

Discussion Paper Series

Free Trade Agreements (FTAs) and Export Structures
in Thailand

Juthathip Jongwanich

Discussion Paper No.75

May 30, 2022

Faculty of Economics, Thammasat University

Free Trade Agreements (FTAs) and Export Structures in Thailand

Juthathip Jongwanich*

The International Competitiveness Research Cluster

Faculty of Economics, Thammasat University

e-mail: juthathip@econ.tu.ac.th

Abstract: This study aims to investigate the role of (in-effect) FTAs in influencing export structures, defined as intensive and extensive margins (products and markets) and sophistication at product level using Thailand's FTA-partner countries as a case study during 2006-2020. The results show that FTAs tended to generate favorable impacts in enhancing export structures in Thailand, except extensive margins in terms of new products. The preferential treatments noticeably expanded (existing) export products of Thailand into the FTA-partner countries (extensive margins in terms of market) while helped maintain traditional products exporting into these countries. Impacts of FTAs in improving intensive and extensive margins were pronounced in Middle-income partners and in manufacturing products. ASEAN and China were export destinations where FTAs driven intensive and extensive margins (markets) played a noticeable role. Regional FTAs, including ASEAN-Japan and ASEAN-Australia-New Zealand showed a limited role in boosting intensive and extensive margins. Apart from FTAs, trade liberalization through unilateral/multilateral liberalization of the partner countries was crucial in expanding (existing) Thai products into these markets. Importance of AFTA and ASEAN-China FTA was also observed when export sophistication is concerned. Imports through FTAs only helped enhance export sophistication, while there is no evidence observed in cases of intensive and extensive margins.

JEL code: F14, F15, O03, O53

Keyword: Export margins, export sophistication, FTAs

* The author would like to thank Prof. Shujiro Urata, Prof. Fukunari Kimura, Prof Shandre Thangavelu, Dr. Dionisius Narjoko and all participants at RCEP Inception Workshop (online), organized by ERIA on 28-29 July 2022. Research assistants from Saveera Thammasiri, Kunchalika Pongjit, Kamonchanok Noikham and Thanapa Leelaudom are highly appreciated.

1. Introduction

Export sector has been crucial in Thailand over the past four decades. During the COVID-19 pandemic, export sector plays the key role in supporting the country's economic recovery.¹ While there has been a growing concern about the economic outcome of the export-led growth model pursued in Thailand since the mid-1980s, relying on exports as one of the main growth engines seems to be unavoidable in the post pandemic era. This seems to be a common pursued strategy among developing countries as reflected by the vaccination strategy in many countries, including Malaysia, Indonesia and Vietnam prioritizing on factory workers during the COVID-19 (Straits Rimes, 2021a; Straits Time, 2021b; Hoang et.al., 2021).

To pursue export-driven growth strategies, export diversification and upgrading has become more crucial in the post pandemic and have been a compromise solution for a country to relying on the export sector. In terms of export diversification, attention has been paid on intensive and extensive margins and how these two margins contribute to economic growth. Intensive margins refer to an increase in exports through expanding existing products (traditional products), while extensive margins refer to expanding exports through creating new products and/or developing new trading partners. Hummels and Klenow (2005), as well as Pham and Martin (2007), find that extensive margins (new products) are more crucial in contributing to export growth than intensive margins. Brenton and Newfarmer (2007), Jongwanich (2020, 2022) provide evidence that extensive margins, in terms of expanding existing products to new geographical markets, are crucial in explaining export growth, and tends to be more important than the discovery of new products. Concerning upgrading or product sophistication, various empirical studies (e.g., Hausmann, Hwang, and Rodrik, 2007; Minondo, 2010; Córcoles, Díaz-Mora, and

¹ In the first half of 2021, export growth soared to around 20 percent, and more than 40 percent in June 2021, from the negative growth (-6 percent) in 2019. Private consumption and investment recovered at the far slower pace. Government spending, especially investment proportion, though showed an increasing trend, its growth was far slower than that of exports. Private investment index and private consumption index (seasonally adjusted) grew by 10 percent and 1.4 percent respectively in the first half of 2021. Government investment increased to 19 percent in 2021Q1 from 5.7 percent in 2019 while government consumption grew 2.1 from 0.9 percent during the same period. See information from the Bank of Thailand <https://www.bot.or.th/English/Statistics/EconomicAndFinancial/Pages/StatEconomicIndices.aspx>.

Gandoy, 2014; Li, 2015;) argue that a country's export basket matters, i.e., economies exporting more sophisticated products tend to grow faster and having greater productivity improvement. In addition, Córcoles, Diaz-Mora, and Gandoy (2014) show that product sophistication helps redress instability of trade flows, especially those linked to global value chains.

Due to importance of export margins and upgrading, it is vital to understand key factors determining these two aspects of a country's export structure. There are several empirical studies investigating this issue in developing countries, but attention has been paid only on some particular variables, e.g., the role of foreign direct investment (e.g., Xu and Lu (2007); Xu (2010); Iwamoto and Nabeshima (2012); Weldemicael (2012); Zhu and Fu (2013); Swenson and Chen (2014); Tran, Truong and Dong (2019)), human capital/R&D (e.g., Costinot (2009)), quality institutions (e.g., Costinot (2009); Kočenda and Poghosyan (2018)) and financial development (Fang, Gu, and Li (2015)). Attention regarding the role of trade liberalization, especially through free trade agreements (FTAs), is limited. Nguyen (2016) examines impacts of trade liberalization on export sophistication in Vietnam. However, trade liberalization is measured through the weighted average of applied MFN tariff rates, without clear considering impacts of in-effect FTAs.

To contribute to literature in this area, this study aims to investigate key factors influencing export margins and sophistication with an emphasis on the role of (in-effect) FTAs using Thailand's FTA-partner countries as a case study.² The impacts are examined for FTA-partner countries at product level, 4-digit HS code during 2006-2020. Instead of using dummy variables, impacts of FTAs are measured through their utilization rates, and their impacts are separately examined in each FTAs, instead of lumping all FTAs together. In Thailand the slowdown in WTO negotiations resulted in a switch in political attention and negotiating resources toward preferential trade agreements and bilateral free trade accords. These processes accelerated as a result of a significant change in the political situation in Thailand between 2001 and 2006, between 2011 to

² Note that we include only in-effect FTAs, instead of including all countries and assigning a binary dummy variable to separate between FTAs and non-FTAs countries, in examining the impacts of FTAs on export margins and sophistication because product-level analysis and FTA utilization rate are employed in this study. In this study, zero FTA utilization rate refers to a situation where firms do not utilize FTAs while products are in excluded lists would not be included in the analysis.

May 2014, and recently since 2015. There are a total of 24 FTAs, of which 14 have come into force. The recent effective FTAs in 2021 is Regional Comprehensive (RCEP) initiated in August 2006, known as ASEAN+6; changed to RCEP in 2011.³ In addition, instead of using a count of export lines to calculate the margins (Cadot et.al., 2011), the measure treating low and high value of export products differently in calculating the margins is employed. Product sophistication is also considered in this study by applying method proposed by Hausmann et al. (2007) and Hidalgo and Hausmann (2009) with the six-digit level HS classification trade information, but instead of applying only for the whole partners, the sophistication measures are calculated separately among FTA partners to see whether (in-effect) FTAs could influence export deepening in Thailand.

The rest of the paper is as follows. Section 2 presents literature reviews relevant to export margins, sophistication and the role of trade liberalization. Section 3 shows export structures, both in terms of margins and sophistication, as well as development of FTAs in Thailand. Empirical model, variable measurement, and data are discussed in Section 4. Section 5 presents results while conclusions and policy inferences are appeared in the final section.

2. Literature Reviews

Factors determining export margins and sophistication has become crucial over the past decade due to their positive implications on growth and productivity improvement. Attention has been paid on trade liberalization, but most of them examine impacts of tariff reduction through WTO commitments or unilateral liberalization, instead of analyzing liberalization through

³ Note that impacts of RECP on the country's export margins and sophistication are not included in this study. However, since other effective FTAs in Thailand, e.g., ASEAN, ASEAN-China, JTEPA, ASEAN-Japan, ASEAN-Korea, cover all members of RCEP. To a certain extent, results from these FTAs could provide some implications to RCEP in influencing the country's export margins and sophistication, especially when tariff reduction schedule of RCEP and other relevant FTAs are relatively comparable. In fact, Park (2022) revealed that ASEAN+ FTAs, except ASEAN-India, offer better tariff concession rates than RCEP, i.e., while the tariff concession rates of the former is about 94 percent on average, the latter is around 91 percent. For Thailand specifically, the gap is wider, i.e., 96 percent for ASEAN+ FTAs and 90 percent for RCEP. Kohpaiboon and Jongwanich (2022) showed that Rules of Origin (RoOs) in RCEP are comparable to other ASEAN+ FTAs, i.e., adopting the diagonal cumulation scheme, and the flexible criteria to identify product origin – there are more than one RoO rules for firms to choose in identifying product origin.

preferential trade agreements.⁴ Amiti and Khandelwal (2013), using US import data during 1990-2005, show that lowering tariffs can induce more competition and result in quality upgrading, but only for products close to the world quality frontier. For product distant from the frontier, lower tariffs hinder quality upgrading. Manova and Zhang (2012) establish many facts concerning the pricing decisions of Chinese firms reflecting product sophistication. Most important finding of the research is firms that pay more for their imported inputs charge consistently higher prices for their exports while being more successful in export markets as measured by export revenue and the diversity of export destinations. Bas and Strauss-Kahn (2015) explore a link between input tariff reduction and the quality of traded products using Chinese transaction data during 2000-06. It seems that tariff reduction results in an increase in exported product prices, reflecting quality upgrading, especially for firms sourcing inputs from developed countries and export to high-income countries. Fan, Li and Yeaple (2015) apply both theoretical and empirical evidence to show that a reduction in import tariffs induce firms to upgrade their export quality in China during 2001-06. In particular, firms receiving import-tariff reductions increase export prices to existing markets and shift their export volume to markets preferring high-quality goods. In addition, extensive margin of quality exports tends to increase inducing by large tariff reductions of intermediate products. Bastos and Silva (2010); Kugler and Verhoogen (2012); Harrigan, Ma and Shlyohkov (2015); Gorg, Halpern and Murakovy (2016) also examine determinants of export price variation, within-product across firms or within product-firm across market and pay attention to the role of trade liberalization.

Nguyen (2016) examines impacts of trade liberalization in terms of tariff reductions, on export sophistication in Vietnam during 2001-10. Such reductions are found to enhance Vietnam's export sophistication, especially for nonmanufacturing sectors. Osakwe, Santos-Paulino and Dagon (2018) employ both parametric and non-parametric techniques for 144 developing countries during 1970-2015 and show that basing parametric method trade liberalization, in terms of lower tariffs, contributes to export diversification in both Sub-saharan Africa and other

⁴ Note that most previous studies also examine impacts of trade liberalization mostly on growth and productivity improvement (see for example Pavnick 2002, Schor 2004, Fernandes 2007, Amiti and Konings 2007, Topalova and Khandelwal 2010, Brandt et al. 2012, Jongwanich and Kohpaiboon, 2017, Jongwanich 2022).

developing countries. Institutions, human capital, and GDP per capita also influence the diversification prospects. Based on the difference-in-differences (DID) estimation from Chinese firms, Zhang, Fu and Zhu (2021) show that input tariff reductions matter to improve export quality for only firms who face binding credit constraints but has no significant impact on firms with low credit constraints. This finding suggests that trade liberalization leads to the upgrading of export quality by firms that face binding credit constraints. Better quality of intermediate inputs and productivity enhancement help upgrade export quality of these firms.

Few studies examine role of free trade agreements on export diversification and upgrading. Amurgo (2006), for example, examines impacts of preferential trade agreements (PTAs) on export diversification of Euro-Mediterranean trade during 1990-2004 and found that the Euro-Mediterranean FTA help expand the range of products traded among members. Amurgo and Pierola (2008) using 24 developed and developing countries during 1990-2005 show that trade growth is mostly explained by intensive margin (traditional products and existing market destinations) while extensive margin in terms of geographic diversification is more vital than product diversification, especially for developing countries. Free trade agreements help to boost export diversification for developing countries. Mayer et al. (2014) build a theoretical model of multi-product firms and employ firm-level exports of France in 2003 to examine a role of competition inducing a firm to skew its exports. In the theoretical model, bilateral trade agreements are included as one of the key factors, but their impacts are not revealed in the empirical study. Limitations regarding unobserved variation in the country of origin for all export flows result in difficulty to separately identify impacts of bilateral trade from the destination' supply potential. Matthee and SantanaGallego (2017), for example, show that free trade agreement with Southern African Development Community help improve the probability of South Africa exporting to a particular destination (extensive margin) as well as export volume (intensive margin). Other economic variables, including GDP of importing countries, population, distance, culture and language, and trade regulations matters in affecting African export performance.

Note that other factors are also investigated in explaining export diversification/sophistication, e.g., the role of foreign direct investment (e.g., Xu and Lu (2007); Xu

(2010); Iwamoto and Nabeshima (2012); Weldemicael (2012); Zhu and Fu (2013); Swenson and Chen (2014); Tran, Truong and Dong (2019)), human capital/R&D (e.g., Wang and Wei (2010); Costinot (2009)), government policy (e.g., Wang and Wei (2010)), quality institutions (e.g., Costinot (2009); Weldemicael (2012); Kočenda and Poghosyan (2018)) and financial development (Fang, Gu, and Li (2015); Fu and Zhu (2021)). For example, Xu and Lu (2007) examining impacts of foreign MNEs on China's export sophistication during 1998-2005 show that MNEs from OECD (wholly foreign owned enterprises (WFOEs)) and Hong Kong, Macao and Taiwan (WFOEs) are vital in explaining export sophistication in China. Iwamoto and Nabeshima (2012) investigates the impact of FDI inflow and stock on the level of export diversification and sophistication for 175 countries during 1980-2007. By using GMM estimation, export diversification is influenced by the five-year lagged FDI inflows while FDI stock determines export sophistication in developing countries.

Tran, Truong and Dong (2019) investigate the determinants of product sophistication at the firm-multi-product level in Viet Nam during 2010– 2016. Only vertical FDI in terms of forward linkage, does help enhance product sophistication while other types of FDI, including horizontal and backward linkage vertical FDI, has a negative impact of product sophistication. Wang and Wei (2010) using China's exports during 1995-2005 reveal that improvement in human capital and government policies in the form of tax-favored high-tech zones are crucial in explaining Chinese export structure and upgrading. Processing trade, foreign invested firms, and government-sponsored high-tech zones contributed considerably to raising the unit values of Chinese exports within a given product category. All in all, there are several empirical studies investigating factors influencing export performance in developing countries. However, Attention regarding the role of trade liberalization, especially through free trade agreements (FTAs), is limited.

