# Asian Export Performance:
# Diversification, Product Variety, and Productivity

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## Declaration

I certify that this entire thesis is my own work. To the best of the author's knowledge, it contains no material previously published or written by another person, except where due reference is made in the text. All inaccuracies are mine.

Alongkorn Tanasritunyakul
16 October 2020

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## Abstract

This thesis investigates export performance in developing Asian countries with an emphasis on the role of product diversification, change in product variety, and the impact of export orientation on manufacturing productivity. The developing Asian countries provide an ideal laboratory for a comparative case study of these issues for two reasons. First, these countries as a group stand out among other regions in the world for achieving impressive export performance through export-oriented industrialisation. Second, there are significant differences among the countries in the region in terms of the timing of policy reforms in favour of export orientation.

Following the introductory chapter that spells out the purpose and scope of the study, the thesis is organised into four chapters. Chapter 2 reviews the policy context and trends and patterns in export performance in developing Asian countries to provide the context for the ensuing three chapters, which form the core of the thesis. These three chapters are written in the form of self-contained articles.

Chapter 3 examines the role of export diversification in export performance. The impact of export diversification on export performance is analysed by estimating a full-specified export equation using a panel dataset of non-oil exports covering the period 1976-2017. The autoregressive distributed lag (ARDL) estimator is used to delineate short-run and long-effects while minimising possible endogeneity bias. There are significant differences among countries and over time in individual countries in terms of the degree of export commodity diversification. The econometric evidence indicates that export diversification is negatively associated with long-run export growth of total non-oil exports and the main product categories. This finding is consistent with the standard trade theory, which postulates that export success depends on specification based on comparative advantage, and the findings of recent studies that specialisation in a few niche products is the key to export success.

Chapter 4 examines the role of product variety in export expansion, focussing on the contribution of the deepening of existing products (intensive margin), the emergence of new products (extensive margin) and the demise of existing products (failure margin) to export expansion of developing Asian countries during 1990-2017. The analysis of data at the five-digit level of the Standard International Trade Classification (SITC) Revision 3 shows a hump-shaped relationship between the level of development measured by GDP per capita and the

number of exported products. According to the disaggregated analysis, the deepening of existing products plays a more prominent role in export performance compared to the emergence of new products and the demise of existing products. The impact of product demise is not significantly high for relatively more successful exporting countries such as South Korea, China, Thailand, and Malaysia. The emergence of new products seems to play a significant role in export performance only in latecomer exporting countries.

Chapter 5 investigates the relationship between export performance and manufacturing productivity by testing two competing hypotheses: 'exporting by self-selection' and 'learning by exporting'. Compared to the previous studies of testing these two hypotheses, this chapter has two methodological innovations. First, it uses a simultaneous equation model that helps directly addressing the well-known endogeneity issue (bidirectional causation) between productivity and exporting. Second, foreign ownership of firms is incorporated into the model as the key intermediating variable between exporting and manufacturing productivity. This variable is central to understanding the relationship between productivity and export performance in developing countries where foreign direct investment (the involvement of multinational enterprises (MNEs) in domestic manufacturing) presumably plays a crucial role in determining both the degree of export orientation and productivity. The model is estimated using a new firm-level panel dataset compiled from the unpublished returns to the industrial censuses of 2007, 2012, and 2017 conducted by the National Statistical Office of Thailand. The results favour the learning by exporting hypothesis over the self-selection hypothesis. Foreign ownership plays an important role in of export orientation of Thai manufacturing, which in turn significantly contribute to improvement in manufacturing productivity.

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## Glossary

| | |
|---|---|
| ACF | Ackerberg-Caves-Frazer method |
| ADB | Asian Development Bank |
| ARDL | Autoregressive distributed lag |
| ASEAN | Association of Southeast Asian Nations |
| BOI | Board of Investment (Thailand) |
| EM | Extensive margin |
| FDI | Foreign Direct Investment |
| FM | Failure margin |
| FOW | Foreign ownership |
| FTA | Free Trade Agreement |
| GPN | Global Production Network |
| HHI | Herfindahl-Hirschman index |
| HS | Harmonised System |
| IM | Intensive margin |
| ISIC | International Standard Industrial Classification |
| LBE | Learning by Exporting |
| LPM | Levinsohn-Petrin method |
| MDR | Import intensity ratio |
| MNE | Multinational enterprise |
| NIEs | Newly Industrialising Economies |
| NTB | Non-tariff barrier |
| OLS | Ordinary Least Square |
| OPM | Olley-Pakes method |
| REER | Real Exchange Rate |
| SITC | Standard International Trade Classification |
| TFP | Total Factor Productivity |
| THI | The Theil index |
| UN | United Nations |
| UNCTAD | United Nations Conference on Trade and Development |
| WTO | World Trade Organization |
| XOR | Export-output ratio |
| 2SLS | Two-stage least square |

# Chapter 1
# Introduction

## 1.1 Motivation and the Asian context

Successful export performance is a key goal of policymakers in developing countries. The development experiences of developing countries during the post-World War II period demonstrate that export-orientation is closely associated with faster and sustainable economic growth and development. There is unanimity among development economists that export orientation contributes to economic growth over and above the direct contribution of exports as a component of aggregate demand. These indirect growth-stimulating effects include scale economies associated with world market penetration, productivity gains from exporter to foreign competition, technology transfer, and learning effects resulting from foreign firms' involvement in domestic export production. While gains from export orientation are widely acknowledged, the debate on the appropriate policy choice for designing export development strategy is far from settled. The purpose of this thesis is to contribute to this debate by undertaking a comparative study of export preformation of developing Asian countries.

For the purpose of the study, developing Asia is defined to encompass member countries of the Asian Development Bank (ADB) other than the small island economies in the Pacific and Papua New Guinea. These countries are suitable for a comparative study of export performance for three reasons. First, as a region developing Asia stands out among other geographical regions in the world for its superior export performance. The region's share in world merchandise exports rose from around 18% in 1980 to about 36% in 2018. By contrast, the share of Latin America remained virtually unchanged, around 5% throughout this period, while the share of Sub-Saharan Africa declined from about 5% in the early 1980s to 3% by the mid-2010s.[1]

Second, there are significant differences among the countries in the region, both in terms of the timing of policy shifts in favour of export orientation and export performance. The four Asian Tigers - Hong Kong, Taiwan, South Korea, and Singapore - took the lead in policy transition from closed-economy and import-substitution industrialisation strategy to export-oriented policy reforms in the late 1960s. The countries in Southeast Asia (Malaysia, Thailand,

[1] Data reported in thesis, unless otherwise stated, are compiled from the UN Comtrade database.

Indonesia, and the Philippines) began to emulate the Four Tigers from about the early 1970s, through the timing and intensity of reforms varied significantly among countries.

China has become the export powerhouse in the world economy, thanks to gradual market-oriented policy reforms began in the late 1970s that culminated in the country's accession to the World Trade Organization (WTO) in 2001. In 1989, Vietnam embarked on a gradual process of 'renovation reforms' (Doi Moi), and the reforms gathered momentum from about the dawn of this millennium. India, the second-biggest economy in the region, began to gradually dismantle restrictions on trade and foreign direct investment from the early 1990s. In recent years, the reform momentum, with export-orientation as a key policy goal, has spread to the remaining countries in the region. However, the transition economies in Central and West Asia are still at the formative stage of market-oriented policy reforms. Policy reforms in Myanmar and Pakistan have been seriously hampered by unsettled domestic political circumstances. In terms of export performance, countries in South Asia and Central and West Asia still lag behind China and the major economies in North Asia and Southeast Asia.

These two characteristics— 'diversity within unity' in export performance among the developing Asian countries— are essential prerequisites for an interesting comparative case study. In addition, there is a third reason that enhances the suitability of developing Asian countries for this study. This is the pivotal role played by the on-going process of global production sharing—the disintegration of production processes of vertically integrated manufacturing industries across national boundaries—in export-oriented industrialisation in the region.

Asian countries' engagement in global production sharing started with the arrival of US electronic multinational enterprises to set-up semiconductor assembly in Singapore in the early 1970s (Athukorala and Kohpaiboon, 2015). This new form of economic globalisation spread to many other countries in the region in subsequent years. As the liberalization reforms that started in the later 1970s gained momentum, China became the regional hub of global production networks. China-centred regional production network now accounts for over half of global manufacturing trade taking place within global production networks (Athukorala, 2017). Developing Asia, therefore, provides a valuable opportunity for examining the role of global production sharing and production networks in the expansion of manufacturing exports.

## 1.2 Structure

Following the introductory chapter, the thesis is organised into four chapters. Chapter 2 reviews the policy context, and trends and patterns of export performance in developing Asian countries during the period from 1970. The next three chapters form the core of the thesis. Chapter 3 examines the impact of export diversification on export performance. Chapter 4 discusses the role of deepening of existing products, emergence of new products, and death of products in export performance. Chapter 5 investigates the relationship between export performance and manufacturing productivity by testing two competing hypotheses: 'exporting by self-selection' and 'learning by exporting' using firm-level data for the manufacturing industry in Thailand.

The empirical analyses in Chapters 2-4 are based on a dataset compiled from trade data at the five-digit level of the Standard International Trade Classification (SITC) extracted from the UN Comtrade database. The empirical analysis of Chapter 5 is based on a new dataset compiled from unpublished returns to the Thailand manufacturing censuses conducted by the National Statistical Office of Thailand. The three core chapters are written in the form of self-contained articles. The key findings and suggestions for future research are discussed in the concluding section of each chapter.

The comparative survey of export performance in Chapter 2 shows that there are notable differences among countries in the region, in terms of the timing of reforms, comprehensiveness of the reforms package, incentive bias in favour of export orientation, and the degree to which the manufacturing industry is integrated within global production networks. However, in general, there has been a policy consensus in favour of greater export orientation among the countries. All countries have embraced promoting foreign direct investment, tariff reforms, and incentives for export-oriented firms as key elements of reforms. The share of the region in total world exports has increased continuously over the period of study, with a notable shift in the composition in favour of manufactured goods. However, there are significant differences in relative export performance among countries closely associated with the level of engagement in global production networks.

Chapter 3 examines patterns and trends of export product diversification in developing Asian countries and explores the role of export diversification in export performance. The analysis is based on a panel export dataset of non-oil exports covering the period 1976-2017. The impact of export product diversification on export performance is examined within a fully

specified export equation. The autoregressive distributed lag (ARDL) estimator is used to estimate short-run and long-run effects of export diversification on export performance.

The findings are as follows. First, most developing Asian countries experienced significant export diversification, with Cambodia and Pakistan recording a mild increase in the degree of product diversification over the period under study. Second, export diversification is negatively associated with long-run export growth for total non-oil merchandise exports and all subcategories. Thus, overall, the result supports the standard trade theory which postulates that a country gains from international trade by specialisation based on its comparative advantage rather than through direct policy intervention to artificially achieve diversification of the commodity composition. Direct policy intervention to stimulate export diversification may not always be an appropriate choice for developing countries. The appropriate policy is to create an overall economic climate that facilitates the adjustment of the commodity mix in line with a country's evolving comparative advantage in the context of the changing global economic context.

Chapter 4 deals with another dimension of changing export patterns: the relative importance of the deepening of existing products (intensive margin), the emergence of new products (extensive margin) and the demise of existing products (failure margin) in determining export performance. To address this issue, export growth is decomposed into these three components over the period 1990-2017. The analysis is based on data of non-oil exports compiled from the UN Comtrade database at the 5-digit level of the Standard International Trade Classification (SITC) Revision 3.

The key results are as follows. First, intensive margin plays a crucial role in export success for total merchandise and its subcategories. It seems that there is a lesser opportunity for moving into extensive margin when a country is specialising in a larger number of export products. There is also evidence that, in most countries, the first two years is the critical period for new products to become well established within the export structure. Most new products die within two years, and those survive this critical period became dynamic addition to the product mix. The product death rate (failure margin) is relatively high among newcomers to export-oriented industrialisation.

GDP per capita of the exporting country, world demand, and the level of trade openness are positively associated with product deepening (intensive margin) of total merchandise exports, manufacturing exports, and most subcategories of manufacturing exports. Trade liberalisation (reduction in tariff) is associated with new product emergence (extensive margin) only for total merchandise exports and non-GPN exports. Interestingly, there is no evidence to suggest that the stage of development of a given country (measured by GDP per capita) is negatively associated with product emergence. Finally, as expected, emergence of new products is much more important for the export success of latecomers to export-oriented industrialisation. Promoting FDI and facilitating access to domestic financing have the potential to promote emergence of new exporting products.

Chapter 5 makes a novel contribution to the empirical literature on the two-competing hypotheses relating to the association between export performance and productivity: firms' self-selection to exporting driven by productivity and learning by exporting (LBE) that leads to productivity gains. Compared to the previous studies of testing these two hypotheses, this chapter has two methodological innovations. First, it uses a simultaneous equation model that helps addressing the well-known endogeneity issue (bidirectional causation) involved in the relationship between productivity and export orientation. Second, foreign ownership of firms (that is, the engagement of multinational enterprises (MNEs) in domestic manufacturing) is used as the key intermediating variable between exporting and manufacturing productivity. This is important for testing the two hypotheses because MNE subsidiaries play a key role in export-oriented manufacturing in developing countries through both productivity improvement and providing marketing links. The model is estimated using a new firm-level panel dataset culled from the unpublished returns to the manufacturing censuses of 2007, 2012, and 2017 conducted by the National Statistical Office of Thailand.

The results indicate that the relationship between firm productivity and export orientation is positive and statistically highly significant, as suggested by the self-selection hypothesis. Productivity is a statistically significant variable in the export-orientation equation as suggested by the self-selection hypothesis. However, interestingly, foreign ownership is far more important in explaining export orientation compared to productivity. Put simply, foreign ownership is the key explanatory variable of export orientation, which is strongly associated with productivity in domestic manufacturing. Causation seems to run mainly from export

orientation to productivity, with foreign firms playing a key role in determining export orientation.

There is also evidence that investment incentives provided by the Board of Investment (BOI) are positively associated with higher export intensity. There is, however, no evidence that these incentives have a significant impact on firms' productivity. Overall, the results cast doubt on the findings of the previous single-equation studied in support of the self-selection hypothesis of firms' export orientation. Evidence from Thai manufacturing suggests that the findings of these studies for developing countries need to be treated with care because of the failure to take into account the pivotal role played by multinational enterprises in the export-orientation of these countries.

# Chapter 2
# Developing Asian Countries: Policy Context and Export Performance

This chapter presents an overview of the policy context and export performance of developing Asian economies to provide the context for the ensuing chapters. The chapter specifically focuses on the policy shift towards export orientation policy and the impact of the policy shift on export performance.

The chapter is organised as follows. The first section surveys the development in policy environment covering trends in tariff reforms, foreign direct investment (FDI) policy, inter-country differences in the current state of trade liberalisation, and the recent proliferation of free trade agreement (FTA) in the region. The second section examines trends and patterns of foreign investment and trade in Asia. The third section compares trends and patterns of trade in developing Asia with countries in other regions during 1970-2018. The final section extends the discussion on export performance to encompass the engagement of these countries in global production networks

## 2.1 The policy environment

Of the developing Asian countries, since the post-World War II, only the city state of Hong Kong has continued to maintain a fully open trade regime without any direct government intervention in domestic production. All other countries, even the city state of Singapore, started the post-war development strategy with an emphasis on import-substitution industrialization, which involved providing domestic manufacturing with tariff protection. From about the late 1960s, there has been a notable transition of the policy regimes of these countries from an emphasis on import substitution and towards export orientation. (Linder, 1986; Hill, 2017). In the late1960s, South Korea, Taiwan, and Singapore changed policy directions in favour of export-oriented industrialisation. Following the example of Japan, South Korea, and Taiwan had a greater emphasis on promoting export-oriented industrialisation with domestic enterprises playing the leading role, with selective approval of MNEs (multinational enterprises)

participation (Perkin, 2013)[2]. By contrast, Singapore's development strategy had the unique feature of placing emphasis on the role of MNEs as the key players in the process of export-oriented industrialisation (Hobday, 2013).

In the 1970s, Malaysia, Thailand, and the Philippines began to embark on export-led industrialisation. Following Singapore, these countries placed emphasis on MNE involvement in export-oriented industrialisation. China has gradually opened the economy to foreign trade and investment starting in the late 1970s. Reforms during the next two decades culminating in the country's accession to the World Trade Organization (WTO) in 2001 have made China the export powerhouse in the world economy. In subsequent years, the reform momentum has spread to India, Vietnam, and other countries in Southeast Asia and Central and West Asia. The success stories of Japan, Taiwan, and South Korea have undoubtedly had a significant demonstration effect on the spread of export-oriented reforms in the region. However, a significant impact of the MNE-led strategy in Singapore can be seen in the reform processes of all latecomers to reforms in the region, including in China.

