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ASEAN-Latin America: Redefining Interregional Trade Cooperation

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Abstract: *The Association of Southeast Asian Nations (ASEAN) and the Pacific Alliance (PA) are committed to move interregional integration by strengthening their bilateral ties. Accordingly, this study informs the policy debate on the scope for unlocking trade potentials through inter-subregional mechanisms. The paper therefore focuses on the bi-subregional relationships between ASEAN with the PA, and the Common Market of the South (MERCOSUR) and then estimates their trade efficiency levels within the context of ASEAN and Latin America (LA). The study employs a stochastic frontier approach to an augmented gravity model to estimate interregional (value-added) export performance for the 1990 to 2019 period. The key findings indicate low interregional export efficiency levels due to rising country-specific 'behind-the-border' effects. The paper concludes with recommendations that ASEAN move forward with sub-interregional cooperation with the PA and MERCOSUR, since both mechanisms display the trade capacity and efficiency to engage more in value-added exports than the region-wide ASEAN-LA interregional engagements.*

Keywords: Exports; Value-added; Stochastic frontier gravity model; ASEAN; PA; MERCOSUR
JEL Classification: F10, F13, F14

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1. Introduction

Interregional or cross-regional cooperation between the Association of Southeast Asian Nations (ASEAN) and Latin America (LA) is seen as a means for both regions to deal with the global economic slowdown, weakening multilateralism, rising protectionism, and the Covid-19 pandemic. The less than favourable global conditions (ADB, 2023; Herreros, 2022) are a push factor for both ASEAN and the LA to intensify and diversify their connections with non-traditional trade partners. The reference point here is the ASEAN-LA region-to-region partnership. Economic distance, namely geographical distance, and regulatory differences (ECLAC, 2008; Medalla & Balboa, 2010; ADB-IDB-ADBI, 2012), apart from varying export structures have been widely cited as reasons for the lack of market-led integration between both regions (Mikic & Jakobson, 2010). That said, ASEAN is already moving ahead with its sub-interregional engagement with the Pacific Alliance (PA; comprising Chile, Mexico, Colombia, and Peru) to explore further cooperation through the development of a new ASEAN-PA Work Plan (2021–2023), that includes trade, among others.

The interregional focus of previous related studies has been between the broader Asia (including East Asia) and LA, while the specific literature on ASEAN-LA remains somewhat sparse (Mikic & Jakobson, 2010; Roldan & Perez, 2010; Devadason & Subramaniam, 2014; Shepherd, 2020; Dosch, 2021; Herreros, 2022). Hence, the paper focuses on the recent characteristics and patterns of the ASEAN-LA[1] interregional trade, and the trade regulations in both regions to provide some new perspectives on how the bi-regional relationship has evolved over the 2000 to 2019 period. Specifically, the paper considers ASEAN's engagement with LA through sub-regional groups (or blocs) of the latter, namely the PA and the Common Market of the South (MERCOSUR; comprising Argentina, Brazil, Paraguay, and Uruguay).[2] Then follows a quantitative analysis based on a stochastic frontier specification of the gravity model to compare the efficiency of interregional trade integration relative to maximum potential levels for ASEAN-LA, ASEAN-PA, and ASEAN-MERCOSUR.

Taking ASEAN-PA and ASEAN-MERCOSUR[3] as case studies of the ASEAN-LA partnership to unlock the potentials of sub-interregional trade, the paper provides specific answers to the following two key questions: how different are the trade interactions between ASEAN-PA and

ASEAN-MERCOSUR? How do trade efficiency scores compare between interregional (ASEAN-LA) and inter-subregional (ASEAN-PA and ASEAN-MERCOSUR) platforms? The paper informs the policy debate on the scope for interregional trade cooperation from an ASEAN perspective. Specifically, it forwards recommendations on whether ASEAN and the LA connectivity can be best strengthened through interregional or inter-subregional trade interactions.

2. Literature Review

2.1 Interregional versus inter-subregional trade

Interregional or cross-regional trade between geographically distant partners has grown in recent years (Katada & Solis, 2008; Dosch, 2021), transcending intraregional trade, as countries that have exhausted their gains or potentials within regional boundaries seek to secure new/alternative world markets. From that perspective, interregional trade is seen as a promising solution. Yet, 'peripheral' interregional trade (Dosch, 2021) between distant partners, such as ASEAN and LA, is often beset with high trade costs (ADB-IDB-ADBI, 2012; Shepherd, 2020), which include transport and other (information, compliance, and procedural) costs related to non-tariff measures (NTMs),[4] non-tariff barriers (NTBs), and trade facilitation (see also Mikic & Jakobson, 2010).

While high trade costs can be addressed and facilitated through a broad interregional FTA, inter-subregional platforms can be considered a practical path towards a broader integration scheme (Medalla & Balboa, 2010). This has been noted in the case of the ASEAN-LA context, where both regions have resorted to bilateral agreements as they failed to establish treaties at the interregional level. Additionally, coordination at the sub-interregional level is considered crucial (Herreros, 2022), as interoperability and harmonisation of regulations lie at the very heart of trade facilitation initiatives.

Both ASEAN and LA are members of several interregional, regional, and sub-regional groupings. Having recognised the diversity within the regions and the dismal possibility of economic integration even within the region, both the ASEAN and LA have many subregional arrangements (or programmes) that co-exist with and parallel the larger blocs. This includes the Greater Mekong Sub-region (GMS), Brunei Darussalam-Indonesia-

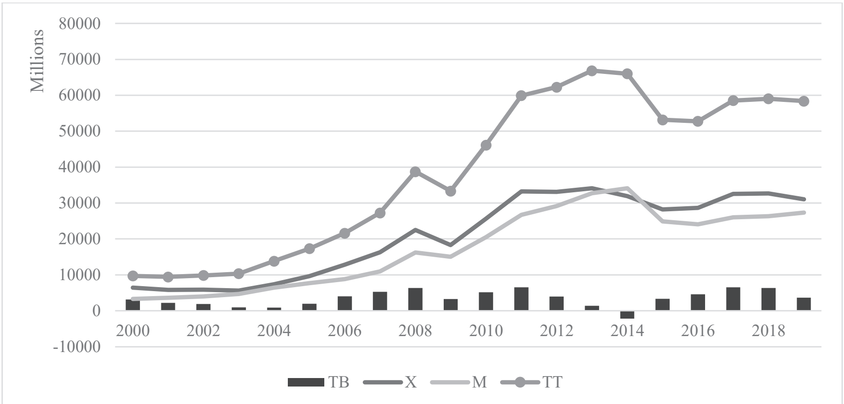
Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA) and Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT) in ASEAN, and the PA,[5] MERCOSUR, Union of South American Nations (UNASUR) and Caribbean Community (CARICOM) in LA, among others. It is therefore not surprising to note the genesis of sub-regionalism (which are part of a larger regional bloc) moving beyond the regions to establish sub-inter-regionalism to drive a common agenda and bring closer a select group of countries between blocs.

Previous studies (ECLAC, 2008; Mikic & Jakobson, 2010; Medalla & Balboa, 2010; Roldan & Perez, 2010; ADB-IDB-ADBI, 2012; Wignaraja et al., 2013; Shepherd, 2020; Herreros, 2016, 2022) that have considered interregional- and sub interregional trade between ASEAN and LA have generally been done in an off-model manner, providing cursory inspections of trade structure, integration through value chains, trade protectionism, trade costs, and provisions in the signed FTAs between both parties. The related works, however, have not distinguished and compared bilateral connections, namely trade efficiencies based on total trade and value-added (VA) trade, between ASEAN, PA, and MERCOSUR.

2.2 ASEAN-LA interregional and inter-subregional trade connections: Comparative trends

The ASEAN-LA trade recorded phenomenal growth since 2004, from USD13.82 billion to USD58.39 billion in 2019. For the 2000 to 2019 period of review, imports grew at 13.1% per annum, marginally higher than that for exports at 10.2%. The trade balances, however, have been in favour of ASEAN (see Figure 1). The major ASEAN exporters to LA are Singapore, which commanded 38.4% of the region's exports to Latin America and the Caribbean (LAC), on average, followed by Thailand (21.4%), Malaysia (14.8%), Indonesia (11.8%) and Vietnam (10.2%). Contributing an average of 93.1% of total imports from LA for the period of review, the five countries were also the major ASEAN importers from LA. These five countries have bilateral FTAs that are signed and in effect with some of the LA countries (see Appendix Table 1).

