo Maximum Likelihood (PPML). This study applies five of the six suggestions, with the exception of recommendation (iii). The reason for excluding the recommendation (iii) is that this study focuses on the comparison in China's value-added trade among its partners.

The remainder of the paper is structured as follows. Section 2 illustrates the extent of China's GVC linkage with emerging ASEAN economies; Section 3 conducts an

[4] The subsequent studies such as Taguchi and Ni Lar (2015 and 2016) added the logistics performance index as the proxy of the service-link costs to the equation. These studies, however, used an ordinary gravity trade model different from this study's model.

econometric analysis by estimating a structural gravity trade model, to examine the quantitative connection between China's forward GVC linkage and logistics performances in emerging ASEAN economies; and Section 4 summarizes and concludes the paper.

2. China's Forward GVC Linkage

This section illustrates the extent of China's GVC linkage with emerging ASEAN economies by using the UNCTAD-Eora Database. The idea on the GVC forms originated from the concept of "vertical specialization" proposed by Hummels et al. (2001). They suggested the following two types of participations in a vertical specialization chain: the country uses imported inputs to produce an exported good (expressed as VS), and the country exports goods that are used as inputs into another country's production of export goods (expressed as VS1). Koopman et al. (2010) precisely computed the share of VS and VS1 relative to gross exports to represent the extent of GVC participation, by the framework integrating vertical specialization and value-added trade in the literature, as follows:

$$\text{GVC Participation} = IV / E + FV / E \quad (1)$$

$$\text{GVC Position} = \ln(1 + IV / E) - \ln(1 + FV / E) \quad (2)$$

where IV, FV, and E stand for "domestic value added embodied as intermediate inputs in other countries' gross exports" (corresponding to VS1), "foreign value added embodied in gross exports" (corresponding to VS), and "gross exports," respectively. In Equations (1) and (2), the first item (IV / E) represents an upstream participation in GVCs, and the second item (FV / E) shows a downstream participation in GVCs. These two indices can be computed for any countries and sectors, so long as the data are available. Then, Equation (1) denotes the total extent of GVC participation in a country-sector, and Equation (2) describes the country-sector's GVC position: if the country-sector lies upstream in a GVC, the numerator tends to be large, but if it lies downstream, then the denominator tends to be large.

In this study, the upstream participation in GVCs (IV / E) is called "forward GVC linkage" and the downstream participation in GVCs (FV / E) is called "backward GVC linkage," following, for example, the World Bank (2020). The UNCTAD-Eora database, which this study uses, offers the GVC data with global coverage (189 countries and a "Rest of World" region) and a time series from 1990 to 2018, and provides the key GVC

indicators: foreign value added (FVA), domestic value added (DVA), and indirect value added (DVX).[5] The variables of IV and FV in Koopman et al. (2010) correspond to DVX and FVA in the UNCTAD-Eora database, respectively.

Figure 1 illustrates China's GVC linkage and position for 1990 – 2018, based on the UNCTAD-Eora database. The backward GVC linkage peaked in 2011 and has since entered a declining phase. This seems to be because China has facilitated domestic value creation in exports with industrial upgrading since the previous decade, as Zhu (2019), Peng and Zhang (2020) and Taguchi and Li (2018) argued. The forward GVC linkage, on the other hand, has continued to grow. This trend is consistent with the perspective of Li et al. (2019) that the Chinese economy has played an increasingly vital role as a supply hub in its GVC activities. As a result, China's GVC position index turned from a declining phase with active backward linkage before the mid-2000s to a rising phase with dominant forward linkage after that. The World Bank (2020), describing an approximate distribution of backward and forward GVC integration across taxonomy groups, also identified China's GVC position as a group of "advanced manufacturing and services" with a rising forward GVC linkage.

China's forward GVC linkage with emerging ASEAN economies could be observed from another angle, that is, the foreign value added in exports of emerging ASEAN economies (ASEAN's backward GVC linkage) by country origins.[6] According to Table 1, looking at the latest year of 2018, China is counted as the country that has the largest share of foreign value added out of total foreign value added in gross exports in Cambodia, Indonesia, Malaysia, Myanmar, Thailand, and Vietnam, and as the country with the second largest share in Lao PDR and the Philippines. At the same time, looking at the time series trend for 1990-2018, the China's foreign value-added share has increased in all of the emerging ASEAN economies. However, Japan, the US, and Taiwan have lost their foreign value-added share during the same period. One additional point to note is that the intra-regional linkages among ASEAN economies have been strengthened in terms of the increasing trends in their shares of foreign value added from themselves, such as Cambodia from Thailand, Indonesia from Malaysia, Lao PDR from Thailand, Malaysia from Indonesia, Thailand from Malaysia, and Vietnam from Thailand.

[5] The methodological background of the UNCTAD-Eora database was described by Casella et al. (2019). The value-added-based trade data originated from the work of the OECD and WTO as the "Trade in Value Added (TiVA)" dataset (see OECD and WTO, 2012). Thus, Casella et al. (2019) also provided a comparison of the results of the UNCTAD-Eora database against the TiVA database.

[6] The data are retrieved from the UNCTAD-Eora database, the country-by-country matrix (1990-2018) with the rows being the country originating the VA, and with the columns being the country exporting that VA.

In sum, China's forward GVC linkage has been strengthened including the linkage with emerging ASEAN economies during the past decades. Thus, the subsequent analysis of a gravity trade model focuses on China's forward GVC linkage with emerging ASEAN economies.

3. Econometric Analysis

This section conducts an econometric analysis by estimating a structural gravity trade model, to examine the quantitative connection between China's forward GVC linkage and logistics performances in emerging ASEAN economies. This section first specifies the estimation model and the sample data, and then presents estimation outcomes with discussions.

3.1 Specification of Estimation Model and Data

This study equips the following two types of structural gravity model specifications for examining China's forward GVC linkage: (i) the model setting using the directional time-varying fixed effects (Equation 3), and (ii) the model setting using the logistics performances of China's partner countries instead of their time-varying fixed effects (Equation 4). The models for the estimations are specified as follows:

$$DVX_{ci,t} = \exp\left[\mu_{ci} + \pi_{c,t} + \chi_{i,t}\right] + \varepsilon_{ci,t} \quad (3)$$

$$DVX_{ci,t} = \exp\left[\mu_{ci} + \pi_{c,t} + \alpha\, LPI_{i,t}\right] + \varepsilon_{ij,t} \quad (4)$$

where the subscripts c, i, and t denote China (offering foreign value added in exports), China's partner countries (receiving foreign value added in exports), and trading years, respectively; DVX is the value added exports from China to its partners; μ_{ci} is the pair fixed effects between China and its partners i (excluding emerging ASEAN economies); $\pi_{c,t}$ and $\chi_{i,t}$ are the time-varying fixed effects of China and its partner i (targeting emerging ASEAN economies)[7], respectively; LPI is the logistics performance index; ε is an error term; α is an estimated coefficient of LPI.