The applied average applied tariff rates of developing Asian countries for the period 1980-2015 are summarised in Table 2.1. Asian countries have been gradually reducing tariff rates over the past five decades. Until about the late 1990s, all countries in the region other than Hong Kong, Singapore and South Korea had tariff rates well above 10%. India stands out for its high average tariff rate of over 30% throughout this period. However, all countries have reduced tariff rates from about the year 2000. Since the average applied tariff rates were below or close to 10% for most of the countries in the region. South Asia generally has higher tariff rates compared to the other subregions in Asia. Interestingly, latecomer countries in Central and West Asia had low average tariff rates, especially Georgia.

Tariff rate is only a partial indicator of economic openness. This is because most countries have continued to use various forms of non-tariff barriers (NTBs) to foreign trade. In addition to NTBs, we need to take into account policies toward foreign direct investment and the use of exchange rate policy as a protectionist measure in order to get a full picture of

[2] Japan initiated the export-orientation policy in the 1950s and became the role development model for Taiwan and South Korea.

economic openness. We therefore employ the Sachs-Warner trade liberalisation index to get a more comprehensive view of policy reform (Sachs & Werner 1995).[3]

Table 2.1 Trends in average applied tariff rates in selected developing Asian countries[1]

| | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-04 | 2005-09 | 2010-15 |
|---|---|---|---|---|---|---|---|
| China | 49.5 | 39.3 | 36.7 | 18.0 | 12.9 | 8.8 | 7.9 |
| Hong Kong | n.a. | n.a. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| South Korea | n.a. | 17.5 | 12.1 | 9.3 | 9.6 | 9.3 | 8.8 |
| | | | | | | | |
| Brunei Darussalam | n.a. | n.a. | 2.9 | 4.0 | 3.4 | 3.1 | 2.4 |
| Cambodia | n.a. | n.a. | n.a. | n.a. | 16.4 | 13.2 | 11.5 |
| Indonesia | n.a. | 13.7 | 19.9 | 12.6 | 6.4 | 5.8 | 5.3 |
| Malaysia | n.a. | 14.9 | 14.7 | 11.1 | 9.0 | 7.0 | 5.9 |
| Philippines | 29.3 | 27.8 | 20.6 | 13.3 | 5.8 | 5.1 | 4.1 |
| Singapore | n.a. | 0.5 | 0.4 | 0.2 | 0.0 | 0.1 | 0.2 |
| Thailand | 41.2 | 40.3 | 43.1 | 32.2 | 14.2 | 10.7 | 10.1 |
| Vietnam | n.a. | n.a. | 10.1 | 12.3 | 13.1 | 10.4 | 6.8 |
| | | | | | | | |
| Bangladesh | n.a. | n.a. | 84.9 | 24.9 | 20.4 | 14.5 | 13.2 |
| India | 74.3 | 93.5 | 68.4 | 32.8 | 29.6 | 13.1 | 10.1 |
| Nepal | 22.1 | 21.6 | 20.9 | 18.0 | 14.7 | 13.7 | 12.7 |
| Pakistan | n.a. | 66.7 | 58.5 | 40.2 | 19.0 | 14.7 | 14.1 |
| Sri Lanka | 31.0 | 27.6 | 24.9 | 15.7 | 9.9 | 11.2 | 9.4 |
| | | | | | | | |
| Armenia | n.a. | n.a. | n.a. | n.a. | 3.6 | 3.8 | 4.8 |
| Azerbaijan | n.a. | n.a. | n.a. | n.a. | 11.5 | 9.7 | 9.0 |
| Georgia | n.a. | n.a. | n.a. | n.a. | 8.8 | 2.9 | 0.9 |
| Kazakhstan | n.a. | n.a. | n.a. | n.a. | 2.4 | 4.5 | 7.3 |
| Kyrgyz Republic | n.a. | n.a. | n.a. | n.a. | 5.4 | 3.0 | 3.7 |

Note: 1. The figures are simple average applied tariff for all products. n.a. denotes non-available data.
Source: Compiled from the World Bank database for the database in 1990-2015 and Nicita and Olarreaga (2007) for the database in 1980-1989.

The Sachs-Warner index distinguishes countries with liberalised trade policy regimes from other countries with interventionist trade policy regimes based on five criteria: no average tariff rates of 40% or more on imports of intermediate and capital goods, no non-tariff barrier covering 40% or more of imports of intermediate and capital goods, no black market exchange rate premium of 20% or more, no a socialist economic system, and none of a state monopoly on major export.

[3] Sachs and Werner (1995) covered the post-war period up to the early 1990s. Wacziarg and Welch (2008) and Paudel (2014) have updated the data to about 2013.

Table 2.2 depicts trade liberalization status of selected Asian countries based on the Sachs-Warner binary index. According to this index, Hong Kong, Singapore, Malaysia, and Thailand have remained as open trade regimes throughout the post-war era. South Korea moved to an open trade regime in the 1960s. There was the transition from closed to open trade regimes for most developing Asian countries in the 1990s. In contrast, even though China, Vietnam, and Kazakhstan have undertaken tariff reforms significantly, their economies have incorporated 'socialist economic system'. The Sachs-Warner index thus classifies these economies as closed trade regimes.

Table 2.2 The Sachs-Warner index of trade liberalisation status

| | The Sachs-Warner index Liberalization status/dates during 1945-2014 |
|---|---|
| China | Remain closed[1] |
| Hong Kong | Always open |
| South Korea | 1968 |
| Taiwan | 1963 |
| | |
| Brunei Darussalam | 2001 |
| Cambodia | 2001 |
| Indonesia | 1970 |
| Malaysia | Always open |
| Philippines | 1988 |
| Singapore | Always open |
| Thailand | Always open |
| Vietnam | Remain closed[1] |
| | |
| Bangladesh | 1996 |
| India | 1994 |
| Nepal | 1991 |
| Pakistan | 1991 |
| Sri Lanka | 1991 |
| | |
| Armenia | 1997 |
| Azerbaijan | 1996 |
| Georgia | 1996 |
| Kazakhstan | Remain closed[1] |
| Kyrgyz Republic | 1995 |

Note: 1. Remain closed only in terms of the country's 'non-market economy' status.
Source: Sachs and Warner (1995), Wacziarg and Welch (2008), and Paudel (2014).

In the late 1990s, Asian economies began to embrace the new-found global enthusiasm for signing FTAs as part of trade policy reforms and as new regionalism in East Asia (Harvie & Lee, 2003). The numbers of FTAs in the region have increased dramatically during the last two decades. By the late 2010s, there were more than 250 FTAs involving developing Asian countries. Asia is, in fact, the most outstanding case in the world of FTA activities (Baldwin, 2006). Especially in developing East Asia, there are six countries (China, South Korea, Indonesia, Malaysia, Thailand, and Singapore) that have more than 30 engagement FTAs. Also,

the pattern of FTA activities in Asia was not only located in Asia but also was negotiating with partners outside Asia such as the European Union and the US.

Table 2.3 Status of free trade agreements (FTAs) in developing Asian countries (numbers)[1]

| | Total | signed and in effect | Negotiations launched | Proposed/under consultation and study | Discontinued |
|---|---|---|---|---|---|
| China | 47 | 21 (4) | 10 | 16 | 0 |
| Hong Kong | 10 | 8 | 1 | 1 | 0 |
| South Korea | 41 | 18 (1) | 13 | 10 | 0 |
| Brunei Darussalam | 21 | 10 | 1 | 9 | 1 |
| Cambodia | 17 | 7 | 1 | 9 | 0 |
| Indonesia | 40 | 15 (4) | 7 | 18 | 0 |
| Malaysia | 34 | 18 (2) | 6 | 9 | 1 |
| Philippines | 26 | 9 | 3 | 14 | 0 |
| Singapore | 43 | 26 (1) | 7 | 7 | 3 |
| Thailand | 38 | 15 (1) | 9 | 14 | 0 |
| Vietnam | 26 | 13 (1) | 3 | 9 | 1 |
| Bangladesh | 13 | 4 (1) | 2 | 7 | 0 |
| India | 42 | 14 (1) | 16 | 12 | 0 |
| Nepal | 5 | 2 | 1 | 2 | 0 |
| Pakistan | 32 | 11 (2) | 6 | 15 | 0 |
| Sri Lanka | 15 | 6 | 3 | 6 | 0 |
| Armenia | 24 | 15 (3) | 4 | 5 | 0 |
| Azerbaijan | 9 | 9 | 0 | 0 | 0 |
| Georgia | 17 | 13 | 0 | 4 | 0 |
| Kazakhstan | 28 | 15 (3) | 6 | 7 | 0 |
| Kyrgyz Republic | 25 | 15 (3) | 4 | 6 | 0 |

Note: 1. The figure in parentheses denotes numbers of signed but not yet in effect FTAs.

Source: Compiled from the Asia Regional Integration Center database (www.aric.adb.org), updated as of the end of 2019.

Table 2.3 provides data on the status of free trade agreements (FTA) in North Asia, Southeast Asia, South Asia, and some transition economies in Central and West Asia. The engagement FTAs include FTAs with four statuses: (1) signed and in effect (or not yet in effect), (2) negotiations launched, (3) proposed/under consultation and study, and (4) discontinued. In 2019, China had the highest numbers of engagement FTAs in the region (47 FTAs), followed by Singapore (43 FTAs), India (42 FTAs), and South Korea (41 FTAs). The signed and in effect FTAs accounted for more than 50% of the engagement FTAs in most cases in Asia. Interestingly, transition economies in Central and West Asia had substantial numbers of engagement FTAs, especially numbers of signed and in effect FTA.

It is important to note that global economic integration of these countries was well underway before this new-found enthusiasm for signing FTAs. Whether FTAs have made a significant contribution to trade liberalisation over and above the unilateral reforms

implemented in the preceding two decades remains a debatable issue. The available evidence suggests that unitisation of tariff concessions offered under FTAs are not widely used by traders because of administrative complications related to rules of origin (ROOs) attached to these agreements. In addition, overlapping FTAs with multiple ROOs (known as the 'noodle bowl effect') complicate international trade and presumably add to trade cost (Baldwin, 2008; Menon, 2019; Menon & Melendez, 2017).

Table 2.4 Trade orientation of developing Asian countries: Merchandise trade as percentage of GDP [1]

| | 1970/71 | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
|---|---|---|---|---|---|---|
| East Asia | | | | | | |
| China | 4.9 | 21.2 | 33.7 | 38.6 | 48.5 | 33.3 |
| Hong Kong | 141.3 | 152.2 | 222.5 | 237.4 | 378.6 | 332.1 |
| South Korea | 33.1 | 62.9 | 47.0 | 55.5 | 82.0 | 65.5 |
| Southeast Asia | | | | | | |
| Brunei Darussalam | 179.3 | 105.3 | 98.2 | 84.6 | 85.2 | 75.3 |
| Cambodia | 10.0 | n.a. | n.a. | 90.3 | 115.4 | 122.6 |
| Indonesia | 24.0 | 43.4 | 46.0 | 62.6 | 40.8 | 33.7 |
| Malaysia | 76.4 | 95.1 | 138.9 | 183.2 | 141.0 | 129.7 |
| Philippines | 33.4 | 41.4 | 47.7 | 87.4 | 50.3 | 53.2 |
| Singapore | 206.1 | 353.5 | 294.9 | 274.1 | 276.9 | 207.6 |
| Thailand | 28.5 | 48.7 | 66.5 | 104.5 | 116.0 | 99.7 |
| Vietnam | n.a. | n.a. | 62.8 | 96.1 | 142.9 | 193.6 |
| South Asia | | | | | | |
| Bangladesh | n.a. | 17.9 | 16.6 | 28.3 | 44.0 | 36.0 |
| India | 6.6 | 12.4 | 13.5 | 19.7 | 38.3 | 29.6 |
| Nepal | 14.3 | 22.0 | 24.7 | 40.0 | 36.4 | 45.1 |
| Pakistan | 11.3 | 32.0 | 32.6 | 24.3 | 33.0 | 26.3 |
| Sri Lanka | 30.6 | 71.8 | 56.6 | 70.1 | 42.9 | 37.8 |
| Central and West Asia | | | | | | |
| Armenia | n.a. | n.a. | n.a. | 59.5 | 52.9 | 57.5 |
| Azerbaijan | n.a. | n.a. | n.a. | 60.5 | 65.3 | 63.4 |
| Georgia | n.a. | n.a. | n.a. | 33.5 | 58.9 | 68.4 |
| Kazakhstan | n.a. | n.a. | n.a. | 71.9 | 62.2 | 49.3 |
| Kyrgyz Republic | n.a. | n.a. | n.a. | 69.9 | 102.3 | 83.7 |

Note: 1. Two-year averages. n.a. denotes non-available data.
Source: Compiled from the World Bank database.

All in all, the policy environment in Asia has become more liberalization during the past five decades. In Table 2.4, trade-orientation measured as trade (exports and imports) as a percentage of GDP has increased over time in all countries, notwithstanding a minor reversal in some countries following the global financial crisis. Interestingly, in Hong Kong, Singapore,

Malaysia, Vietnam and Cambodia, the trade to GDP ratios are well over 100%. This pattern reflects these countries' engagement in global production networks.[4]

### 2.2 Investment

From about the early 1970s, all Asian countries have become more open to FDI regimes over time with uneven progress among economies. Some developing Asian countries (Hong Kong, Malaysia, and Thailand) have not enforced any FDI policy reforms since the 1970s. In other words, these Asian countries are always moving towards openness to investment. However, South Korea and Singapore had only liquidation restrictions in the 1970s.

Apart from Hong Kong and Singapore, almost all countries had significant restrictions on foreign direct investment before the 1970s. These restrictions have been lifted in all countries over the past four decades. Even the governments of Taiwan and South Korea became more open to FDI from about the mid-1980s. In all countries, ownership restrictions have been eliminated on export-oriented FDI. However, some countries still maintain ownership restrictions on domestic-market oriented FDI. There are no restrictions on profit remittance and repatriation of returns from project liquidation on all types of FDI. For example, Vietnam has been a latecomer to FDI reforms. However, from about the mid-2010s, Vietnam has lifted restrictions on ownership, profit remittance and repatriation of proceeds from liquidation of export-oriented FDI (Athukorala & Hill, 2010; Sally & Sen, 2011; Jarvis, 2012).

The establishment of export processing zones (EPZs) has been a common part of FDI policy for promoting export-oriented industrialisation in most Asia countries (Amirahmadi & Wu, 1995; Hofman, Zhao, & Ishihara, 2007; Lipsey & Sjöholm, 2011). EPZs provide some preferential treatments for MNE affiliates in the form of duty exemptions on imported materials and machinery, good infrastructure, and cheap utilities). The first export processing zone in Asia was opened by India in 1965, followed by Taiwan (1970) and South Korea (1970). As part of the policy shift from import substitution to export orientation in the 1970s, all developing Asian countries have established export processing zones with attractive incentive packages for export-oriented manufacturing. The most important case was the setting up special economic

[4] Production sharing within global production networks involves multiple border crossing of parts and components which results in faster growth of reported trade compared to GDP (which measures only value added in production) (Krugman, 1995). Reported trade data are in 'gross' terms (that is these data include both value-added and intermediate inputs embodied in exports and imports) whereas GDP captures on value added of domestic production.

zones (SEZs) in China starting in 1979 for opening the economy to FDI (Amirahmadi & Wu, 1995).

Table 2.5 FDI inflow in developing Asian countries (% of total world FDI Inflow)[1]

| | 1970/71 | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
|---|---|---|---|---|---|---|
| **Developing Asia** | | | | | | |
| **North Asia** | **1.2** | **2.8** | **4.9** | **9.7** | **14.5** | **19.5** |
| China | 0.0 | 0.2 | 2.3 | 4.5 | 8.2 | 9.8 |
| Hong Kong | 0.4 | 2.1 | 1.1 | 3.9 | 5.7 | 8.2 |
| Taiwan | 0.4 | 0.3 | 0.7 | 0.4 | 0.0 | 0.4 |
| South Korea | 0.4 | 0.2 | 0.7 | 0.8 | 0.7 | 1.2 |
| **Southeast Asia** | **3.7** | **5.0** | **7.6** | **2.2** | **6.9** | **10.5** |
| Brunei Darussalam | 0.3 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| Cambodia | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| Malaysia | 0.7 | 1.8 | 2.0 | 0.2 | 0.7 | 0.6 |
| Indonesia | 1.6 | 0.3 | 0.7 | -0.4 | 1.1 | 1.5 |
| Malaysia | 0.7 | 1.8 | 2.0 | 0.2 | 0.7 | 0.6 |
| Philippines | 0.1 | 0.3 | 0.3 | 0.1 | 0.1 | 0.5 |
| Singapore | 0.8 | 2.3 | 2.9 | 1.7 | 3.4 | 5.5 |
| Thailand | 0.3 | 0.4 | 1.3 | 0.5 | 0.6 | 0.6 |
| Viet Nam | 0.0 | 0.0 | 0.2 | 0.1 | 0.5 | 1.1 |
| **South Asia** | **0.8** | **0.5** | **0.2** | **0.6** | **2.7** | **3.8** |
| Bangladesh | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| India | 0.3 | 0.1 | 0.1 | 0.5 | 2.2 | 3.0 |
| Nepal | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pakistan | 0.1 | 0.1 | 0.2 | 0.0 | 0.1 | 0.2 |
| Sri Lanka | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 |
| **World FDI Inflow (Billion US$)** | **13.7** | **62.0** | **179.4** | **1064.7** | **1463.2** | **1397.3** |
| Shares of FDI Inflow (%) | | | | | | |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Developed economies | 73.2 | 76.0 | 78.7 | 76.7 | 51.0 | 46.8 |
| Developing economies | 26.8 | 24.0 | 21.3 | 23.3 | 49.0 | 53.2 |
| Africa | 7.7 | 1.8 | 1.8 | 1.6 | 3.2 | 3.2 |
| Latin America and the Caribbean | 12.4 | 11.8 | 5.7 | 7.6 | 12.3 | 10.8 |
| Asia | 6.0 | 10.1 | 13.5 | 13.2 | 28.5 | 36.2 |

Note: 1. Two-year averages.