Figure 1: ASEAN-LA – Exports, Imports and Trade Balance, 2000-2019 (USD million)

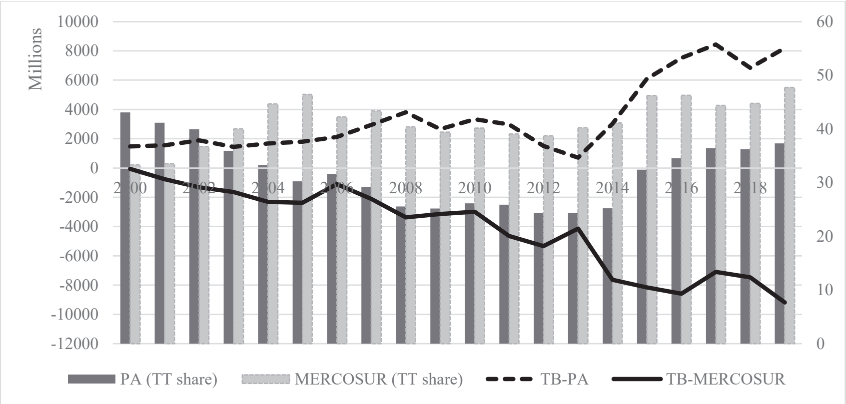


Notes: ASEAN is the reporter and LA is the partner. TB – trade balance; X – exports; M – imports; TT – total trade.
Source: UN Comtrade (2021).

From an inter-subregional context, an interesting difference is observed in the ASEAN-LA trade connections. The PA and MERCOSUR are important for ASEAN as they constituted, on average, 31.9% and 41.5% of ASEAN's total trade with LA for the 1990 to 2019 period. However, while ASEAN ran a consistent trade surplus with the PA, it countered a trade deficit with MERCOSUR (see Figure 2). On average, MERCOSUR commanded 58.9% of ASEAN's imports from LA, relative to only 24.5% from PA. Conversely, 37.8% of ASEAN's exports to the LA were destined for PA, while 27.7% were to MERCOSUR. Comparatively, PA is more important as an export destination for ASEAN than MERCOSUR. MERCOSUR, instead, is an important import source for ASEAN.

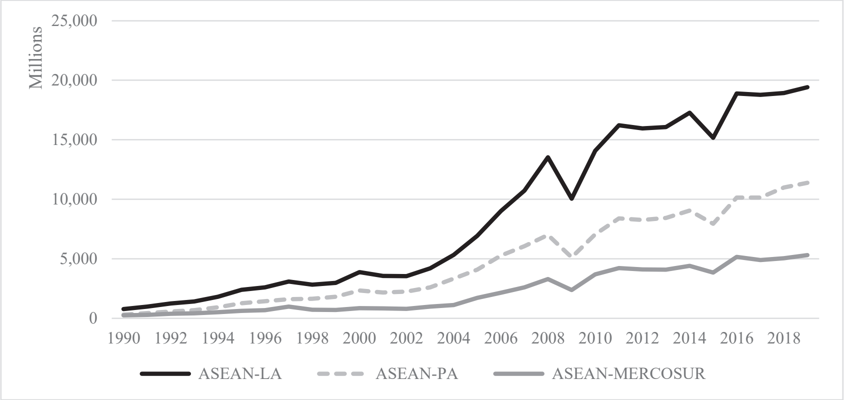
Beyond gross exports, the trade connections between ASEAN and LA should also be examined in terms of their total interregional VA exports (see Figure 3). The annual average growth rates of the sub-interregional ASEAN-PA and ASEAN-MERCOSUR VA exports at 14.4% and 13% were close to 12.9% for ASEAN-LA. At an average of 54.7% for the 1990 to 2019 period, the PA contributed a sizeable proportion of interregional ASEAN-LA two-way VA exports relative to MERCOSUR's contribution at 25.8%. Worth noting here is that in the ASEAN-PA bilateral connections the VA contributions were higher from the PA relative to the ASEAN (seen

Figure 2: ASEAN-PA and ASEAN-MERCOSUR – Trade Balance (USD million) and Trade Share (%)



Notes: ASEAN is the reporter and PA and MERCOSUR are the partners. The left axis is the trade balance (TB), and the right axis is the trade share (TT). The TT share is the share of PA and MERCOSUR in ASEAN's total trade with the LA.
Source: Calculated from UN Comtrade (2021).

Figure 3: ASEAN, LA, PA, and MERCOSUR – Interregional* Value-Added Exports (USD million)

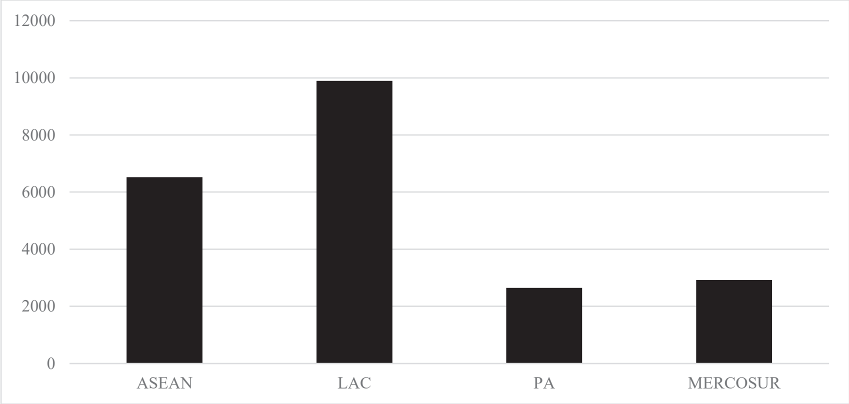


Notes: Reflects two-way value-added export flows. It has a bilateral dimension as it refers to the contribution of all countries in each region (and bloc) to the other region (bloc).
Source: Calculated from UNCTAD-Eora GVC database.

from the one-way trade flows perspective; not shown in Figure 3), while the opposite held true in the case of the ASEAN-MERCOSUR. In the latter case, the value-added contributions from ASEAN were higher than that from MERCOSUR.

It is important to also identify the roles of the PA and MERCOSUR within the LA in terms of their VA exports and participation in global value chains (GVCs).[6] For the 2000 to 2018 period, on average, both the sub-blocs of LA contributed 79.4% and 82.9% of LA's total VA exports and GVC participation. In fact, the VA exports and GVC participation of PA is higher than that of MERCOSUR for the period of review. However, the gaps in the levels of engagement in terms of VA exports and GVCs between both blocs have been reducing post- 2000. The reason is the contribution of PA to VA exports and GVCs within LA has been on a downtrend since 2000, while it has been trending upwards for MERCOSUR, as shown in Figure 4.

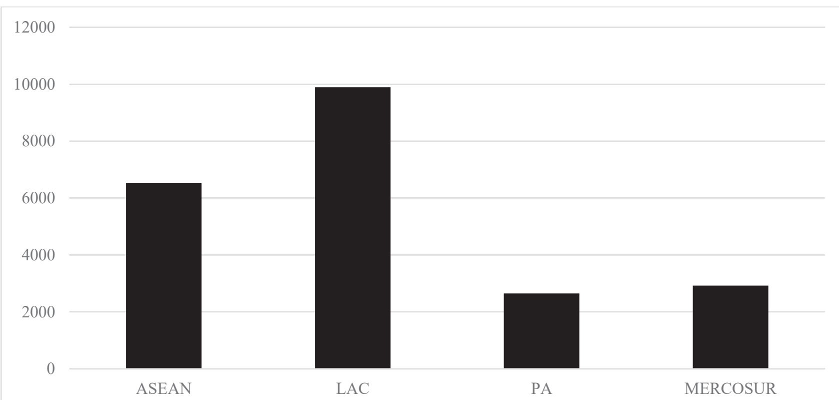
Figure 4: PA and MERCOSUR – Share of Value-Added and GVCs in LA, 1990-2018 (%)



Notes: The latest data available at the time of study is 2018. The VA is on the left axis and the GVC is on the right axis.
Source: UNCTAD-Eora GVC database (2021).