3. FTAs and Export Structure in Thailand

3.1 FTAs in Thailand

Table 1 presents details of all the FTAs in which Thailand has been involved from the 1990s until December 2020, some of which comprise ongoing negotiations. These amount to a total of 24 FTAs, of which 14 have come into force. Regarding the coverage of tariff cuts, there

are only nine FTAs in which tariff cuts have been substantial, covering more than 80% of tariff lines and having been offered since 2010. They comprise the ASEAN Free Trade Area (AFTA), the Thailand–Australia FTA (TAFTA), the Thailand–New Zealand FTA (TNFTA), the Japan–Thailand Economic Partnership Agreement (JTEPA), ASEAN–China FTA (ACFTA), the ASEAN–Australia–New Zealand FTA (AANZFTA), the ASEAN–Japan FTA (AJFTA), the ASEAN–Korea FTA (AKFTA), and the ASEAN–India FTA (AIFTA). For another three FTAs (the Thailand–Peru FTA, the Thailand–Chile FTA, and ASEAN–India FTA), substantial tariff cuts have taken place only in recent years, specifically in 2015 and 2016. The Regional Comprehensive Economic Partnership (RCEP) is the latest free trade agreement, which was signed in November 2020 and became effective in 2021.

Most of FTAs in Table 1 mainly focus on goods market liberalisation. The commitments that Thailand made on other issues under these FTAs, except in the case of the AEC, were rather weak and at most in line with WTO commitments. These issues include government procurement; service liberalisation (for air transport, professionals, education, health, tourism, marine transport, financial services and the movement of people), environmental standards, competition policy, sanitary and phytosanitary (SPS) measures, technical barriers to trade, intellectual property protection, labour standards, environmental obligations, agricultural export subsidies, import licensing, and customs procedures. This is especially true for FTAs Thailand has with developing country FTA partners.

Regarding preferential tariff rates received by Thailand from the nine FTAs during 2010–20, the average MFN tariffs of the developed countries involved (Australia, New Zealand, and Japan) were generally lower than those of the developing countries, implying the magnitude of the tariff margins, comparing MFN tariffs with preferential tariffs, received from developed countries tends to be smaller. Korea seems to be an outlier as the average MFN tariff was relatively high by high-income-country standards, 13.19 percent. The preferential tariffs offered in these agreements vary across FTAs, so the tariff margins also varied considerably from about 0.6 percent to about ten percent. As expected, the tariff margins for the developed countries are smaller – ranging from 0.6 percent to 6.1 percent than those of the developing countries – ranging between five and about ten percent. The tariff cuts offered by Thailand in each FTA were in between five and

ten percent, compared to the MFN rate. The substantial tariff margins were for four FTAs, namely AFTA, Thai-Australia, Thai-New Zealand, and ASEAN-Korea, and the least was for ASEAN-Japan and the JTEPA. However, for Thai-New Zealand, ASEAN-Korea ASEAN-Australia-New Zealand and ASEAN-Japan, substantial tariff lines were subject to tariff margins of more than five percent. Particularly, Thai-New Zealand and ASEAN-Australia-New Zealand, about 30 and 26 percent of tariff lines, respectively were subject to tariff margins of higher than ten percent, reflecting the possible potential of using FTAs to stimulate trade among partners in these FTAs.

Regarding FTA utilization for exports, it increased noticeably during 2006-20, though the utilisation rates vary across FTA partners (Table 2). Among ASEAN members, Indonesia had the highest utilisation rate, followed by the Philippines and Viet Nam. The utilisation rates were higher for non-ASEAN partners, i.e., the highest for Australia, reaching 80 percent in 2016-20, followed by India, Korea, China and Japan. The Covid-19 tended to negatively affect FTA utilization in original ASEAN countries like Indonesia and the Philippines while new ASEAN countries like Vietnam, the utilization remained relatively stable. For non-ASEAN countries, the utilization rates of Australia and Japan declined during the COVID-19 while in others, the rates remained relatively stable, except China where the utilization rate tended to increase. Export products from Thailand that applied FTA schemes were highly concentrated. There were not large differences in the top-15 export products from Thailand to each ASEAN member. The products were dominated by five subsections – completely built up (CBU) vehicles, auto parts, electrical appliances (air conditioning, washing machines), tyres, and primary petrochemical products. For non-ASEAN members, the degree of product concentration was declining, but still higher in ASEAN countries, especially in Australia and New Zealand. The products applied for these FTAs included primary food-related products, primary chemical products, electrical appliances and automotive-related products.

Concerning the FTA utilisation for imports, the ratios on the import side were much lower than those on the export side but they gradually increased (Table 3). The ASEAN utilisation rate on imports increased and there was not much difference in the utilisation rates between the original and new ASEAN members. Indonesia, Viet Nam, and Cambodia were top in terms of

utilisation for imports. Cambodia's utilisation reached about 40 percent in 2016-20 partly owing to the increasing importance of cassava imports to Thailand in recent years. For Indonesia and Vietnam, the high utilisation was due to the operation of the global production network of multinational companies. For non-ASEAN members, New Zealand was top in terms of FTA utilisation, following by Korea, China and Japan. Its utilisation rate exceeding 50 percent of New Zealand dominated by milk and dairy products. Note that import values from New Zealand were rather small, averaging under US\$1 billion a year. Product details in the top-15 preferential imports varied across partners. An analysis of Thailand's top-15 preferential imports from its major FTA partners suggests that the nature of the country's preferential imports comprises fresh agricultural products and raw materials/intermediates for further uses such as coal, CBU vehicles, certain auto parts, shovels, and excavators. The relative importance of raw materials/intermediates in preferential imports might to a certain extent explain the lower FTA utilization rate than that on the export side since raw materials/intermediates are eligible for the tariff exemption schemes that have long been available for export businesses in Thailand.

3.2 Measurements of export margins and sophistication

Export margins can be divided into intensive and extensive ones. Intensive margins refer to an increase in exports through expanding existing products (traditional products), while extensive margins refer to expanding exports through creating new products and/or developing new trading partners. To determine margins, we use the definition of Klinger and Lederman (2006), who defined 'discoveries' by comparing exports between two periods using a three-year average as a benchmark. Discoveries of new products occur when products are not exported in the previous period, e.g., 2011-14, but are exported in the latter period, i.e., 2015-17. We also use another definition outlined by Cadot et.al. (2011), who define 'discoveries' as export lines that were inactive for the previous two years but become active and remain active for the subsequent two years.⁵

⁵ Note that the results of the discoveries uncovered by Klinger and Lederman (2006) and Cadot et.al. (2011) are similar. We did not apply the findings of Besedes and Prusa (2006) which defines discoveries as export lines that were not exported in the preceding year but were exported in the following year (one-year cut off) due to sustainability concerns related to the products.

Table 1: Free Trade Agreements in Thailand, 1990 - 2021

FTA	Signed	Effective	Remarks
1. ASEAN	1990	2003	Tariff reduction started in 2003 and completed in 2010 for original ASEAN members; 2015 for new members
2. ASEAN-China	2003	2003	Early harvest programme was launched to eliminate tariffs on fruit and vegetables (HS 07 and 08) in October 2003. China's tariff reduction – 60% (2009), 90% (2010) Thailand's tariff reduction – 33.3% (2009), more than 90% (2010)
3. India	2003	2004	Early Harvest Programme was launched to gradually liberalise 82 product items in September 2004 and completed in 2006. Two tracks are applied for tariff reductions, i.e. normal track and sensitive track.
4. Australia	2004	2005	Australia's tariff reduction – 83% (2005), 96.1% (2010), and 100% (2015) Thailand's tariff reduction – 49.5% (2005), 93.3% (2010), and 100% (2025)
5. New Zealand	2005	2005	New Zealand's tariff reduction – 79.1% (2005), 88.5% (2010), and 100% (2015) Thailand's tariff reduction – 54.1% (2005), 89.7% (2010), and 100% (2025)
6. Peru	2006	2011	Tariff reduction between Thailand and Peru – 50% (2011) and 70% (2015)
7. Chile	2006	2015	Tariff of 90% of product lines were cut to zero by November 2015.
8. Japan	2007	2007	Japan's tariff reduction – 86.1% (2007) and 91.2% (2017) Thailand's tariff reduction – 31.1% (2007) and 97.6% (2017) Currently, there is talk regarding further liberalisation known as the Japan-Thailand Economic Partnership Agreement Phase 2.
9. ASEAN-Japan	2008	2008	Japan's tariff reduction – 85.51% (December 2008), 90.16% (April 2018) Thailand's tariff reduction – 30.94% (June 2009), 86.17% (April 2018)
10. ASEAN-Korea	2009	2010	Korea's tariff reduction – 90% (2010) Thailand's tariff reduction – 81% (2010), 83% (2012), 86% (2016), and 90% (2017)
11. ASEAN-Australia-New Zealand	2009	2010	Australia's tariff reduction – 96.34% (2010), 96.85% (2016), 100% (2020) New Zealand's tariff reduction – 82.47% (2010), 88.01% (2016), 100% (2020) Thailand's tariff reduction – 73.05% (2010), 91.11% (2016), 98.89% (2020)
12. ASEAN-India	2009	2010	Tariff reduction began in 2010 with a target of 80% for Brunei Darussalam, Indonesia, India, Malaysia, Philippines, Singapore, and Thailand by 2016; and by 2021 for new ASEAN members.
13. ASEAN-Hong Kong	2007	2019	Tariff reduction for general products (0% within 3-10 years); sensitive products 90-5% within 12 years) and extremely sensitive products (50% or less within 14 years)
14. Regional Comprehensive (RCEP)	2020	2021	Initiated by August 2006, known as ASEAN+6; changed to RCEP in 2011. Plan to cut tariffs to zero immediately on at least 65% of product lines. The negotiation was expected to be concluded by the end of 2019.
15. Thai-Pakistan	Under negotiation		Official negotiations launched in August 2015.
16. Thailand-Turkey	Under negotiation		Negotiations launched in July 2016.
17. Thailand-European Union	Under negotiation/		Initiated by November 2007 under ASEAN-European Union; shift to bilateral agreements with individual ASEAN members in 2009. Four meetings held from May 2013 to April 2014, but talk was stalled because of the 2014 Thai coup. Negotiations are expected to be resumed after a newly elected government is in office.
	Stalled		
18. Thailand-European Free Trade Association	Under negotiation/		Initiated by October 2005 but stalled because of the 2014 coup.
	Stalled		
19. Thai-Sri Lanka	Under negotiation		Initiated by March 2016 due to a slow progress of Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation: BIMSTEC
20. Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation: BIMSTEC	Under negotiation		Waiting for Sri Lanka to submit tariff reduction schedule.
21. Comprehensive and Progressive Trans-pacific Partnership (CPTPP)	Consideration		
22. Thailand-Canada	Under negotiation		Initiated by March 2012 but stalled because of the 2014 coup.
23. ASEAN-European	Under negotiation		No progress since 2009
24. ASEAN and the Gulf Cooperation Council (GCC)	Under negotiation		In July 2011, senior officials of both sides agreed to develop 'Framework Arrangement'

Source: Author's compilation from Department of Trade Negotiation, Thailand and Association of Southeast Asian Nations.

Table 2: The FTAs Utilization Rates from Thai Exports, 2006-21

	2006-10			2011-15			2016-20			2021		
	Value of preferential exports (billion US\$)	Share in total preferential exports	FTA utilization (the value of preferential exports to total exports)	Value of preferential exports (billion US\$)	Share in total preferential exports	FTA utilization (the value of preferential exports to total exports)	Value of preferential exports (billion US\$)	Share in total preferential exports	FTA utilization (the value of preferential exports to total exports)	Value of preferential exports (billion US\$)	Share in total preferential exports	FTA utilization (the value of preferential exports to total exports)
ASEAN	9.58	48.10	26.64	17.56	37.08	30.90	24.74	39.13	41.48	25.59	34.39	40.02
Original countries	7.22	36.30	27.18	12.94	27.44	34.26	15.31	24.21	44.88	15.38	20.67	42.14
Brunei Darussalam	0.00	0.00	9.16	0.00	0.00	15.88	0.03	0.05	34.92	0.01	0.01	10.16
Indonesia	3.06	15.34	57.08	6.14	13.12	62.30	7.10	11.23	82.12	5.71	7.68	65.23
Malaysia	2.18	11.18	25.38	3.28	6.96	27.00	3.07	4.86	30.49	4.52	6.08	38.09
Philippines	1.66	8.28	48.08	3.12	6.50	58.84	4.49	7.11	68.54	4.50	6.05	64.77
Singapore	0.32	1.66	3.56	0.48	1.06	4.92	0.61	0.96	6.98	0.64	0.86	7.21
New countries	2.34	11.72	25.22	4.62	9.68	23.98	9.43	14.91	36.94	10.21	13.72	37.19
Cambodia	0.02	0.06	1.32	0.24	0.50	5.76	0.86	1.36	14.05	1.07	1.44	15.34
Lao PDR	0.04	0.14	3.10	0.14	0.30	3.96	0.46	0.73	12.07	0.82	1.10	20.91
Myanmar	0.00	0.00	1.08	0.30	0.60	7.22	0.80	1.26	18.85	0.72	0.97	17.02
Viet Nam	2.22	11.10	48.88	3.94	8.26	51.58	7.31	11.56	64.41	7.60	10.21	61.69
Non-ASEAN members	11.20	51.90	22.14	29.78	62.94	43.58	38.49	60.87	51.76	48.81	65.61	54.92
Australia	4.32	22.42	n.a.	6.70	14.02	n.a.	8.20	12.97	80.59	8.40	11.29	78.36
- Thai - Australia	4.32	22.42	61.38	6.44	13.48	68.78	7.00	11.06	68.75	6.08	8.18	56.75
- ASEAN-Australia-New Zealand	0.00	0.00	n.a.	0.26	0.54	n.a.	1.20	1.91	11.84	2.32	3.11	21.61
New Zealand	0.00	0.00	n.a.	0.04	0.08	n.a.	0.16	0.25	10.79	0.18	0.25	9.89
- Thai - New Zealand	0.00	0.00	0.40	0.04	0.08	3.72	0.00	0.00	0.00	0.00	0.00	0.00
- ASEAN-Australia-New Zealand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.16	0.25	10.79	0.18	0.25	9.89
China	3.28	14.82	18.78	11.98	25.26	46.30	15.98	25.27	56.53	25.33	34.04	69.26
India	0.58	2.68	17.68	2.44	5.14	45.62	3.72	5.88	58.49	4.75	6.39	56.57
- Thai - India							0.56	0.89	8.82	0.52	0.70	6.22
- ASEAN - India							3.16	4.99	49.67	4.23	5.68	50.35
Japan	2.82	11.38	15.34	6.48	13.82	29.28	7.22	11.42	31.81	6.05	8.13	24.59
- Thai - Japan	2.82	11.38	15.34	6.46	13.76	29.28	6.94	10.97	30.56	5.76	7.74	23.40
- ASEAN - Japan	0.00	0.00	n.a.	0.00	0.00	n.a.	0.28	0.45	1.25	0.29	0.39	1.19
Korea (ASEAN-Korea)	0.18	0.52	4.90	2.14	4.58	47.90	2.64	4.17	58.85	3.49	4.69	60.24
Chile (Thai-Chile)							0.57	0.89	97.06	0.57	0.76	94.93
Peru (Thai-Peru)							0.01	0.02	4.14	0.04	0.05	11.65
Total	20.78	100.00	24.00	47.34	100.00	37.94	63.23	100.00	47.19	74.40	100.00	48.68

Sources: Author's calculations from official data source: preferential exports from Bureau of Preferential Trade, Ministry of Commerce; trade data from UNComtrade and World Trade Atlas.