Source: Compiled from the UNCTAD database.

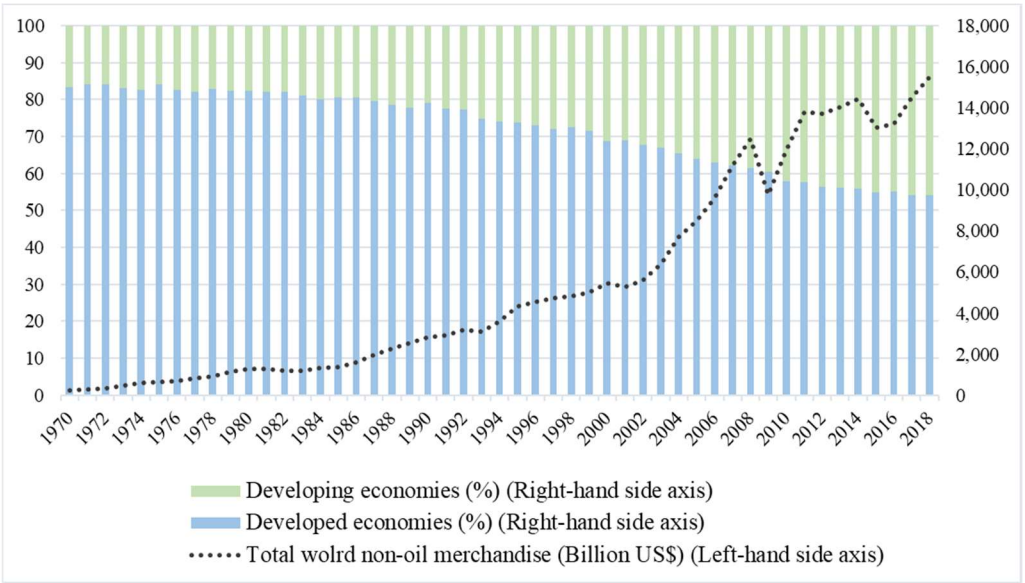
Liberalisation of FDI policy regimes as part of broader outward-oriented policy reforms have been instrumental in the significant inflow of FDI to the region. Table 2.5 shows shares of FDI inflow to the region in total world inward FDI. By comparison among developing countries, developing Asian countries have been the most important destinations of FDI during the period 1990-2018. In 1970/71, the shares of developing Asian countries and countries in Latin America in total FDI inflows were 6.0% and 12.4%, respectively. However, in 2017/18, these figures had changed to 36.2% and 10.8%, respectively.

In Asia, China has accounted for the lion's share of FDI inflows during the past four decades. China's share in total world FDI increased from a mere 0.2% in 1980/81 to 19.5% in 2017/18. In addition, in Southeast Asia, Singapore had the highest share of FDI inflow in the region over the period 1980-2018. Interestingly, after the FDI policy regime in Vietnam, FDI inflow to Vietnam increased from 0.1% in 2000/01 to 1.1% in 2017/18. FDI inflow to India had significantly increased since the year 2000 or after its FDI policy reform.

### 2.3 Trends and patterns of trade

From about the early 1970s, shares of total non-oil merchandise exports from developing economies have increased continuously. The rate of increase was faster from about the early 1990s compared to the previous decades (Figure 2.1). Developing countries accounted for around 46% of merchandise exports in 2018 compared to around 20% in 1990. The rapid expansion of developing countries' share in world exports has been mainly driven by the export performance of developing Asian countries. During the period 1970-2018, these countries' total world non-oil merchandise exports rose around 6% in 1970 to about 36% in 2018. By contrast, the shares of developing economies in America and Africa in world non-oil exports in 2018 were 6% and 1.7%, respectively (Figure 2.2).

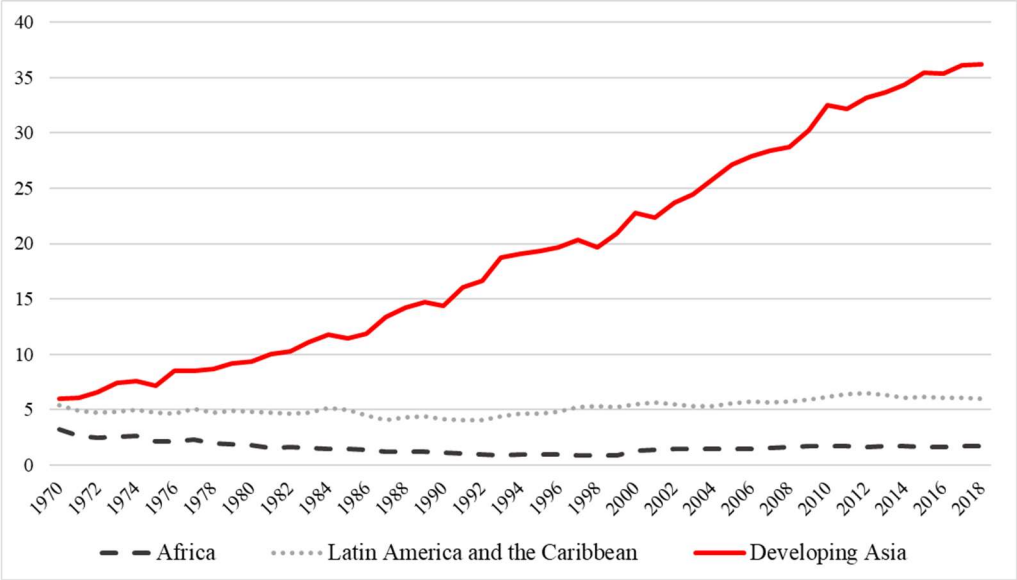
Figure 2.1 Shares of developed and developing countries in total world non-oil merchandise exports in 1970-2018 (%)[1]




Note: 1. The definition of developed and developing countries based on the UN country classification. Total non-oil merchandise is defined as total exports minus oil and gas exports (SITC 3).

Source: Compiled from the UN Comtrade database.

Figure 2.2 Shares of developing regions in total world non-oil merchandise exports in 1970-2018 (%)[1]

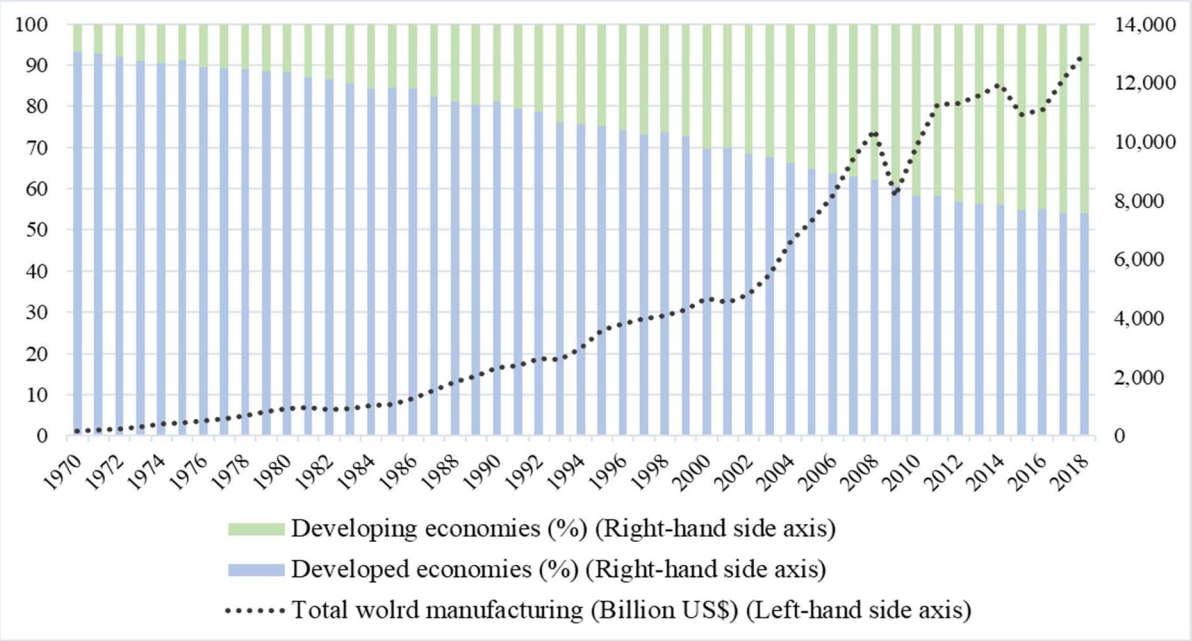



Note: 1. The definition of developed and developing countries based on the UN country classification. Total non-oil merchandise is defined as total exports minus oil and gas exports (SITC 3).

Source: Compiled from the UN Comtrade database.

Manufacturing products have been the most dynamic component of total non-oil merchandise for both developed economies and developing economies. In the case of developing economies, total manufacturing exports accounted for more than 70% of total non-oil merchandise since 1990. Figure 2.3 shows that the share of manufacturing exports in developing economies had significantly increased in the world market over time. However, only developing Asia contributed the highest export share for developing economies. In other words, developing Asia has become one of the most important production bases in the world and is often referred to as 'Factory Asia'. The share in developing Asian countries rose from only 4% in 1990 to around 39% in 2018 (Figure 2.4).

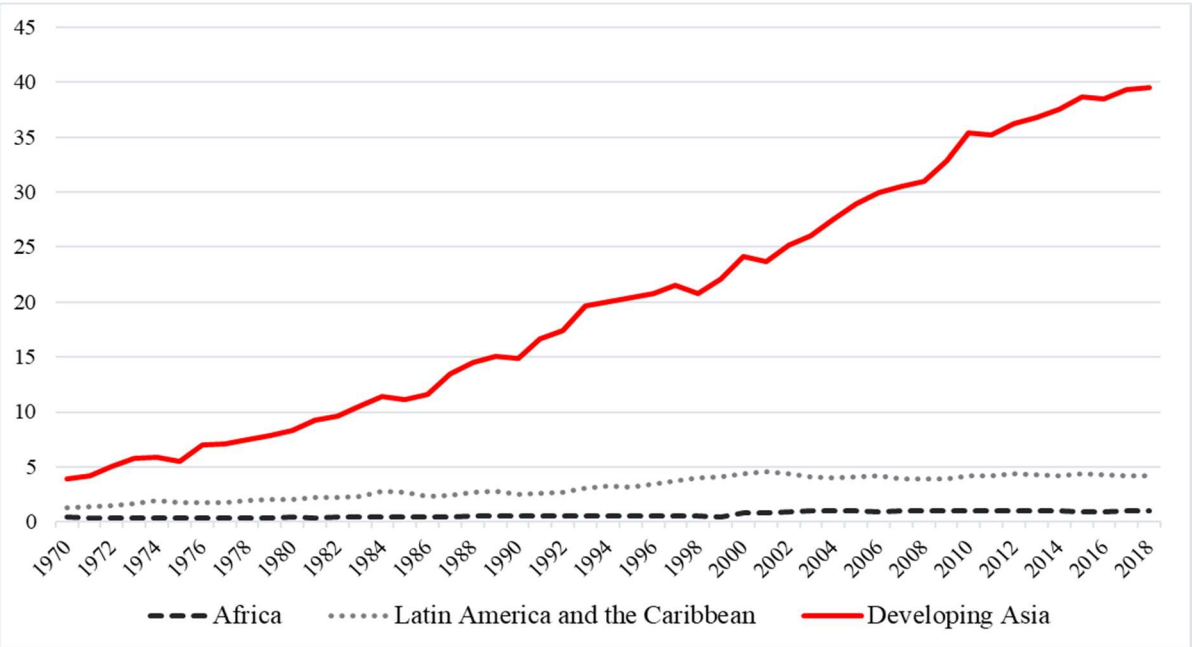
Figure 2.3 Shares of developed and developing countries in total world manufacturing exports in 1970-2018 (%)[1]




Note: 1. The definition of developed and developing countries based on the UN country classification. Total manufacturing is defined as SITC 5 + 6 + 7 + 8 - 68.

Source: Compiled from the UN Comtrade database.

Figure 2.4 Shares of developing regions in total world manufacturing exports in 1970-2018 (%)[1]




Note: 1. The definition of developed and developing countries based on the UN country classification. Total manufacturing is defined as SITC 5 + 6 + 7 + 8 - 68.

Source: Compiled from the UN Comtrade database.

Table 2.6 shows shares of total non-oil exports and manufacturing exports in the world market for developing Asian countries. Even though the overall export performance of developing Asian countries is outstanding compared to the other regions in the world, there are significant differences in relative export performance among countries in this region.

North Asia has the most notable export performance record, followed by Southeast Asia, South Asia, and Central and West Asia (Table 2.6). Asia's rise in the world trade has been dominated by China. China's share in total world non-oil exports increased from about 1% in the early 1970s to over 19% in 2017/18[5]. In 2017/18, China accounted for nearly 50% of total non-oil exports of developing Asian countries. The share of Southeast Asian countries in total non-oil merchandise and manufacturing exports has been increasing over time. However, export success is largely confined to Singapore, Malaysia, Thailand, and Vietnam. Since the early 2000s, Vietnam stands out among these countries for its rapid export market penetration. Vietnam's share in world manufacturing exports increased from 0.2% in 2000/01 to 1.9% in 2017/18.

Export performance of South Asian countries is less impressive, however, when compared to countries in North Asia and Southeast Asia. South Asia's shares of total non-oil merchandise and manufacturing exports in the world market increased slightly between 1970 and 2018. India's share in world exports has increased following the policy reforms started in the early 1990s. However, in 2017/18 it accounted for only 1.7% of both total non-oil and manufacturing exports. Bangladesh and Sri Lanka have recorded notable increases in export market penetration because of expansion in labour-intensive manufactured goods (mostly garments). However, both countries still account for a tiny share of world exports. The world export share of Pakistan has hardly changed over the past three decades.

Countries in Central and West Asia are at the early stage of transition from central planning to market-oriented economies. As yet, there is no notable increase in their shares in world exports.

[5] In order to minimize the effect of possible random shocks and measurement errors, two-year averages (that is, 2017/18 for the average of 2017 and 2018) are used in inter-temporal comparison throughout this thesis.

Table 2.6 Developing Asian countries: The shares of total non-oil merchandise exports and manufacturing exports in the world market (%)[1]

| | Total non-oil merchandise export share in the world (%) | | | | | | Total manufacturing export shares in the world (%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970/71 | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 | 1970/71 | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
| **North Asia** | **2.6** | **5.3** | **9.3** | **13.6** | **21.2** | **23.2** | **2.8** | **6.2** | **10.6** | **15.1** | **24.5** | **26.6** |
| China | 0.7 | 1.2 | 3.1 | 7.3 | 14.9 | 16.9 | 0.5 | 1.0 | 3.3 | 8.0 | 17.4 | 19.4 |
| Hong Kong | 0.9 | 1.2 | 1.7 | 1.0 | 0.5 | 0.5 | 1.2 | 1.6 | 2.0 | 1.1 | 0.6 | 0.5 |
| South Korea | 0.3 | 1.3 | 2.0 | 2.8 | 3.6 | 3.9 | 0.4 | 1.5 | 2.4 | 3.2 | 4.1 | 4.5 |
| Taiwan | 0.7 | 1.7 | 2.5 | 2.5 | 2.2 | 2.0 | 0.8 | 2.1 | 2.9 | 2.9 | 2.4 | 2.3 |
| **Southeast Asia** | **2.0** | **2.8** | **4.0** | **6.6** | **7.1** | **8.3** | **0.4** | **1.4** | **3.5** | **6.7** | **6.8** | **8.4** |
| Brunei Darussalam | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cambodia | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| Indonesia | 0.3 | 0.4 | 0.5 | 0.9 | 1.1 | 1.0 | 0.0 | 0.1 | 0.4 | 0.7 | 0.7 | 0.7 |
| Malaysia | 0.7 | 0.8 | 1.1 | 1.9 | 1.8 | 1.7 | 0.1 | 0.3 | 0.9 | 2.0 | 1.8 | 1.8 |
| Philippines | 0.5 | 0.5 | 0.3 | 0.8 | 0.6 | 0.6 | 0.1 | 0.2 | 0.3 | 0.9 | 0.6 | 0.6 |
| Singapore | 0.2 | 0.6 | 1.2 | 1.5 | 1.4 | 1.3 | 0.2 | 0.6 | 1.3 | 1.7 | 1.6 | 1.5 |
| Thailand | 0.3 | 0.5 | 0.9 | 1.3 | 1.6 | 1.7 | 0.0 | 0.2 | 0.7 | 1.2 | 1.6 | 1.7 |
| Viet Nam | n.a. | 0.0 | 0.0 | 0.2 | 0.6 | 1.8 | n.a. | 0.0 | 0.0 | 0.2 | 0.6 | 1.9 |
| **South Asia** | **1.0** | **0.9** | **1.0** | **1.2** | **2.0** | **2.3** | **0.6** | **0.7** | **0.9** | **1.2** | **1.9** | **2.3** |
| Bangladesh | n.a. | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | n.a. | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 |
| India | 0.7 | 0.6 | 0.6 | 0.8 | 1.5 | 1.7 | 0.5 | 0.5 | 0.5 | 0.7 | 1.4 | 1.7 |
| Pakistan | n.a. | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Nepal | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | n.a. | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| Sri Lanka | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Central and West Asia[2]** | **0.4** | **0.5** | **0.8** | **1.1** | **2.2** | **2.4** | **0.1** | **0.4** | **0.7** | **1.0** | **2.1** | **2.2** |
| Armenia | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Azerbaijan | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Georgia | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Kazakhstan | n.a. | n.a. | n.a. | 0.1 | 0.1 | 0.1 | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.1 |
| Kyrgyzstan | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 | n.a. | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Developed countries | 83.8 | 82.4 | 78.4 | 68.9 | 57.8 | 54.1 | 93.0 | 87.6 | 80.2 | 69.8 | 58.2 | 54.1 |
| Developing countries | 16.2 | 17.6 | 21.6 | 31.1 | 42.2 | 45.9 | 7.0 | 12.4 | 19.8 | 30.2 | 41.8 | 45.9 |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: 1. Two-year averages. n.a. denotes non-available data.