The value-added exports from China to its partners (DVX) are defined as China's domestic value added embodied as intermediate inputs in its partners' gross exports

[7] The pair fixed effects, μ_{cj}, exclude emerging ASEAN economies, and the time-varying fixed effects of the partners, $\chi_{j,t}$, target only emerging ASEAN economies, because the inclusion of all the partners in their effects causes near singular matrix errors due to the perfect collinearity among regressors.

(corresponding to China's forward GVC linkage in this study). The UNCTAD-Eora database provides the country/sector-by-country matrix for all years from 1990 to 2017, reporting, for each country of exports, the value contributed by all other country/sector in the world, where the rows show the country/sector originating the value added and the columns show the country exporting that value added. China's value-added exports (DVX) are represented by the row in China's country/sector column, that is, China's value-added contributions to its partners' exports. The DVX in this study's estimation targets three groups of sectors: total industry, manufacturing, and machinery (the industrial classification is defined in Appendix 1). The reason for focusing on the manufacturing and machinery sectors is that GVC activities with many multi-layered vertical production processes as the mode of fragmentation are typically observed in these sectors, as Kimura (2006) argued.

Equation (3), the structural gravity model setting, conforms to the following recommendations of Piermartini and Yotov (2016). First, the time-varying fixed effects of China and its partners, $\pi_{c,t}$ and $\chi_{j,t}$, are incorporated in the equation to control for the multilateral resistances, as suggested initially by Anderson and van Wincoop (2003). The time-varying fixed effects absorb all the observable and unobservable country-specific characteristics that influence bilateral trade (e.g., China's and its partners' GDPs). For the time-varying fixed effects of China's partners, this study treats the US and Japan as a benchmark of the partners, for examining the effects of emerging ASEAN economies on China's value-added exports. Second, the pair fixed effects between China and its partners, μ_{ci}, are introduced to the equation to account for the effects of all time-invariant bilateral trade costs, as Agnosteva et al. (2014) demonstrated. The pair fixed effects contain all the time-invariant bilateral elements such as geographical distance and the presence of contiguous borders and a common official language. Third, the estimation applies the PPML as its methodology to manage the possibility of zero trade flows and heteroscedasticity of trade data, as Santos Silva and Tenreyro (2006) recommended.[8] The estimation of Equation (3) also adopts the Ordinary Least Squares (OLS) estimator as a robustness check, as Head and Mayer (2014) suggested.

Equation (4) replaces the time-varying fixed effects of China's partners in Equation (3) by their logistics performances. As mentioned in the introduction, the service-link costs are a key determinant of GVC linkage in the framework of the fragmentation theory, and contain not only bilateral trade costs such as transportation costs, but also country-

[8] The UNCTAD-Eora database this study uses does not include zero trade data. However, the application of PPML estimation is still appropriate and effective because of the heteroscedasticity of trade data.

specific costs such as logistics costs in a trading country (Jones and Kierzkowski, 1990). Thus, the service-link costs occupy some portions of the time-varying fixed effects of China and its partners ($\pi_{c,t}$, $\chi_{j,t}$) and their pair fixed effects (μ_{ci}).[9] This study focuses on the time-varying logistics costs of China's partners as one part of the service-links (Figure 2). The logistics costs are expressed by the Logistics Performance Index (LPI) of the World Bank.[10] The index measures the performance on trade logistics from the six perspectives: customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness, and takes the number ranging from 1 (very low in the performances) to 5 (very high).[11] The estimation of Equation (4) is expected to verify positive significance of the LPI variable, and the study, using the estimated coefficient α, demonstrates the contribution of the logistics performances to the time-varying country-specific fixed effects in emerging ASEAN economies as China's partners. This estimation also uses the PPML estimator.

The sample economies and period are set as follows. China is the host country, and the partners for its value-added exports are 39 economies including eight emerging ASEAN economies (see Appendix 2), which account for more than 95 percent of China's value-added exports in 2017. As for the sample period, the study selects discrete years such as 2007, 2010, 2012, 2014, 2016, and 2017 because of the constraint of data availability of the LPI[12]. The study then constructs panel data for six years with the 39 combinations between China and its partners (6 times 39 = 234) for the estimation. The selection of discrete sample years and the construction of panel data also fits the suggestions of Piermartini and Yotov (2016) in the structural gravity trade model setting.

For the subsequent panel estimation, this study investigates the stationary property of the constructed panel data by employing panel unit root tests: the Levin, Lin, and Chu test (Levin et al. 2002) as a common unit root test; and the Fisher-ADF and Fisher-PP tests (Maddala and Wu 1999; Choi 2001) and the Im, Pesaran and Shin, test (Im et al. 2003) as individual unit root tests. The common unit root test assumes that there is a

[9] The service-link costs are also affected by the "time-varying" bilateral trade costs, represented by the effects of, for instance, new regional trade agreements. This study omits these effects to highlight the arguments on country-specific effects.

[10] See the website: https://lpi.worldbank.org/. (Accessed January 14, 2021)

[11] The logistics costs are also shown by other indexes such as the score of "Trading across borders" in the Doing Business of the World Bank (https://www.doingbusiness.org/en/custom-query, accessed May 12, 2021). In the subsequent estimations in Table 3, the LPI is replaced by the score of Trading across borders, and the almost same results are obtained with its positive coefficients at conventionally significant levels. Since this score's availability is confined to the period after 2015, the subsequent estimations focus on the LPI index.

[12] The UNCTAD-Eora database has the data range for 2017, and the LPI data in 2018 are applied to the data as 2017, since the LPI does not have the data for 2017.

common unit root process across cross-sections, and the individual unit root test allows for individual unit root processes that vary across cross-sections. These tests are conducted based on the null hypothesis that a level of panel data has a unit root, by including 'intercept' and 'trend and intercept' in the test equations. Table 2 reports the test results as follows: the common unit root test, that is, the Levin, Lin, and Chu test, identifies the rejection of the null hypothesis of a unit root at the 99 percent significance level in all the variables in both test equations. The individual unit root tests do not necessarily reject the null hypothesis of a unit root in all cases, but the Fisher-PP test rejects it at more than the 99 percent level in all the variables in the test equation with the intercept. Thus, it is speculated that the there is no serious problem of low power in the unit root tests, thus using the level of panel data for the estimation in this study.

3.2 Estimation outcomes and discussions

Table 3 reports the estimation outcomes of Equation (3) and (4) with the US and Japan benchmarks for the cases of total industry, manufacturing and machinery. The cases with any benchmarks and in any industries produce similar results with the same direction of the coefficients' signs, although their magnitudes slightly differ among the cases. Thus, this section focuses mainly on the results with the US benchmark in total industry, and it adds explanations in the other cases later on.