Table 3: The FTAs Utilization Rates from Thai Imports, 2006-21

	2006-10			2011-15			2016-20			2021		
	Value of preferential imports (billion US\$)	Share in total preferential imports	FTA utilization (the value of preferential imports to total imports)	Value of preferential imports (billion US\$)	Share in total preferential imports	FTA utilization (the value of preferential imports to total imports)	Value of preferential imports (billion US\$)	Share in total preferential imports	FTA utilization (the value of preferential imports to total imports)	Value of preferential imports (billion US\$)	Share in total preferential imports	FTA utilization (the value of preferential imports to total imports)
ASEAN	4.22	65.06	15.46	15.90	37.88	20.24	11.75	30.83	28.82	13.21	27.09	29.11
Original countries	3.76	58.84	16.74	11.86	28.94	22.50	8.30	21.77	28.24	8.61	17.66	27.36
Brunei Darussalam	0.00	0.00	0.00	0.00	0.02	6.38	0.00	0.00	0.01	n.a.	n.a.	n.a.
Indonesia	1.52	23.38	33.46	5.16	12.42	35.60	3.06	8.01	44.68	3.25	6.67	39.52
Malaysia	1.02	16.24	10.96	3.12	7.86	22.22	2.88	7.55	24.85	2.88	5.91	23.92
Philippines	0.66	10.06	30.46	2.64	5.90	27.56	0.70	1.83	22.71	0.61	1.25	15.85
Singapore	0.58	9.18	9.10	0.96	2.74	15.50	1.67	4.38	22.87	1.87	3.83	25.37
New countries	0.44	6.22	9.28	4.02	8.94	16.90	3.45	9.06	30.30	4.60	9.44	33.09
Cambodia	0.00	0.14	11.34	0.22	0.50	18.88	0.48	1.25	41.14	0.50	1.03	56.39
Lao PDR	0.14	1.54	21.88	0.32	1.00	23.94	0.33	0.87	13.73	0.39	0.80	11.96
Myanmar	0.00	0.28	0.66	0.30	0.60	4.96	0.22	0.59	8.19	0.65	1.33	23.14
Viet Nam	0.30	4.22	22.06	3.22	6.86	31.62	2.42	6.36	47.39	3.06	6.28	44.01
Non-ASEAN members	2.54	34.56	3.90	26.24	62.06	18.88	26.37	69.17	27.80	35.90	73.59	28.44
Australia	0.46	7.88	n.a.	5.10	10.46	n.a.	0.83	2.17	19.89	1.03	2.11	16.10
- Thai - Australia	0.46	7.76	10.70	4.86	10.02	20.32	0.75	1.98	18.10	0.76	1.56	11.89
- ASEAN-Australia-New Zealand	0.00	0.10	n.a.	0.24	0.46	n.a.	0.07	0.20	1.79	0.27	0.55	4.21
New Zealand	0.16	2.70	n.a.	0.20	0.58	n.a.	0.09	0.23	12.94	0.54	1.11	65.97
- Thai - New Zealand	0.16	2.50	38.42	0.20	0.58	29.76	0.00	0.00	0.00	0.33	0.69	40.61
- ASEAN-Australia-New Zealand	0.00	0.20	n.a.	0.00	0.00	n.a.	0.09	0.23	12.94	0.21	0.43	25.36
China	0.14	3.24	0.84	10.98	26.56	18.10	14.02	36.79	30.24	19.72	40.42	29.71
India	0.00	0.62	1.72	1.70	3.44	19.32	0.70	1.84	17.53	0.82	1.69	12.81
- Thai - India							0.01	0.03	0.26	0.00	0.01	0.06
- ASEAN - India							0.69	1.81	17.27	0.82	1.68	12.74
Japan	1.66	19.52	n.a.	6.50	16.74	n.a.	8.16	21.41	26.17	10.64	21.81	29.88
- Thai - Japan	1.64	19.40	5.12	6.38	16.44	16.76	7.86	20.61	25.18	10.26	21.03	28.81
- ASEAN - Japan	0.00	0.08	n.a.	0.12	0.30	n.a.	0.31	0.81	0.99	0.38	0.78	1.07
Korea (ASEAN-Korea)	0.10	0.82	1.28	1.78	4.30	18.60	2.48	6.51	31.30	3.07	6.29	30.97
Chile (Thai-Chile)							0.06	0.15	14.28	0.06	0.12	10.59
Peru (Thai-Peru)							0.03	0.07	20.10	0.02	0.04	13.90
ASEAN-HK							0.00	0.00	0.00	0.00	0.00	0.04
Total	6.76	100.00	7.36	42.16	100.00	18.70	38.12	100.00	28.11	48.78	100.00	28.42

Sources: Author's calculations from official data source: preferential imports from the Customs Department, Ministry of Finance; trade data from UNComtrade and World Trade Atlas.

There are two alternatives to measure margins, i.e., applying count measures and value of exports. Using count measures; however, has limitations, especially in terms of treating different value of products equally. In fact, low- and high-value products could have implication on measurements of export margins and their determinants (Hummels and Klenow, 2005). In addition, it is likely that the number of export lines defined as extensive margin are far lower than those defined as intensive margin, but such extensive margins may be significant economically. To take this information into account, definitions of intensive (IN_j) and extensive (EX_j) margins are defined as follows;

$$IN_j = \frac{\sum_{i \in G_1^i} X_{ij}}{\sum_{i \in G_1^i} X_{iW}} \quad \text{and} \quad EX_j = \frac{\sum_{i \in G_2^i} X_{ij}}{\sum_{i \in G_2^i} X_{iW}} \quad (1)$$

where X_{ij} is the value of country j 's exports of good i , X_{iW} is the world's exports of good i , G_1^i and G_2^i stand for the group of traditional products and new products, respectively. From equation (1), the country's j intensive (extensive) margin is its world market share in traditional (new) products.⁶ Noted that we can define extensive margin in terms of world market share since, as mentioned in Cadot et.al. (2011), opening new export lines in developing countries tends to entail copying products from developed countries, not genuine innovation. Klinger and Lederman (2006) called an increase in export lines such as this 'inside-the-frontier innovation'.

In addition, our study examines extensive margins in terms of new export destinations for a particular product, which could have implications on economic growth (see Brenton and

⁶ Note that intensive and extensive margins defined as in equation (1) are slightly different from Hummels and Klenow (2005). In Hummels and Klenow (2005), intensive margins, which are calculated as the market share of exports, includes all active export lines (both traditional and new exports) while extensive margins measure the importance of all active export lines, i.e., how much the goods which the country exports count in terms of world trade. In equation (1), we clearly divide exports into traditional and new products and look at the importance of each product relative to corresponding world exports.

Newfarmer, 2007).⁷ Suppose $g_k^{j,d}$ is the exports of product k from country j to new destination country d . m_k^d is the imports of product k by the destination country d from any origin. The index to measure the importance of new destinations in country j is as follows;

$$EXM_j = \frac{\sum_{d=1}^X \sum_{k=1}^n g_k^{j,d}}{\sum_{d=1}^X \sum_{k=1}^n m_k^d} \quad (2)$$

To calculate export margins, data from UNCOMTRADE is applied. We use data under the Harmonized System (HS) classification 2002 at 6 digits, which covers approximately 5,000 products and 200 export destinations during 2003-2020. Note that we summarize extensive margins, as mentioned in equations (1)-(2) in 4-digit HS code.

Export sophistication index proposed by Hausmann et al. (2007) and Hidalgo and Hausmann (2009) will be employed. In short, the index 's formula is in Equations (3) and (4);

$$PRODY_k = \sum_j^n RCA_{k,j} Y_j \quad (3)$$

where $RCA_{k,j}$ = Reveal comparative advantage of product k from Country j using the

following formula: $\frac{x_{jk}/X_j}{\sum_j^n x_{jk}/\sum_j^n X_j}$

x_{jk} = Export value of product k from Country j

X_j = Total export value from Country j , $\sum_k^m x_{jk}$

Y_j = GDP per capita of Country j .

Note that there is alternative measure developed in Lall et al (2006). The main difference between Hausmann et al. (2007) and Lall et al (2006) is that in the latter, GDP per capita is

⁷ Note that the index in equation (2) is slightly different from Brenton and Newfarmer (2007). In Brenton and Newfarmer (2007), the index measures the importance of each market destination for active product lines of a country j (or country i in Brenton and Newfarmer (2007)). In equation (2), we consider only the importance of new market destinations for active product lines.

weighted by export share. This might enlarge the influence of the size of both the countries and the trade flows. By contrast, the former uses RCA index thereby eliminating the size influence.

According to Equation 3, products that high-income countries export and are in line with their comparative advantage ($RCA > 1$) are regarded as the sophisticated products. Hence, the product between RCA and GDP per capita will be large and so is the summation. In other words, the higher the value of $PRODY_k$, the greater the level of product sophistication is revealed. This is the way to avoid inferring from intrinsic product features (the technology embedded in it, the specialized skills required to produce it, R&D investments, etc.). Instead, the measure infers from observed patterns of trade, i.e., the products which require greater levels of development are likely to be exported. Note that in the previous studies, the weighted average of $PRODY_k$ is calculated to reflect the sophistication at the country level while in this paper, this method is applied to the sectoral level as expressed in Equation 4.

$$EXPY_{i,j,t} = \sum_{k \in i} \frac{X_{jkt}}{X_{jt}} * PRODY_k \quad (4)$$

As the core analysis is on sectoral difference in the sophistication level, the calculation is undertaken at the most disaggregate level of export, which can be compared across countries, i.e., at 6-digit HS level, and apply for individual FTA partners.

3.3 Export margins and sophistication in Thailand

Regarding export margins, intensive margins dominated export structure in Thailand, i.e., about 97 percent of Thai exports were classified as intensive margins, followed by extensive margins in terms of new markets and new products. The importance of intensive margins is found both in agriculture and manufacturing and their sub-sectors (Table 4). Since 2012, the share of intensive margin in agriculture exports showed an increasing trend while in manufacturing sector, its share slightly declined. The decline was evident in almost all sectors, except plastics and rubber products. For extensive margin, the world market share of new products, tended to fluctuate during 2006-20, reaching 5.37 percent in 2009-11, but declined to 0.23 percent in 2015-

17 and 0.45 in 2018-20 (Table 6).⁸ The share of extensive margin in 2009-11 arose mainly from the manufacturing sector, especially in chemicals, textiles, and electronics while in 2012-17 extensive margin in agriculture sector increased noticeably. During COVID-19, new products were found, mostly in manufacturing sector, particularly chemicals, electronics and electrical appliances and processed food. Extensive margin in terms of new markets was relatively more stable than that of new products during 2006-20 and on average manufacturing tended to be a key contributor to such margin. Market expansion was predominantly contributed by processed food, textile, electronics and vehicle parts. During the pandemic, extensive margins of pharmaceutical products, vehicle products and some agriculture products increased while those of the other sectors slightly declined.

Table 4: Intensive and extensive margins of Thailand's exports (% of World market), by sector during 2006-20

	Intensive (% of World market)					Extensive_Products (% of World market)					Extensive_markets (% of World market)				
	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20
Total	1.875	2.187	1.990	2.043	1.992	0.651	5.369	1.631	0.235	0.451	0.477	0.297	0.354	0.667	0.499
Agriculture (HS 0-21)	5.494	5.732	4.926	5.255	5.380	0.541	3.196	10.370	2.099	0.030	0.375	0.385	0.406	0.168	0.222
Manufacturing (HS 28-98)	1.784	2.095	1.984	1.956	1.887	0.927	9.723	1.627	0.234	0.491	0.552	0.463	0.445	0.813	0.627
Fish and crustaceans (HS03)	6.072	5.514	3.851	3.285	2.629	0.279	0.153	1.261	0.101	0.298	0.976	0.478	0.748	0.799	0.437
Preparations of meats, fish and crustaceans (HS16)	20.596	22.701	19.400	17.792	16.296	4.033	0.000	0.000	0.000	0.000	1.536	0.865	0.549	0.993	0.642
Products of Chemicals (HS 28-38)	1.090	1.364	1.546	1.285	1.189	0.468	18.308	0.218	0.977	0.276	0.444	0.325	0.433	0.255	0.260
Plastics and rubber (HS39-40)	4.070	4.867	4.609	4.360	4.401	0.028	0.119	0.104	0.000	0.000	0.834	0.487	0.369	0.427	0.285
Textile (HS 50_60)	2.757	3.049	2.555	2.552	2.552	0.475	0.503	4.131	5.760	0.050	1.085	1.074	0.665	0.618	0.586
Apparel and clothing accessories (HS 61-62)	1.183	1.003	0.771	0.688	0.674	0.000	0.000	0.378	0.339	0.000	0.377	0.327	0.331	0.192	0.169
Electronics (HS 84-85)	1.957	1.959	1.945	1.900	1.732	5.578	0.206	1.501	2.449	0.149	0.549	0.466	0.457	0.532	0.507
Vehicles (HS 87)	1.895	2.252	2.603	2.650	2.518	0.000	0.000	0.000	0.000	0.000	0.397	0.419	0.515	0.484	0.665

Note: Extensive margins in terms of products refer to both new products, which were exported into totally new markets and existing markets in which Thailand exports other products. Almost 99 percent of our observations show that new products were exports to the existing market. Extensive margins in terms of markets refer to expansion of markets in terms of both totally new markets and existing markets (for other existing products). On average almost 99 percent of our observations, market expansions were in a case of extension into existing markets.