2. The figures for Central and West Asia include all countries in this region.

Source: Compiled from the UN Comtrade database.

The data clearly show that faster world export market penetration of countries is closely associated with a shift in export composition towards manufactured goods (Table 2.7). Overall, the share of manufactured exports to total non-oil exports is relatively larger in countries in North Asia. However, the manufacturing share has increased across all countries over time other than the countries in Central and West Asia. Exports of the countries in Central and West Asia are relatedly more concentrated in primary products. For example, the shares of manufacturing exports in total non-oil exports for Armenia, Azerbaijan, and Kyrgyzstan were less than 40% in 2017/18.

Table 2.7 Developing Asian countries: The shares of manufacturing exports in total non-oil exports (%)[1]

| | 1970/71 | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
|---|---|---|---|---|---|---|
| **North Asia** | **74.1** | **85.5** | **93.0** | **95.8** | **94.2** | **94.3** |
| China | 44.3 | 64.6 | 86.1 | 93.7 | 95.8 | 96.3 |
| Hong Kong | 95.3 | 95.6 | 96.7 | 96.8 | 92.4 | 90.6 |
| South Korea | 77.1 | 90.2 | 93.8 | 95.7 | 95.2 | 95.6 |
| Taiwan | 79.8 | 91.8 | 95.4 | 97.1 | 93.2 | 94.8 |
| **Southeast Asia** | **11.7** | **38.2** | **53.2** | **80.0** | **69.8** | **77.5** |
| Brunei Darussalam | 10.7 | 71.6 | 98.6 | 98.6 | 89.1 | 91.7 |
| Cambodia | 4.9 | 64.6 | 22.3 | 94.2 | 87.8 | 89.5 |
| Indonesia | 2.2 | 11.1 | 61.8 | 72.2 | 53.5 | 59.7 |
| Malaysia | 7.9 | 29.2 | 65.8 | 90.6 | 82.6 | 87.4 |
| Philippines | 9.9 | 36.7 | 66.2 | 92.1 | 83.0 | 85.3 |
| Singapore | 53.3 | 78.8 | 92.7 | 96.4 | 95.1 | 94.4 |
| Thailand | 8.2 | 28.6 | 63.9 | 80.3 | 79.5 | 82.2 |
| Viet Nam | n.a. | 24.4 | 20.0 | 70.2 | 78.3 | 90.0 |
| **South Asia** | **23.0** | **50.7** | **78.3** | **84.0** | **81.3** | **81.1** |
| Bangladesh | n.a. | 62.7 | 81.7 | 92.6 | 94.2 | 96.8 |
| India | 48.9 | 60.3 | 73.3 | 80.0 | 77.5 | 82.4 |
| Pakistan | 15.7 | 44.5 | 90.3 | 78.7 | 81.2 | 71.5 |
| Nepal | n.a. | 57.1 | 79.2 | 87.1 | 78.5 | 78.6 |
| Sri Lanka | 4.3 | 28.8 | 66.9 | 81.4 | 75.2 | 76.1 |
| **Central and West Asia[2]** | **30.3** | **56.0** | **58.7** | **56.9** | **58.5** | **53.6** |
| Armenia | n.a. | n.a. | n.a. | 63.3 | 42.1 | 29.8 |
| Azerbaijan | n.a. | n.a. | n.a. | 46.1 | 48.5 | 36.8 |
| Georgia | n.a. | n.a. | n.a. | 33.0 | 45.2 | 47.4 |
| Kazakhstan | n.a. | n.a. | n.a. | 42.8 | 37.6 | 42.7 |
| Kyrgyzstan | n.a. | n.a. | n.a. | 28.2 | 51.5 | 36.2 |

Note: 1. Two-year averages. n.a. denotes non-available data.
2. The figures for Central and West Asia include all countries in this region.

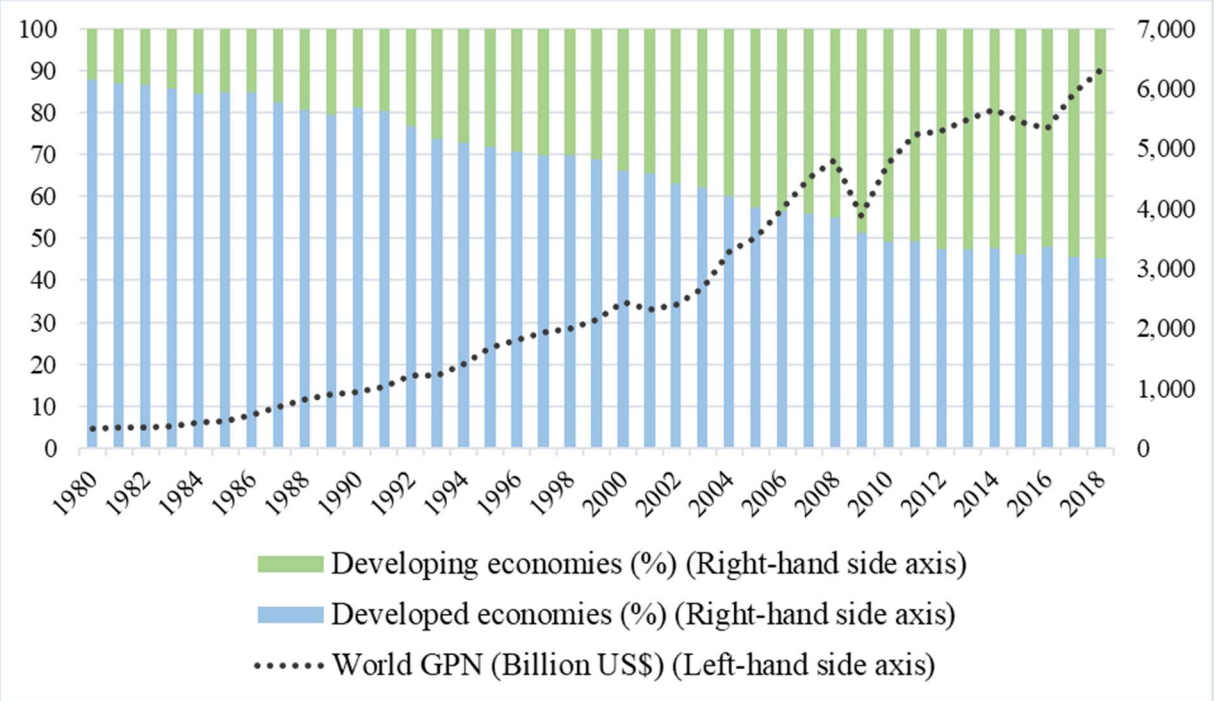
Source: Compiled from the UN Comtrade database.

## 2.4 Developing Asia in global production networks

The key driving force of rapid expansion of manufacturing exports from the developing Asian countries has been these countries' engagement in production sharing (specialisation in separate tasks in vertically integrated production processes) within global production networks. Global production networks are organised and operated by MNEs through which final goods and intermediate goods are produced and distributed. This section presents an overview of the pivotal role played by exports within GPNs in the expansion of world manufacturing exports and the role of developing Asian countries in this trade using disaggregated trade data compiled from the UN Comtrade database. The classification system used in delineating GPN products from the reported trade data is discussed in Appendix 2.1.

The role of GPN exports in world manufacturing trade increased more than tenfold, from 333 billion US$ in 1980 to 6,317 billion US$ in 2018. The share of these exports in total world manufacturing exports was 50.0% in 2018, up from 36.2% in 1980. Interestingly, the share of developing countries in world GPN exports increased from 12.0% to 54.8% between these two years (Figure 2.5).

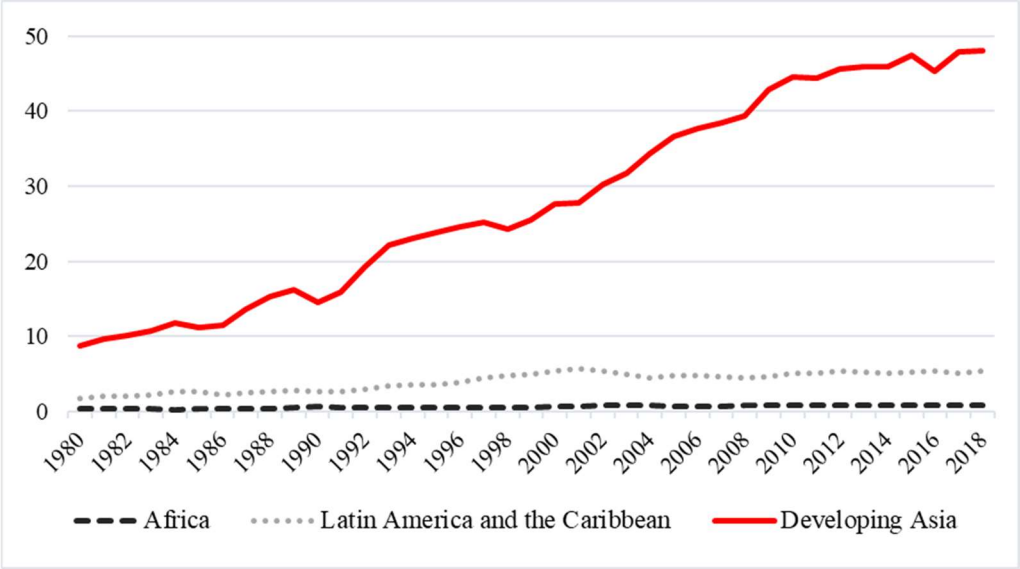
Figure 2.5 Shares of developed and developing countries in total world GPN exports in 1980-2018 (%)[1]




Note: 1. The definition of developed and developing countries based on the UN country classification. The definition of GPN is based on Athukorala (2014, 2019), see Appendix 2.1.

Source: Compiled from the UN Comtrade database.

Figure 2.6 Shares of developing regions in total world GPN exports in 1980-2018 (%)[1]




Note: 1. The definition of developed and developing countries based on the UN country classification. The definition of GPN is based on Athukorala (2014, 2019), see Appendix 2.1.
Source: Compiled from the UN Comtrade database.

Developing Asian countries account for the lion's share of total GPN exports from developing countries. These countries' share in world GPN exports increased from 8.8% in 1980 to over 48.1% in 2018. By contrast, the shares of countries in Latin America and Africa had hardly changed during this period. In 2018, the share in world GPN exports was around 5% and 1%, respectively (Figure 2.6).

The share of China in world GPN exports increased from only 0.8% in 1980/81 to 27.1% in 2017/18. Among the other countries in North Asia, South Korea's share of GPN exports increased from 2.2% in 1980/81 to 5.6% in 2017/18. Hong Kong's share has declined over time because of the shift in production bases from there to mainland China from about the late 1970s. Taiwan is a leading exporter of electronics in the world market. However, Taiwan is not covered in this study because data for that country are not included in the UN Comtrade database. Therefore, data reported in Table 2.8 understate the share of developing Asia's share in world GPN exports.

The share of Southeast Asian countries in world GPN exports increased over the period under study by approximately fivefold, from 2.4% in 1980/81 to 11.7% in 2017/18 (Table 2.8). Even though Singapore, Malaysia, Thailand, the Philippines, and Vietnam have recorded an increase in market share during this period, Vietnam has outperformed the other countries from

about the early 2010s. Vietnam's world market share in GPN exports increased from 0.6% in 2010/11 to 1.9% in 2017/18. In recent decades, GPN exports have accounted for over 70% of total manufacturing exports from these countries (Table 2.9). Cambodia has a much larger share of GPN products in total manufacturing exports (over 90% in 2017/18) because of the heavy concentration of its export in a single GPN product, garments.

Table 2.8 Developing Asian countries: The shares of GPN exports in the world market (%)[1]

| | GPN export shares in the world (%) | | | | |
|---|---|---|---|---|---|
| | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
| **North Asia** | **6.0** | **8.5** | **16.3** | **32.4** | **33.2** |
| China | 0.8 | 2.9 | 10.9 | 26.3 | 27.1 |
| Hong Kong | 3.0 | 2.3 | 1.4 | 0.6 | 0.5 |
| South Korea | 2.2 | 3.3 | 3.9 | 5.4 | 5.6 |
| **Southeast Asia** | **2.4** | **5.3** | **9.8** | **9.5** | **11.7** |
| Brunei Darussalam | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cambodia | 0.0 | 0.0 | 0.1 | 0.1 | 0.3 |
| Indonesia | 0.1 | 0.3 | 0.7 | 0.8 | 0.7 |
| Malaysia | 0.6 | 1.5 | 3.2 | 2.8 | 2.8 |
| Philippines | 0.5 | 0.5 | 1.5 | 1.0 | 1.1 |
| Singapore | 1.1 | 2.1 | 2.5 | 1.9 | 1.6 |
| Thailand | 0.2 | 0.9 | 1.5 | 2.0 | 2.1 |
| Viet Nam | 0.0 | 0.0 | 0.2 | 0.8 | 3.1 |
| **South Asia** | **0.4** | **0.7** | **0.8** | **1.5** | **1.6** |
| Bangladesh | 0.0 | 0.1 | 0.2 | 0.4 | 0.6 |
| India | 0.3 | 0.4 | 0.4 | 0.9 | 0.8 |
| Nepal | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pakistan | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Sri Lanka | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Central and West Asia** | **0.5** | **0.8** | **1.1** | **1.4** | **1.5** |
| Armenia | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Azerbaijan | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Georgia | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Kazakhstan | n.a. | n.a. | n.a. | 0.0 | 0.0 |
| Kyrgyzstan | n.a. | n.a. | 0.0 | 0.0 | 0.0 |
| Developed countries | 87.5 | 80.8 | 65.7 | 49.1 | 45.5 |
| Developing countries | 12.5 | 19.2 | 34.3 | 50.9 | 54.5 |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: 1. The definition of GPN is based on Athukorala (2014, 2019), see Appendix 2.1.
n.a. denotes non-available data.

Source: Compiled from the UN Comtrade database.

GPN exports still account for a large share of total manufacturing exports in countries in South Asia. In 2017/18, this region accounted for 1.6% of total world GPN exports compared to 33.2% of North Asian countries and 11.7% of Southeast Asian countries. However, GPN products account for a large share of manufacturing exports from Bangladesh and Sri Lanka because of the dominance of garments in their export baskets (Table 2.9).