Columns (i) and (iii) correspond to the results of Equation (3) estimation by the OLS and the PPML, respectively, and display the time-varying fixed effects of emerging ASEAN economies as China's partners ($\chi_{i,t}$) with the US benchmark (the time-varying fixed effects of China $\pi_{c,t}$ and the pair fixed effects μ_{ci} are omitted for brevity). They clearly show negative effects at conventionally significant levels, except for Thailand and Malaysia in 2010, 2012, and 2014 in column (i), with the wide range of their magnitudes from the largest negative values in Myanmar to the least negative values in Malaysia. They imply that China is less linked with emerging ASEAN economies than with the US as the partner of China's forward GVC linkage. In a comparison of the estimation methodologies, the OLS estimation provides extremely large coefficients in their absolute magnitudes in column (i): the coefficient of Myanmar in 2007 is, for instance, exp. (-11.079) = 0.00001, whereas the PPML estimator gives reasonable levels of coefficients in column (iii): that of Myanmar is exp. (-1.135) = 0.321. Another difference between the OLS and the PPML estimation is the one in the result of the Ramsey RESET test shown at the bottom of Table 3. The test detects model specification errors from possible omission of variables, with the null hypothesis that the model does not suffer from

misspecification errors. The RESET p values in these columns reveal that it is not the OLS but the PPML estimator that passes the misspecification tests. Thus, this study identifies the PPML as a reasonable standard of estimation, and so the subsequent estimation of Equation (4) applies only to the PPML estimator.

In the other cases, almost the same results as those above in total industry with the US benchmark are obtained, although there are slight differences in the coefficients' magnitudes. The cases of manufacturing and machinery (columns ix and xv) have larger magnitudes of their negative coefficients of the time-varying fixed effects of emerging ASEAN economies than total industry. As for the comparison of the benchmarks, the Japan benchmark (column iv and x) provides larger magnitudes of their coefficients than the US benchmark in total industry and manufacturing.

Column (v) reports the PPML estimation result of Equation (4) that applies explicitly to the logistics performances of China's partners (LPI) instead of their time-varying fixed effects. It shows that the LPI coefficient α is significantly positive as expected, and it implies that the logistics performances of China's partners have some effects to explain the less linkage of China's forward GVC with emerging ASEAN economies. The RESET p value in this column suggests that the estimation of Equation (4) does not pass the misspecification tests even by the PPML estimator. It seems to be probably because there are omitted variables in this estimation so that the logistics performances themselves cannot cover all the time-varying country-specific factors. All the other cases, that is, those in manufacturing and machinery and with the Japan benchmark, have positively significant LPI coefficients, although their magnitudes are larger in manufacturing and machinery (columns xi and xvii) and those are smaller with the Japan benchmark (columns vi, xii, and xviii) than with the US benchmark.

Here comes the final step to examine the contribution of the logistics performances to the time-varying country-specific fixed effects in emerging ASEAN economies as China's partners. Table 4 compares emerging ASEAN economies' fixed effects and their effects of logistics performances (LPI) in terms of the period average of 2007-2017 with the US and Japan benchmarks in total industry, manufacturing and machinery. Column (a) shows the period-average coefficients of emerging ASEAN economies' fixed effects; the LPI deviations from the US and Japan benchmarks in column (c) is computed by subtracting the benchmarks' LPI from each emerging ASEAN economies' LPI in column (b); and the LPI effects in column (d) is then calculated by multiplying the LPI deviations with the estimated coefficients of LPI in Table 3.

Focusing on the case with the US benchmark in total industry in Table 4, the negative LPI effects in column (d) are comparable to the country-specific negative fixed effects in

column (a) in the absolute levels. In Myanmar, Lao PDR and Cambodia, their LPI effects account for most of their fixed effects. In Vietnam, the Philippines, Indonesia, Thailand, and Malaysia, on the other hand, their LPI effects exceed largely their fixed effects in the magnitudes. It seems to be probable because the country-specific fixed effects in these countries contains the other factors that offset the LPI effects, such as their preferential tax systems and the other incentives for their industries. The similar results are shown in the other cases in manufacturing and machinery and with the Japan benchmark. In sum, the lack of logistics performances of emerging ASEAN economies as China's partners is a significant factor in explaining the less linkage of China's forward GVC with them. This finding is also consistent with the analytical messages from the World Bank (2016 and 2020) that GVC integrations are highly sensitive to logistics performances.

3.3 Policy Implications

GVC integrations offer great opportunities that allow China to improve its economic development. Along with China's industrial upgrading, emerging ASEAN economies have become absolutely necessary trade partners for China since the 2000s. The analysis of China's forward GVC linkage, nevertheless, reveals that the connection of China with emerging ASEAN economies is weaker than with the US and Japan, and that one of the significant reasons is the lack of logistics performances in emerging ASEAN economies. The findings in this paper have the following policy implications for China to improve its GVC integrations, especially the forward linkage with emerging ASEAN economies.

Policy makers in China can strengthen the assistance to enhance the logistics performances in emerging ASEAN economies through the framework of the Belt and Road Initiative (BRI). The BRI was proposed in 2013 with the objective to make China's domestic overcapacities and capitals contribute to the infrastructure development and economic growth in South-East Asian, Central Asian, and European countries, through improving the connectivity with these countries along with the Belt and Road. According to Arvis (2016), the World Bank has marked the BRI as one of the "major new international initiatives address logistics issues". The official documents issued by the National Development and Reform Commission in 2015 indicate that the Chinese government identified five the key cooperation areas for advancing the BRI: policy coordination, facilities connectivity, unimpeded trade, financial integration, and people-to-people bond, which are considered to have positive effects on the strategic decisions in logistics performance (Ye and Haasis, 2018). In particular, the facilities connectivity includes a series of infrastructure projects such as the construction of roads, railways,

ports, and airports, etc., which influence the transportation factors significantly (Ylander, 2017). As important trade partners on the BRI route, the Chinese authorities have actively promoted cooperation with ASEAN economies by linking the BRI and the Master Plan on ASEAN Connectivity. As one of the important areas of China-ASEAN cooperation, the transportation field, for instance, the promotion of the Trans-Asian Railway and the construction of sea and air transportation has made major achievements during the second decade in the 21st century. In addition, the case studies on Pakistan, Kazakhstan, and Thailand in James and Selina (2018) shows the BRI has played a role as a catalyst and an obligatory passage point to obtain the required resources and supports for facilitating mega transnational transport infrastructure projects in the regional scale. Furthermore, based on a modified gravity prediction model, Zeng et al. (2017) examines the changes in transshipment traffic as the impact of the Carat Canal. It is concluded that under the BRI, the opening of the Carat Canal affects the market shares of transshipment among hub ports and diversifies shipping network patterns.

The government documents and previous studies above provide evidence that it is possible for China to help improve the logistics performance in emerging ASEAN economies through the BRI framework, so that China could enhance its forward GVC linkage with them.

In addition, the Chinese government could intensify its assistance and investment of logistic infrastructure in emerging ASEAN economies through a “dual circulation strategy”. The dual circulation strategy was first mentioned in 2020, which is a new development pattern that places a greater focus on internal circulation, at the same time allows domestic and international double circulation to promote each other. According to the Central Finance and Economics Committee of China, as an important link of the dual circulation, the logistics system connects production, distribution, circulation, and consumption, which is an important support and guarantee for opening up the supply chain and coordinating the industrial chain. Therefore, it is necessary to improve the construction and logistics efficiency of the transportation network both in domestic and foreign countries. Overall, the dual circulation strategy can be expected to improve the logistics performance in emerging ASEAN economies and strengthen the GVC forward link with them.