In terms of trade regulations, the average effectively applied weighted tariff rate on ASEAN imports was 1.3% and 5.1% on LAC (LA and including the Caribbean countries) imports in 2019 (UNCTAD TRAINS, 2021; downloaded from WITS). Traditional trade policy areas, such as tariff reductions, have been frequently negotiated in bilateral and plurilateral agreements between ASEAN and LA. Following which, the tariff rates have significantly fallen over the years. Notwithstanding that, these tariff preferences through FTAs alone do not justify the extent of trade integration between the regions, as there has been a concomitant rise in NTMs as countries begin to disproportionately regulate import flows with new measures (see also Mikic & Jakobson, 2010). MERCOSUR, for example, regulates its imports with NTMs more than the PA. Approximately 29.5% (or 2,921 measures) and 26.7% (2,645 measures) of the total import related NTMs within LA are from MERCOSUR and PA, respectively (see Figure 5). The NTM portfolio in both blocs is dominated by technical measures,[7] with 66% of NTMs in MERCOSUR and 67.5% in the PA. Technical measures, though not designed to inhibit trade, can impose substantial trade costs for traders to access markets in both regions. These measures are regulatory in nature and can lower trade efficiency between the regions (The issue of trade efficiency is taken up in the next two sections).

Figure 5: ASEAN and LA – Number of Import-Related NTMs (as of June 2021)



Note: LA does not include Haiti and Dominican Republic as there is no data for both countries.
Source: UNCTAD-TRAINS database (2021).

It is obvious that there is some heterogeneity in the ASEAN-LA engagement, mirroring differences in trade interactions between the interregional and sub-interregional levels. Despite the nuanced differences in the ASEAN-PA and ASEAN-MERCOSUR trade connections, both sub-blocs of the LA are important to ASEAN, as they constitute the region's major trading partners within the bloc, and they are more active in value-added trade and GVCs within the LA.

3. Method and Data

3.1 Stochastic frontier gravity model

Various specifications of the gravity model have emerged in the literature. The conventional gravity model, however, cannot satisfactorily control the various resistances to trade as most are hard to quantify. Hence, they are added to the unobserved disturbance term. The stochastic frontier analysis (SFA)[8] is considered appropriate for estimating unobservable resistances to trade and is widely used with the gravity equation. It is commonly employed to identify trade potentials and trade efficiencies (TEs).[9] The SFA analysis is therefore applied to the augmented gravity specification of Wang et al. (2010), which comprehensively accounts for the key determinants of trade flows, as elaborated below:

$$X_{ij}^{t} = f\left(GDPT_{ij}^{t},\ SIMGDPPC_{ij}^{t},\ FDIT_{ij}^{t},\ SIMFDI_{ij}^{t},\ RLFAC_{ij}^{t}, TRF_{j}^{t}, ER_{ij}^{t}, DIST_{ij},\ FTA_{ij}\ LL_{ij}\right)\ \exp\left(v_{ij}^{t}\right)\exp(-u_{ij}^{t}) \quad (1)$$

where X_{ij}^{t} refers to the bilateral export flows between country *i* (reporter) and country *j* (partner) at time *t*. X_{ij}^{t} is used interchangeably with VA_{ij}^{t}, the contributions of value-added exports of countries *j* to country *i*. GDP_{ij}^{t} and $SIMGDPPC_{ij}^{t}$ are the total gross domestic products (*GDP*) of countries *i* and *j* and the similarity in the levels of GDP per capita (*GDPPC*) in *i* and *j*, respectively. $FDIT_{ij}^{t}$ and $SIMFDI_{ij}^{t}$ are the total inward foreign direct investment (*FDI*) stock[10] of *i* and *j* and the similarity in inward *FDI* stocks in *i* and *j*, respectively. $RLFAC_{ij}^{t}$ refers to the relative factor endowments (capital-labor; K/L) in *i* and *j*; TRF_{j}^{t} is the importing country's tariff rate; and ER_{ij}^{t} is the bilateral exchange rate between *i* and *j*. $DIST_{ij}$ is the geographical distance between the capitals of the two partner countries; FTA_{ij} indicates if the two partner countries are in a bilateral or regional trade agreement; and LL_{ij} represents a landlocked economy for *i* and/or *j*. The error term of the gravity model comprises two components, namely v_{ij}^{t} representing statistical noise due to measurement error and the one-sided inefficiency element represented by u_{ij}^{t} that measures trade performance. v_{ij}^{t} follows a normal distribution while u_{ij}^{t} is assumed to be distributed independently of the random error and the regressors.

The one-sided inefficiency representing technical inefficiency is a non-negative random variable. It denotes the degree to which actual trade levels deviate from potential or maximum trade performance. A zero value of u_{ij}^{t} indicates that the inefficiency term reduces to the random noise component where the actual and potential trade are equal. While a non-zero value of u_{ij}^{t} indicates that there is a deviation between actual and potential trade, providing scope for trade integration. This deviation can be due to multilateral resistances (economic distance), which are often unobservable and difficult to quantify. In other words, these can be 'behind the border' barriers[11] specific to trading countries (Armstrong, 2007; Kalirajan, 2007). The estimate of the total error variance is represented by $\sigma^2 = \sigma_u^2 + \sigma_v^2$, while the estimate of the ratio of the standard deviation of the inefficiency component to the standard deviation of the idiosyncratic component is represented by $\lambda = \sigma_u/\sigma_v$. If λ is significant, then it signifies the use of the SFA since it assesses the degree of inefficiency relative to random error. In addition, testing the presence of TE requires the one-sided likelihood ratio (LR) test to be performed on the null hypothesis, $H_0: \sigma_u^2 = 0$, against the alternative hypothesis, $H_1: \sigma_u^2 > 0$. If one fails to reject the null hypothesis, then the SFA model reduces to an ordinary least squares (OLS) model.

The point estimates of the TE for each bilateral partner can be computed as $TE_{ij}^{t} = E[\exp(-u_{ij}^{t})\,\mathcal{E}_{ij}^{t}]$. The estimated TE ranges between zero to one. TE with a unitary value implies that the actual and potential trade levels coincide and values moving towards zero indicate that there is a scope to raise actual trade levels to the maximum levels, for example, a lower efficiency level.

The full gravity stochastic frontier model specification of interregional ASEAN-LAC exports is specified below:

$$\begin{aligned} \ln X_{ij}^{t} = {} & \beta_0 + \beta_1 \ln GDPT_{ij}^{t} + \beta_2 SIMGDPPC_{ij}^{t} + \beta_3 \ln FDIT_{ij}^{t} + \beta_4 SIMFDI_{ij}^{t} \\ & + \beta_5 RLFAC_{ij}^{t} + \beta_6 \ln TRF_{j}^{t} + \beta_7 \ln ER_{ij}^{t} + \beta_8 \ln DIST_{ij} + \beta_9 FTA_{ij}^{t} \\ & + \beta_{10} LL_{ij} + v_{ij}^{t} - u_{ij}^{t} \end{aligned} \quad (2)$$

where $DIST_{ij}$, and $LL_{i,j}$, geographical distance and landlocked economy, respectively, are time-invariant explanatory variables. Other definitions of the explanatory variables follow equation (1). *GDPT*, *FDIT*, *TRF*, *ER*, and *DIST* are transformed into logarithmic form.

The level of *GDP* of both reporter and partner countries is supposed to positively affect their trade. Instead of using the levels of *GDP* of both countries independently, the total *GDP* of both partners, *GDPT*, is included in the estimations to jointly capture economies of scale or the size effect. The higher the *GDPT*, the larger the trade flows, given that a greater division of labour and specialization becomes feasible under a larger scale of operation. However, the level of *GDP* alone may not be enough to explain trade as the similarities of the two trading partners' *GDPs* are of no less importance. From a theoretical perspective, similarity in the level of *GDPPC* (*SIMGDPPC*) or convergence in income levels (or tastes) is likely to increase trade either through expansions in trade in manufactures or the increase in scope for product diversity (Hallak, 2006, 2010).