Table 2.9 Developing Asian countries: The shares of GPN exports in manufacturing exports (%)[1]

| | 1980/81 | 1990/91 | 2000/01 | 2010/11 | 2017/18 |
|---|---|---|---|---|---|
| **North Asia** | **49.1** | **47.7** | **67.6** | **61.6** | **61.2** |
| China | 26.9 | 36.6 | 70.5 | 71.6 | 68.0 |
| Hong Kong | 69.4 | 48.3 | 68.6 | 51.0 | 54.5 |
| South Korea | 51.1 | 58.1 | 63.8 | 62.1 | 61.2 |
| | | | | | |
| **Southeast Asia** | **41.5** | **51.7** | **80.7** | **65.0** | **67.6** |
| Brunei Darussalam | 48.2 | 12.9 | 86.3 | 11.2 | 20.8 |
| Cambodia | 44.5 | 67.5 | 95.0 | 98.0 | 92.5 |
| Indonesia | 30.8 | 30.6 | 49.6 | 51.1 | 50.0 |
| Malaysia | 66.6 | 72.2 | 82.5 | 76.4 | 75.6 |
| Philippines | 66.4 | 72.9 | 92.5 | 86.6 | 88.1 |
| Singapore | 63.1 | 67.3 | 75.3 | 56.7 | 53.1 |
| Thailand | 36.7 | 55.9 | 65.3 | 60.5 | 60.4 |
| Viet Nam | 34.8 | 46.3 | 73.4 | 64.8 | 78.6 |
| | | | | | |
| **South Asia** | **22.6** | **44.6** | **54.0** | **49.8** | **51.9** |
| Bangladesh | 1.7 | 68.5 | 86.0 | 90.8 | 93.7 |
| India | 25.8 | 30.1 | 28.5 | 29.0 | 24.3 |
| Nepal | 7.2 | 26.5 | 43.1 | 20.9 | 21.7 |
| Pakistan | 16.9 | 29.4 | 34.3 | 34.2 | 45.4 |
| Sri Lanka | 61.2 | 68.6 | 78.3 | 74.1 | 74.3 |
| | | | | | |
| **Central and West Asia** | **34.7** | **26.1** | **28.6** | **20.0** | **22.6** |
| Armenia | n.a. | n.a. | 18.7 | 21.0 | 49.8 |
| Azerbaijan | n.a. | n.a. | 18.8 | 13.7 | 13.0 |
| Georgia | n.a. | n.a. | 18.9 | 18.1 | 21.9 |
| Kazakhstan | n.a. | n.a. | n.a. | 1.3 | 5.5 |
| Kyrgyzstan | n.a. | n.a. | 42.5 | 50.9 | 39.5 |
| | | | | | |
| Developed countries | 36.5 | 43.3 | 49.9 | 41.2 | 42.2 |
| Developing countries | 36.9 | 41.8 | 60.3 | 59.4 | 59.6 |
| World | 36.5 | 43.0 | 53.1 | 48.8 | 50.2 |

Note: 1. The definition of GPN is based on Athukorala (2014, 2019), see Appendix 2.1.
n.a. denotes non-available data.

Source: Compiled from the UN Comtrade database.

In conclusion, total non-oil merchandise exports in developing Asian countries have been characterised by a palpable shift in export composition away from primary products and towards manufacturing products. The engagement in production sharing within global production networks has been the key driver of the rapid expansion of manufacturing exports. Openness to trade and FDI inflows jointly determined export performance. However, beneath this impressive overall picture, there are notable differences in export performance among countries in the region, with China and Vietnam as the two outstanding success cases in the last two decades.

## Appendix 2.1

## Compilation of data on GPN exports from the UN Comtrade data

Exports within global production networks (GPN trade) have two components: (1) parts and components and (2) final assembly. The delineation of GPN exports from reported trade data was done using the classification system developed by Athukorala (2014, 2019). The list of parts and components used in data compilation is given in Appendix Table 2.A.1. There is no standard method for delineating final goods assembled within global production networks from the standard trade data. The only practical way of doing this is to focus on the specific product categories which are almost entirely composed of GPN products (final assembly and parts and components) and then delineate final assembly as the difference between total exports and parts and components.

Guided by the available literature on GPN trade, the following product categories are identified for this purpose: office machines and automatic data processing machines (SITC 75), telecommunication and sound recording equipment (SITC 76), electrical machinery (SITC 77), road vehicles (SITC 78), other transport equipment (SITC 79), travel goods (SITC 83), clothing and clothing accessories (SITC 84), footwear (SITC 85), professional and scientific equipment (SITC 87), photographic apparatus (SITC 88) and toys and sporting goods (894). It is quite reasonable to assume that these product categories contain virtually no products produced from start to finish in a given country (Krugman, 2008; World Bank, 2020).

Admittedly the estimates based on this list do not provide full coverage of final assembly in world trade. For instance, outsourcing of final assembly does take place in various miscellaneous product categories such as furniture and leather products. It is not possible to meaningfully delineate parts and components and assembled goods in reported trade data in these product categories because they contain a significant (yet unknown) share of horizontal trade.

The data are compiled from the UN comrade database. ‘Mirror export data’, that is data extracted from the importers’ side, are used because of gaps in data extracted from the exporters' side. Mirror data are also considered to be more appropriate for analysing trade patterns than the corresponding exporter records. Compared to country records, importer records are also presumably less susceptible to double-counting and erroneous identification of the source/destination country in the presence of entrepot trade (e.g., the People's Republic of China’s trade through Hong Kong and Indonesia’s trade through Singapore) (Ng & Yeats, 2003; Feenstra, Lipsey, Deng, Ma, & Mo, 2005).

## Table 2.A.1 Parts and components list

| No. | SITC Rev.3 | Description | No. | SITC Rev.3 | Description |
|---|---|---|---|---|---|
| 1 | 58291 | Cellular plastic sheet | 63 | 69561 | Cutting blades for machn |
| 2 | 58299 | Non-cellular plast sheet | 64 | 69562 | Carbide tool tips etc |
| 3 | 59850 | Doped chemicals (electr) | 65 | 69563 | Rock etc drilling tools |
| 4 | 61120 | Composition leather | 66 | 69564 | Parts to insert in tools |
| 5 | 62141 | Uh rubber tube no fittng | 67 | 69680 | Knives and blades nes |
| 6 | 62142 | Uh metal-reinf rubr tube | 68 | 69915 | Base mtl vehicle fitment |
| 7 | 62143 | Uh text-reinf rubbr tube | 69 | 69933 | Base metal buckles etc |
| 8 | 62144 | Uh nes-reinf rubber tube | 70 | 69941 | Iron,steel springs,etc |
| 9 | 62145 | Uh rubber tube + fitting | 71 | 71191 | Pts nes of boilers 711.1 |
| 10 | 62921 | Conveyor/etc belts v | 72 | 71192 | Pts nes boiler equ 711.2 |
| 11 | 62929 | Conveyor/etc belts nes | 73 | 71280 | Stm turbine(712.1)parts |
| 12 | 62999 | Uh non-cell rub articles | 74 | 71311 | Aircraft piston engines |
| 13 | 65611 | Narrow woven pile fabric | 75 | 71319 | Pts nes a/c piston engs |
| 14 | 65612 | Narrow woven elastic fab | 76 | 71321 | Recip piston engs<1000cc |
| 15 | 65613 | Narrow woven fabric nes | 77 | 71322 | Recip piston engs>1000cc |
| 16 | 65614 | Narrow bonded fabrics | 78 | 71323 | Diesel etc engines |
| 17 | 65621 | Woven textile labels etc | 79 | 71332 | Marine spark-ign eng nes |
| 18 | 65629 | Non-woven text label etc | 80 | 71333 | Marine diesel engines |
| 19 | 65631 | Gimped yarns | 81 | 71381 | Spark-ign piston eng nes |
| 20 | 65632 | Braids/trimmings/etc | 82 | 71382 | Diesel engines nes |
| 21 | 65641 | Tulles, net fabrics | 83 | 71391 | Parts nes spark-ign engs |
| 22 | 65642 | Mechanical lace | 84 | 71392 | Parts nes diesel engines |
| 23 | 65643 | Hand-made lace | 85 | 71441 | Turbo-jets |
| 24 | 65651 | Embroidery,no vis.ground | 86 | 71449 | Reaction engines nes |
| 25 | 65659 | Embroidery nes | 87 | 71481 | Turbo-propellers |
| 26 | 65711 | Needleloom/stch bnd felt | 88 | 71489 | Other gas turbines nes |
| 27 | 65712 | Felt nes not impregnated | 89 | 71491 | Parts nes turbo-jet/prop |
| 28 | 65719 | Felt impregnated etc | 90 | 71499 | Parts nes gas turbines |
| 29 | 65720 | Non-woven fabrics nes | 91 | 71610 | Electric motors <37.5w |
| 30 | 65731 | Gum etc coated textiles | 92 | 71620 | Dc motor(>37w)/generator |
| 31 | 65732 | Plastic coated textiles | 93 | 71631 | Ac,ac/dc motors >37.5w |
| 32 | 65733 | Rubberized textiles nes | 94 | 71651 | Gen sets with pistn engs |
| 33 | 65734 | Coated/impreg text. nes | 95 | 71690 | Pts nes motors/generator |
| 34 | 65735 | Textile wall coverings | 96 | 71819 | Parts nes hydraul turbin |
| 35 | 65740 | Quilted textile products | 97 | 71878 | Nuclear reactor parts |
| 36 | 65751 | Twine/cordage/rope/cable | 98 | 71899 | Parts nes of engines nes |
| 37 | 65752 | Knotted rope/twine nets | 99 | 72119 | Agric machine(7211)parts |
| 38 | 65759 | Articles of cordage nes | 100 | 72129 | Pts nes of machy of 7212 |
| 39 | 65761 | Felt hat bodies/forms .. | 101 | 72139 | Pts nes dairy machinery |
| 40 | 65762 | Hat bodies nes | 102 | 72198 | Parts wine/etc machines |
| 41 | 65771 | Textile wadding nes etc | 103 | 72199 | Pts nes agric machines |
| 42 | 65772 | Textile wicks/mantle etc | 104 | 72391 | E-m bucket/grab/shovels |
| 43 | 65773 | Industrial textiles nes | 105 | 72392 | Bulldozer etc blades |
| 44 | 65781 | Textile covd rubber cord | 106 | 72393 | Boring/sink machry parts |
| 45 | 65785 | Coated hi-ten synth yarn | 107 | 72399 | Pts nes earth-movg mach |
| 46 | 65789 | Rubber/plasticized t nes | 108 | 72439 | Sew mch needles/furn/pts |
| 47 | 65791 | Textile hosepiping etc | 109 | 72449 | Pts nes textile machines |
| 48 | 65792 | Machinery belts etc,text | 110 | 72461 | Auxil weave/knit machine |
| 49 | 65793 | Tyre cord fabric | 111 | 72467 | Weaving loom parts/acces |
| 50 | 66382 | Asbestos manuf-friction | 112 | 72468 | Loom/knitter etc pts/acc |
| 51 | 66471 | Tempered safety glass | 113 | 72488 | Parts for leather machns |
| 52 | 66472 | Laminated safety glass | 114 | 72491 | Washing machine parts |
| 53 | 66481 | Vehicle rear-view mirror | 115 | 72492 | Textile machinry pts nes |
| 54 | 66491 | Edge worked sheet glass | 116 | 72591 | Paper manuf machine pts |
| 55 | 66591 | Laboratory etc glass | 117 | 72599 | Paper product mach parts |
| 56 | 66599 | Other glass articles nes | 118 | 72635 | Printing type,plates,etc |
| 57 | 69551 | Band saw blades | 119 | 72689 | Pts nes of bookbind mchn |
| 58 | 69552 | Steel circular saw blade | 120 | 72691 | Type-setting machn parts |
| 59 | 69553 | Circular saw blades nes | 121 | 72699 | Printing press parts |
| 60 | 69554 | Chain saw blades | 122 | 72719 | Cereal/dry legm mach pts |
| 61 | 69555 | Straight saw bl for metl | 123 | 72729 | Indus food proc mach pts |
| 62 | 69559 | Saw blades nes | 124 | 72819 | Pts nes of tools of 7281 |

Table 2.A.1 (continued)

| No. | SITC R3 | Description | No. | SITC R3 | Description |
|---|---|---|---|---|---|
| 125 | 72839 | Pts nes of machy of 7283 | 187 | 74860 | Clutches/sh coupling/etc |
| 126 | 72851 | Glass-working machy part | 188 | 74890 | Gear/flywheel/cltch part |
| 127 | 72852 | Plastic/rubber mach part | 189 | 74920 | Metal clad gaskets |
| 128 | 72853 | Tobacco machinery parts | 190 | 74991 | Ships propellers/blades |
| 129 | 72855 | Parts nes, machines 7284 | 191 | 74999 | Mach parts nonelec nes |
| 130 | 73511 | Tool holder/slf-open die | 192 | 75230 | Digital processing units |
| 131 | 73513 | Metal mch-tl work holder | 193 | 75260 | Adp peripheral units |
| 132 | 73515 | Dividing head/spec atach | 194 | 75270 | Adp storage units |
| 133 | 73591 | Pts nes metal rmvl tools | 195 | 75290 | Adp equipment nes |
| 134 | 73595 | Pts nes mtl nonrmvl tool | 196 | 75910 | Copy mach parts/access. |
| 135 | 73719 | Foundry machine parts | 197 | 75991 | Typewrtr parts,acces nes |
| 136 | 73729 | Roll-mill pts nes, rolls | 198 | 75993 | Dupl/addr mach parts etc |
| 137 | 73739 | Mtl weld/solder eq parts | 199 | 75995 | Calculator parts/access. |
| 138 | 73749 | Parts gas welders etc. | 200 | 75997 | Adp equip parts/access. |
| 139 | 74128 | Furnace burner parts | 201 | 76211 | Mtr vehc radio/player |
| 140 | 74135 | Elect furnace/oven parts | 202 | 76212 | Mtr vehc radio rec only |
| 141 | 74139 | Parts ind non-el furn/ov | 203 | 76281 | Other radio/record/play |
| 142 | 74149 | Pts nes indus refrig equ | 204 | 76282 | Clock radio receivers |
| 143 | 74155 | Air-conditioners nes | 205 | 76289 | Radio receivers nes |
| 144 | 74159 | Air-conditioner parts | 206 | 76432 | Radio transceivers |
| 145 | 74172 | Water proc gas gen parts | 207 | 76481 | Radio recep equip nes |
| 146 | 7419 | Parts indus heat/cool eq | 208 | 76491 | Telephone system parts |
| 147 | 74220 | Piston eng fuel/wtr pump | 209 | 76492 | Sound reprod equip parts |
| 148 | 74291 | Pump parts | 210 | 76493 | Telecomm equipmt pts nes |
| 149 | 74295 | Liquid elevator parts | 211 | 76499 | Parts etc of sound equip |
| 150 | 74363 | Engine oil/petrol filter | 212 | 77111 | Liquid dielec transfrmrs |
| 151 | 74364 | Engine air filters | 213 | 77119 | Other elec transformers |
| 152 | 7438 | Parts for fans/gas pumps | 214 | 77125 | Inductors nes |
| 153 | 74391 | Parts for centrifuges | 215 | 77129 | Pts nes elec power mach. |
| 154 | 74395 | Parts filters/purifiers | 216 | 77220 | Printed circuits |
| 155 | 74419 | Pts nes of work trucks | 217 | 77231 | Fixed carbon resistors |
| 156 | 74443 | Jacks/hoists nes hydraul | 218 | 77232 | Fixed resistors nes |
| 157 | 74491 | Parts for winches/hoists | 219 | 77233 | Wirewound var resistors |
| 158 | 74492 | Lift truck parts | 220 | 77235 | Variable resistors nes |
| 159 | 74493 | Lift/skip h/escalat part | 221 | 77238 | Elect resistor parts |
| 160 | 74494 | Lifting equip parts nes | 222 | 77241 | High voltage fuses |
| 161 | 74519 | Pts nes of tool of 7451 | 223 | 77242 | Auto circuit breakr<72kv |
| 162 | 74529 | Packing etc mchy pts nes | 224 | 77243 | Other auto circuit brkrs |
| 163 | 74539 | Weighng mach wts,pts nes | 225 | 77244 | Hi-volt isolating switch |
| 164 | 74568 | Spraying machinery parts | 226 | 77245 | Limiter/surge prtect etc |
| 165 | 74593 | Rolling machine parts | 227 | 77249 | Hi-volt equipment nes |
| 166 | 74597 | Automatic vending machs | 228 | 77251 | Fuses (electrical) |
| 167 | 74610 | Ball bearings | 229 | 77252 | Automatic circuit breakr |
| 168 | 74620 | Tapered roller bearings | 230 | 77253 | Circuit protect equi nes |
| 169 | 74630 | Spherical roller bearing | 231 | 77254 | Relays (electrical) |
| 170 | 74640 | Needle roller bearings | 232 | 77255 | Other switches |
| 171 | 74650 | Cyl roller bearings nes | 233 | 77257 | Lamp holders |
| 172 | 74680 | Ball/roller bearings nes | 234 | 77258 | Plugs and sockets |
| 173 | 74691 | Bearing ball/needle/roll | 235 | 77259 | El connect equ nes<1000v |
| 174 | 74699 | Ball etc bearng part nes | 236 | 77261 | Switchboards etc <1000v |
| 175 | 74710 | Pressure reducing valves | 237 | 77262 | Switchboards etc >1000v |
| 176 | 74720 | Pneumat/hydraulic valves | 238 | 77281 | Switchboards etc unequip |
| 177 | 74730 | Check valves | 239 | 77282 | Switchgear parts nes |
| 178 | 74740 | Safety/relief valves | 240 | 77311 | Winding wire |
| 179 | 74780 | Taps/cocks/valves nes | 241 | 77312 | Co-axial cables |
| 180 | 74790 | Tap/cock/valve parts | 242 | 77313 | Vehicle etc ignition wir |
| 181 | 74810 | Transmission shafts | 243 | 77314 | Elect conductor nes <80v |
| 182 | 74821 | Ball/roll bearing housng | 244 | 77315 | El conductor nes 80-1000 |
| 183 | 74822 | Bearing housings nes | 245 | 77317 | El conductor nes >1000v |
| 184 | 74839 | Iron,stl a-l chain parts | 246 | 77318 | Optical fibre cables |
| 185 | 74840 | Gears and gearing | 247 | 77322 | Glass electric insulator |
| 186 | 74850 | Flywheels/pulleys/etc | 248 | 77323 | Ceramic elect insulators |