Finally, the government of China could encourage private companies in the field of logistics services to promote their foreign direct investments (FDI) in emerging ASEAN economies. Through the FDI, emerging ASEAN economies as the host countries could expect to gain the spillover effects from the Chinese investors in the field of innovative logistics both directly and indirectly.

4. Concluding remarks

This paper aimed to evaluate the extent of China's forward GVC linkage with emerging ASEAN economies compared to those with the US and Japan, and also to examine the connection of China's GVC linkage with logistics performances in emerging ASEAN economies as China's trade partners. The hypothesis of this study was that there would be much more room to deepen China's forward GVC linkage with emerging ASEAN economies under the improvements in logistics performances in emerging ASEAN economies. This study used the UNCTAD-Eora Database and applied a structural gravity trade model for the analysis. The statistical observations have highlighted that the major position of China's GVC has transformed from a backward linkage to a forward linkage since the mid-2000s. The empirical estimation of a structural gravity trade model has identified the less linkage of China's forward GVC with emerging ASEAN economies than with the US and Japan, and has demonstrated that the lack of logistics performances in emerging ASEAM has been a significant factor in explaining the less linkage of China's forward GVC with them.

As the logistics performances are one of manageable factors for countries' strategies, there should still be the policy space for emerging ASEAN economies to improve them. From the Chinese perspective, it could be a good strategy for deepening its forward GVC linkage to strengthen its assistance to emerging ASEAN economies for enhancing their logistics performances through, for instance, the framework of the Belt and Road Initiative.

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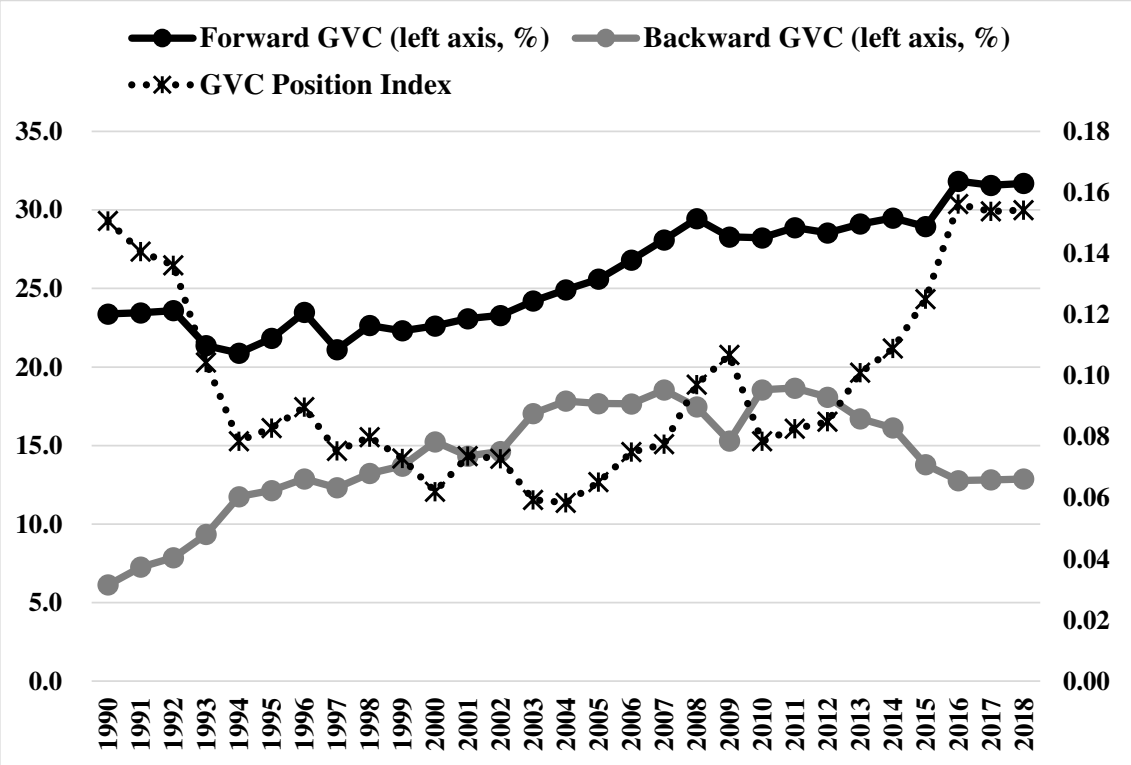
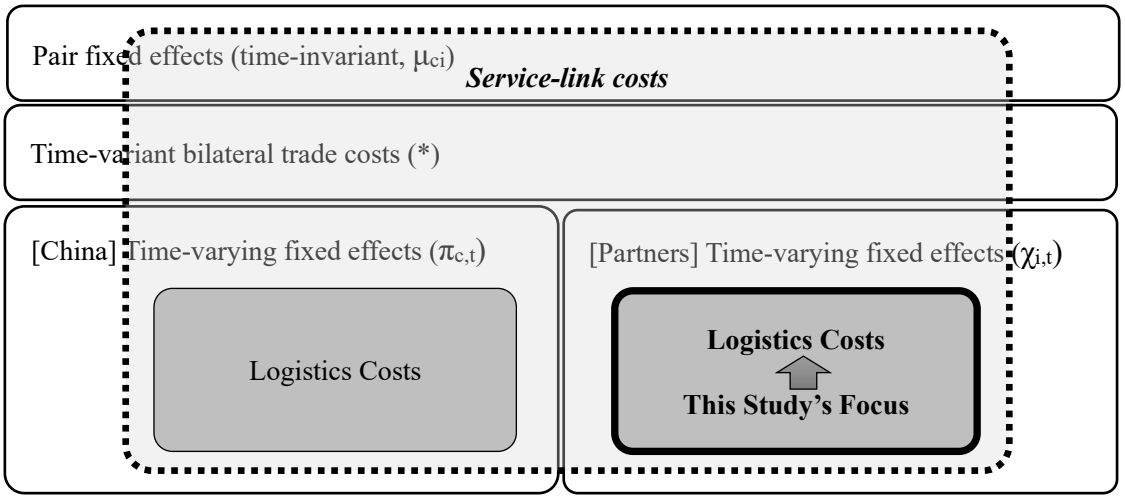
Figure 1 Forward and Backward GVC Linkage in China



Source: Author's estimation based on the UNCTAD-Eora Global Value Chain Database

Figure 2 Relationship between Service-link Costs and Logistics Costs



*: They are not incorporated in the estimation.
Source: Author's description based on Jones and Kierzkowski (1990).