Source: Author's calculation

⁸ It is interesting to note that when a number of new products in all markets are considered instead of their share in the world market, the picture remains the same, i.e., extensive margin remains relatively lower than that of intensive margin and tends to fluctuate during 2006-20. A number of new products in all market were only 404 out of 5,300 export products in 2006-2014 and declined to 151 from around 5,300 products in 2015-20. However, in some specific products, such as chemicals and textile, using a number of new products and their share in the world market yield different picture. For example, a number of new products in 2009-11 for chemicals and textile are similar, but a share in the world market of the former is greater than the latter. This implies that new products in chemical sector had higher value in the world market than those in textile. Thus, as mentioned by Hummels and Klenow (2005) using count measures to analyse extensive margin *per se* would have some limitations.

Intensive margins of FTA partners were relatively stable after the global financial crisis, about 61-62 percent of total intensive products of Thailand, and were prominent in China, Japan, Vietnam, Australia and original AEC countries like Malaysia, Singapore and Indonesia, reflecting by relatively higher share of intensive products in these markets (Table 5). During 2015-2020, there were six countries where intensive margins increased, namely China, Vietnam, Cambodia, Japan, Singapore and India. In China, such increases arose from agriculture products, processed food (especially those in preparation of meat, fish and crustaceans), products of chemicals and vehicle parts while intensive margins of electronics and electrical appliances slightly declined. The share of electronics and electrical appliances (old products), by contrast, went up in Vietnam and Japan, along with vehicle parts. Processed food expanded in Vietnam, but tended to be stable in Japan. For Cambodia, all sectors expanded, except apparel and clothing accessories. In India, products of chemicals, textile and processed food expanded while products in plastic and rubber categories (key export sector to India) remained relatively stable.

FTA partners had become more crucial in terms of extensive products as reflected by higher share of extensive products in these markets, both in terms of value and country coverage. In 2018-20, new products in these FTA partners reached almost 90 percent of total value of Thailand's extensive products from about 60 percent in 2015-17 while the share in terms of country coverage increased to 43 percent, from 12 percent during the same period. In other word, the new products tended to be concentrated more in FTAS partners, especially Asian countries. Within the FTA-partner countries, China, Vietnam, Hong Kong, Japan, Singapore and Malaysia tended to contribute significantly to extensive margins after the global financial crisis (Table 5). However, it seems that the share of extensive products continued to increase during 2015-2020 only in the three former countries and Indonesia. For China, extensive products were found in agriculture and chemical sectors while in Hong Kong, the new products were expanded in agriculture, textile and electronics. Textile and agriculture products were also expanded in Vietnam while in Indonesia, the new products were found in chemicals and electronics.

Table 5: Intensive and extensive margins of Thailand's FTA-partner countries (% of total Thailand intensive/extensive margins) during 2006-20

	Intensive margin (% of total Thailand intensive-margin value)					Extensive products (% of total Thailand extensive-products value)					Extensive markets (% of total Thailand extensive-markets value)				
	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20
Original AEC															
Brunei	0.067	0.065	0.070	0.040	0.042	0.251	0.011	0.001	0.007	0.009	0.2035	0.3352	0.4793	0.1492	0.9109
Indonesia	3.129	3.818	4.783	3.701	3.457	0.723	0.172	0.835	1.645	2.575	1.8482	3.0818	1.0791	4.4266	19.3636
Malaysia	5.288	5.337	5.645	4.559	4.230	0.518	0.654	5.199	6.537	1.073	2.6713	5.6201	0.2940	0.3821	1.0778
Philippines	1.970	2.176	2.274	2.964	2.710	0.028	0.006	3.134	3.226	1.180	1.2894	1.3028	1.4754	1.2241	1.3821
Singapore	6.102	4.835	4.572	3.789	3.816	7.373	0.118	9.907	4.335	1.311	2.8949	3.0880	1.4151	0.6415	0.2908
New AEC															
Vietnam	2.617	3.126	3.261	4.452	4.957	0.761	0.315	1.103	7.670	25.137	2.3177	1.5195	3.5873	2.9197	4.8639
cambodia	1.008	1.268	1.947	2.238	2.865	0.694	0.013	0.026	3.830	3.129	0.9493	0.7378	0.8430	0.6485	0.5108
Lao	0.886	1.136	1.704	1.831	1.550	4.302	1.618	0.165	1.095	4.004	0.3541	0.8228	1.6116	0.2751	0.5343
Myanmar	0.653	1.117	1.654	1.894	1.752	0.414	0.091	0.037	1.288	0.345	0.8457	0.8731	1.9951	0.6500	0.2687
China	9.262	11.237	11.701	11.390	12.186	27.143	83.829	6.137	13.168	20.515	2.0724	4.2442	2.5743	30.9374	3.3260
Japan	11.989	10.425	9.939	9.337	9.804	5.814	1.510	7.319	7.816	0.671	1.0114	1.1056	0.8151	7.3879	3.9726
Korea	2.034	1.905	1.846	1.934	1.900	1.920	0.099	6.896	1.756	0.020	1.9451	3.2088	5.4335	1.4825	0.8333
HK	5.699	6.812	5.003	5.357	4.752	0.000	0.031	29.384	3.707	27.175	0.9794	0.5727	0.4369	0.2222	11.3446
India	1.728	2.216	2.343	2.604	2.789	31.253	0.088	0.515	1.335	2.390	2.8510	3.0402	10.6892	0.8544	1.5339
Australia	3.878	4.498	4.424	4.581	4.368	0.080	3.382	0.112	1.165	0.087	1.9965	0.8862	1.9511	0.4079	0.5129
New Zealand	0.420	0.390	0.511	0.655	0.606	0.033	0.005	0.020	0.144	0.001	0.5359	0.1755	0.7035	0.5250	0.1878
Peru	0.058	0.121	0.194	0.178	0.119	0.000	0.000	0.000	0.055	0.000	2.2767	0.5158	0.7608	0.3457	0.3920
Chile	0.203	0.199	0.290	0.283	0.230	0.000	0.000	0.001	0.047	0.000	1.0532	0.5218	0.2740	0.4655	0.2354

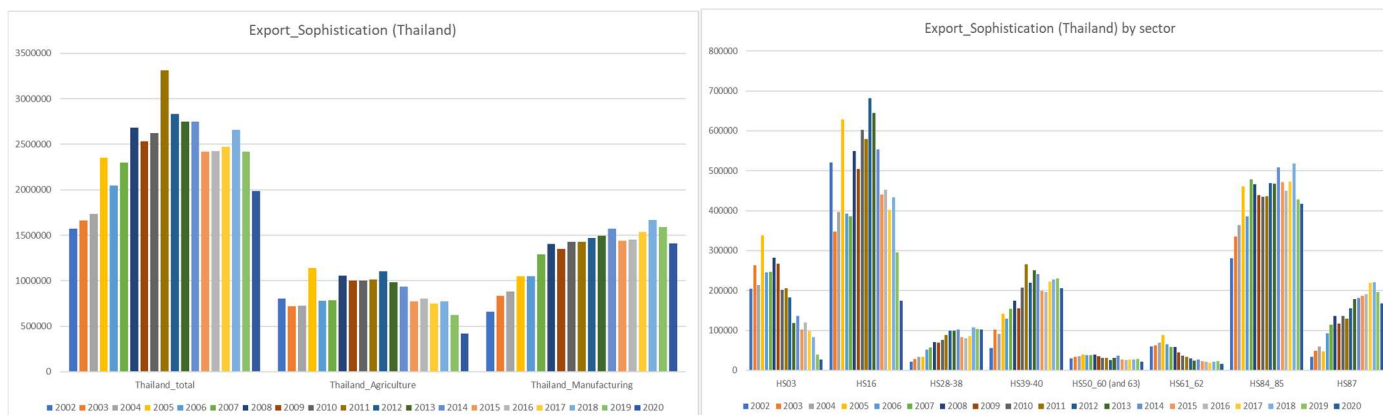
Note: Extensive margins in terms of products and markets are defined the same as in Table 4.

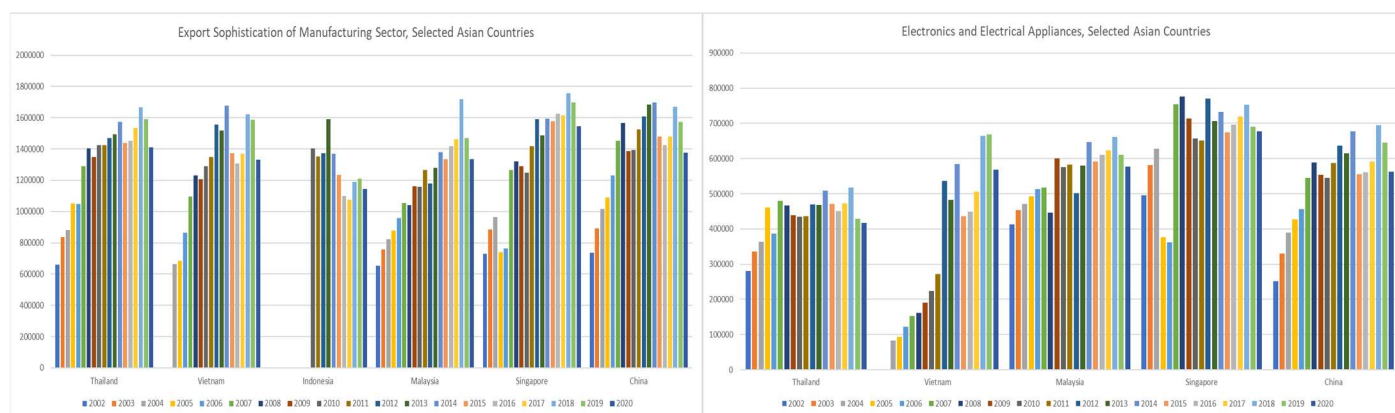
Source: Author's calculation

For extensive markets, mostly dominated by expanding existing products to Thailand's existing partners in which other Thai products were imported, FTA-partner countries accounted for around 50 percent of total Thailand's extensive margin value but only about less than 10 percent of all country coverage. This implies that although new markets were diversified in terms of number of countries, but the export value was still concentrated to particular markets, including some FTA-partner countries. Table 7 shows that among FTA-partner countries, China, Indonesia, Japan, Hong Kong, India and Vietnam dominated the market expansion after the global financial crisis. In China, the market expansion was discovered in plastics and rubber, textile and vehicle-parts sectors. The auto-parts sector was also revealed in Indonesia, Vietnam, Japan and India. In Vietnam and Japan, the expansion was also shown in chemical products, textile and apparel while in Indonesia, it was uncovered in processed food sector. In Hong Kong, extensive margins were shown in chemical products, textile and plastics and rubber. The latter two products were revealed in India.

While Thailand's intensive margins were relatively stable, with a slight expansion in agriculture products, and extensive products were evident in 2015-17, the export sophistication index measured by Hausmann et al. (2007) and Hidalgo and Hausmann (2009) method shows a declining trend after the global financial crisis. Figure 1 clearly shows that the decline was mainly contributed by deterioration of export sophistication in agriculture sector while the sophistication of manufacturing exports was relatively stable. This may reflect that expansion of agriculture products, especially in intensive margins, mostly occurred in relatively low value-added categories. In the manufacturing sector, the sophistication was comparable to Malaysia and Vietnam, but lower than that of Singapore and China. Disaggregated analysis shows that the sophistication obviously declined in processed food (HS03 and 16), textile (HS50-60, 63) and apparel and clothing accessories (HS 61-62) while it tended to be stable in chemical products and plastics and rubber products. In electronics and electrical appliances and automotive sectors, the sophistication tended to show a declining trend in 2018-2020. Compared to other selected Asian countries, the sophistication level in 2020 were the lowest, with the highest was revealed in Singapore, followed by Malaysia, China and Vietnam. By contrast, the sophistication of automotive sector tended to be the highest among these selected Asian countries, although it showed a declining trend recently as development of green vehicles, especially EV, in Thailand still follows many countries in Asia, including China.

Figure 1: Export Sophistication of Thailand and selected Asian Countries, 2002-20





Source: Author's calculations

For FTA partners, the product sophistication of Thai exports was evident in Japan and China, followed by Singapore, Australia, Hong Kong, and Vietnam (Table 6). Interestingly, while the sophistication noticeably declined in Japan during 2012-2020, it almost doubled in Vietnam and showed increasing trend in China during this period. The decline in the sophistication in Japan was driven by agriculture and food products, especially frozen and processed shrimp, fish and crustaceans (HS03 and HS16), while the sophistication of manufacturing continued to grow in various types of products, including chemical and allied industries, plastic and rubber, electronics and automotive products. This evidence was also revealed in Singapore where sophistication of food and agriculture products declined during this period, but with slower path than that revealed in Japan, while the sophistication of manufacturing exports slightly increased in 2018-20, particularly in chemical and allied industries. In China and Vietnam, the larger sophistication of Thai exports was driven by both agriculture/food and manufacturing products, with the higher growth of such sophistication discovered in the latter.

For other countries, the sophistication remained relatively constant, except New AEC countries, including Cambodia, Laos, and Myanmar, as well as the Philippines; Peru; and Chile where the export products exhibited more sophistication, though the level of the sophistication was far lower than that of Japan and China. In these countries, the sophistication was driven mostly by agriculture and food products. In Cambodia where the level of export sophistication was approaching to that of Malaysia, the sophistication of agriculture/food exports was discovered

in almost all categories, except cereals (HS10 – rice in particular) and products of the milling industries (HS11) while in manufacturing, except apparel and clothing accessories (HS62-63), the level of export sophistication increased in all categories. This finding confirms what was revealed in export margins where extensive products in Cambodia had showed an increasing trend over the past decades, along with an expansion of intensive margin.