Table 2.A.1 (continued)

| No. | SITC R3 | Description | No. | SITC R3 | Description |
|---|---|---|---|---|---|
| 249 | 77324 | Other electrc insulators | 311 | 78431 | Motor vehicle bumpers |
| 250 | 77326 | Ceram elec insul fit nes | 312 | 78432 | Motor veh body parts nes |
| 251 | 77328 | Plastic el insul fit nes | 313 | 78433 | Motor vehicle brake/part |
| 252 | 77329 | Other elec insul fit nes | 314 | 78434 | Motor vehicle gear boxes |
| 253 | 77423 | X-ray tubes | 315 | 78435 | Motor veh drive axle etc |
| 254 | 77429 | X-ray etc parts/access. | 316 | 78436 | Mot veh non-drive axles |
| 255 | 77549 | Electr shaver/etc parts | 317 | 78439 | Other motor vehcl parts |
| 256 | 77579 | Parts dom elect equipmnt | 318 | 78535 | Parts/access motorcycles |
| 257 | 77589 | Domest el-therm app part | 319 | 78536 | Parts/acces inv carriage |
| 258 | 77611 | Tv picture tubes colour | 320 | 78537 | Parts,acces cycles etc |
| 259 | 77612 | Tv picture tubes monochr | 321 | 78689 | Trailer/semi-trailer pts |
| 260 | 77621 | Tv camera tubes etc | 322 | 79199 | Rail/tram parts nes |
| 261 | 77623 | Cathode-ray tubes nes | 323 | 79291 | Aircraft props/rotors |
| 262 | 77625 | Microwave tubes | 324 | 79293 | Aircraft under-carriages |
| 263 | 77627 | Electronic tubes nes | 325 | 79295 | Aircraft/helic parts nes |
| 264 | 77629 | Electrnic tube parts nes | 326 | 79297 | Air/space craft part nes |
| 265 | 77631 | Diodes exc photo-diodes | 327 | 81211 | Radiators, parts thereof |
| 266 | 77632 | Transistors <1watt | 328 | 81215 | Air heat/distrib equipmt |
| 267 | 77633 | Transistors >1watt | 329 | 81219 | Parts for c-heat boilers |
| 268 | 77635 | Thyristors/diacs/triacs | 330 | 81380 | Portable lamp parts |
| 269 | 77637 | Photo-active semi-conds | 331 | 81391 | Glass lighting parts |
| 270 | 77639 | Semi-conductors nes | 332 | 81392 | Plastic lighting parts |
| 271 | 77641 | Dig monolith integ units | 333 | 81399 | Lighting parts nes |
| 272 | 77643 | Monolith integ units nes | 334 | 82111 | Aircraft seats |
| 273 | 77645 | Hybrid integrat circuits | 335 | 82112 | Motor vehicle seats |
| 274 | 77649 | Integrated circuits nes | 336 | 82119 | Parts of chairs/seats |
| 275 | 77681 | Piezo-elec crystals,mntd | 337 | 82180 | Furniture parts |
| 276 | 77688 | Piezo-elec assmbly parts | 338 | 84552 | Girdles/corsets/braces.. |
| 277 | 77689 | Electrnic compon pts nes | 339 | 84842 | Headgear plaited |
| 278 | 77812 | Electric accumulators | 340 | 84848 | Parts for headgear |
| 279 | 77817 | Primary batt/cell parts | 341 | 87119 | Binoc/telescope part/acc |
| 280 | 77819 | Elec accumulator parts | 342 | 87139 | Electron/etc diffr parts |
| 281 | 77821 | Elec filament lamps nes | 343 | 87149 | Microscopes parts/access |
| 282 | 77822 | Elec discharge lamps nes | 344 | 87199 | Parts/access for 8719 |
| 283 | 77823 | Sealed beam lamp units | 345 | 87319 | Gas/liq/elec meter parts |
| 284 | 77824 | Ultra-v/infra-r/arc lamp | 346 | 87325 | Speed etc indicators |
| 285 | 77829 | Pts nes of lamps of 7782 | 347 | 87329 | Meter/counter parts/acc. |
| 286 | 77831 | Ignition/starting equipm | 348 | 87412 | Navigation inst part/acc |
| 287 | 77833 | Ignition/starting parts | 349 | 87414 | Survey instr parts/acc. |
| 288 | 77834 | Veh elect light/etc equ. | 350 | 87424 | Pts nes of inst of 8742 |
| 289 | 77835 | Veh elect light/etc part | 351 | 87426 | Meas/check instr part/ac |
| 290 | 77848 | Hand elec-mech tool part | 352 | 87439 | Fluid instrum parts/acc |
| 291 | 77861 | Fixed power capacitors | 353 | 87454 | Mech tester parts/accs |
| 292 | 77862 | Tantalum fixd capacitors | 354 | 87456 | Thermometer etc part/acc |
| 293 | 77863 | Alum electrolyte capacit | 355 | 87461 | Thermostats |
| 294 | 77864 | Ceram-diel capacit sngle | 356 | 87463 | Pressure regulators/etc |
| 295 | 77865 | Ceram-diel capacit multi | 357 | 87469 | Regul/cntrl inst part/ac |
| 296 | 77866 | Paper/plastic capacitor | 358 | 87479 | Elec/rad meter parts/acc |
| 297 | 77867 | Fixed capacitors nes | 359 | 8749 | Instrument part/acc nes |
| 298 | 77868 | Variable/adj capacitors | 360 | 88112 | Photo flashbulbs/etc |
| 299 | 77869 | Electrical capacitr part | 361 | 88113 | Photo flashlight equipmt |
| 300 | 77871 | Particle accelerators | 362 | 88114 | Camera parts/accessories |
| 301 | 77879 | Parts el equip of 778.7 | 363 | 88115 | Flashlight parts/access |
| 302 | 77881 | Electro-magnets/devices | 364 | 88123 | Movie camera parts/acc. |
| 303 | 77882 | Elec traffic control equ | 365 | 88124 | Movie projector part/acc |
| 304 | 77883 | Elec traffic control pts | 366 | 88134 | Photo equip nes part/acc |
| 305 | 77885 | Electric alarm parts | 367 | 88136 | Photo,cine lab equip ne |
| 306 | 77886 | Electrical carbons | 368 | 88422 | Spectacle frame parts |
| 307 | 77889 | Elec parts of machy nes | 369 | 88431 | Camera/etc objectiv lens |
| 308 | 78410 | Motor veh chassis+engine | 370 | 88432 | Objective lenses nes |
| 309 | 78421 | Motor car bodies | 371 | 88433 | Optical filters |
| 310 | 78425 | Motor vehicle bodies nes | 372 | 88439 | Mounted opt elements nes |

Table 2.A.1 (continued)

| No. | SITC R3 | Description |
|---|---|---|
| 373 | 88571 | Instr panel clocks/etc |
| 374 | 88591 | Watch cases,case parts |
| 375 | 88592 | Watch straps/bands metal |
| 376 | 88593 | Watch strap/band non-mtl |
| 377 | 88597 | Clock cases, case parts |
| 378 | 88598 | Clock/watch mmnts unass |
| 379 | 88599 | Clock/watch parts nes |
| 380 | 89121 | Cartridges rivet gun etc |
| 381 | 89129 | War munitions/parts |
| 382 | 89191 | Pistol parts/accessories |
| 383 | 89195 | Shotgun/rifle parts nes |
| 384 | 89199 | Military weapon part nes |
| 385 | 89281 | Labels paper, paperboard |
| 386 | 89395 | Plastic furniture fittings |
| 387 | 89423 | Doll parts/accessories |
| 388 | 89865 | Recorded tapes w4-6.5mm |
| 389 | 89867 | Recorded tapes w>6.5mm |
| 390 | 8989 | Musical instr parts/acc. |
| 391 | 89935 | Cig lighter parts/access |
| 392 | 89949 | Parts nes umbrella/canes |
| 393 | 89983 | Buttons/studs/snaps/etc |
| 394 | 89985 | Slide fasteners |
| 395 | 89986 | Slide fastener parts |

# Chapter 3
# Product Diversification and Export Performance: A Comparative Study of Developing Asian Countries

**Summary**

There has been renewed emphasis in the recent trade policy debate on the potential positive impact of diversification of the product composition on export expansion. However, the standard trade theory predicts that export success depends on pursuing comparative advantages rather than policy-induced export diversification. This chapter studies the relationship between product diversification and export performance of developing Asian economies using panel data for the period 1976–2017. The methodology involves estimating export equations for total non-oil exports and product subcategories. Commodity diversification is alternatively measured using the Herfindahl-Hirschman and Theil indices. The autoregressive distributed lag (ARDL) technique is used to delineate short-run and long-run effects. The results suggest that export diversification has a negative and statistically significant impact on export performance. This relationship holds for total non-oil exports and the major exports subcategories. The magnitude of the impact varies for product categories, casting doubt on the results of previous studies that have focused on aggregate exports. Supply-side factors appear to be more important than external demand in explaining inter-country differences in export performance.

## 3.1 Introduction

The World economic slump and export contraction in the aftermath of the global economic crisis of 2008-09 has led to a renewed policy concern calling for export diversification. It is widely believed that dependence on too few products can adversely affect export growth. This concern is prominent in policy circles in both developed and developing countries (Newfarmer, Shaw, & Walkenhorst, 2009; López-Cálix, Walkenhorst, & Diop, 2010; Vos & Koparanova, 2011).

The case for the diversification of the product mix of exports of developing countries is not new to the trade and development policy debate (Maizels, 2003). The related literature dates back to the early 1950s when economic development in developing countries began to emerge as a key theme in the economic profession (Prebisch, 1950; Singer, 1950, 1959). These studies

were concerned with the decline in the term of trade of developing countries resulted from the heavy concentration of exports in primary products.

Some later studies came up with the idea of 'Dutch disease', alternatively called the natural resource curse, which postulated the negative impact of natural resource export on economic growth and non-natural resource exports (Corden, 1984; Gelb, 1988; Sachs & Warner, 1999). The mechanism of Dutch disease is that when there is a boom in natural resource exports, this situation can raise wage levels and result in currency appreciation. The latter effects deteriorate the price competition in non-natural resource sectors such as manufacturing products. Thus, high dependence on natural resource export is postulated to be potentially harmful to export performance.

In the context of renewed policy emphasis on export diversification, some economists have recently argued that countries should be able to diversify exports through industrial policy, that is, government policy specifically targeted at industries, or even individual firms, with export potential, in order to overcome the barriers to entry into export markets (Hausmann and Rodrik, 2003; Rodrik, 2007). This literature based on the perceived risk faced by 'pioneer firms' firms in "discovery of exports" and make a strong case the government engage in targeted industrial policy to eliminate barriers to entry. When the pioneer firm succeeds in the discovery of a new export product, other firms can obtain information from the pioneer firm and enter export markets.

The case for export diversification policy, however, is not consistent with the standard trade theory: the Ricardian and the Heckscher-Ohlin models. These standard trade theories postulate that export patterns should evolve naturally on specialisation based on countries' comparative advantage. The international market is highly competitive, and hence specialisation in a few products based on comparative advantage would be more important for export success than diversification into many products through direct policy intervention. This is because specialisation would help reap gains from economies of scale and competitiveness in world markets.

There are, indeed, some vivid examples that export diversification may not always guarantee faster export growth. For instance, India had a highly diversified export basket evolved through a protectionist trade regime during the first four decades during the post-

independent period. However, its share in world trade declined throughout this period (Krueger, 2010). In contrast, some countries with less export diversification can maintain considerable export growth. Hong Kong is such an outstanding case. Hong Kong had experienced rapid export growth with high commodity concentrations in textiles, clothing, and footwear in the 1970s - the 1990s. The share of textiles, clothing, and footwear exports accounted for over 60% of the total exports of Hong Kong during this period (Weiss, 2005). Recent in-depth studies of emerging exports patterns in developing countries have demonstrated that product-specific factors matter in export success over and above policy-induced changes in the commodity mix (e.g. Hausmann & Rodrik, 2005; Daruich, Easterly, & Reshef, 2019).

In addition, the rise in global production networks cast doubt on the validity of the proposition that export diversification contributes to export expansion. This is because the lead firms operating within global production networks set up production bases in individual countries based on their relative cost advantage for specialisation-specific segments/tasks in the value chain. A given developing country is, therefore, not able to determine its pattern of specialisation within global production networks. It can only create an enabling business environment in order to facilitate the process of specialization within global production networks (Jones & Kierzkowski, 2001; Athukorala, 2014).

The advocacy of export diversification as a means of export expansion based on the prior view that export diversification invariably promotes export growth. Only a few studies have systematically tested this hypothesised relationship (Ali, Alwang, & Siegel, 1991; Roy, 1991; Piñeres & Ferrantino, 1997; Funke & Ruhwedel, 2001; Kandogan, 2006; Rosal, 2019). Also, regarding these studies, there are mixed results in the impact of export diversification on export performance for developed and developing economies.

Therefore, the purpose of this study is to examine the impact of export diversification on export growth drawing on the experiences of export performance of developing Asian countries over the period 1976-2017. These countries provide an ideal laboratory for examining this issue because they have significant policy shifts and structural changes in export patterns during this period.

This study has a number of methodological improvements compared to the previous studies. First, the empirical analysis covers a longer period that can capture significant policy shifts and structural changes in export patterns of the countries covered. The previous studies have covered much shorter periods (10 to 15 years) which is not sufficient to capture the dynamic of export diversification and its impact on export growth. Second, the empirical analysis is undertaken for total non-oil exports as well as by decomposing total non-oil exports into commodity groups (primary products and manufactured products and major subcategories within the latter). This disaggregation is needed because diversification within different product groups can result in different impacts on export performance. Third, this study examines the implications of countries' engagement in global production networks for the relationship between commodity diversification and export growth. Finally, the empirical analysis employs an econometric methodology that enables distinguishing between the short-run and long-run (steady-state) relationships between export diversification and export growth.

The main finding of the chapter is that product diversification is negatively associated with export growth. This result holds for total non-oil merchandise exports, primary exports, and manufactured exports. Thus, the findings are consistent with the postulate of the standard trade theory that export success depends on specialisation based on comparative advantage in world trade rather than on product diversification achieved through direct policy intervention.

The rest of the chapter is structured as follows. Section 2 examines trends and patterns of commodity diversification and export performance. Section 3 describes the estimation method and variables. Section 4 undertakes an econometric analysis of the impact of commodity diversification on export performance. The final section summarises the findings and makes policy inferences.

## 3.2. Trends and patterns of export diversification

### 3.2.1 Measurement of export diversification

There are two standard measures of export diversification: the Herfindahl-Hirschman index (HHI) (Hirschman, 1964), and the Theil index (THI) (Theil, 1972).

The Herfindahl-Hirschman index (HHI) is

$$\text{HHI} = \frac{\sqrt{\sum_{i=1}^{N}(S_i)^2} - \sqrt{1/N}}{1 - \sqrt{1/N}} \tag{1}$$

where $s_i$ is the share of export in each product i and N is total product lines. An increase in the HHI represents concentration, while a decrease in the HHI indicates diversification. In the extreme case, each product has the same export share; then the HHI is zero. By contrast, a country exports only one product; then the HHI is one.

The Theil index (THI) is defined as

$$THI = \frac{1}{N}\sum_{i=1}^{N}\frac{x_i}{\mu} ln\left(\frac{x_i}{\mu}\right) \qquad \text{and} \quad \mu = \frac{1}{N}\sum_{i=1}^{n} x_i \tag{2}$$

where $x_i$ is the export value of product i and an N is the number of products. A higher value of the THI indicates higher export concentration, while a lower value reflects higher export diversification. The index ranges between 0 (extreme export diversification) and the natural logarithm of N (extreme export concentration). Thus, the Theil index can be normalized between 0 and 1 by dividing the natural logarithm of N.

The HHI is more sensitive to large changes in export shares, which can result from an economic crisis and demand and supply shocks because it is the sum of squared export shares. By contrast, the THI is less susceptible to such extreme changes since it measures the share of each export relative to the average exports. The HHI is therefore generally more volatile than the THI. In the case of negatively skewed export data series, the numerical value of the THI tends to be higher than that of the HHI (Cowell, 2000). Given these differences, both indices are used in this chapter for a robustness check.

Both indices are ‘indirect’ measures of diversification (‘direct’ measures of concentration). Decreases in both indices (reflecting export diversification) can result from two factors: an increase in a number of new export products and/or a decrease in export shares of existing products without new products entering the product mix.