Table 1 Foreign Value Added in Exports by Country Origins

Cambodia					[% of total foreign value added]		
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	2.2	7.7	9.7	14.1	18.1	20.2	25.7
Thailand	3.2	13.2	13.4	15.5	14.4	15.8	19.6
Indonesia	1.7	6.1	6.1	5.1	5.7	6.1	6.6
Japan	6.3	9.6	8.3	7.7	6.7	5.0	5.2
Malaysia	1.5	2.8	3.8	4.2	4.2	4.3	4.5
Taiwan	39.7	11.2	10.5	5.5	4.0	3.5	3.8
US	5.9	6.3	6.0	5.3	4.6	3.9	3.7

Indonesia					[% of total foreign value added]		
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	3.5	5.0	6.3	9.7	12.9	15.4	18.2
Japan	18.2	19.3	15.2	13.1	12.2	9.9	10.2
US	13.2	14.2	13.9	10.9	9.6	8.9	9.0
Malaysia	3.6	3.1	5.4	6.1	6.4	6.8	6.8
South Korea	4.9	5.0	5.6	5.2	5.1	5.7	5.4
Taiwan	7.3	3.8	5.0	2.4	1.5	1.3	1.1

Lao PDR					[% of total foreign value added]		
Country Origins	1990	1995	2000	2005	2010	2015	2018
Thailand	27.4	39.8	39.5	40.9	38.8	42.3	41.5
China	2.5	3.6	4.7	6.4	8.3	10.4	10.7
Vietnam	1.5	1.6	2.2	1.8	1.2	1.4	8.9
Japan	7.3	7.7	6.8	5.8	4.9	3.7	4.5
India	1.0	0.9	1.1	1.4	2.0	2.0	2.4
US	5.7	5.6	5.1	4.2	3.8	3.3	1.7

Malaysia					[% of total foreign value added]		
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	2.6	4.0	6.4	9.4	13.1	16.6	18.1
Japan	25.9	25.0	21.6	17.8	14.7	12.1	11.9
US	14.4	15.4	16.0	12.6	10.7	9.8	10.7
Indonesia	2.6	4.1	3.9	4.3	5.3	5.7	6.3
Germany	5.4	5.6	5.0	5.7	5.6	4.4	5.4
Taiwan	11.4	4.4	5.8	3.1	2.0	1.7	1.5

Myanmar						[% of total foreign value added]	
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	2.0	3.4	4.0	3.8	3.4	4.6	9.0
US	7.0	7.9	6.9	6.7	5.8	6.0	8.1
India	0.9	1.3	1.7	1.6	1.7	1.8	3.5
Japan	6.3	6.9	6.0	5.1	4.8	3.8	1.6
Taiwan	21.4	4.5	2.9	2.2	1.2	1.0	0.4

The Philippines						[% of total foreign value added]	
Country Origins	1990	1995	2000	2005	2010	2015	2018
Japan	20.0	26.4	23.5	20.8	18.9	15.8	15.4
China	1.9	2.7	4.4	7.0	10.6	13.0	15.3
US	11.7	12.1	14.5	11.0	10.2	9.3	9.8
South Korea	4.5	8.2	6.9	8.0	6.3	7.2	6.8
Taiwan	31.5	15.5	13.0	11.4	8.7	7.8	6.5

Thailand						[% of total foreign value added]	
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	3.0	4.8	8.9	13.0	18.7	23.1	24.7
Japan	28.2	25.4	22.5	17.5	14.7	12.0	11.2
US	10.5	11.6	11.7	8.3	7.5	6.8	7.0
Malaysia	2.7	3.3	4.0	4.8	5.4	5.5	5.6
Germany	6.4	5.9	5.0	5.7	5.7	4.4	5.4
Taiwan	7.0	3.3	5.1	2.3	1.6	1.3	1.2

Vietnam						[% of total foreign value added]	
Country Origins	1990	1995	2000	2005	2010	2015	2018
China	5.0	8.1	8.5	11.9	15.0	18.5	22.8
Japan	13.1	23.4	16.0	23.9	26.0	21.8	20.6
South Korea	5.3	6.3	7.8	7.9	8.1	9.3	7.7
Thailand	3.2	5.4	5.2	5.8	5.1	5.7	5.5
US	7.1	7.0	7.6	6.6	5.7	4.9	4.8
Taiwan	37.4	20.1	19.3	7.9	4.5	3.8	2.9

Source: Author's estimation based on the UNCTAD-Eora Global Value Chain Database

Table 2 Panel Unit Root Tests

	DVX [Total Industry]	DVX [Manufacturing]	DVX [Machinery]	LPI
[Intercept]				
Levin, Lin & Chu Test	-17.763 ***	-14.676 ***	-15.011 ***	-15.135 ***
Fisher ADF Chi-square	103.178 **	91.024	98.045 *	145.068 ***
Fisher PP Chi-square	178.513 ***	166.005 ***	177.496 ***	188.214 ***
Im, Pesaran and Shin W-stat	-1.225	-0.466	-1.000	-3.943 ***
[Intercept & Trend]				
Levin, Lin & Chu Test	-5.806 ***	-4.242 ***	-4.623 ***	-18.333 ***
Fisher ADF Chi-square	81.227	62.251	54.352	97.143 *
Fisher PP Chi-square	146.146 ***	108.588 **	90.382	184.368 ***
Im, Pesaran and Shin W-stat	0.276	1.373	1.683	-0.384

Note: *, **, and *** denote the rejection of the null hypothesis at the 90%, 95%, and 99% levels of significance.

Sources: Author's estimation

Table 3 Estimation Outcomes

[Total Industry]