Table 6: The Level of Thailand's Export Sophistication in Thailand's FTA-partner countries during 2006-20

	Total (million US\$)					Agriculture and Food					Manufacturing products (HS 2800-9706)				
	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20	2006_8	2009_11	2012_14	2015_17	2018_20
Original AEC															
Brunei	1,238	1,458	1,603	1,004	1,158	530	601	706	548	596	709	857	898	455	561
Indonesia	62,452	104,430	99,697	79,687	87,622	21,992	50,266	26,803	26,813	31,625	40,460	54,164	72,894	52,874	55,996
Malaysia	105,174	104,478	128,764	93,320	90,609	31,286	30,058	46,433	26,433	31,642	73,888	74,420	82,331	66,888	58,968
Philippines	34,580	45,039	52,348	59,743	61,242	10,331	15,022	14,458	11,411	12,471	24,249	30,017	37,890	48,333	48,771
Singapore	119,505	114,248	129,023	97,812	108,342	49,087	52,784	58,707	33,615	30,066	70,418	61,464	70,317	64,197	78,276
New AEC															
Vietnam	55,053	68,024	79,485	108,399	112,126	23,440	26,479	32,478	50,988	43,009	31,613	41,545	47,007	57,411	69,116
cambodia	26,513	33,662	57,617	64,003	83,263	16,502	20,709	34,591	33,391	46,746	10,011	12,953	23,026	30,612	36,517
Lao	21,276	30,266	46,994	49,107	42,594	11,077	16,257	25,803	24,409	24,093	10,199	14,010	21,191	24,699	18,501
Myanmar	15,654	32,872	53,793	57,464	49,048	8,174	20,160	33,168	35,038	26,965	7,479	12,711	20,625	22,426	22,084
China	139,371	178,142	215,578	210,114	235,415	47,311	44,130	61,291	62,953	79,705	92,060	134,012	154,287	147,161	155,710
Japan	325,818	343,078	339,633	262,378	243,290	186,106	193,399	189,670	126,525	90,304	139,712	149,679	149,964	135,853	152,986
Korea	48,479	48,185	53,641	46,642	45,329	27,275	22,101	23,641	17,298	16,442	21,204	26,084	30,000	29,344	28,888
HK	108,592	363,911	110,779	103,352	102,136	14,016	14,037	13,194	12,444	12,467	94,577	349,874	97,585	90,908	89,669
India	31,866	41,920	46,254	46,001	53,825	4,256	5,401	3,227	3,081	5,771	27,610	36,520	43,027	42,920	48,054
Australia	85,616	112,505	124,678	115,404	103,482	30,123	36,847	51,206	39,762	30,140	55,494	75,658	73,472	75,642	73,342
New Zealand	10,652	11,443	15,451	17,053	15,913	4,435	5,159	6,612	4,959	4,020	6,217	6,284	8,838	12,094	11,893
Peru	1,409	2,147	5,848	8,435	6,895	65	272	2,827	5,873	5,319	1,344	1,875	3,022	2,562	1,576
Chile	3,964	5,175	9,395	10,091	8,496	1,917	2,244	5,191	5,453	5,119	2,047	2,931	4,204	4,638	3,377

Source: Author's calculations

4. Empirical Model

Impacts of FTAs on export margins and sophistication are examined for FTA-partner countries at product level (4-digit HS code) during 2006-2020. Fourteen in-effect FTAs with 18 FTA-partner countries are included in the model and 4-digit HS code is chosen in the study due to data availability of control variables in the model. The models applied in this study are as follows:

$$ExportS_{i,j,t} = \exp\{\alpha_1 FTAex_{i,j,t} + \alpha_2 MFN_{i,j,t} + u_{it} + u_{jt} + u_{ij}\} \cdot \varepsilon_{ijt} \quad (5)$$

$$ExportS_{i,j,t} = \exp\{\alpha_1 FTAex_{i,j,t} + \alpha_2 MFN_{i,j,t} + \alpha_3 FTAIM_{i,j,t} + u_{it} + u_{jt} + u_{ij}\} \cdot \varepsilon_{ijt} \quad (6)$$

where $ExportS_{i,j,t}$ is Thailand's export structures of product i (HS-4 digit) relevant to FTA-partner country j at time t . Note that there are two types of exports structure as described in Section 3, namely (1) export margins composing of intensive margin (*Intensive*), extensive products (*ExtensiveP*) and extensive markets (*ExtensiveM*); and (2) export sophistication (*ExSophis*).

$FTAex_{i,j,t}$ is the proxy of FTAs for export side of product i , corresponding to country j at time t .

$FTAim_{i,j,t}$ is the proxy of FTAs for import side of product i , corresponding to country j at time t .

$MFN_{i,j,t}$ is MFN rate of product group i , corresponding to country j , at time t

u_{it} is the product-year fixed effects, controlling all time-variant product-specific elements such as output size, process, worker quality.

u_{jt} is the import-year fixed effects, controlling for all time-invariant import country-specific element such as market size and price indices. Note that with one country exporter, the import-year fixed effects could capture country pair-specific elements, such as the geographical distance, language commonality, or cultural ties between countries.

u_{ij} is the product-import fixed effect, capturing the effects of time-invariant product-import pair specific element, e.g., specific preferences of consumers in each country varying by products.

ε_{it} is the error term.

Note that FTAs utilization rates ($FTAex$, $FTAim$), i.e., the value of preferential exports (imports) adjusted by total exports (imports)⁹, is applied to proxy the use of FTAs. To take into

⁹ It is noteworthy that to calculate FTA utilization at the aggregate level, this study uses the total value of exports (imports) where zero tariff items values are included. This is in contrast with some studies, e.g., Plummer, Cheong, and Hamanaka (2010), using the value of non-zero tariff items only. The zero tariff lines are included here for two key reasons. First, the appropriate definition of non-zero-tariff items remains unclear when other tariff exemption schemes exist. A clear example is an export processing zone, where the tariffs of inputs used for export can be exempted. As the argument in favour of using only non-zero-tariff items goes, such exempted items should be excluded from the denominator. However, it is extremely difficult to exclude them in practice as it is not clear how much import values are subject to tariff exemption schemes. Second, negotiation in designing RoOs is done

account a case where a country has a multiple in-effect FTAs, such as Japan which has both Japan-Thailand FTA and ASEAN-Japan FTA or Australia, which has both Thailand-Australia and ASEAN-Australia-New Zealand FTAs, FTA utilization rates are divided into (1) $FTAex_D_{i,j,t}$ and $FTAim_D_{i,j,t}$ (called original FTAs) refer to the utilization rates (export and import side) under bilateral FTAs and that under ASEAN+, which a partner country has only single FTAs with Thailand, including ASEAN-Korea, ASEAN-China while (2) $FTAex_InD_{i,j,t}$, and $FTAim_InD_{i,j,t}$ (called alternative FTAs) refer to the utilization rates, replacing bilateral FTAs with those under regional ones for countries signing a multiple in-effect FTAs, including ASEAN-Japan; ASEAN-Australia-New Zealand; and ASEAN-India.¹⁰

Equations (5) and (6) are estimated by applying the Poisson pseudo-maximum likelihood (PPML) method, as suggested in Silva and Tenreyro (2006).¹¹ This type of fixed effect is also known to play a key role in addressing endogeneity bias in RTA variables (Baier and Bergstrand, 2007). The results are reported in terms of the incident rate ratios (IRR), which is calculated by exponentiating the Poisson regression coefficient. The ratios, which is greater than 1 and statistically significant, show that FTAs could positively influence export structure (the higher the ratios, the greater the influence of FTAs on the export structures).

Regarding the data sources, certificates of origin records for export side are from the Trade Preference Division, Department of Foreign Trade, Ministry of Commerce. On the import side, the certifications are from the Customs Department, Ministry of Finance. In general, certificate of origin records is classified according to the HS classification. MFN tariffs are from the Customs Department, Ministry of Finance. Trade data are from UNCOMTRADE and World Trade Atlas.

in all HS items regardless of their existing MFN tariff. If zero-tariff items are not relevant for FTA use, RoO negotiations should focus on non-zero-tariff items only.

¹⁰ Note that while this study applied the self-certification scheme, $FTAex_SC_{i,j,t}$ as an alternative variable to investigate impacts of FTAs. However, with small observations involved with this scheme, we cannot reveal impacts of such scheme on Thai export structure. In addition, for countries signing regional FTAs with ASEAN, it is possible for Thai exporters (importers) who export to (import from) ASEAN countries could utilize other ASEAN-FTAs, such as ASEAN-China or ASEAN-Korea, this study introduces $FTAex_InDD_{i,j,t}$, $FTAim_InDD_{i,j,t}$ to capture utilization when enterprises did not apply FTA corresponding to the FTA-partner country.

¹¹ In the estimation, we use a Stata command of “PPMLHDFE” (Correia et al., 2019; 2020).

5. Results

Tables 7-10 report results concerning impacts of FTAs on intensive margins, extensive margins in terms of products, markets and product sophistication, respectively. For each export structure, the analysis involves not only with income and product differences in response to FTA utilization but also differences in FTA-partner countries, particularly ASEAN countries and countries involved with ASEAN+, including China, Korea, Japan, India, Australia and New Zealand. Note that due to a small number of observations in each country, to study impacts of FTAs by FTA-partner countries, ASEAN countries are employed as a base case, then individual country utilizing ASEAN+ FTAs add other countries utilizing.

FTAs tended to generate favorable impacts in enhancing export structure in Thailand, except extensive margins involving with new products. The incident rate ratios associated with $FTAex_D_{ij,t}$ (called original FTAs) for intensive margins was positive and significant when all observations were included (Table 7), implying utilization of original FTAs helped expand the traditional products of Thailand in FTA-partner countries. The effect tended to be prominent in middle-income countries where tariff margins were far higher than those observed in the high-income countries' FTAs. In addition, for middle-income countries, IRR associated with $FTAex_InD_{ij,t}$ (the so-called alternative FTAs) was greater than 1 and significant. Such significance tended to be created by ASEAN-India in which utilization was increasing during 2006-2021 and in 2021 it was about 51 percent. The high tariff margins, about 13 percent on average, and less restricted rule of origins, i.e., there are more than one RoOs for firms to choose when applying for preferential treatments, may explain attractiveness of ASEAN-India FTA (Kohpaiboon and Jongwanich, 2022). Manufacturing products dominated the positive influence of FTAs on intensive-margins expansion in middle-income countries. For high-income countries, FTAs (through original FTAs: $FTAex_D_{ij,t}$) helped expand traditional products, but only in agriculture and food sectors, except Japan where indirect FTAs, namely ASEAN_Japan, helped boost the export products, reflecting by IRR associated with $FTAex_InD_{ij,t}$ was positive and statistically significant. Note that intensive margins driven by FTAs from import side were negligible, probably due to the fact that utilization had

been relatively low as importers have various choices to apply for tariff-exemption schemes as mentioned in Section 3.1.

When FTA-partner countries are concerned, FTAs tended to help promote expansion of Thailand's intensive margins noticeably in ASEAN (under AFTA) and China (under ASEAN-China FTA), particularly in manufacturing products (Table 7). The incident rates corresponding to these products were higher and became significant when Lao and Myanmar were excluded from our analysis. Value of preferential exports and utilization rates in these two countries were low, comparing to other ASEAN countries, except Singapore – the tariff-free country –, and they were mostly dominated by utilization in agriculture/food products (HS 4, 12, 17 and 21 in which utilization rate closes to or above 50%), particularly in a case of Myanmar. For ASEAN, FTAs tended to help expand intensive margins in completely built-up (CBU) vehicles, auto parts, electrical appliances (air conditioning, washing machines), tires, and primary petrochemical products, i.e., the main products in which exporters applied FTA scheme from AFTA (see Section 3.1). For China, interestingly, although FTA utilization was concentrated in food and agriculture products¹² such as fresh fruits and vegetables, cassava, and fish and crustaceans, our study revealed the positive and statistical impacts of FTAs on intensive margins only in manufacturing products, particularly natural rubber products, petrochemical products, and textile where the utilization rates were significant. This may probably due to more sophisticated and less flexible RoOs associated with food and agriculture products in ASEAN-China FTA than manufacturing ones (see Kohpaiboon and Jongwanich, 2022: Tables 3 and 5), and perhaps could be due to a decline in tariff margins in these products during our study period.¹³ The growth of utilization in agriculture was observed only around 3 percent on average during 2012-2020 while that of manufacturing products was about 5.5 percent during the same period.

Along with intensive margins, favorable impacts of FTAs were also evident on extensive margins in terms of market, i.e., expansion of other existing Thai products into these FTA-partners (Table 8). The IRRs associated with both original and alternative FTAs (export side) were

¹² FTA utilization for agriculture products is about 55 and 45 percent in 2020 and 2021, respectively.

¹³ The tariff margins in agriculture and food products declined from 9.92 percent in 2012 to 7.76 in 2020.

significantly greater than 1 and far higher than that in a case of intensive margins. This would suggest preferential treatments tended to help not only maintain traditional products in the FTA-partner countries, but also noticeably expand existing export products of Thailand into these markets.¹⁴ For the latter, the evidence was revealed both in high-income and middle-income countries, and mainly in manufacturing products. The significance of alternative FTAs ($FTAex_InD_{ij,t}$) was dominated by agriculture and food products of middle-income countries and as in a case of intensive margin, ASEAN-India helped expand extensive margins in India market markedly. Categories, which could notice the expansion of Thai existing products, were chemical; rubber products, textile, preparation of cereals; Lac Gums and Resins, vegetable planting, tree and other plants. Indirect FTA also influenced expansion of extensive markets in Japan, through ASEAN-Japan, but the positive relationship was shown only for agriculture and food products.

In line with intensive margin, evidence of extensive margins seemed to be more pronounced in ASEAN member countries and China, especially in manufacturing products. FTAs tended to help expand Thailand's extensive margins in Japan, Australia and New Zealand, especially for manufacturing products through original FTAs ($FTAex_D_{ij,t}$), i.e., Thai-Japan, Thai-Aus. The alternative FTAs like ASEAN-Japan; ASEAN-AUS-New did not generate favorable impacts in expanding extensive margins, except in a case of Japan for agriculture and food products as mentioned earlier. While extensive margins driven by FTAs from import side were negligible, in almost all scenarios, especially in ASEAN, Korea, China, Japan, India, Australia and New Zealand, the IRRs associated with MFN rates of these countries, especially in manufacturing products, were less than one. It tended to suggest that other things being equal, unilateral/multilateral liberalization from partner countries mattered in boosting market expansion of Thai products.