### 3.2.2 Data compilation

The pattern of export diversification in developing Asian countries is examined over the period 1976-2017. Data are compiled from the UN Comrade database. Data based on the Revision 3 of Standard International Trade Classification (SITC Rev. 3) available for the period 1986 - 2018. Data are backdated to 1976 by linking data based on the SITC Rev 2 for 1976-1985 to data based on SITC Rev. 3 using the SITC Rev 3 – Rev 2 concordance available from the website of the UN Statistical Office. Data for non-oil exports (Total exports – products belonging to SITC Section 3) are disaggregated into four subcategories for the purpose of the analysis (Table 3.1). Data on oil and gas products (SITC 3) are excluded from the commodity coverage of this analysis because exports of these products depend on a country's specific resource endowment. Not all countries are thus able to diversify their export in oil and gas products. Also, price and volume fluctuations of oil and gas products are significantly determined by non-market factors.[6]

Table 3.1 Definition of commodity group

| No. | Commodity group | SITC Codes |
|---|---|---|
| 1 | Total non-oil merchandise | Total merchandise exports excluding oil and gas (SITC section 3) |
| 2 | Primary products | SITC section 0, 1, 2, 4 and 68 |
| 3 | Manufactured products | SITC section 5 + 6 (less SITC 68: nonferrous metals) + 7 + 8 |
| 4 | GPN products | See Appendix 2.1 |
| 5 | Non-GPN products | Item 3 - 4 |

Source: Author's compilation.

### 3.2.3 Trends and patterns

The export structures of developing Asian countries have changed significantly over the past five decades (Table 3.2). In all countries, the shares of primary products in total exports has declined, while manufactured goods are accounting for an increasing share of export composition. In the early 1980s, manufactured goods accounted for 46.8% of total exports from developing Asian countries. This share had increased to 74.3% by 2016/17.

[6] We perform the robustness check by estimating total merchandise exports including oil and gas products. According to the estimation results, the coefficient of diversification indices between total merchandise exports and total non-oil merchandise exports are not significantly different sign. However, the size of coefficient in the case of total merchandise export is greater than the coefficient of total non-oil merchandise.

Table 3.2 Shares of manufactured products in total non-oil exports (%)[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **91.8** | **89.6** | **92.3** | **94.4** | **95.6** | **94.5** | **94.8** |
| China | n.a. | 80.7 | 87.6 | 91.5 | 94.3 | 94.7 | 94.9 |
| Hong Kong | 92.9 | 93.4 | 93.9 | 95.9 | 96.8 | 94.2 | 94.7 |
| South Korea | 90.7 | 94.7 | 95.3 | 95.9 | 95.8 | 94.6 | 94.7 |
| | | | | | | | |
| **Southeast Asia** | **32.0** | **72.3** | **82.2** | **86.2** | **84.3** | **79.6** | **82.4** |
| Brunei | n.a. | 81.3 | 98.9 | 99.2 | 94.1 | 96.2 | 95.5 |
| Cambodia | n.a. | n.a. | n.a. | 96.3 | 97.6 | 94.9 | 93.0 |
| Indonesia | 11.7 | 64.7 | 68.5 | 76.1 | 62.9 | 51.0 | 57.0 |
| Malaysia | 26.0 | 69.1 | 82.4 | 89.7 | 87.2 | 73.9 | 74.9 |
| Philippines | 27.7 | 64.4 | 77.1 | 92.4 | 90.1 | 80.0 | 86.2 |
| Singapore | 70.0 | 88.6 | 92.7 | 95.7 | 94.1 | 93.0 | 91.8 |
| Thailand | 24.4 | 65.8 | 73.8 | 79.4 | 81.0 | 76.0 | 79.0 |
| Vietnam | n.a. | n.a. | n.a. | 60.6 | 67.6 | 71.4 | 82.0 |
| | | | | | | | |
| **South Asia** | **45.8** | **73.5** | **81.3** | **84.4** | **82.0** | **79.6** | **81.9** |
| Bangladesh | 68.1 | 80.0 | 87.2 | 91.9 | 91.9 | 93.6 | 96.4 |
| India | 45.2 | 74.0 | 75.0 | 81.5 | 78.7 | 78.6 | 81.2 |
| Pakistan[2] | 58.7 | 80.2 | 84.3 | 86.6 | 85.5 | 77.0 | 77.9 |
| Sri Lanka | 11.3 | 59.8 | 78.8 | 77.5 | 72.0 | 69.2 | 72.3 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **46.1** | **41.0** | **49.3** | **47.2** | **42.9** |
| Armenia[3] | n.a. | n.a. | 56.4 | 62.6 | 68.4 | 33.6 | 29.4 |
| Azerbaijan | n.a. | n.a. | 58.4 | 44.7 | 42.3 | 44.1 | 32.7 |
| Georgia | n.a. | n.a. | 50.0 | 36.1 | 44.0 | 62.0 | 48.2 |
| Kazakhstan | n.a. | n.a. | 19.8 | 16.6 | 35.5 | 42.3 | 44.8 |
| Kyrgyzstan | n.a. | n.a. | 46.1 | 45.1 | 56.5 | 54.0 | 59.6 |
| | | | | | | | |
| **Developing Asia** | 46.8 | 76.7 | 73.7 | 75.8 | 76.8 | 73.7 | 74.3 |

Note: 1. n.a. denotes non-available data.
2. Due to lack of observation in 1980/81 for Pakistan, we use observation in 1982 instead of 1980/81.
3. Due to lack of observation in 1995/96 for Armenia, we use observation in 1997 instead of 1995/96.
Source: Author's computation using the UN Comtrade database.

At the individual country level, this pattern is more prominent in East Asia and Southeast Asia and South Asia where, on average, manufactured goods account for over two-thirds of total exports. In Southeast Asia, the only exception to this overall pattern is Indonesia, where primary products still account for over 40% of total exports. Interestingly, some developing countries, with low per capita income, have very high export shares in manufactured products. For example, Bangladesh's manufactured products accounted for around 80% of total exports in 1990/91 and increased to around 96% of total exports in 2016/17. In Cambodia, manufacturing share has remained around 90% over the past two decades.

In Central and West Asia, primary products still account for the bulk of total exports. Armenia has the highest primary export share in developing Asian countries, with these products accounting for around 70% of total exports in 2016/17. In this subregion, only two transition countries (Kazakhstan and Kyrgyzstan) have an upward trend in their manufactured export shares in total exports (Table 3.2).

Data compiled to discuss the role of global production sharing exports within global production networks (GPNs) in the export composition are summarised in Table 3.3.[7] A comparison of data in Table 3.2 and 3.3 clearly show that GPN exports are the key factor in the upward trend of manufactured export shares. In the region as a whole, the share of GPN products in total manufacturing exports increased from 46.7% in 1980/81 to 65.0% in 2016/17. This increase can be seen for all countries except India, Pakistan, and Kazakhstan. In 2016/17, the share of GPN exports in total manufactured exports, on average, in North Asia, Southeast Asia and South Asia was more than 60%, compared to only 34.3% in Central and West Asia (Table 3.3).

Table 3.3 Shares of GPN Products in total manufactured exports (%)[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **65.8** | **67.3** | **65.0** | **70.3** | **73.6** | **68.7** | **67.0** |
| China | n.a. | 63.0 | 61.4 | 68.1 | 70.2 | 65.9 | 62.0 |
| Hong Kong | 74.6 | 72.1 | 68.5 | 73.1 | 78.2 | 74.0 | 75.1 |
| South Korea | 57.0 | 66.9 | 65.1 | 69.6 | 72.3 | 66.3 | 64.0 |
| | | | | | | | |
| **Southeast Asia** | **59.7** | **67.6** | **67.5** | **77.1** | **72.6** | **63.0** | **66.1** |
| Brunei | n.a. | n.a. | 46.2 | 81.0 | 79.2 | 54.7 | 41.8 |
| Cambodia | n.a. | n.a. | n.a. | 79.2 | 78.3 | 67.8 | 92.3 |
| Indonesia | 40.4 | 36.2 | 45.3 | 52.1 | 51.5 | 49.8 | 49.0 |
| Malaysia | 75.1 | 80.5 | 79.2 | 82.2 | 77.2 | 65.2 | 63.1 |
| Philippines | 55.7 | 73.6 | 83.0 | 93.3 | 91.4 | 82.3 | 86.2 |
| Singapore | 71.0 | 77.3 | 81.9 | 81.8 | 65.4 | 61.3 | 58.1 |
| Thailand | 56.1 | 70.6 | 69.4 | 69.9 | 66.8 | 57.8 | 60.9 |
| Vietnam | n.a. | n.a. | n.a. | 77.1 | 71.2 | 64.8 | 77.3 |
| | | | | | | | |
| **South Asia** | **21.0** | **49.0** | **54.1** | **58.6** | **56.3** | **56.3** | **61.2** |
| Bangladesh | 2.9 | 60.7 | 75.7 | 85.7 | 83.7 | 88.4 | 93.2 |
| India | 28.5 | 35.2 | 32.4 | 31.7 | 30.5 | 32.1 | 35.0 |
| Pakistan[2] | 35.0 | 28.8 | 31.5 | 35.2 | 35.3 | 31.2 | 38.1 |
| Sri Lanka | 17.6 | 71.4 | 76.7 | 81.8 | 75.6 | 73.5 | 78.5 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **25.6** | **33.9** | **31.0** | **32.5** | **34.3** |
| Armenia[3] | n.a. | n.a. | 28.0 | 24.5 | 9.7 | 15.7 | 34.3 |
| Azerbaijan | n.a. | n.a. | 29.1 | 50.5 | 47.1 | 25.0 | 18.9 |
| Georgia | n.a. | n.a. | 15.9 | 37.8 | 41.7 | 44.6 | 37.3 |
| Kazakhstan | n.a. | n.a. | 25.0 | 10.1 | 15.1 | 7.0 | 11.9 |
| Kyrgyzstan | n.a. | n.a. | 30.0 | 46.5 | 41.5 | 70.1 | 69.0 |
| | | | | | | | |
| **Developing Asia** | 46.7 | 61.4 | 52.5 | 61.6 | 59.1 | 54.9 | 65.0 |

Note: 1. n.a. denotes non-available data.
2. Due to lack of observation in 1980/81 for Pakistan, we use observation in 1982 instead of 1980/81.
3. Due to lack of observation in 1995/96 for Armenia, we use observation in 1997 instead of 1995/96.
Source: Author's computation using the UN Comtrade database.

Some countries in South Asia, and Central and West Asia involving slightly in global production networks, their GPN export shares account for less than 40% of total manufactured exports. India is one example that is not able to engage in global production networks.

[7] The method of data compilation is discussed in Chapter 2, Appendix 2.1.

Compared with Bangladesh and Sri Lanka, India's share of GPN exports in total manufactured exports was very low, around 35% in 2016/17. On the other hand, the shares of GPN exports in Bangladesh and Sri Lanka accounted for around 90% and 80% of total manufactured exports, respectively.

Data on the patterns of export diversification are summarised as measured by the Herfindahl-Hirschman index (HHI) and the Theil index (THI) are plotted in Figure 3.1 and Figure 3.2, respectively. Table 3.4 reports only the Herfindahl-Hirschman index (HHI) for each developing Asian country. To facilitate the analysis, both indices are reported as percentages.

In general, both indices show the same export diversification pattern in total exports, primary products, and the major export categories over the last three decades (Figure 3.1 and Figure 3.2). The two indices are highly correlated[8]. However, there are two vital differences between the HHI and the THI; the HHI is slightly more volatile than the THI, and on average the magnitude of the THI is relatively large than the HHI for all commodity groups.

The export diversification levels in total non-oil exports and its subcategories are shown in Figure 3.1. In developing Asia, this region experienced a significant export diversification in total non-oil exports. Its export diversification increased by approximately 10% during the period 1980-2017. A comparison between primary products and manufactured products shows that the level of HHI in primary products, on average, is higher (the degree of diversification is lower) than that of manufactured products. This finding is consistent with the fact that manufactured sector has more chances of product diversification compared to primary products due to its greater number of product lines and its lesser domestic resource constraint in productions.

Patterns of export diversification reflect some responses to external shocks. For example, after the Asian financial crisis of 1997-98, the degree of export diversification dropped significantly; the HHI for total non-oil exports increased from 18.9% in 1997 to 23.1% in 1999 (Figure 3.1).

[8] As the correlation calculation (not shown in the study), we find that correlations between the HHI and the Theil index in each commodity group are around 0.90 - 0.97.

## Figure 3.1 Export diversification in developing Asia: the Herfindahl-Hirschman index[1]

Figure 3.1 (a) Total exports, primary and manufactured products

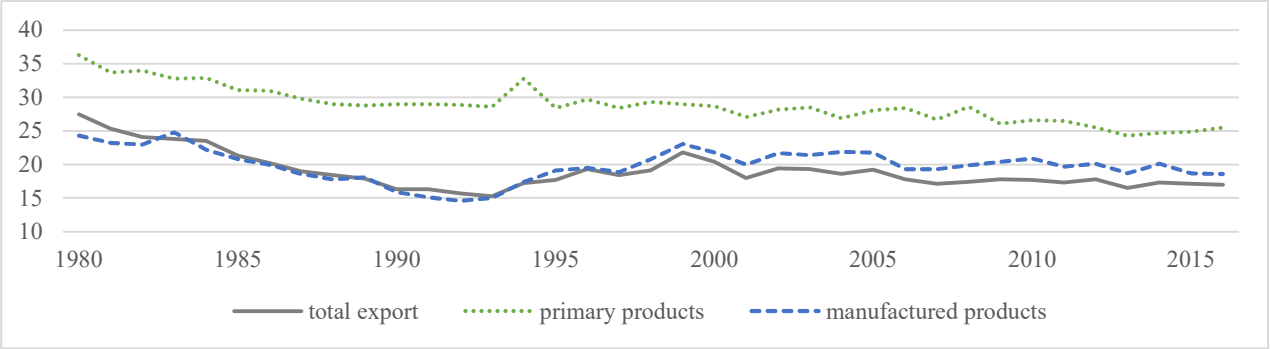
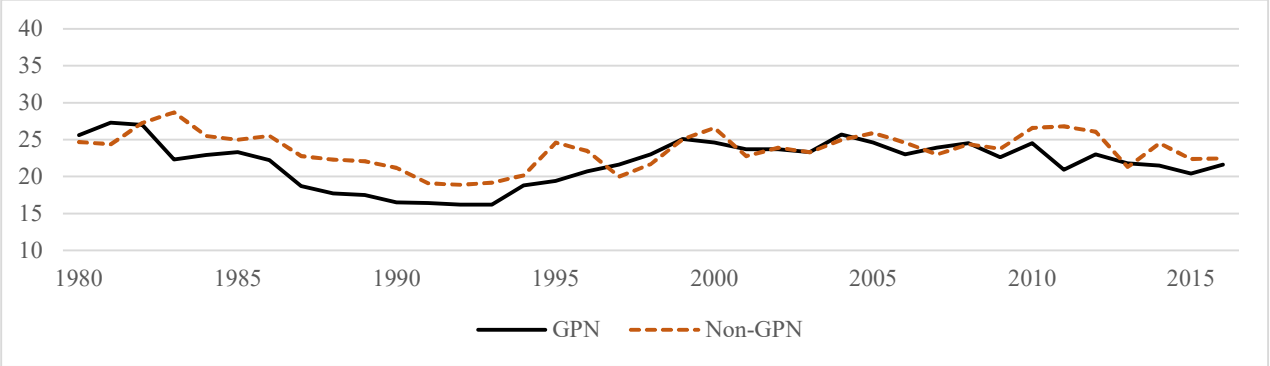



Figure 3.1 (b) GPN and non-GPN products




Note: 1. The values are simple average of the Herfindahl-Hirschman index (HHI).
Source: Author's computation using the UN Comtrade database.