The next core argument of the gravity model is the *DIST* variable. *DIST* remains important for considerations of transport costs, transaction costs, and timeliness in delivery and is included in the estimations. Thus, the expectations are for $\beta_8 < 0$.

Theoretically, *FDI* contributes to intra-firm trade through global production networks and the increase in product variety in the host economy. This, in turn, increases the volume of trade, through intra-industry trade (IIT). However, if *FDI* and trade are substitutes, for example, if *FDI* is channelled into the domestic production of the host economy, then it does not necessarily contribute to expansions in exports. As such, the relationship between *FDI* and international trade remains inconclusive. The distribution of *FDI* amongst trade partners is also considered important for international trade. If the size of *FDI* (*SIMFDI*) is similar between trade partners, one may expect similar volumes and varieties of bilateral exports from the partner countries. Following which, the import capabilities of both partner countries are also likely to be similar, leading to expansions in bilateral trade. Conversely, if the *SIMFDI* is uneven between trade partners, the country with a smaller stock offers fewer export capabilities and, likewise, smaller import capabilities, resulting in lower expansions in bilateral trade. Based on this reasoning, a positive relationship is envisaged between *SIMFDI* and trade.

Differences in factor endowments or factor intensity (capital-labour ratio or K/L) matters for international trade and is relevant for driving VA trade between ASEAN and LA (see also Shepherd, 2020; ADB, 2023). Traditional neoclassical trade theories suggest that comparative advantages based on differences in factor endowments (*RLFAC*) explain inter-industry trade (IT). Alternatively, newer trade theories based on economies of scale and product differentiation (Krugman, 1979, 1980; Helpman & Krugman, 1989) attribute similarities in factor endowments to trade expansions through IIT. Thus, the differences and similarities of factor endowments (apart from *SIMGDPPC*) are linked to trade structure. If the trade structure is IT-based, *RLFAC* will facilitate trade expansion vis-à-vis similarities in factor endowments. In this respect, the expected sign for β_5 will be positive (negative) if IT (IIT) dominates.

The tariff (*TRF*) rate is a border measure in the importing country (j), and it can pose a hindrance to country i's exports to j and is, therefore, included in equation (2). Equation (2) is also augmented with the bilateral exchange rate (*ER*) to explain export flows. As *ER* is defined as the ratio of country i's currency per USD to country j's currency per USD, an increase in *ER* reflects a depreciation of the exchange rate, which is then expected to increase exports.

To account for FTA effects, a dummy variable is included in the estimations, taking a value of 1 when two partners are members of the same bilateral or regional trade agreement that has been signed and in effect (based on Appendix Table 1) and 0 otherwise. Likewise, a dummy is incorporated in equation (2) to control for the omitted variable effects, landlocked, on export flows. It takes the value of 1 for countries with neither sea or ocean access (only Lao PDR in the ASEAN sample, and Bolivia and Paraguay in the LAC sample). Landlocked countries have a certain disadvantage since they cannot easily use ship transport for their goods. The expected sign for β_{10} is negative.

3.2 Data description and sources

Annual data are extracted from secondary sources. Exports (X) are compiled from the UN Comtrade database. Data for *GDP*, *GDP* per capita (*GDPPC*), and gross fixed capital formation (*GFCF*) are sourced from the World Development Indicators (WDI) database. The nominal exchange rate (*ER*) data is obtained from the International Monetary Fund (IMF) online database. The data on FDI is obtained from the online database of the United Nations Conference on Trade and Development (UNCTAD), which is UNCTADstat. Data on average weighted tariff rates are obtained from the UNCTAD-Trade Analysis Information System (TRAINS) of the WDI database. Data for geographical distance (*DIST*), based on the average distance between the capitals of country pairs, and the information for landlocked economy (*LL*) are extracted from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) database. All values for *GDP* and *GDPPC* are expressed in 2010 constant US$. *FDI* and *GFCF* are deflated by the Consumer Price Index (CPI 2010 = 100). The definition and measurement of the key variables used in the regression analysis are summarized in the Appendix Table 2.

The (unbalanced) panel dataset, constructed for two-way ASEAN-LAC[12] exports, spans the 2000 to 2019 period (20 years) and comprises 353 country-pairs. The descriptive statistics and correlation matrix are not reported in want of space. Some noteworthy observations in terms of the series are mentioned herein. First, the high standard deviations for *SIMGDPPC* and *SIMFDI* indicate the high dispersion of those values. This also indicates that the trading partners are quite heterogenous. Second, the fat-tailed nature of the *RLFAC* series due to the disparate K/L ratios for the various country-pairs may understate but not invalidate the model's predictable power. The absolute correlation coefficients are all less than 0.7, hence it can be concluded that multicollinearity is not present.

4. Findings and Discussion

Table 1 presents the results of the Poisson Pseudo-Maximum Likelihood (PPML) estimates of the stochastic frontier gravity model for the unbalanced panel of ASEAN-LAC interregional exports. The PPML estimator is considered a suitable technique given the following properties: it can deal with zero-valued trade flows because of its multiplicative form; it avoids the underprediction of large trade volumes; and it is consistent in the presence of overdispersion in the dependent variable, especially when there are no excessive zero trade flows (Santos & Tenreyro, 2006, 2011). The estimates based on the time-invariant model of Battese and Coelli (1988, model bc88) and the time-varying inefficiency specifications of Battese and Coelli

(1992, model bc92) are reported in the first panel and the second panel of Table 1, respectively. A set of year dummies to control for unobserved time-dependent variation in exports are considered for the estimations for (1b) and (2b). Together with year dummies, country-fixed effects are also considered in (1c) and (2c), to control for country-level (exporter) heterogeneity.

Table 1: PPML Estimates for Interregional Exports

	Time-invariant model (bc88)			Time-varying model (bc92)		
Variables	**(1a)**	**(1b)**	**(1c)**	**(2a)**	**(2b)**	**(2c)**
ln*GDPT*	1.162***	1.257***	1.012***	1.146***	1.283***	0.634***
	(0.183)	(0.181)	(0.160)	(0.178)	(0.220)	(0.171)
SIMGDPPC	0.010	0.016	0.012	0.018	0.021	0.022*
	(0.014)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)
ln*FDIT*	0.541***	0.481***	0.481***	0.825***	0.501***	0.548***
	(0.083)	(0.163)	(0.159)	(0.140)	(0.169)	(0.145)
SIMFDI	0.020***	0.021***	0.023***	0.027***	0.022***	0.024***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
RLFAC	-0.875***	-0.839***	-0.777***	-0.818***	-0.763***	-0.535***
	(0.195)	(0.195)	(0.188)	(0.189)	(0.188)	(0.168)
ln*TRF*	-6.311***	-5.833***	-5.709***	-7.171***	-5.676***	-6.121***
	(1.703)	(1.896)	(1.840)	(1.727)	(1.849)	(1.650)
ln*ER*	0.083***	0.079***	0.048**	0.075***	0.075***	0.028**
	(0.027)	(0.028)	(0.031)	(0.026)	(0.026)	(0.035)
ln*DIST*	3.526	3.605*	1.999	2.999	2.062	-2.039
	(2.182)	(2.164)	(1.652)	(1.943)	(2.039)	(2.200)
FTA	0.114	0.048	0.028	0.070	0.898	0.101
	(0.196)	(0.195)	(0.201)	(0.196)	(0.200)	(0.192)
LL	-1.636***	-1.598***	-1.719***	-1.070***	-1.181***	-1.627***
	(0.370)	(0.378)	(0.336)	(0.362)	(0.384)	(0.460)
Sigma-squared	2.079***	2.075***	1.449***	1.928***	1.974***	1.852***
	(0.071)	(0.074)	(0.097)	(0.080)	(0.098)	(0.227)
Gamma	1.418***	1.425***	0.562***	1.218***	1.290***	1.204***
	(0.105)	(0.109)	(0.171)	(0.117)	(0.140)	(0.334)
Mu	7.422***	7.563***	4.559***	4.471***	5.873***	6.544***
	(0.478)	(0.497)	(0.844)	(0.526)	(0.982)	(1.126)
Eta				-0.000***	-0.004	-0.024***
				(0.000)	(0.003)	(0.004)
Year dummies	No	Yes	Yes	No	Yes	Yes
Exporter fixed effects	No	No	Yes	No	No	Yes
Log pseudolikelihood	-9633.895	-9610.443	-9466.082	-9169.900	-9602.42	-9412.807
Wald chi2	817.20	971.14	3219.86	801.23	817.34	1491.47