From table 9, the evidence was clear that when all observations are included, FTAs, both original and indirect ones, could enhance export sophistication of Thai export products in FTA-partner countries. However, when countries' income was concerned, original FTAs could not

¹⁴ It is noteworthy that FTAs driven expansion in FTA partner countries may arise from trade diversion from non-FTA partners, which is beyond the scope of our study, so that it would probably be overclaimed the benefit of FTAs concerning extensive margins in terms of market expansion.

significantly enhance export sophistication in high-income countries while the positive and significance of alternative FTAs ($FTAex_InD_{i,j,t}$) was observed only in Japan's, Australia's and New Zealand's agriculture and food products. For middle-income countries, FTAs enhanced export sophistication was shown in manufacturing products of ASEAN countries and China. To enhance export sophistication, FTA utilization from import side mattered in some cases, including that in middle-income countries – ASEAN, China and India. For ASEAN and China, the sophistication was apparent in agriculture and food products while in India, FTA (import) utilization caused sophistication appeared both food and manufacturing products. For high-income countries, though the importance of FTA utilization from import side was not observed when all observations were included, it appears to be crucial in cases of Japan and Australia-New Zealand. For the former, its importance was shown in manufacturing while in the latter its effect was observed in agriculture and food products. Utilization corresponding to imports, to a certain extent, helped explain such findings as imports of raw materials from Japan were mostly used in manufacturing sectors such as steel and auto-parts while primary and food-related products were imported from Australia and New Zealand. Importance of liberalization through FTAs' import side was in line with previous studies indicating trade liberalization could enhance firms' productivity, possibly through increasing quality and variety of intermediate inputs and strengthening competition.¹⁵ However, in a case of Thailand, Jongwanich and Kohpaiboon (2020) and Jongwanich (2022) showed that FTAs-led liberalization tended to generate less favorable impacts on promoting firms' productivity than unilateral/multilateral liberalization.

There is no evidence that FTAs, both export and import sides, helped expand extensive margins in terms of products, i.e., new products exporting to FTA partners, except in Australia and New Zealand in which the IRR was greater than one and significant (Table 10). Such insignificance might be due to few observations classified as new products exporting into FTA-partner countries so that the extensive products-FTAs nexus could not be revealed in the study or probably due to an ignorant role of FTAs in stimulating new export products, defined in developing countries as 'inside-the-frontier innovation'. As shown in previous studies¹⁶, main factors which drive new

¹⁵ See for example Aghion and Durlauf (2005); Amiti and Konings (2007); Melitz and Trefler (2012); Halpern et al. (2015)

¹⁶ See for example Belderbos (2003), Frost and Zhou (2005), Cadot et.al., 2013; Ferraris et al. (2017).

and innovative products in developing countries are quality of labour and investment, and excellent facilitation from government, especially in terms of creating good business environment.¹⁷ Trade liberalization is also mentioned in the previous literature as one of the key factors in driving innovative products, but mostly through unilateral/multilateral liberalization (see Cadot et.al., 2013 and the works cited therein).

6. Conclusion and Policy Inferences

This study aims to investigate the role of (in-effect) FTAs in influencing export structure defined as intensive margins, extensive margins (products and markets) and sophistication at product level using Thailand's FTA-partner countries as a case study during 2006-2020. Instead of using dummy variables, impacts of FTAs are measured by employing their utilization rates, and their impacts are separately examined in each FTAs, instead of lumping all FTAs together. The results showed that FTAs tend to generate favorable impacts in enhancing export structure in Thailand, except extensive margins in terms of new products. The preferential treatments noticeably expanded (existing) export products of Thailand into the FTA-partner countries (extensive margin in terms of market) while helped maintain traditional products exporting into these countries. Impacts of FTAs in enhancing intensive and extensive margins were pronounced in Middle-income partners and in manufacturing products. ASEAN and China were export destinations where FTAs driven intensive and extensive margins (markets) played a noticeable role. Regional FTAs, including ASEAN-Japan and ASEAN-Australia-New Zealand had a limited role in boosting intensive and extensive margins, especially in manufacturing products. Exception was found in ASEAN-India where it played a role in enhancing intensive and extensive margins. Preferential tariff schedule offered, and more relaxed rules of origin in ASEAN-India tended to be

¹⁷ Note that Pack and Saggi (2006) and Chang and Andreoni (2016) argue that public policy intervention helps determine future production possibilities under learning-by-doing economies while Hausmann, Hwang and Rodrik (2007) and Hausmann and Rodrik (2003) point out that due to the nature of investment, especially that involved with innovation, observing 'the returns to the pioneer investors' cost discovery become socialized if their pioneer (innovate) projects are successful but if the projects fail, the cost or losses remain private', without any interventions, the investment levels of these products are likely to be sub-optimal. Subsidizing initial entrants in new (innovate) activities is crucial in properly diversifying production structures and moving a country to a higher income level (Hausmann, Hwang and Rodrik, 2007).

a part of the reasons supporting such findings. Apart from FTAs, trade liberalization through unilateral/multilateral liberalization from the partner countries was still importance in expanding (existing) Thai products into these markets. Importance of AFTA and ASEAN-China FTA was also observed when export sophistication was concerned while FTAs high-income countries, including Japan, Australia and New Zealand through ASEAN+ tended to improve export sophistication in Thailand's food exports. Imports through FTAs helped only enhance export sophistication, while there is no evidence observed in cases of intensive and extensive margins.

There are three policy inferences could be drawn from this study. First, evidence of negative relationship between extensive markets, export sophistication and MFN tariffs suggests that unilateral/multilateral liberalization of trading partners is crucial in improving Thailand's export structure. From Thailand's experience, it tends to indicate that multilateral cooperation is still an essential way for helping developing countries expand the markets and upgrade their export quality. Second, while multilateral liberalization has been paused for a certain period and FTA negotiations are expected to drive further trade liberalisation, tariff cuts for import products under the FTA must be implemented in a comprehensive manner with minimum exceptions to ensure that the negotiation efforts undertaken so far are ultimately worthwhile. Reducing the costs incurred from the presence of RoOs is also essential in promoting FTA utilization. Lowering such costs requires the inter-governmental co-operation between exporting and importing countries. Although our analysis could not provide any concrete evidence regarding the role of self-certification (in AFTA) in enhancing Thai export structures due to negligible information of such certifications, with less involved sophisticated procedures, this scheme is likely to lower the incurred costs and promote FTA utilization. Thus, promoting self-certification scheme along with expanding the scheme into other FTAs is necessary to help improve FTA utilization rates and their role in influencing export structures. Third, since limited benefits from alternative FTAs are revealed in the study, introducing multiple FTAs for each partner, without adding new members, should be done with caution. From our evidence, it seems that firms tend to rigidly applying for the original FTAs, for example Japan_Thailand FTA instead of ASEAN_Japan or Thailand_Australia instead of ASEAN_Australia_New Zealand. To well harness benefits from new introduced FTAs, new countries, especially promising trading partners, should be included in those FTAs or at least

more relaxed rules of origins and improved path of tariff preferential schedules should be encouraged to ensure the ultimate benefits from the negotiation efforts.

Table 7: Impacts of FTAs on Intensive Margins during 2006-2020

	Total		High-income			Middle-income			ASEAN								
	Total	Total	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Manufact (without Lao and Myanmar)					
<i>FTAex_D</i> _{i,j,t}	1.082 0.086	1.163** 0.080	0.993 0.118	1.350* 0.240	0.906 0.120	1.212** 0.097	1.006 0.170	1.211** 0.105	1.172** 0.088	1.165 0.189	1.093 0.084	1.125* 0.088					
<i>FTAex_InD</i> _{i,j,t}	1.198 0.274	1.222 0.287	0.949 0.194	1.228 0.739	0.935 0.223	1.660** 0.389	1.660 0.713	1.492** 0.373									
<i>FTAim_D</i> _{i,j,t}		0.977 0.054	0.684** 0.111	1.125 0.131	0.530*** 0.115	1.080 0.066	1.184 0.163	1.025 0.068	0.974 0.076	1.213 0.155	0.865 0.075	0.929 0.086					
<i>FTAim_InD</i> _{i,j,t}		0.946 0.171	0.939 0.271	1.917 1.185	0.882 0.267	0.999 0.226	0.965 0.517	1.030 0.223									
<i>MFN</i> _{i,j,t}	0.996 0.009	0.987** 0.006	0.990 0.015	0.982 0.030	1.058 0.045	0.985** 0.007	0.973** 0.012	0.990 0.008	0.996 0.008	0.989 0.018	1.001 0.009	0.998 0.010					
C	0.033*** 0.002	0.019*** 0.001	0.016*** 0.001	0.020*** 0.005	0.012 0.001	0.017*** 0.001	0.059*** 0.009	0.011*** 0.001	0.012*** 0.001	0.020*** 0.003	0.011*** 0.001	0.009*** 0.001					
No. of obs	63,659	47,383	17,822	2,521	15,301	28,672	4,155	24,516	25,192	3,497	21,695	18,150					
Log pseudolikelihood	-483.845	-364.370	-127.685	-28.638	-99.012	-217.694	-49.850	-167.758	-158.880	-31.037	-127.791	-110.488					
Pseudo R2	0.417	0.347	0.321	0.313	0.319	0.336	0.420	0.297	0.3171	0.3474	0.3068	0.2836					
	ASEAN_Korea				ASEAN_China				ASEAN_Japan			ASEAN_India			ASEAN_Aus_New		
	Total	Agri and Food	Manufact	Manufact (without Lao and Myanmar)	Total	Agri and Food	Manufact	Manufact (without Lao and Myanmar)	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact
<i>FTAex_D</i> _{i,j,t}	1.149* 0.086	1.225 0.195	1.069 0.084	1.092 0.088	1.163** 0.088	0.974 0.158	1.151* 0.091	1.175** 0.096	1.123 0.105	1.075 0.197	1.079 0.110	1.165** 0.087	1.196 0.199	1.084 0.082	1.080 0.077	1.125 0.169	1.019 0.074
<i>FTAex_InD</i> _{i,j,t}									0.560 0.224	4.627** 3.203	0.379** 0.163	1.429* 0.274	1.497 0.700	1.33* 0.257	1.309 0.313	1.198 1.064	1.363 0.328
<i>FTAim_D</i> _{i,j,t}	0.948 0.069	1.137 0.142	0.864 0.068	0.917 0.076	1.040 0.064	1.287** 0.162	0.953 0.065	0.995 0.070	0.982 0.071	1.193 0.146	0.879 0.076	0.991 0.078	1.110 0.154	0.908 0.076	0.946 0.068	1.188* 0.134	0.840** 0.066
<i>FTAim_InD</i> _{i,j,t}									0.397 0.187	0.858 1.091	0.652 0.406	1.158 0.267	1.074 0.607	1.270 0.265	1.177 0.353	5.035*** 1.989	0.810 0.203
<i>MFN</i> _{i,j,t}	0.997 0.006	0.995 0.009	1.000 0.009	0.996 0.010	0.992 0.008	0.979# 0.014	0.996 0.010	0.996 0.010	0.994 0.009	0.989 0.017	1.004 0.010	0.988* 0.007	0.975* 0.014	0.996 0.007	0.995 0.008	0.987 0.017	0.999 0.009
C	0.012*** 0.001	0.018*** 0.002	0.010*** 0.001	0.009*** 0.001	0.021*** 0.001	0.050*** 0.009	0.016*** 0.001	0.015*** 0.001	0.016*** 0.001	0.035*** 0.005	0.012*** 0.001	0.012*** 0.001	0.024*** 0.003	0.010*** 0.000	0.013*** 0.001	0.019*** 0.003	0.012*** 0.001
No. of obs	28,859	3,964	24,895	21,353	30,267	4,351	25,916	22,373	30,448	4,376	26,072	28,295	3,901	24,394	29,508	4,219	25,289
Log pseudolikelihood	-173.526	-34.710	-138.759	-121.484	-226.912	-49.751	-177.074	-159.913	-240.262	-52.207	-187.942	-177.553	-34.344	-143.145	-181.837	-35.529	-146.248
Pseudo R2	0.314	0.339	0.305	0.283	0.362	0.416	0.339	0.328	0.322	0.382	0.298	0.314	0.351	0.302	0.320	0.338	0.313

Note: *FTAex_D*_{i,j,t}, called the original FTAs, refers to the utilization rates (export side) under bilateral FTAs or that under ASEAN+, which a partner country has only single FTAs with Thailand, including ASEAN-Korea, ASEAN-China; *FTAex_InD*_{i,j,t}, called alternative FTAs import side, is the utilization rates replacing bilateral FTAs with those under regional ones for countries signing a multiple in-effect FTAs, including ASEAN-Japan, ASEAN-Australia-New Zealand; ASEAN-India; *FTAim_D*_{i,j,t} and *FTAim_InD*_{i,j,t} are the utilization rates (import side) corresponding to the original and alternative FTAs, respectively; *MFN*_{i,j,t} is the MFN rate. Estimation results were obtained using the PPML method. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors clustered by product-import pairs are shown in brackets. The results are reported in terms of the incident rate ratios (IRR), which is calculated by exponentiating the Poisson regression coefficient. In all specifications, we control for the product-year fixed effects, the import-year fixed effects, and the product-import pair fixed effects.

Source: Author's estimations.