Estimation		(i)	(ii)	(iii)	(iv)	(v)	(vi)
Equation		(3)	(3)	(3)	(3)	(4)	(4)
Methodology		OLS	OLS	PPML	PPML	PPML	PPML
Benchmark		US	Japan	US	Japan	US	Japan
LPI						0.375 ***	0.369 ***
						(0.045)	(0.043)
Dummy: Myanmar	2007	-11.079 ***	-11.466 ***	-1.135 ***	-1.157 ***		
	2010	-11.275 ***	-11.662 ***	-1.141 ***	-1.163 ***		
	2012	-11.015 ***	-11.402 ***	-1.068 ***	-1.090 ***		
	2014	-10.908 ***	-11.296 ***	-1.032 ***	-1.054 ***		
	2016	-9.402 ***	-9.7894 ***	-0.776 ***	-0.799 ***		
	2017	-9.411 ***	-9.7984 ***	-0.776 ***	-0.799 ***		
Dummy: Lao PDR	2007	-7.638 ***	-8.025 ***	-0.629 ***	-0.652 ***		
	2010	-7.581 ***	-7.968 ***	-0.611 ***	-0.633 ***		
	2012	-7.528 ***	-7.915 ***	-0.595 ***	-0.617 ***		
	2014	-7.545 ***	-7.932 ***	-0.589 ***	-0.611 ***		
	2016	-8.047 ***	-8.434 ***	-0.620 ***	-0.643 ***		
	2017	-8.111 ***	-8.498 ***	-0.626 ***	-0.649 ***		
Dummy: Cambodia	2007	-5.220 ***	-5.607 ***	-0.383 ***	-0.406 ***		
	2010	-5.315 ***	-5.702 ***	-0.386 ***	-0.408 ***		
	2012	-5.307 ***	-5.694 ***	-0.379 ***	-0.402 ***		
	2014	-5.301 ***	-5.688 ***	-0.375 ***	-0.397 ***		
	2016	-5.875 ***	-6.262 ***	-0.412 ***	-0.435 ***		
	2017	-5.972 ***	-6.360 ***	-0.420 ***	-0.443 ***		
Dummy: Vietnam	2007	-2.209 ***	-2.596 ***	-0.143 ***	-0.166 ***		
	2010	-2.215 ***	-2.602 ***	-0.142 ***	-0.165 ***		
	2012	-2.265 ***	-2.652 ***	-0.144 ***	-0.167 ***		
	2014	-2.284 ***	-2.671 ***	-0.144 ***	-0.167 ***		
	2016	-2.282 ***	-2.669 ***	-0.141 ***	-0.164 ***		
	2017	-2.283 ***	-2.671 ***	-0.141 ***	-0.164 ***		
Dummy: Philippines	2007	-1.442 ***	-1.829 ***	-0.090 ***	-0.113 ***		
	2010	-1.445 ***	-1.832 ***	-0.090 ***	-0.112 ***		
	2012	-1.486 ***	-1.873 ***	-0.092 ***	-0.114 ***		
	2014	-1.509 ***	-1.896 ***	-0.093 ***	-0.116 ***		
	2016	-1.925 ***	-2.312 ***	-0.118 ***	-0.141 ***		
	2017	-1.948 ***	-2.335 ***	-0.119 ***	-0.142 ***		
Dummy: Indonesia	2007	-1.621 ***	-2.008 ***	-0.102 ***	-0.125 ***		
	2010	-1.549 ***	-1.936 ***	-0.097 ***	-0.119 ***		
	2012	-1.461 ***	-1.848 ***	-0.090 ***	-0.113 ***		
	2014	-1.540 ***	-1.927 ***	-0.095 ***	-0.118 ***		
	2016	-1.847 ***	-2.234 ***	-0.113 ***	-0.136 ***		
	2017	-1.847 ***	-2.234 ***	-0.113 ***	-0.136 ***		
Dummy: Thailand	2007	-0.319	-0.706 ***	-0.017 ***	-0.040 ***		
	2010	-0.299	-0.686 ***	-0.017 ***	-0.039 ***		
	2012	-0.268	-0.655 ***	-0.015 ***	-0.038 ***		
	2014	-0.278	-0.665 ***	-0.016 ***	-0.039 ***		
	2016	-0.833 ***	-1.220 ***	-0.050 ***	-0.073 ***		
	2017	-0.849 ***	-1.236 ***	-0.051 ***	-0.074 ***		
Dummy: Malaysia	2007	-0.242	-0.629 ***	-0.013 **	-0.035 ***		
	2010	-0.207	-0.594 ***	-0.011 *	-0.034 ***		
	2012	-0.226	-0.613 ***	-0.013 **	-0.035 ***		
	2014	-0.258	-0.645 ***	-0.015 ***	-0.038 ***		
	2016	-0.645 ***	-1.032 ***	-0.039 ***	-0.061 ***		
	2017	-0.654 ***	-1.041 ***	-0.039 ***	-0.062 ***		
c,t Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
i,t Fixed Effects		Yes	Yes	Yes	Yes	No	No
c,i Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
RESET p-vals		0.000	0.000	0.771	0.771	0.000	0.000

[Manufacturing]

Estimation		(vii)	(viii)	(ix)	(x)	(xi)	(xii)
Equation		(3)	(3)	(3)	(3)	(4)	(4)
Methodology		OLS	OLS	PPML	PPML	PPML	PPML
Benchmark		US	Japan	US	Japan	US	Japan
LPI						0.406 ***	0.394 ***
						(0.049)	(0.048)
Dummy: Myanmar	2007	-11.364 ***	-11.485 ***	-1.299 ***	-1.306 ***		
	2010	-11.548 ***	-11.669 ***	-1.300 ***	-1.307 ***		
	2012	-11.265 ***	-11.386 ***	-1.203 ***	-1.210 ***		
	2014	-11.158 ***	-11.279 ***	-1.151 ***	-1.159 ***		
	2016	-9.679 ***	-9.800 ***	-0.862 ***	-0.869 ***		
	2017	-9.686 ***	-9.807 ***	-0.861 ***	-0.869 ***		
Dummy: Lao PDR	2007	-7.781 ***	-7.902 ***	-0.687 ***	-0.694 ***		
	2010	-7.726 ***	-7.847 ***	-0.665 ***	-0.673 ***		
	2012	-7.673 ***	-7.794 ***	-0.647 ***	-0.654 ***		
	2014	-7.692 ***	-7.813 ***	-0.637 ***	-0.645 ***		
	2016	-8.177 ***	-8.298 ***	-0.670 ***	-0.677 ***		
	2017	-8.237 ***	-8.358 ***	-0.676 ***	-0.683 ***		
Dummy: Cambodia	2007	-5.365 ***	-5.486 ***	-0.418 ***	-0.426 ***		
	2010	-5.462 ***	-5.583 ***	-0.420 ***	-0.427 ***		
	2012	-5.453 ***	-5.574 ***	-0.413 ***	-0.420 ***		
	2014	-5.444 ***	-5.565 ***	-0.406 ***	-0.413 ***		
	2016	-5.975 ***	-6.096 ***	-0.442 ***	-0.449 ***		
	2017	-6.065 ***	-6.186 ***	-0.450 ***	-0.457 ***		
Dummy: Vietnam	2007	-2.514 ***	-2.635 ***	-0.173 ***	-0.180 ***		
	2010	-2.524 ***	-2.645 ***	-0.171 ***	-0.179 ***		
	2012	-2.577 ***	-2.698 ***	-0.173 ***	-0.181 ***		
	2014	-2.579 ***	-2.700 ***	-0.172 ***	-0.179 ***		
	2016	-2.563 ***	-2.684 ***	-0.167 ***	-0.175 ***		
	2017	-2.562 ***	-2.683 ***	-0.167 ***	-0.174 ***		
Dummy: Philippines	2007	-1.455 ***	-1.576 ***	-0.095 ***	-0.102 ***		
	2010	-1.467 ***	-1.588 ***	-0.095 ***	-0.103 ***		
	2012	-1.507 ***	-1.628 ***	-0.097 ***	-0.105 ***		
	2014	-1.520 ***	-1.641 ***	-0.098 ***	-0.105 ***		
	2016	-1.952 ***	-2.073 ***	-0.125 ***	-0.133 ***		
	2017	-1.978 ***	-2.099 ***	-0.127 ***	-0.134 ***		
Dummy: Indonesia	2007	-1.886 ***	-2.007 ***	-0.126 ***	-0.133 ***		
	2010	-1.806 ***	-1.927 ***	-0.119 ***	-0.126 ***		
	2012	-1.722 ***	-1.843 ***	-0.112 ***	-0.120 ***		
	2014	-1.792 ***	-1.913 ***	-0.116 ***	-0.124 ***		
	2016	-2.067 ***	-2.188 ***	-0.133 ***	-0.140 ***		
	2017	-2.066 ***	-2.187 ***	-0.133 ***	-0.140 ***		
Dummy: Thailand	2007	-0.240 **	-0.361 ***	-0.013 *	-0.020 ***		
	2010	-0.222 **	-0.343 ***	-0.012 *	-0.020 ***		
	2012	-0.188 **	-0.309 ***	-0.011 *	-0.018 **		
	2014	-0.200 **	-0.321 ***	-0.012 **	-0.020 ***		
	2016	-0.764 ***	-0.885 ***	-0.048 ***	-0.055 ***		
	2017	-0.784 ***	-0.905 ***	-0.049 ***	-0.057 ***		
Dummy: Malaysia	2007	-0.305 ***	-0.426 ***	-0.017 **	-0.024 ***		
	2010	-0.270 ***	-0.391 ***	-0.015 **	-0.023 ***		
	2012	-0.287 ***	-0.408 ***	-0.017 ***	-0.024 ***		
	2014	-0.317 ***	-0.438 ***	-0.019 ***	-0.027 ***		
	2016	-0.698 ***	-0.820 ***	-0.044 ***	-0.051 ***		
	2017	-0.710 ***	-0.831 ***	-0.045 ***	-0.052 ***		
c,t Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
i,t Fixed Effects		Yes	Yes	Yes	Yes	No	No
c,i Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
RESET p-vals		0.000	0.000	0.770	0.770	0.000	0.000