Variables	Time-invariant model (bc88)			Time-varying model (bc92)		
	(1a)	**(1b)**	**(1c)**	**(2a)**	**(2b)**	**(2c)**
No. of groups	353	353	353	353	353	353
No. of observations	5443	5443	5443	5443	5443	5443

Notes: The dependent variable is ln*X*. The robust standard errors are reported in parentheses. Columns (1b) and (2b) include year dummies only, while columns (1c) and (2c) incorporate both year dummies and exporter fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The coefficient of sigma-squared (σ^2) is found to be positive and statistically significant in all model specifications. This indicates that the potential exports over time have shown significant variation about its asymptotic mean, and that the interregional potential exports have been changing over the period of study. The variation in potential exports can be attributed to random factors, or due to the influence of country-specific characteristics within both regions. The significance of the σ^2 justifies the use of the SFA to estimating the gravity model. It also implies that all deviations from the frontier are due to noise and trade inefficiency (higher trade resistance).

The parameter gamma (γ) is positive, significant, and close to 1 (except for 1c of the bc88 estimates), which means that there is a variation in export efficiency with each partner. In other words, it is effective to decompose the error term into u and v for the given data set, and 'behind the border' constraints cause deviations of actual exports from potential exports. The eta (η) is negative and statistically significant in the time-varying model (bc92), except for 2b, which implies that the constraining impact of country-specific 'behind the border' effects on achieving the potential trade in an interregional context is increasing over time or the trade efficiency of countries decreases given the time surveyed (20 years). Finally, the mu (μ) estimate, which is positive and significant for all specifications of the time-varying model, implies that the truncated normal distributional assumption for the one-sided error term fits the data used in the estimations.

Within the time-invariant (bc88) and the time-varying (bc92) models, the results are somewhat robust to the inclusion of time dummies and exporter fixed effects. Most of the estimated coefficients in Table 1 carry their expected signs and are in line with the theory. The coefficients for *GDPT*, *FDIT* and *SIMFDI* are positive and statistically significant for two-way ASEAN-LA exports, implying the importance of the economic size, FDI size and similarities in FDI size, for export integration. There is also evidence that relative factor endowment differences dictate interregional export flows, thereby reflecting IT trade. Though differences in factor endowments are fundamental to understanding the structure of interregional trade between ASEAN and LA, there are some cases where pairs of countries IIT account for a reasonable proportion of bilateral trade (Mikic & Jakobson, 2010; Roldan & Perez, 2010). As expected, the lower the tariffs and the weaker the exporter's currency, the larger the interregional export flows. Likewise, landlocked economies are found to discourage interregional trade flows.

The most revealing point from the estimations in Table 1 is that FTAs do not significantly matter for ASEAN-LA interregional exports. Wignaraja et al. (2013) notes that though many Asia-LA FTAs liberalise tariffs in a fast manner, they contain temporary or permanent exclusions lists. For example, the Thailand-Peru FTA adopted a gradual approach to tariff liberalisation, where they only committed 70% of total tariff lines to liberalisation, excluding a wide range of goods, within the categories of agricultural products, fish products and durable goods. With the exception of bilateral agreements, such as the Singapore-Panama FTA (2006), Singapore-Peru FTA (2009) and Singapore-Costa Rica FTA (2013), that do include commitments that are substantive[13] through separate SPS and TBT chapters that include cooperation on regulatory issues to facilitate trade, namely unilateral recognition or equivalence or harmonisation and alignment of regulations to international standards, many of the remaining bilateral agreements do not include substantive commitments (Mattoo et al., 2020). It can therefore be inferred that the current bilateral FTAs between ASEAN and LA,[14] which are signed and in effect, have not significantly created the intended market access for trade integration.

The estimations are subsequently conducted for interregional VA exports and the results are presented in Table 2. Within models bc88 and bc92, the results are not robust to the inclusion of time dummies and exporter fixed effects. There is some evidence of the size of FDI driving interregional VA exports, while similarities in FDI discourage such trade flows. Lower tariffs, currency depreciation, geographical distance and landlocked economies reduce interregional export flows.

Table 2: PPML Estimates for Interregional Value-Added Exports

	Time-invariant model (bc88)			Time-varying model (bc92)		
Variables	**(1a)**	**(1b)**	**(1c)**	**(2a)**	**(2b)**	**(2c)**
ln*GDPT*	0.536	0.050	-0.025	0.236	0.197	0.966
	(0.152)	(0.171)	(0.165)	(0.166)	(0.136)	(0.109)
SIMGDPPC	0.010	-0.000	-0.001	-0.000	0.008	0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.005)
ln*FDIT*	0.392***	-0.052	-0.040	0.133***	-0.008	0.011
	(0.049)	(0.049)	(0.050)	(0.047)	(0.051)	(0.047)
SIMFDI	0.001	-0.006***	-0.006***	-0.005*	-0.005**	-0.004**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RLFAC	-0.085	-0.085	-0.077	-0.081	-0.132**	-0.071
	(0.063)	(0.162)	(0.061)	(0.059)	(0.063)	(0.051)
ln*TRF*	-3.017***	0.172	0.106	-2.224***	-0.097	-1.759***
	(0.710)	(0.694)	(0.698)	(0.633)	(0.655)	(0.491)
ln*ER*	0.024	0.030*	0.033**	0.027	0.009	0.013
	(0.018)	(0.016)	(0.170)	(0.016)	(0.017)	(0.012)
ln*DIST*	-1.121	-0.121	-8.379***	-0.645	-6.978**	-10.428***
	(1.611)	(1.243)	(0.451)	(1.915)	(3.128)	(2.604)
FTA	0.027	0.052	0.053	0.037	-0.083	0.148**
	(0.053)	(0.060)	(0.060)	(0.055)	(0.065)	(0.064)
LL	-0.982***	-1.946***	-2.542***	-1.572***	-0.802	-0.420
	(0.191)	(0.296)	(0.357)	(0.246)	(0.581)	(0.611)
Sigma-squared	1.117***	1.765***	2.152***	1.487***	1.775***	2.774***
	(0.108)	(0.142)	(0.315)	(0.126)	(0.134)	(0.242)
Gamma	2.717***	3.666***	4.064***	3.184***	3.701***	4.990***
	(0.126)	(0.171)	(0.323)	(0.143)	(0.163)	(0.252)
Mu	5.171***	6.250***	1.762**	390.218***	7.241***	5.688***
	(0.168)	(0.224)	(0.913)	(27.778)	(0.377)	(1.461)
Eta				-0.000***	-0.006***	-0.011***
				(0.000)	(0.001)	(0.001)
Year dummies	No	Yes	Yes	No	Yes	Yes
Exporter fixed effects	No	No	Yes	No	No	Yes
Log pseudolikelihood	-5138.816	-4376.089	-4289.393	-4965.929	-4283.977	-3471.985
Wald chi2	1719.85	24414.77	85294.68	168.24	26434.75	29202.76
No. of groups	353	353	353	353	353	353
No. of observations	7041	7041	7041	7041	7041	7041

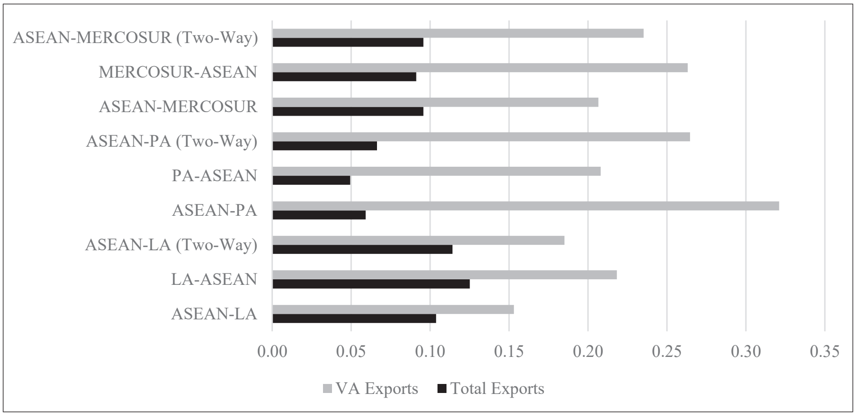
Notes: The dependent variable is ln*VA*. The robust standard errors are reported in parentheses. Columns (3b) and (4b) include year dummies only, while columns (3c) and (4c) incorporate both year dummies and exporter fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Subsequently, to identify interregional exports and VA exports efficiency relative to their maximum potential levels, the TE scores are derived by applying the coefficients of the estimations from the time-invariant model[15] of the ML estimator in Tables 1 and 2, respectively. The interregional export efficiency scores for each country-pair are presented in the Appendix Tables 3A and 3B respectively.