Table 8: Impacts of FTAs on Extensive Margins (Markets) during 2006-2020

	Total		High-income			Middle-income			ASEAN						
	Total	Total	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact				
<i>FTAex_D</i> _{ij,t}	2.053** 0.589	1.249 0.375	2.818* 1.603	1.371 1.047	3.398** 2.136	2.123** 0.729	1.137 0.614	1.808* 0.738	2.182** 0.870	0.736 0.471	2.826** 1.207				
<i>FTAex_InD</i> _{ij,t}	8.216* 9.331	9.629 9.347	0.253 0.381	0.000 0.002	0.240 0.381	10.476 15.996	100.565** 226.413	4.973 6.228							
<i>FTAIM_D</i> _{ij,t}		1.564 0.615													
<i>FTAIM_InD</i> _{ij,t}		0.016 2.021													
<i>MFN</i> _{ij,t}	0.964 0.041	1.111** 0.055	0.919 0.062	1.923 1.089	0.890 0.072	0.987 0.034	1.070* 0.043	0.932 0.032	0.936* 0.040	1.100 0.064	0.865*** 0.032				
C	0.155*** 0.037	0.024*** 0.006	0.015*** 0.003	0.000 0.000	0.017*** 0.003	0.143*** 0.031	0.151*** 0.060	0.135 0.023	0.281*** 0.066	0.280*** 0.127	0.142*** 0.021				
No. of obs	40,671	26,347	12,251	2,068	10,183	24,325	4,520	19,795	22,935	4354	18581				
Log pseudolikelihood	-74.896	-39.405	-13.644	-1.800	-11.832	-52.628	-12.853	-39.488	-49.349	-15.079	-34.049				
Pseudo R2	0.661	0.556	0.463	0.375	0.473	0.661	0.724	0.633	0.6993	0.7821	0.6248				
	ASEAN_Korea			ASEAN_China			ASEAN_Japan			ASEAN_India			ASEAN_Aus_New		
	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact
<i>FTAex_D</i> _{ij,t}	0.97983 0.353	1.296 0.818	1.862* 0.661	2.961*** 1.123	1.660 0.969	2.952** 1.370	1.988** 0.733	0.787 0.470	2.463** 0.986	0.260 0.441	0.016 0.042	0.271 0.335	8.245*** 5.216	0.141 0.362	8.032*** 4.531
<i>FTAex_InD</i> _{ij,t}							1.801 5.358	645.548*** 1393.805	0.544 1.670	5.536 9.404	36.739* 89.896	6.737* 8.353	0.266** 0.183	5.770 15.293	0.333* 0.210
<i>FTAIM_D</i> _{ij,t}															
<i>FTAIM_InD</i> _{ij,t}															
<i>MFN</i> _{ij,t}	0.920** 0.041	1.084 0.059	0.834*** 0.034	0.941 0.039	1.074 0.063	0.871*** 0.037	0.937* 0.037	1.103* 0.061	0.866*** 0.031	0.986 0.043	1.055 0.056	0.939 0.042	0.933* 0.038	1.093 0.063	0.869*** 0.031
C	0.302*** 0.074	0.278*** 0.119	0.151*** 0.025	0.237*** 0.055	0.288*** 0.1283098	0.141*** 0.026	0.255*** 0.055	0.2643*** 0.113	0.127*** 0.018	0.224*** 0.056	0.356*** 0.151	0.129*** 0.024	0.258*** 0.057	0.282*** 0.124	0.122*** 0.018
No. of obs	26,194	4914	21,280	26,231	5,011	21,220	25,706	4,913	20,793	25,209	4,776	20,433	26,066	4,933	21,133
Log pseudolikelihood	-53.701	-15.877	-37.523	-56.999	-15.980	-40.784	-52.711	-15.457	-37.018	-54.163	-16.411	-37.506	-52.436	-15.662	-36.556
Pseudo R2	0.688	0.777	0.612	0.687	0.776	0.620	0.691	0.781	0.613	0.697	0.774	0.633	0.692	0.780	0.615

Note: *FTAex_D*_{ij,t}, called the original FTAs, refers to the utilization rates (export side) under bilateral FTAs or that under ASEAN+, which a partner country has only single FTAs with Thailand, including ASEAN-Korea, ASEAN-China; *FTAex_InD*_{ij,t}, called alternative FTAs import side, is the utilization rates replacing bilateral FTAs with those under regional ones for countries signing a multiple in-effect FTAs, including ASEAN-Japan, ASEAN-Australia-New Zealand; ASEAN-India; *FTAIM_D*_{ij,t} and *FTAex_InD*_{ij,t} are the utilization rates (import side) corresponding to the original and alternative FTAs, respectively; *MFN*_{ij,t} is the MFN rate. Estimation results were obtained using the PPML method. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors clustered by product-import pairs are shown in brackets. The results are reported in terms of the incident rate ratios (IRR), which is calculated by exponentiating the Poisson regression coefficient. In all specifications, we control for the product-year fixed effects, the import-year fixed effects, and the product-import pair fixed effects.

Source: Author's estimations.

Table 9: Impacts of FTAs on Export Sophistication during 2006-2020

	Total	High-income			Middle-income			ASEAN							
		Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Manufact (without Lao and Myanmar)				
$D_{i,j,t}$	1.1869**	1.005	0.879	0.925	1.214***	0.850	1.387***	1.002	0.876	1.093	1.158*				
	0.093	0.110	0.134	0.149	0.094	0.150	0.115	0.081	0.119	0.099	0.115				
$lnD_{i,j,t}$	1.261*	1.398	6.599**	1.174	0.942	0.774	0.987								
	0.189	0.314	5.522	0.290	0.177	0.565	0.183								
$D_{i,j,t}$	1.126*	0.871	0.948	0.874	1.229***	1.479***	1.033	1.065	1.273**	0.929	0.951				
	0.081	0.081	0.108	0.098	0.101	0.212	0.090	0.079	0.133	0.083	0.089				
$lnD_{i,j,t}$	0.580**	0.555**	0.674	1.017	0.969	0.343	1.219								
	2.153	0.127	0.193	0.296	0.283	0.307	0.232								
$\rho_{i,t}$	0.987	0.995	0.992	1.009	0.982*	0.966***	0.992	0.996	0.987	1.000	0.988				
	0.010	0.006	0.006	0.052	0.010	0.013	0.012	0.009	0.013	0.011	0.013				
C	1926.339***	3619.732***	12586.820***	1199.300***	1182.432***	3242.999***	794.771***	1065.077***	3588.974***	553.206***	663.754***				
	148.871	174.484	1013.512	129.885	121.997	593.188	78.562	80.843	400.965	46.845	64.060				
No. of obs	48,733	18,335	2,633	15,702	29,595	4,419	25,176	25,903	3676	22227	18,617				
Log pseudolikelihood	426744.449	-102137.439	-22388.232	-74903.839	-228532.290	-60748.073	#####	-171164.856	-41801.902	-123096.947	-105571.657				
Pseudo R2	0.973	0.988	0.995	0.980	0.968	0.972	0.967	0.9697	0.9806	0.9612	0.964				
	ASEAN_Korea			ASEAN_China			ASEAN_Japan			ASEAN_India			ASEAN_Aus_New		
	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact	Total	Agri and Food	Manufact
$FTAex_D_{i,j,t}$	0.9415254	0.683***	1.138*	1.146**	0.859	1.275***	1.123	0.958	1.089	1.029	0.898	1.116	0.978	0.923	1.023
	0.072	0.089	0.092	0.087	0.137	0.107	0.093	0.149	0.087	0.082	0.120	0.099	0.072	0.121	0.088
$FTAex_lnD_{i,j,t}$							1.345	8.243**	0.290***	0.949	0.790	1.025	1.934**	17.073***	1.469
							0.578	8.064	0.093	0.167	0.562	0.174	0.510	15.889	0.409
$FTAim_D_{i,j,t}$	1.049	1.161	0.929	1.244***	1.543***	1.024	1.053	1.132	0.984	1.082	1.260**	0.963	1.110	1.430***	0.949
	0.077	0.128	0.077	0.102	0.208	0.094	0.083	0.155	0.084	0.079	0.130	0.084	0.086	0.161	0.074
$FTAim_lnD_{i,j,t}$							0.193**	0.111***	4.317***	1.126	0.294	1.441**	1.495	4.924***	0.923
							0.137	0.075	2.737	0.313	0.264	0.244	0.537	2.851	0.331
$MFN_{i,j,t}$	0.997	0.998	0.999	0.986	0.972**	0.994	1.001	1.005	1.000	0.990	0.974**	0.998	0.998	0.984	1.002
	0.007	0.007	0.011	0.012	0.015	0.013	0.009	0.015	0.010	0.009	0.012	0.010	0.011	0.013	0.012
C	1036.546***	3292.635***	529.466***	1384.585***	3958.739***	853.519***	1832.608***	7277.886***	685.046***	1025.839***	3883.634***	526.980***	1287.412***	3700.666***	731.162***
	61.018	220.115	43.650	135.084	632.8311	81.700	111.696	895.695	37.468	74.336	406.977	40.479	101.360	357.332	63.769
No. of obs	29,801	4171	25,630	31,064	4,555	26,509	31,232	4,586	26,646	29,232	4,153	25,079	30,274	4,418	25,856
Log pseudolikelihood	-199011.036	-51195.403	-139582.258	-249320.099	-66306.425	-173152.680	-246638.558	-66574.748	-168367.735	-192292.965	-44464.102	-140322.699	-210959.034	-52629.678	-149798.427
Pseudo R2	0.968	0.978	0.960	0.970	0.976	0.967	0.976	0.986	0.965	0.968	0.980	0.960	0.972	0.981	0.966

Note: $FTAex_D_{i,j,t}$, called the original FTAs, refers to the utilization rates (export side) under bilateral FTAs or that under ASEAN+, which a partner country has only single FTAs with Thailand, including ASEAN-Korea, ASEAN-China; $FTAex_lnD_{i,j,t}$, called alternative FTAs (import side), is the utilization rates replacing bilateral FTAs with those under regional ones for countries signing a multiple in-effect FTAs, including ASEAN-Japan, ASEAN-Australia-New Zealand; ASEAN-India; $FTAim_D_{i,j,t}$ and $FTAex_lnD_{i,j,t}$ are the utilization rates (import side) corresponding to the original and alternative FTAs, respectively; $MFN_{i,j,t}$ is the MFN rate. Estimation results were obtained using the PPML method. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors clustered by product-import pairs are shown in brackets. The results are reported in terms of the incident rate ratios (IRR), which is calculated by exponentiating the Poisson regression coefficient. In all specifications, we control for the product-year fixed effects, the import-year fixed effects, and the product-import pair fixed effects.

Source: Author's estimations.

Table 10: Impacts of FTAs on Export Margins (Products) during 2006-2020

	Total	Total	High-income	Middle-income	ASEAN	ASEAN_Korea	ASEAN_China	ASEAN_Japan	ASEAN_India	ASEAN_AUS
<i>FTAex_D</i> _{i,j,t}	1.847	0.692	0.062**	2.167	0.540	0.407	1.982	0.259	0.909	0.373
	0.958	0.611	0.080	1.489	0.474	0.390	1.217	0.329	0.857	0.289
<i>FTAex_InD</i> _{i,j,t}	2.423	6.352	1.383	0.779				6.500	2.271	16.475**
	2.035	14.273	1.725	1.192				7.550	2.430	76.760
<i>FTAIM_D</i> _{i,j,t}		0.132	9.168	0.171***	0.317*	0.222**	0.199**	0.601	0.286*	0.564
		0.187	17.260	0.116	0.228	0.151	0.128	0.805	0.214	0.513
<i>FTAIM_InD</i> _{i,j,t}		0.292	0.158	0.085***				0.0004	0.134***	0.0002
		0.692	0.276	0.045				0.0010	0.072	0.0002
<i>MFN</i> _{i,j,t}		1.072	1.718**	1.038	1.059	0.995	1.061*	1.146	1.046**	1.088
		0.080	0.244	0.024	0.056	0.053	0.038	0.148	0.019	0.064
C	0.135***	0.141***	0.044***	0.268***	0.274***	0.335***	0.234***	0.127	0.242***	0.223***
	0.014	0.048	0.021	0.040	0.065	0.091	0.039	0.086	0.031	0.055
No. of obs	3,159	1,874	504	861	664	824	938	992	780	814
Log pseudolikelihood	-51.799	-25.344	-6.146	-12.185	-9.900	-10.358	-12.817	-16.784	-10.645	-10.577
Pseudo R2	0.552	0.562	0.673	0.647	0.636	0.635	0.643	0.567	0.626	0.630

Note: *FTAex_D*_{i,j,t}, called the original FTAs, refers to the utilization rates (export side) under bilateral FTAs or that under ASEAN+, which a partner country has only single FTAs with Thailand, including ASEAN-Korea, ASEAN-China; *FTAex_InD*_{i,j,t}, called alternative FTAs import side, is the utilization rates replacing bilateral FTAs with those under regional ones for countries signing a multiple in-effect FTAs, including ASEAN-Japan, ASEAN-Australia-New Zealand; ASEAN-India; *FTAIM_D*_{i,j,t} and *FTAex_InD*_{i,j,t} are the utilization rates (import side) corresponding to the original and alternative FTAs, respectively; *MFN*_{i,j,t} is the MFN rate. Estimation results were obtained using the PPML method. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors clustered by product-import pairs are shown in brackets. The results are reported in terms of the incident rate ratios (IRR), which is calculated by exponentiating the Poisson regression coefficient. In all specifications, we control for the product-year fixed effects, the import-year fixed effects, and the product-import pair fixed effects.

Source: Author's estimations.

References

- Aghion, P. and S. Durlauf (2005), *Handbook of Economic Growth*, Elsevier, Amsterdam.
- Agosin, M.R., R. Alvarez, and C. Bravo-Ortega (2012), 'Determinants of Exports Diversification around the World: 1962-2000', *The World Economy*, 35 (3): 295-315.
- Amiti, M. and A. Khandelwal (2013), 'Import Competition and Quality Upgrading', *The Review of Economics and Statistics*, 95 (2): 476-490.
- Amiti, M., and Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review*, 97(5), 1611-1638.
- Amurgo-Pacheco, A. (2006). "Preferential Trade Liberalization and the Range of Exported Products: The Case of the Euro-Mediterranean FTA," *IHEID Working Papers* 18-2006, Economics Section, The Graduate Institute of International Studies.
- Amurgo-Pacheco, A, & M.D. Pierola. (2008). 'Patterns of Export Diversification in Developing Countries: Intensive and Extensive Margins', *World Bank Policy Research Working paper* 4473, The World Bank.
- Arellano, M., and S. Bond. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277-297.
- Baier, S.L. and Bergstrand, J.H., 2007, Do Free Trade Agreements Actually Increase Members' International Trade?, *Journal of International Economics*, 71(1): 72-95.
- Bas and Strauss-Kahn (2015), 'Input-trade liberalization, export prices and quality upgrading', *Journal of International Economics*, 95(2): 250-262.
- Bastos, P. and J., Silva, 2010, 'The Quality of a Firm's Exports: Where you Export to Matter', *Journal of International Economics*, 82(2), 99-111.
- Belderbos, R. (2003), 'Entry Mode, Organizational Learning, and R&D in Foreign Affiliates: Evidence from Japanese Firms', *Strategic Management Journal*, 24(3): 235-59.
- Besedes, T., and T. Prusa. (2006). Ins, outs, and the duration of trade. *The Canadian Journal of Economics*, 39(1), 266-295. doi:10.1111/j.0008-4085.2006.00347.
- Blundell, R., & S. Bond. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143.