[Machinery]

Estimation		(xiii)	(xvi)	(xv)	(xvi)	(xvii)	(xviii)
Equation		(3)	(3)	(3)	(3)	(4)	(4)
Methodology		OLS	OLS	PPML	PPML	PPML	PPML
Benchmark		US	Japan	US	Japan	US	Japan
LPI						0.462 ***	0.444 ***
						(0.056)	(0.056)
Dummy: Myanmar	2007	-11.767 ***	-11.743 ***	-1.605 ***	-1.603 ***		
	2010	-11.924 ***	-11.900 ***	-1.590 ***	-1.589 ***		
	2012	-11.637 ***	-11.613 ***	-1.451 ***	-1.450 ***		
	2014	-11.537 ***	-11.513 ***	-1.377 ***	-1.376 ***		
	2016	-9.967 ***	-9.943 ***	-1.001 ***	-0.999 ***		
	2017	-9.972 ***	-9.948 ***	-1.000 ***	-0.998 ***		
Dummy: Lao PDR	2007	-8.010 ***	-7.987 ***	-0.783 ***	-0.781 ***		
	2010	-7.949 ***	-7.925 ***	-0.755 ***	-0.753 ***		
	2012	-7.904 ***	-7.880 ***	-0.733 ***	-0.732 ***		
	2014	-7.947 ***	-7.924 ***	-0.724 ***	-0.722 ***		
	2016	-8.319 ***	-8.296 ***	-0.751 ***	-0.750 ***		
	2017	-8.368 ***	-8.344 ***	-0.757 ***	-0.755 ***		
Dummy: Cambodia	2007	-5.852 ***	-5.828 ***	-0.503 ***	-0.502 ***		
	2010	-5.967 ***	-5.943 ***	-0.506 ***	-0.505 ***		
	2012	-5.968 ***	-5.944 ***	-0.498 ***	-0.496 ***		
	2014	-5.968 ***	-5.945 ***	-0.489 ***	-0.488 ***		
	2016	-6.407 ***	-6.383 ***	-0.523 ***	-0.521 ***		
	2017	-6.496 ***	-6.472 ***	-0.532 ***	-0.530 ***		
Dummy: Vietnam	2007	-3.088 ***	-3.064 ***	-0.232 ***	-0.230 ***		
	2010	-3.114 ***	-3.090 ***	-0.231 ***	-0.229 ***		
	2012	-3.178 ***	-3.154 ***	-0.234 ***	-0.232 ***		
	2014	-3.204 ***	-3.180 ***	-0.233 ***	-0.231 ***		
	2016	-3.037 ***	-3.014 ***	-0.216 ***	-0.214 ***		
	2017	-3.033 ***	-3.009 ***	-0.215 ***	-0.214 ***		
Dummy: Philippines	2007	-1.428 ***	-1.405 ***	-0.098 ***	-0.097 ***		
	2010	-1.424 ***	-1.400 ***	-0.098 ***	-0.096 ***		
	2012	-1.462 ***	-1.438 ***	-0.100 ***	-0.099 ***		
	2014	-1.443 ***	-1.419 ***	-0.098 ***	-0.097 ***		
	2016	-1.839 ***	-1.816 ***	-0.126 ***	-0.124 ***		
	2017	-1.875 ***	-1.851 ***	-0.128 ***	-0.127 ***		
Dummy: Indonesia	2007	-2.187 ***	-2.163 ***	-0.157 ***	-0.156 ***		
	2010	-2.103 ***	-2.080 ***	-0.149 ***	-0.148 ***		
	2012	-2.019 ***	-1.995 ***	-0.141 ***	-0.140 ***		
	2014	-2.089 ***	-2.065 ***	-0.146 ***	-0.144 ***		
	2016	-2.298 ***	-2.274 ***	-0.159 ***	-0.158 ***		
	2017	-2.291 ***	-2.267 ***	-0.159 ***	-0.157 ***		
Dummy: Thailand	2007	-0.044	-0.020	0.000	0.001		
	2010	-0.017	0.006	0.000	0.002		
	2012	0.020	0.043	0.001	0.003		
	2014	0.015	0.039	0.000	0.001		
	2016	-0.443 ***	-0.419 ***	-0.030 ***	-0.029 ***		
	2017	-0.463 ***	-0.439 ***	-0.032 ***	-0.030 ***		
Dummy: Malaysia	2007	-0.392 ***	-0.369 ***	-0.023 ***	-0.022 ***		
	2010	-0.344 ***	-0.320 ***	-0.021 ***	-0.019 ***		
	2012	-0.359 ***	-0.335 ***	-0.023 ***	-0.021 ***		
	2014	-0.384 ***	-0.360 ***	-0.025 ***	-0.024 ***		
	2016	-0.709 ***	-0.686 ***	-0.048 ***	-0.046 ***		
	2017	-0.722 ***	-0.698 ***	-0.049 ***	-0.047 ***		
c,t Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
i,t Fixed Effects		Yes	Yes	Yes	Yes	No	No
c,i Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
RESET p-vals		0.000	0.000	0.740	0.740	0.000	0.000

Note: ***, **and * denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance. The standard errors are in parentheses attached in the coefficients.