Appendix Table 3A shows that the efficiency scores for most of the country-pairs are far less than one and as low as zero, indicating that actual exports are below the potential level than determined by the frontier. The scores suggest that only a few bilateral country-pairs perform closer to their frontier export levels (TE > 0.5). Interestingly, the export efficiency of Singapore-Panama, at 0.74, is the highest score from the ASEAN-LA perspective. Not only is Panama the biggest LA trading partner of Singapore, but the Singapore-Panama FTA is also the city-state's first pact with a LA nation providing tariff elimination for 98% of Singapore's exports to Panama. Alternatively, Appendix Table 3B reveals interesting facts based on the technical efficiency scores for interregional VA exports by country-pairs. There is more evidence of some country-pairs performing closer to their frontier VA export levels. Except for Cambodia, all AMS have recorded high TE scores (TE > 0.5) with Mexico. This is not surprising as Mexico is an established trading partner of ASEAN and has engaged in value-added trade with the region. From the perspective of ASEAN's VA exports to the LA, Vietnam records high TE scores with some PA (Chile and Mexico) and MERCOSUR (Brazil and Paraguay) countries. From the LA to ASEAN case, high TE scores are observed in Singapore, and for several country-pairs in Malaysia and Thailand as these countries, relative to the other AMS, are deeply engaged in VA trade with LA (Shepherd, 2020).

Comparatively, TE between the regions is higher for VA exports relative to total exports, as shown in Figure 6. That said, the interregional TEs are still low (TE < 0.5), irrespective of the type of trade flows. For two-way export flows, the TE for ASEAN-MERCOSUR is only marginally higher than that for ASEAN-PA. The opposite holds true when interregional VA exports are considered. For the one-way VA export flows between ASEAN and the PA, the technical efficiency at 0.321 is higher for export flows from ASEAN to PA than PA to ASEAN. However, the TE for the one-way VA export flows from MERCOSUR to ASEAN is higher than ASEAN to MERCOSUR. Figure 6 suggests that, overall, trade integration through the sub-interregional platforms (ASEAN-PA and ASEAN-MERCOSUR) is somewhat comparable with that of the overall interregional context.

Figure 6: ASEAN-LA – Average Technical Efficiency, by Sub-Regional Groups



Notes: TE is calculated as an average for the country-pairs within the region (and sub-region) for the 2000 to 2019 period. It refers to one-way export flows between the reporter-partner, unless otherwise stated as two-way export flows. It is based on the TE estimated from (1c) and (3c) of models bc88 from Tables 1 and 2 for total interregional exports and interregional VA exports, respectively.

In total, the empirical results above reveal that the levels of interregional exports and interregional VA exports (except for specific country-pairs as indicated in Appendix Table 3B) are far from the potential levels, suggesting a high degree of trade resistances in the form of NTBs. There is, therefore, scope for improved efficiency of interregional exports and VA exports, and significant amount of space for both regions to further strengthen the interregional market by developing their export capacity or reducing trade resistance.

5. Concluding Remarks

The paper examines and compares the trade connections and trade efficiency between ASEAN and LA with ASEAN and two LA blocs, the PA and MERCOSUR, to inform the contemporary debate on the options for interregional cooperation. Though interregional cooperation has been growing, the level of export integration is still low from the perspectives of gross export flows and VA exports. The country-specific 'behind-the-border' effects on achieving potential trade in an interregional context are found to be increasing over time, which explains the low export efficiency levels between both regions, and between ASEAN and PA, as well as between ASEAN and MERCOSUR.

There are two key implications of the study. First, the low levels of trade integration and efficiency suggest that there are unexhausted potentials in trade between the regions. It seems only practical for ASEAN to move forward with sub-interregional cooperation with the PA and MERCOSUR, since they include the key LA trading partners of ASEAN, and both sub-regional groups display the capacity and efficiency to engage more in VA exports and GVC trade within LA. Therefore, the possibility for ASEAN deriving quality trade integration through the development of interregional GVCs appears more plausible through sub-interregional cooperation with the PA and MERCOSUR. Second, the insignificant effects of the existing bilateral (and plurilateral) FTAs on interregional trade suggests that much work needs to be done with existing FTAs or for future interregional FTAs, if they were to be signed. Worth noting here is that regulatory barriers, in the form of NTMs and other 'behind-the-border' measures, may first require domestic and structural reforms within the countries, for them to conclude deep interregional (and inter-subregional FTAs). For that purpose, it may be easier for ASEAN to establish regulatory coherence through sub-interregional cooperation with the PA and MERCOSUR, rather than a region-to-region-wide arrangement with LA.

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Notes

1 LA refers to the following 20 countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

2 This does not include Venezuela, whose membership has been suspended.

3 The PA was initiated in 2011 and formalized by a framework agreement in 2012, while MERCOSUR was founded in 1991.

4 NTMs are defined as policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, and/or prices. NTBs are a subset of NTMs as they restrict trade.

5 In fact, among the founding objectives of the PA is to become a platform for connecting LA with the Asia Pacific (see also Herreros, 2016). Members of the PA have also been active in signing FTAs with ASEAN (see Appendix Table 1), and some of the ASEAN member states (AMS) hold the PA observer status – the Philippines, Indonesia, Singapore, and Thailand.

6 VA exports refer to the summation of domestic value-added exports (DVA) and foreign value-added exports (FVA), while GVC participation includes FVA and indirect value-added exports (IDX).

7 Technical measures include sanitary and phytosanitary (SPS) measures, technical barriers to trade (TBTs) and pre-shipment inspection (PSI).

8 The SFA estimates a production frontier indicating the maximum possible (and not the average) output that is produced given a certain level of inputs. A fully efficient unit operates at the frontier, and those inefficient units operate at a point within the frontier signifying a shortfall between the observed and the maximum possible levels of output.

9 Trade potential is the trade achieved at a frontier; the level of trade that might be achieved in the case of the most open and frictionless, while TE is a measure of actual levels of trade against potential trade and can be estimated statistically using the stochastic frontier gravity model for all trade flows.

10 Inward FDI data is not available on a bilateral basis.

11 "Behind the border barriers" refer to a variety of NTBs, or even protective NTMs that operate inside countries rather than at the border, but that nonetheless can restrict trade.

12 ASEAN consists of 10 countries, Malaysia, Singapore, Thailand, Philippines, Indonesia, Brunei, Cambodia, Lao PDR, and Viet Nam.

Cuba is not included in the estimations due to the lack of FDI data for the period of study.

[13] This includes agreements that go beyond procedural rules, transparency, and enforcement mechanisms to include specific commitments on integration, such as market access commitments, and specific obligations such as harmonisation of standards.

[14] The coverage of substantive commitments for Vietnam-Chile FTA (2012) and Malaysia-Chile FTA (2012) is only 2.2% and 5.4% respectively, compared to 23.3% for Singapore-Panama FTA, 25.6% each for Singapore-Peru FTA and Singapore-Costa Rica FTA. In contrast to the bilateral agreements, the coverage ratio of substantive commitments in the CPTPP is 61% (Mattoo et al., 2020).