- Brandt, L., J. V. Biesebroeck, and Y. Zhang, 'Creative Accounting or Creative destruction? Firm-level Productivity Growth in Chinese Manufacturing', *Journal of Development Economics*, 97 (2), 339–351.
- Brenton, P. and R. Newfarmer (2007), 'Watching more than the discovery channel: export cycles and diversification in development', *World Bank Policy Research Working Paper #4302*, The World Bank
- Cadot, O., C. Carrere and V. Strauss-Kahn (2013), 'Trade Diversification, Income and Growth: What Do We Know?', *Journal of Economic Survey* 27 (4): 790-812.
- Cadot, O., C. Carrère., and V. Strauss-Kahn. (2011). Export diversification: What's behind the hump? *The Review of Economics and Statistics*, 93(2), 590-590.
- Carluccio, J. and T. Fally (2013), 'Foreign Entry and Spillovers with Technological Incompatibilities in the Supply Chain', *Journal of International Economics*, 90(1), pp.123–35.
- Chang, H.-J. and A. Andreoni (2016), Industrial Policy in a Changing World: Basic Principles, Neglected Issues and New Challenges, *Cambridge Journal of Economics 40 Years Conference*, Cambridge, 12–13 July.
- Córcoles, D., Díaz-Mora, C. and Gandoy, R. (2019), 'Product Sophistication: A Tie that Binds Partners in International Trade', *Economic Modelling*, Vol. 44 No.1, pp. S33-S41.
- Correia, S., Guimarães, P., and Zylkin, T., 2019, Verifying the Existence of Maximum Likelihood Estimates for Generalized Linear Models, arXiv:1903.01633.
- Correia, S., Guimarães, P., and Zylkin, T., 2020, Fast Poisson Estimation with High-dimensional Fixed Effects, *The Stata Journal*, 20(1): 95-115.
- Costinot, A. (2009), 'On the Origins of Comparative Advantage', *Journal of International Economics*, 77(2), pp.255–64.
- Fan, H., Y.M Li and S. R. Yeaple. (2015), 'Trade Liberalization, Quality, and Export Prices', *The Review of Economics and Statistics* (2015) 97 (5): 1033–1051.
- Fang, Y., G. Gu, and H. Li (2015), 'The Impact of Financial Development on the Upgrading of China's Export Technical Sophistication', *International Economics and Economic Policy*, 12(2), pp.257–80.

- Fernandes, A. (2007), 'Trade Policy, Trade Volumes and Plant-Level Productivity in Colombian Manufacturing Industries', *Journal of International Economics* 71(1): 52-71.
- Ferraris, A., Santoro, G., & Dezi, L. (2017). How MNC's subsidiaries may improve their innovative performance? The role of external sources and knowledge management capabilities. *Journal of Knowledge Management*, 21(3), 540-552.
- Financial Times. (2021). Asia Benefits from Sharp Shift in Cross-Border Investment Flows, 2 February. <https://www.ft.com/content/ea7e36b8-210d-4198-a048-120e32f2df3939> (accessed 12 February 2021).
- Frost, T.S. and C. Zhou (2005), 'R&D Co-Practice and 'Reverse' Knowledge Integration in Multinational Firms', *Journal of International Business Studies*, 36(6): 676-87.
- Gorg H., L. Halpern and B. Murakozy, 2010, 'Why Do within Firm-Product Export Prices Differ across Markets?', *The World Economy*, 40(6): 1233-1246.
- Halpern, L., M. Koren., A. Szeidl (2015), 'Imported Inputs and Productivity', *American Economic Review*, 105(12): 3660-3703.
- Harding T, and B.S. Javorcik (2007), 'Note on the effect of FDI on export diversification in central and eastern Europe.', Unpublished manuscript. Retrieved 7 Dec 2009, from http://siteresources.worldbank.org/INTEXP/COMNET/Resources/Javorcik,_Note_on_the_Effect_of_FDI_on_Export.
- Harrigan, J., X. Ma and V. Shlychkov, 2015, 'Export Prices of U.S. Firms', *Journal of International Economics*, 97(1): 100-111.
- Hausmann, R., and D. Rodrik (2003). 'Economic Development as Self-Discovery', *Journal of Development Economics*, 72 (2): 603-33.
- Hausmann, R., J. Hwang., D. Rodrik, (2007), 'What you export matters', *Journal of Economic Growth* 12 (1), 1-25.
- Hidalgo, C., and R. Hausmann (2009). The building blocks of economic complexity. *Proceedings of the National Academy of Sciences of the United States of America* 106 (26), 10570-10575.
- Hoang, L., C. Ting-Fang and L. Li (2021), 'COVID forces Vietnam factories to choose sleepovers or stoppages', *Nikkei Asia* 20 July available at <https://asia.nikkei.com/Business/Companies/COVID-forces-Vietnam-factories-to-choose-sleepovers-or-stoppages>

- Hummels, D. and P. Klenow (2005), 'The Variety and Quality of a Nation's Exports', *American Economic Review* 95: 704-23
- Iwamoto, M. and K. Nabeshima (2012), 'Can FDI Promote Export Diversification and Sophistication of Host Countries? Dynamic Panel System GMM Analysis', Institute of Developing Economies, *IDE Discussion Paper*, No. 347, Tokyo: Institute of Developing Economies, Japan External Trade Organization (JETRO).
- Jongwanich, J. (2020). Export diversification, margins and economic growth at industrial level: Evidence from Thailand. *The World Economy*, 43(10), 2674–2722.
- Jongwanich, J. (2022), *The Economic Consequences of Globalization on Thailand*, Routledge, Taylor & Francis Group, London and New York.
- Jongwanich, J., and Kohpaiboon. (2020), 'Effectiveness of industrial policy on firm productivity: evidence from Thai manufacturing', *Asian-Pacific Economic Literature*, vol. 34(2): 39-63.
- Klinger, B. and D. Lederman. (2006), 'Innovation and Export Portfolios', *World Bank Policy Research Working Paper* 3983, World Bank, Washington DC.
- Kočenda, E. and K. Poghosyan (2018), 'Export Sophistication: A Dynamic Panel Data Approach', *Emerging Markets Finance and Trade*, 54(12), pp.2799– 814.
- Kohpaiboon, A. and J. Jongwanich (2022), 'Restrictiveness of RCEP Rules of Origin: Implications for Global Value Chains in East Asia', in Kimura, F., S. Urata, S. Thangavelu, and D. Narjoko (eds.), *Dynamism of East Asia and RCEP: The Framework for Regional Integration*. Jakarta: ERIA, pp.39-69
- Kohpaiboon, A., & Jongwanich, J. (2021). Global Value Chain and Clusters: Implication for ASEAN Integration. *Discussion Paper* No.62. Bangkok, Thailand: Faculty of Economics, Thammasat University.
- Kugler, M., and E. Verhoogen, 2009, 'Plants and Imported Inputs: New Facts and an interpretation', *American Economic Review Papers and Proceedings*, 99(2), 501-507
- Lall, S., J. Weiss., J. Zhang (2006), 'The 'sophistication' of exports: a new trade measure', *World Development* 34, 222–237.
- Li, A.X. (2015), 'State-Society Synergy and Export Sophistication', *Economics and Politics*, 27(3), pp.433–58.

- Manova, K., and Z. W. Zhang. (2012). Export Prices across Firms and Destinations. *The Quarterly Journal of Economics*, 127 (1): 379-436.
- Matthee, M. and M. Santana-Gallego (2017), 'Identifying the determinants of South Africa's extensive and intensive trade margins: A gravity model approach', *South African Journal of Economic and Management Sciences* 20(1), a1554.
- Mayer, T., M. Melitz., & G. Ottaviano. (2014). 'Market Size, Competition, and the Product Mix of Exporters', *The American Economic Review*, 104(2), 495-536.
- Melitz, M. and D. Trefler (2012), 'Gains from Trade When Firms Matter', *Journal of Economic Perspectives*, 26 (2): 91-118.
- Minondo, A. (2010), 'Exports' Quality-Adjusted Productivity and Economic Growth', *The Journal of International Trade and Economic Development*, 19(2), pp.257-87.
- Nguyen, D.X. (2016), 'Trade liberalization and export sophistication in Vietnam', *The Journal of International Trade & Economic Development*, 25 (8): 1-19.
- Organisation for Economic Co-operation and Development (OECD). (2020). COVID-19 and Global Value Chains: Policy Options to Build More Resilient Production Networks. Paris. https://read.oecd-ilibrary.org/view/?ref=134_134302-ocsbti4mh1&title=COVID-19-and-Global-Value-Chains-Policy-Options-to-Build-More-Resilient-Production-Networks.
- Osakwe, Santos-Paulino and Dagan (2018), 'Trade dependence, liberalization and exports diversification in developing countries', *UNCTAD Research Paper No.21*, United Nations.
- Pack, H. and K. Saggi (2006), Is There a Case for Industrial Policy? A Critical Survey, *World Bank Research Observer*, 21(2), pp.267-97.
- Park, I. (2022), 'Comparison of the Regional Comprehensive Economic Partnership and Other Free Trade Agreements' in Kimura, F., S. Urata, S. Thangavelu, and D. Narjoko (eds.), *Regional Comprehensive Economic Partnership: Implications, Challenges, and Future Growth of East Asia and ASEAN*, Jakarta: ERIA, pp.45-82
- Pavcnik, Nina. (2002). 'Trade Liberalization, Exit, and Productivity Improvement: Evidence from Chilean Plants', *Review of Economic Studies*. 69 (1): 245-76.
- Pham, C., and W. Martin. (2007). "Extensive and Intensive Margin Growth and Developing Country Exports." Unpublished. World Bank, Washington, D.C.

- Plummer, M.G., D. Cheong., and S. Hamanaka (2010), *Methodology for Impact Assessment of Free Trade Agreements*, Asian Development Bank.
- Schor, A. (2004), 'Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms', *Journal of Development Economics*, 75 (2): 373-96.
- Silva, S. and Tenreyro, S., 2006, The Log of Gravity, *Review of Economics and Statistics*, 88(4): 641–658.
- Straits Times (2021a), 'Malaysia's factory workers get COVID-19 jabs, as vaccinations top 200,000 for second day running' 17 January available at <https://www.straitstimes.com/asia/se-asia/malaysias-factory-workers-get-shots-as-vaccine-jabs-top-200000-for-second-day-running>
- Straits Times (2021b), 'Indonesia rolls out company-funded COVID-19 vaccinations of workers', 18 May available at <https://www.straitstimes.com/asia/se-asia/indonesia-rolls-out-company-funded-vaccinations-of-workers>
- Swenson, D.L. and H. Chen (2014), 'Multinational Exposure and the Quality of New Chinese Exports', *Oxford Bulletin of Economics and Statistics*, 76(1), pp.41– 66.
- Topalova, P., & Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of India. *Review of economics and statistics*, 93(3), 995-1009.
- Tran, T.H., Truong, Q.H., Dong, V.C. (2019), 'Determinants of Product Sophistication in Viet Nam: Findings from the Firm– Multi-Product Level Microdata Approach', *ERIA Discussion Paper Series* No. 314.
- Wang, Z. and S.-J. Wei (2010), 'What Accounts for the Rising Sophistication of China's Exports', in R. Feenstra, and S. J. Wei (eds.) *China's Growing Role in World Trade*. Chicago: University of Chicago Press, pp.63–104.
- Weldemicael, E. (2012), 'Determinants of Export Sophistication', The University of Melbourne, https://pdfs.semanticscholar.org/1992/e3dfd06ced9fe997d0b26843a660d93c4d_c8.pdf.
- Xu, B. (2010), 'The Sophistication of Exports: Is China Special?', *China Economic Review*, 21(3), pp.482–93.

- Xu, B. and J. Lu, (2007), 'The Impact of Foreign MNEs on Export Sophistication of Host Countries: Evidence from China', China Europe International Business School. <http://www.ceibs.edu/facultyCV/xubin/xu-lu.pdf>.
- Yao, S. (2009), 'Why Are Chinese Exports Not So Special?', *China and World Economy*, 17(1), pp.47–65.
- Zhang, T., Q. Fu and C. Zhu (2021), 'Trade Liberalization, Credit Constraints, and Export Quality Upgrading', *Empirical Economics* 63(1): 499-524.
- Zhu, S. and X. Fu (2013), 'Drivers of Export Upgrading', *World Development*, 51, pp.221–33.

Appendix I: Data Description and Correlations

Variable	Obs	Mean	Std. dev.	Min	Max
<i>Intensive</i> _{i,j,t}	107,604	0.002	0.024	0	2.972
<i>ExtensiveP</i> _{i,j,t}	111,960	0.000	0.015	0	1.664
<i>ExtensiveM</i> _{i,j,t}	111,960	0.000	0.020	0	2.795
<i>ExSophis</i> _{i,j,t}	111,960	65.109	1054.530	0	259475.800
<i>FTAex_D</i> _{i,j,t}	73,759	0.162	0.303	0	1.000
<i>FTAex_InD</i> _{i,j,t}	76,258	0.015	0.099	0	1.000
<i>FTAim_D</i> _{i,j,t}	63,676	0.159	0.304	0	1.000
<i>FTAex_InD</i> _{i,j,t}	67,027	0.012	0.083	0	1.000
<i>MFN</i> _{i,j,t}	110,249	5.363	12.096	0	513.000
<i>FTAex_InDD</i> _{i,j,t}	77,034	0.001	0.026	0	1.000
<i>FTAim_InDD</i> _{i,j,t}	67,027	0.001	0.025	0	1.000

Source: Author's compilation

<i>Intensive</i> _{i,j,t}	1										
<i>ExtensiveP</i> _{i,j,t}	0.0012	1									
<i>ExtensiveM</i> _{i,j,t}	0.0152	0.0055	1								
<i>ExSophis</i> _{i,j,t}	0.1355	0.0004	0.0069	1							
<i>FTAex_D</i> _{i,j,t}	0.0349	-0.0035	0.0009	0.0366	1						
<i>FTAex_InD</i> _{i,j,t}	-0.0057	-0.002	-0.0026	-0.0033	-0.0677	1					
<i>FTAim_D</i> _{i,j,t}	-0.0032	-0.0007	-0.0012	0.0003	0.0135	-0.0086	1				
<i>FTAex_InD</i> _{i,j,t}	-0.0041	-0.0015	-0.0024	0.0014	-0.0556	0.3373	-0.0076	1			
<i>MFN</i> _{i,j,t}	-0.0038	-0.0034	-0.005	-0.0015	0.0741	0.0594	0.0161	0.083	1		
<i>FTAex_InDD</i> _{i,j,t}	0.0013	-0.0008	-0.0011	0.0011	0.0205	-0.0089	0.0007	-0.0079	-0.0004	1	
<i>FTAim_InDD</i> _{i,j,t}	-0.0032	-0.0007	-0.0012	0.0003	0.0135	-0.0086	1.0000	-0.0076	0.0161	0.0007	1

Source: Author's compilation