Source: Author's estimation based on the UNCTAD-Eora Global Value Chain Database and the World Bank's Logistics Performance Index

Table 4 Partner Country's Fixed Effect and Logistics Performance

[US Benchmark]

Total Industry	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.375 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-0.988	2.261	-1.643	-0.616
Lao PDR	-0.612	2.395	-1.509	-0.566
Cambodia	-0.393	2.592	-1.312	-0.492
Vietnam	-0.143	3.044	-0.860	-0.323
Philippines	-0.101	2.937	-0.967	-0.363
Indonesia	-0.102	2.989	-0.916	-0.343
Thailand	-0.028	3.313	-0.592	-0.222
Malaysia	-0.022	3.442	-0.462	-0.173

Manufacturing	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.406 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-1.113	2.261	-1.643	-0.667
Lao PDR	-0.664	2.395	-1.509	-0.613
Cambodia	-0.425	2.592	-1.312	-0.533
Vietnam	-0.171	3.044	-0.860	-0.349
Philippines	-0.107	2.937	-0.967	-0.393
Indonesia	-0.124	2.989	-0.916	-0.372
Thailand	-0.025	3.313	-0.592	-0.240
Malaysia	-0.027	3.442	-0.462	-0.188

Machinery	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.462 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-1.338	2.261	-1.643	-0.759
Lao PDR	-0.751	2.395	-1.509	-0.697
Cambodia	-0.509	2.592	-1.312	-0.606
Vietnam	-0.227	3.044	-0.860	-0.397
Philippines	-0.109	2.937	-0.967	-0.447
Indonesia	-0.152	2.989	-0.916	-0.423
Thailand	-0.010	3.313	-0.592	-0.273
Malaysia	-0.032	3.442	-0.462	-0.213

[Japan Benchmark]

Total Industry	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.369 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-1.011	2.261	-1.711	-0.631
Lao PDR	-0.635	2.395	-1.577	-0.582
Cambodia	-0.416	2.592	-1.380	-0.509
Vietnam	-0.166	3.044	-0.928	-0.343
Philippines	-0.124	2.937	-1.036	-0.382
Indonesia	-0.125	2.989	-0.984	-0.363
Thailand	-0.051	3.313	-0.660	-0.243
Malaysia	-0.045	3.442	-0.530	-0.196

Manufacturing	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.394 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-1.120	2.261	-1.711	-0.674
Lao PDR	-0.672	2.395	-1.577	-0.621
Cambodia	-0.433	2.592	-1.380	-0.544
Vietnam	-0.179	3.044	-0.928	-0.366
Philippines	-0.114	2.937	-1.036	-0.408
Indonesia	-0.131	2.989	-0.984	-0.388
Thailand	-0.032	3.313	-0.660	-0.260
Malaysia	-0.034	3.442	-0.530	-0.209

Machinery	Partner Country's Fixed Effects (average: 2007-2017)	LPI (average: 2007-2017)	LPI (b) - US LPI	(c) × 0.444 [coefficient]
	(a)	(b)	(c)	(d)
Myanmar	-1.336	2.261	-1.711	-0.760
Lao PDR	-0.749	2.395	-1.577	-0.700
Cambodia	-0.508	2.592	-1.380	-0.613
Vietnam	-0.226	3.044	-0.928	-0.412
Philippines	-0.107	2.937	-1.036	-0.460
Indonesia	-0.151	2.989	-0.984	-0.437
Thailand	-0.008	3.313	-0.660	-0.293
Malaysia	-0.030	3.442	-0.530	-0.235

Source: Author's estimation based on the UNCTAD-Eora Global Value Chain Database and the World Bank's Logistics Performance Index

Appendix 1 Industrial Classification

[Manufacturing]
Grain mill products
Feeding stuff production and processing
Vegetable oil and forage
Sugar refining
Slaughtering , meat processing, eggs and dairy products
Prepared fish and seafood
Other food products
Wines, spirits and liquors
Non-alcoholic beverage
Tobacco products
Cotton textiles
Woolen textiles
Hemp textiles
Other textiles not eslseshere classified
Knitted mills
Wearing apparel
Leather, furs, down and related products
Sawmills and fibreboard
Furniture and products of wood, bamboo, cane, palm, straw, etc.
Paper and products
Printing and record medium reproduction
Cultural goods
Toys, sporting and athletic and recreation products
Petroleum refining
Coking
Raw chemical materials
Chemical fertilizers
Chemical pesticides
Chemicals for painting, dying and others
Synthetic chemicals
Chemicals for special usages
Chemical products for daily use
Medical and pharmaceutical products
Chemical fibers
Rubber products
Plastic products
Cement and cement asbestos products
Glass and glass products
Pottery, china and earthenware
Fireproof products
Other non-metallic mineral products
Iron-smelting
Steel-smelting
Steel-processing
Alloy iron smelting
Nonferrous metal smelting
Nonferrous metal processing
Metal products
Other manufacturing products
[Manufacturing: Machinery]
Boiler, engines and turbine
Metalworking machinery
Other general industrial machinery
Agriculture, forestry, animal husbandry and fishing machinery
Other special industrial equipment
Railroad transport equipment
Motor vehicles
Vehicles fittings production
Ship building
Other transport machinery
Generators
Household electric appliances

Other electric machinery and equipment
Communication equipment
Electronic computer
Other computer devices
Electronic element and device
Electronic appliances
Other electronic and communication equipment
Instruments, meters and other measuring equipment
Cultural and office equipment
Arts and crafts products
[Other Industries]
Crop cultivation
Forestry
Logging and transport of timber and bamboo
Livestock and livestock products
Fishery
Technical services for agriculture, forestry, livestock and fishing
Coal mining and processing
Crude petroleum products and Natural gas products
Ferrous ore mining
Non-ferrous ore mining
Salt mining
Non-metal minerals and other mining
Scrap and waste
Electricity and steam production and supply
Gas production and supply
Water production and supply
Construction
Railway passenger transport
Railway freight transport
Highway freight and passangers transport
Domestic public transport
Water freight and passangers transport
Air passenger transport
Air freight transport
Pipeline transport
Warehousing
Post
Telecommunication
Computing services and software
Wholesale and retail trade
Hotels
Eating and drinking places
Finance
Insurance
Real estate
Leasehold
Business services
Tourism
Scientific research
General technical services
Geological prospecting
Water conservancy
Environmental resources and public infrastructure
Resident services and other services
Educational services
Health services
Social welfare
Culture and arts, radio, film and television
Sports
Recreational services
Public administration and other sectors

Source: The UNCTAD-Eora Global Value Chain Database

Appendix 2 Sample Economies

Australia	Austria	Belgium	Brazil
Cambodia	Canada	Czech Republic	Denmark
Finland	France	Germany	Hong Kong
Hungary	India	Indonesia	Ireland
Italy	Japan	Laos	Malaysia
Mexico	Myanmar	Netherlands	Philippines
Poland	Romania	Russia	Singapore
Slovakia	South Korea	Spain	Sweden
Switzerland	Taiwan	Thailand	Turkey
UK	US	Viet Nam	

Source: The UNCTAD-Eora Global Value Chain Database