[15] The time-invariant model (bc88) is considered appropriate given the signs and significance of the parameters σ^2, γ, and μ.

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Appendices

Appendix Table 1: ASEAN – Bilateral and Plurilateral FTAs with LA

ASEAN	Bloc	LA	Status (date)
Malaysia	Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)	Chile, Mexico, Peru	Signed and in effect December 30, 2018
	Malaysia-Chile FTA	Chile	Signed and in effect April 18, 2012
Singapore	Singapore-Mexico FTA (MSFTA)	Mexico	Negotiations launched July 2000
	Singapore-MERCOSUR FTA	Argentina, Brazil, Paraguay, Uruguay	Negotiations launched July 23, 2018
	CPTPP	Chile, Mexico, Peru	Negotiations launched December 30, 2018
	Singapore PA-FTA (PASFTA)	Chile, Colombia, Mexico, Peru	Negotiations concluded July 21, 2021
	Singapore-Panama FTA (PSFTA)	Panama	Negotiations launched July 24, 2006
	Singapore-Peru FTA	Peru	Negotiations launched August 1, 2009
	Singapore-Costa Rica FTA	Costa Rica	Negotiations launched July 1, 2013
Thailand	Thailand-MERCOSUR FTA	Argentina, Brazil, Paraguay, Uruguay	Proposed/under consultation and study March 11, 2006
	Thailand-Colombia FTA	Colombia	Proposed/under consultation and study July 12, 2013
	Thailand-Peru FTA	Peru	Signed and in effect December 31, 2011
	Thailand-Chile FTA	Chile	Signed and in effect November 5, 2015
Philippines	Philippines-Mexico FTA	Mexico	Proposed/under consultation and study January 1, 2015
	Philippines-Chile FTA	Chile	Proposed/under consultation and study January 1, 2015

ASEAN	Bloc	LA	Status (date)
Indonesia	Indonesia-Peru FTA	Peru	Proposed/under consultation and study March 5, 2014
	Indonesia-Colombia FTA	Colombia	Proposed/under consultation and study November 14, 2019
	Indonesia-Chile FTA	Chile	Signed and in effect August 10, 2019
Brunei	CPTPP	Chile, Mexico, Peru	Signed and in effect December 12, 2018
Vietnam	CPTPP	Chile, Mexico, Peru	Signed and in effect December 12, 2018
	Vietnam-Chile FTA	Chile	Signed and in effect March 14, 2012

Sources: ADB (2021), ARIC (2015), press releases.

Appendix Table 2: Definition and Measurement of Variables

Variable	Definition	Measurement	Source
X	Gross exports	Bilateral exports, expressed in current USD	UN Comtrade database https://comtradeplus.un.org/TradeFlow
VA	Value-added exports	Value-added originating from the partner country j in the reporter country i's exports, expressed in current USD	UNCTAD-Eora GVC database https://worldmrio.com/unctadgvc/
GDP	Total real GDP	$GDP = GDP_i + GDP_j$ Values are expressed in constant (2010=100) USD	WDI database https://databank.worldbank.org/source/world-development-indicators
SIMGDPPC	Similarity in the GDP per capita (GDPPC) level between trade partners	$SIMGDP_{ij} = 1 - \frac{GDPPC_i^2}{(GDPPC_i + GDPPC_j)^2} - \frac{GDPPC_j^2}{(GDPPC_i + GDPPC_j)^2}$	
		Values of GDPPC are expressed in constant (2010=100) USD. Range of values = $0 \leq SIMGDP_{ij} \leq 0.5$ $SIMGDP_{ij} = 0$ (divergence in size) $SIMGDP_{ij} = 0.5$ (convergence in size)	WDI database

Variable	Definition	Measurement	Source
FDIT	Total real inward FDI stock	$FDIT_{ij} = FDI_i + FDI_j$ FDI stock is the value of the share of capital and reserves (including retained profits) attributable to the parent enterprise, add the net indebtedness of affiliates to the parent enterprises. It is approximated by the accumulated value of past FDI flows. Values are expressed in constant (2010 = 100) USD	UNCTADstat database - https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en
SIMFDI	Similarity in the inward FDI stock between trade partners	$SIMFDI_{ij} = 1 - \frac{FDS_i^2}{(FDS_i + FDS_j)^2} - \frac{FDS_j^2}{(FDS_i + FDS_j)^2}$ Range of values = $0 \leq SIMFDI_{ij} \leq 0.5$ $SIMFDI_{ij} = 0$ (divergence in size) $SIMFDI_{ij} = 0.5$ (convergence in size)	UNCTADstat database
RLFAC	Similarity in capital-labour ratios in terms of relative factor endowments	$RLFAC_{ij} = \mid \ln\left(\frac{K_{jt}}{L_{jt}}\right) - \ln\left(\frac{K_{it}}{L_{it}}\right) \mid$ where K represents capital stock while L stands for labour force. The zero value of $RLFAC_{ij}$ means countries share the same proportion of factor endowments so the estimated capital stock is $K_t = GFCF_t + (1 - \delta)K_{t-1}$. The GFCF measures the value addition to land improvements (construction related to transportation facilities) and fixed assets (plant, machinery, and equipment) plus the net changes in the inventories. Values are expressed in constant (2010 = 100) USD. Using the data on GFCF, K is estimated using the standard perpetual inventory calculation method: $K_0 = GFCF_0/[\lambda g_d + (1-\lambda)g_w + \delta]$, where the base year is 1970 g_d = average GDP growth rate for the related countries (1990-2019) g_w = estimated average world growth rate (1990-2019) λ = mean reversion in growth rates, 0.25 δ = depreciation rate, 0.05 Total labour force population aged 15 and older who meet the International Labour Organization (ILO)'s definition	WDI database

Variable	Definition	Measurement	Source
TRF	Tariffs	Average weighted tariffs applied in country *j*, expressed as $\ln(1 + t_j^t)$	UNCTAD-TRAINS *database https://trains.unctad.org/*
ER	Exchange rate	Bilateral exchange rate is defined as the exporting country's currency per USD to importing country's currency per USD. An increase in the variable represents a depreciation in the exporting currency per USD, and a positive effect on exports	IMF database *https://data.imf.org/regular.aspx?key=61545850*
DIST	Geographical distance	The average distance between the capitals of countries *i* and *j*. Values are measured in kilometres	CEPII database - *http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp*
LL	Landlocked economy	Dummy for landlocked economy, where 1= landlocked economy; 0 if otherwise	CEPII database

Appendix Table 3A: Interregional Export Efficiency Scores, by Country-Pairs

	j = partner (importer)																		
i	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**CRI**	**DR**	**ECU**	**SLV**	**GUA**	**HTI**	**HON**	**MEX**	**NIC**	**PAN**	**PRY**	**PER**	**URU**	**VEN**
MYS	0.008	0.018	0.008	0.007	0.006	0.012	0.006	0.004	0.009	0.011	0.113	0.013	0.028	0.005	0.020	0.026	0.010	0.006	0.003
SGP	0.010	0.074	0.010	0.005	0.010	0.006	0.004	0.006	0.003	0.008	0.034	0.009	0.016	0.016	*0.737*	0.031	0.009	0.006	0.002
PHL	0.027	0.002	0.026	0.050	0.008	0.068	0.011	0.004	0.002	0.004	0.003	0.003	0.228	0.000	0.056	0.019	0.008	0.032	0.008
THA	0.013	0.020	0.011	0.014	0.006	0.007	0.009	0.011	0.006	0.012	0.013	0.013	0.025	0.007	0.017	0.025	0.006	0.005	0.006
IDN	0.028	0.011	0.047	0.026	0.010	0.005	0.006	0.008	0.002	0.004	0.029	0.003	0.030	0.003	0.022	0.025	0.006	0.011	0.011
BRN	0.066		0.014	0.077	0.067		*0.544*	0.308					0.021		0.297		0.100	*0.687*	0.085
CAM	0.024	0.026	0.008	0.066	0.007	0.007	0.013	0.008	0.007	0.007	0.109	0.003	0.059	0.013	0.256	0.427	0.015	0.031	0.022
LAO	0.191	*0.660*	0.165	0.130	0.359	*0.615*	*0.646*	*0.657*		0.469	0.421	*0.734*	0.085	*0.542*	0.461		0.138	*0.712*	0.491
MMR	0.226	*0.592*	0.077	0.095	0.164	0.191	0.064	0.062	*0.712*	0.228	0.339	*0.549*	0.192	0.431	0.180	0.328	0.175	0.220	0.216
VNM	0.014	0.026	0.014	0.037	0.013	0.011	0.013	0.019	0.009	0.010	0.007	0.006	0.058	0.007	0.098	0.043	0.005	0.018	0.008
	i = reporter (exporter)																		
i	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**CRI**	**DR**	**ECU**	**SLV**	**GUA**	**HTI**	**HON**	**MEX**	**NIC**	**PAN**	**PRY**	**PER**	**URU**	**VEN**
MYS	0.032	0.403	0.021	0.013	0.021	0.040	0.049	0.009	0.015	0.100		0.031	0.023	0.045	0.032	0.018	0.019	0.004	0.022
SGP	0.007	0.044	0.038	0.017	0.377	0.042	0.102	0.021	0.015	0.150		0.067	0.077	0.016	0.098	0.005	0.034	0.008	0.168
PHL	0.068	0.002	0.047	0.074	0.038	0.017	0.019	0.014	0.002	0.003		0.008	0.079	0.009	0.063	0.002	0.047	0.025	0.117
THA	0.030	0.021	0.044	0.027	0.025	0.003	0.023	0.006	0.008	0.008		0.024	0.051	0.034	0.067	0.031	0.040	0.028	0.084
IDN	0.049	0.002	0.064	0.027	0.007	0.001	0.010	0.009	0.004	0.006		0.006	0.025	0.005	0.011	0.008	0.013	0.003	0.086
BRN	0.001	0.243	0.000	0.047	0.002		0.106	0.030		0.348			0.001		*0.605*	*0.526*	0.032	0.011	0.107
CAM	0.029	0.313	0.007	0.011	0.035	0.133	0.228	0.192	0.154	0.055		0.349	0.007	0.479	0.435	0.359	0.011	0.068	*0.657*
LAO	0.004	0.066	0.001	0.024	0.126	0.371	0.239	*0.742*	*0.633*	0.499		*0.642*	0.026	*0.673*	*0.634*		0.041	*0.678*	
MMR	0.000	0.473	0.001	0.003	0.009	0.003	0.349	0.263	0.235	0.135			0.000	0.468	0.354	0.235	0.016	0.005	0.322
VNM	0.441	0.032	0.145	0.262	0.040	0.059	0.373	*0.560*	0.196	0.087		0.234	0.079	0.237	*0.541*	0.243	0.169	0.270	0.109

Notes: MYS – Malaysia; SGP – Singapore; PHL – Philippines; THA – Thailand; IDN – Indonesia; BRN – Brunei; CAM – Cambodia; LAO – Lao PDR; MMR – Myanmar; VNM – Viet Nam; ARG – Argentina; BOL – Bolivia; BRA – Brazil; CHL – Chile; COL – Colombia; CRI – Costa Rica; DR – Dominican Republic; ECU – Ecuador; SLV – El Salvador; GUA – Guatemala; HTI – Haiti; HON – Honduras; MEX – Mexico; NIC – Nicaragua; PAN – Panama; PRY – Paraguay; PER – Peru; URU – Uruguay; VEN – Venezuela. TE scores are computed based on the time-invariant model (bc88) of Table 1 and are averaged over the 1990 to 2019 period.

Source: Authors' own estimation.

Appendix Table 3B: Interregional Value-Added Export Efficiency Scores, by Country-Pairs

	j = partner (importer)																		
i	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**CRI**	**DR**	**ECU**	**SLV**	**GUA**	**HTI**	**HON**	**MEX**	**NIC**	**PAN**	**PRY**	**PER**	**URU**	**VEN**
MYS	0.062	0.063	0.176	0.074	0.047	0.015	0.005	0.016	0.003	0.004	0.001	0.003	0.914	0.001	0.009	0.042	0.022	0.003	0.032
SGP	0.035	0.063	0.145	0.046	0.051	0.017	0.008	0.016	0.003	0.004	0.001	0.003	0.913	0.002	0.010	0.038	0.016	0.003	0.064
PHL	0.194	0.283	*0.889*	0.411	0.042	0.021	0.009	0.018	0.003	0.004	0.002	0.003	0.858	0.002	0.013	0.216	0.031	0.020	0.064
THA	0.076	0.094	0.162	0.179	0.033	0.014	0.006	0.015	0.003	0.003	0.001	0.002	0.912	0.002	0.008	0.069	0.028	0.005	0.023
IDN	0.032	0.056	0.130	0.070	0.071	0.020	0.013	0.017	0.003	0.005	0.002	0.003	0.912	0.001	0.011	0.027	0.018	0.002	0.072
BRN	0.211		0.481	0.336	0.155		0.039	0.114					0.792		0.059		0.103	0.052	0.252
CAM	0.140	*0.877*	0.129	0.162	0.056	0.064	0.018	0.085	0.017	0.019	0.010	0.024	0.353	0.025	0.163	0.488	0.089	0.053	0.137
LAO	0.630	0.316	0.340	*0.763*	0.139	0.108	0.045	0.232		0.056	0.033	0.069	0.729	0.066	0.082		0.280	0.234	0.306
MMR	0.256	*0.862*	0.278	0.391	0.108	0.051	0.018	0.079	0.023	0.019	0.007	0.039	0.822	0.020	0.034	0.495	0.194	0.069	0.096
VNM	0.492	*0.842*	0.579	*0.561*	0.151	0.052	0.023	0.075	0.014	0.019	0.006	0.016	0.847	0.013	0.035	0.550	0.159	0.047	0.177
	i = reporter (exporter)																		
j	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**CRI**	**DR**	**ECU**	**SLV**	**GUA**	**HTI**	**HON**	**MEX**	**NIC**	**PAN**	**PRY**	**PER**	**URU**	**VEN**
MYS	*0.857*	*0.671*	*0.643*	*0.693*	0.300	0.379	0.478	0.306	0.456	0.416		0.421	0.323	0.375	0.479	0.416	*0.592*	0.204	0.187
SGP	0.466	*0.857*	*0.868*	*0.616*	*0.883*	*0.869*	*0.868*	*0.875*	*0.840*	*0.873*		*0.814*	*0.892*	*0.824*	*0.870*	*0.593*	*0.547*	0.379	*0.888*
PHL	0.215	0.244	*0.563*	0.252	0.042	0.099	0.103	0.048	0.080	0.037		0.088	0.037	0.154	0.039	0.552	0.124	0.331	0.029
THA	*0.540*	*0.599*	0.423	*0.865*	0.143	0.155	0.220	0.190	0.276	0.147		0.231	0.234	0.287	0.079	*0.543*	*0.873*	*0.843*	0.075
IDN	0.163	0.127	0.315	0.236	0.203	0.150	0.209	0.110	0.190	0.130		0.201	0.107	0.278	0.629	0.149	0.126	0.076	0.127
BRN	0.006	0.013	0.004	0.002	0.002	0.002	0.007	0.004		0.006			0.001		0.004	0.078	0.002	0.015	0.001
CAM	0.006	0.012	0.003	0.004	0.002		0.005	0.005	0.019	0.005		0.014	0.001	0.025	0.008	0.082	0.004	0.021	0.001
LAO	0.045	0.007	0.010	0.024	0.007	0.013	0.021	0.018	0.074	0.023		0.060	0.002	0.137	0.027		0.011	0.152	
MMR	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.001			0.000	0.003	0.001	0.006	0.000	0.003	0.000
VNM	0.155	0.095	0.056	0.084	0.023	0.022	0.035	0.043	0.097	0.033		0.067	0.015	0.127	0.044	0.305	0.055	0.176	0.018

Notes: See the notes of Appendix Table 3A for the abbreviation of countries. TE scores are computed based on the time-invariant model (bc88) of Table 2 and are averaged over the 1990 to 2019 period.
Source: Authors' own estimation.