## Figure 3.2 Export diversification in developing Asia: the Theil index[1]

Figure 3.2 (a) Total exports, primary and manufactured products

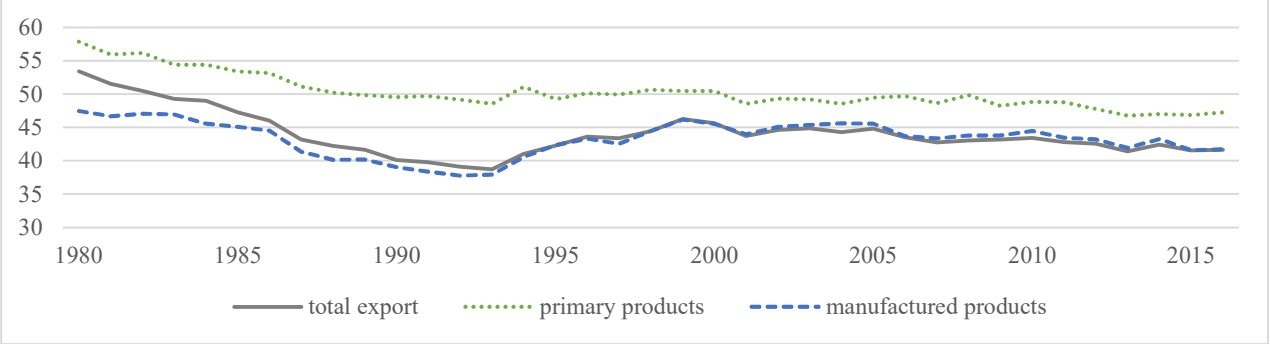
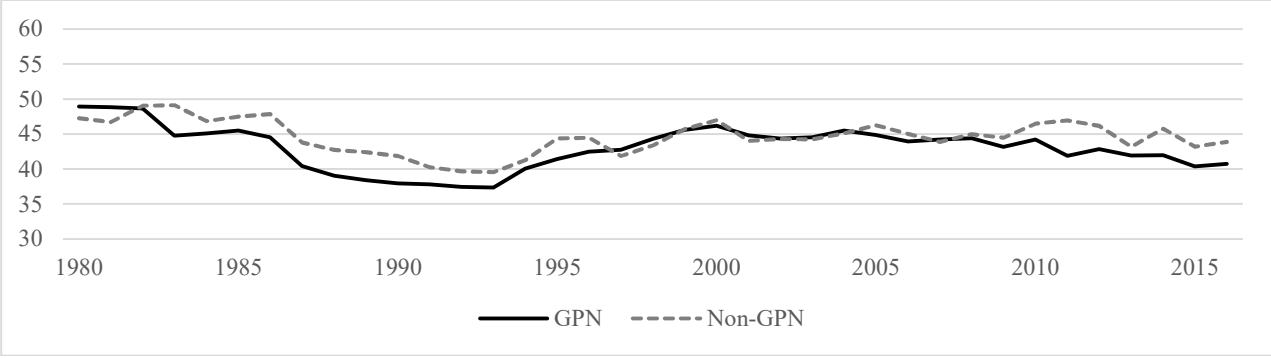



Figure 3.2 (b) GPN and non-GPN products




Note: 1. The values are simple average of the Theil index (THI).
Source: Author's computation using the UN Comtrade database.

# Table 3.4 Export diversification in developing Asia: the Herfindahl-Hirschman index

Table 3.4 (a) Total non-oil exports[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **7.66** | **7.44** | **8.10** | **9.23** | **11.70** | **10.70** | **10.56** |
| China | n.a. | 7.76 | 4.37 | 5.30 | 7.90 | 8.07 | 7.59 |
| Hong Kong | 7.66 | 5.74 | 6.34 | 7.69 | 11.70 | 10.17 | 12.02 |
| South Korea | 7.66 | 8.82 | 13.60 | 14.69 | 15.50 | 13.85 | 12.08 |
| | | | | | | | |
| **Southeast Asia** | **18.95** | **12.63** | **19.32** | **20.16** | **17.35** | **16.21** | **16.13** |
| Brunei | n.a. | n.a. | 48.66 | 34.10 | 33.74 | 30.18 | 28.97 |
| Cambodia | n.a. | n.a. | n.a. | 30.03 | 32.89 | 32.57 | 21.94 |
| Indonesia | 25.25 | 17.06 | 11.57 | 7.40 | 9.27 | 13.00 | 11.75 |
| Malaysia | 20.81 | 12.25 | 13.53 | 16.83 | 13.63 | 11.64 | 8.11 |
| Philippines | 16.01 | 11.92 | 17.24 | 31.02 | 19.86 | 14.08 | 23.41 |
| Singapore | 9.93 | 12.13 | 15.90 | 17.94 | 10.57 | 8.58 | 7.50 |
| Thailand | 22.75 | 9.77 | 9.00 | 11.26 | 8.89 | 9.29 | 9.45 |
| Vietnam | n.a. | n.a. | n.a. | 12.72 | 9.97 | 10.32 | 17.87 |
| | | | | | | | |
| **South Asia** | **34.08** | **19.52** | **17.00** | **17.04** | **16.72** | **18.19** | **16.49** |
| Bangladesh | 42.76 | 21.81 | 20.11 | 21.90 | 24.86 | 28.99 | 27.59 |
| India | 23.11 | 15.31 | 14.69 | 15.43 | 12.76 | 14.22 | 11.58 |
| Pakistan[2] | 24.68 | 21.42 | 21.31 | 16.82 | 15.22 | 14.46 | 12.97 |
| Sri Lanka | 45.80 | 19.57 | 11.90 | 14.04 | 14.03 | 15.08 | 13.85 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **22.52** | **23.53** | **24.07** | **23.02** | **22.12** |
| Armenia[3] | n.a. | n.a. | 25.73 | 32.94 | 36.20 | 30.79 | 29.65 |
| Azerbaijan | n.a. | n.a. | 22.87 | 18.46 | 25.21 | 21.69 | 20.83 |
| Georgia | n.a. | n.a. | 16.61 | 18.75 | 19.69 | 27.61 | 22.65 |
| Kazakhstan | n.a. | n.a. | 31.61 | 26.92 | 24.32 | 22.78 | 22.18 |
| Kyrgyzstan | n.a. | n.a. | 15.81 | 20.58 | 14.95 | 12.25 | 15.31 |

Table 3.4 (b) Primary products[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **14.75** | **14.64** | **12.11** | **10.91** | **11.88** | **13.40** | **11.60** |
| China | n.a. | 9.37 | 7.71 | 7.61 | 8.24 | 8.03 | 8.14 |
| Hong Kong | 14.30 | 21.29 | 14.77 | 11.54 | 13.46 | 18.48 | 13.57 |
| South Korea | 15.19 | 13.25 | 13.86 | 13.59 | 13.94 | 13.70 | 13.09 |
| | | | | | | | |
| **Southeast Asia** | **26.65** | **20.32** | **24.17** | **22.23** | **27.15** | **27.28** | **24.39** |
| Brunei | n.a. | n.a. | 31.49 | 25.38 | 42.78 | 40.91 | 32.84 |
| Cambodia | n.a. | n.a. | n.a. | 30.95 | 50.31 | 45.98 | 49.81 |
| Indonesia | 25.95 | 20.03 | 22.93 | 20.33 | 22.59 | 25.65 | 25.19 |
| Malaysia | 30.49 | 25.99 | 30.59 | 26.30 | 26.70 | 31.81 | 21.07 |
| Philippines | 23.53 | 20.88 | 22.54 | 19.65 | 22.70 | 20.72 | 17.44 |
| Singapore | 25.68 | 13.66 | 15.94 | 13.55 | 11.37 | 11.67 | 15.66 |
| Thailand | 27.58 | 21.04 | 21.52 | 18.12 | 16.74 | 18.04 | 14.46 |
| Vietnam | n.a. | n.a. | n.a. | 23.56 | 23.97 | 23.43 | 18.68 |
| | | | | | | | |
| **South Asia** | **46.38** | **40.88** | **38.44** | **43.29** | **37.87** | **32.79** | **28.53** |
| Bangladesh | 56.64 | 54.60 | 65.89 | 70.21 | 50.11 | 38.44 | 35.21 |
| India | 36.21 | 19.61 | 19.57 | 16.37 | 20.82 | 18.31 | 17.17 |
| Pakistan[2] | **45.50** | 45.58 | 41.95 | 43.49 | 47.82 | 39.78 | 30.89 |
| Sri Lanka | 47.18 | 43.73 | 26.35 | 43.09 | 32.75 | 34.64 | 30.85 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **33.03** | **30.09** | **30.43** | **28.82** | **31.40** |
| Armenia[3] | n.a. | n.a. | 31.24 | 32.45 | 37.93 | 40.96 | 39.97 |
| Azerbaijan | n.a. | n.a. | 49.48 | 26.70 | 28.37 | 28.78 | 27.00 |
| Georgia | n.a. | n.a. | 23.16 | 24.88 | 27.55 | 27.25 | 34.44 |
| Kazakhstan | n.a. | n.a. | 37.47 | 32.79 | 33.55 | 27.07 | 26.89 |
| Kyrgyzstan | n.a. | n.a. | 23.79 | 33.65 | 24.76 | 20.03 | 28.69 |

Table 3.4 (c) Manufactured products[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **8.04** | **8.12** | **8.48** | **9.54** | **12.04** | **11.14** | **10.98** |
| China | n.a. | 9.45 | 4.80 | 5.64 | 8.22 | 8.35 | 7.83 |
| Hong Kong | 7.96 | 5.79 | 6.53 | 7.82 | 11.88 | 10.60 | 12.52 |
| South Korea | 8.11 | 9.13 | 14.10 | 15.15 | 16.01 | 14.48 | 12.59 |
| | | | | | | | |
| **Southeast Asia** | **17.07** | **15.02** | **20.70** | **21.41** | **17.92** | **16.37** | **17.24** |
| Brunei | n.a. | n.a. | 49.07 | 34.32 | 35.39 | 31.18 | 30.19 |
| Cambodia | n.a. | n.a. | n.a. | 31.05 | 33.53 | 34.09 | 23.21 |
| Indonesia | 24.68 | 24.29 | 13.35 | 7.49 | 6.61 | 6.69 | 8.29 |
| Malaysia | 18.75 | 13.59 | 15.12 | 18.48 | 15.12 | 11.09 | 8.36 |
| Philippines | 10.07 | 13.53 | 19.98 | 33.47 | 21.85 | 16.85 | 27.06 |
| Singapore | 8.88 | 13.53 | 16.99 | 18.61 | 11.07 | 9.06 | 7.94 |
| Thailand | 22.95 | 10.18 | 9.66 | 13.45 | 10.30 | 10.82 | 11.39 |
| Vietnam | n.a. | n.a. | n.a. | 14.42 | 9.51 | 11.14 | 21.49 |
| | | | | | | | |
| **South Asia** | **37.39** | **20.76** | **19.29** | **18.32** | **18.20** | **19.70** | **17.95** |
| Bangladesh | 57.79 | 23.82 | 21.03 | 22.95 | 26.64 | 30.77 | 28.46 |
| India | 19.36 | 19.67 | 18.59 | 18.63 | 15.27 | 17.44 | 13.74 |
| Pakistan[2] | 25.09 | 24.37 | 24.10 | 18.25 | 15.94 | 14.91 | 14.31 |
| Sri Lanka | 47.31 | 15.20 | 13.44 | 13.44 | 14.98 | 15.68 | 15.28 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **27.09** | **28.52** | **32.69** | **33.82** | **27.24** |
| Armenia[3] | n.a. | n.a. | 39.02 | 48.51 | 50.17 | 41.43 | 26.61 |
| Azerbaijan | n.a. | n.a. | 18.05 | 24.29 | 39.31 | 32.32 | 27.67 |
| Georgia | n.a. | n.a. | 23.69 | 25.12 | 27.02 | 41.64 | 28.84 |
| Kazakhstan | n.a. | n.a. | 35.29 | 25.94 | 28.74 | 38.91 | 36.63 |
| Kyrgyzstan | n.a. | n.a. | 19.39 | 18.75 | 18.22 | 14.82 | 16.48 |

Table 3.4 (d) GPN products[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **10.43** | **11.58** | **11.99** | **12.64** | **15.51** | **15.17** | **15.12** |
| China | n.a. | 15.24 | 6.63 | 7.25 | 10.93 | 12.03 | 11.92 |
| Hong Kong | 9.87 | 7.12 | 8.48 | 9.58 | 14.14 | 12.32 | 14.54 |
| South Korea | 10.99 | 12.39 | 20.86 | 21.10 | 21.45 | 21.17 | 18.91 |
| | | | | | | | |
| **Southeast Asia** | **23.86** | **14.75** | **19.49** | **24.52** | **21.02** | **16.95** | **19.21** |
| Brunei | n.a. | n.a. | 32.42 | 39.82 | 41.51 | 20.77 | 22.48 |
| Cambodia | n.a. | n.a. | n.a. | 31.81 | 34.73 | 26.79 | 24.01 |
| Indonesia | 33.22 | 11.39 | 11.46 | 10.15 | 8.98 | 9.23 | 10.12 |
| Malaysia | 27.39 | 16.15 | 17.91 | 21.58 | 18.68 | 16.04 | 12.12 |
| Philippines | 11.12 | 16.47 | 22.70 | 35.00 | 22.82 | 18.72 | 30.08 |
| Singapore | 11.87 | 17.00 | 19.89 | 21.84 | 15.69 | 12.91 | 10.43 |
| Thailand | 35.70 | 12.73 | 12.55 | 18.40 | 14.28 | 17.01 | 17.37 |
| Vietnam | n.a. | n.a. | n.a. | 17.55 | 11.50 | 14.09 | 27.05 |
| | | | | | | | |
| **South Asia** | **34.77** | **20.34** | **19.20** | **18.96** | **19.33** | **20.79** | **19.46** |
| Bangladesh | 39.56 | 27.62 | 25.51 | 25.59 | 30.46 | 33.84 | 29.56 |
| India | 28.60 | 16.13 | 14.76 | 11.87 | 9.68 | 11.21 | 10.80 |
| Pakistan[2] | 20.29 | 20.21 | 21.23 | 23.40 | 19.77 | 19.87 | 19.81 |
| Sri Lanka | 50.64 | 17.40 | 15.30 | 14.97 | 17.43 | 18.24 | 17.67 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **24.29** | **31.85** | **37.31** | **37.64** | **28.99** |
| Armenia[3] | n.a. | n.a. | 17.66 | 19.68 | 33.17 | 25.96 | 19.93 |
| Azerbaijan | n.a. | n.a. | 20.13 | 40.49 | 65.50 | 50.68 | 37.20 |
| Georgia | n.a. | n.a. | 20.15 | 41.40 | 33.38 | 69.32 | 49.18 |
| Kazakhstan | n.a. | n.a. | 38.88 | 26.50 | 30.38 | 22.49 | 16.41 |
| Kyrgyzstan | n.a. | n.a. | 24.62 | 31.20 | 24.15 | 19.75 | 22.22 |

Table 3.4 (e) Non-GPN products[1]

| | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **8.72** | **7.43** | **6.35** | **6.29** | **6.85** | **9.22** | **10.70** |
| China | n.a. | 7.06 | 5.00 | 4.97 | 4.08 | 3.92 | 4.65 |
| Hong Kong | 8.15 | 6.62 | 5.88 | 7.14 | 9.46 | 16.54 | 20.14 |
| South Korea | 9.29 | 8.62 | 8.17 | 6.77 | 7.02 | 7.21 | 7.30 |
| | | | | | | | |
| **Southeast Asia** | **20.74** | **17.69** | **25.37** | **24.99** | **26.54** | **29.07** | **20.76** |
| Brunei | n.a. | n.a. | 86.94 | 55.61 | 59.05 | 63.93 | 49.86 |
| Cambodia | n.a. | n.a. | n.a. | 82.91 | 88.90 | 90.62 | 29.64 |
| Indonesia | 29.59 | 37.97 | 22.90 | 10.92 | 9.55 | 9.57 | 13.10 |
| Malaysia | 17.31 | 14.61 | 14.29 | 9.24 | 8.76 | 7.44 | 7.06 |
| Philippines | 19.43 | 14.44 | 11.72 | 10.65 | 14.65 | 25.47 | 35.58 |
| Singapore | 7.27 | 6.83 | 6.30 | 9.95 | 9.47 | 9.96 | 11.62 |
| Thailand | 30.09 | 14.60 | 10.06 | 7.95 | 8.57 | 9.62 | 9.51 |
| Vietnam | n.a. | n.a. | n.a. | 12.71 | 13.36 | 15.97 | 9.68 |
| | | | | | | | |
| **South Asia** | **40.85** | **33.44** | **28.32** | **24.06** | **24.92** | **25.30** | **22.61** |
| Bangladesh | 57.34 | 41.94 | 29.35 | 25.12 | 30.76 | 28.29 | 27.55 |
| India | 25.28 | 29.41 | 26.89 | 27.04 | 21.82 | 25.47 | 20.64 |
| Pakistan[2] | 35.80 | 34.29 | 34.12 | 25.39 | 22.41 | 19.90 | 19.88 |
| Sri Lanka | 44.99 | 28.12 | 22.94 | 18.69 | 24.71 | 27.55 | 22.37 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **35.31** | **35.95** | **36.49** | **36.44** | **33.21** |
| Armenia[3] | n.a. | n.a. | 54.18 | 64.08 | 55.45 | 48.85 | 39.53 |
| Azerbaijan | n.a. | n.a. | 24.28 | 26.94 | 27.37 | 29.00 | 32.57 |
| Georgia | n.a. | n.a. | 27.91 | 25.86 | 40.21 | 49.52 | 36.00 |
| Kazakhstan | n.a. | n.a. | 44.33 | 40.32 | 33.12 | 41.66 | 41.48 |
| Kyrgyzstan | n.a. | n.a. | 25.84 | 22.55 | 26.34 | 13.19 | 16.45 |

Note: 1. n.a. denotes non-available data.

2. Due to lack of observation in 1980/81 for Pakistan, we use observation in 1982 instead of 1980/81.

3. Due to lack of observation in 1995/96 for Armenia, we use observation in 1997 instead of 1995/96.

Source: Author's computation using the UN Comtrade database.

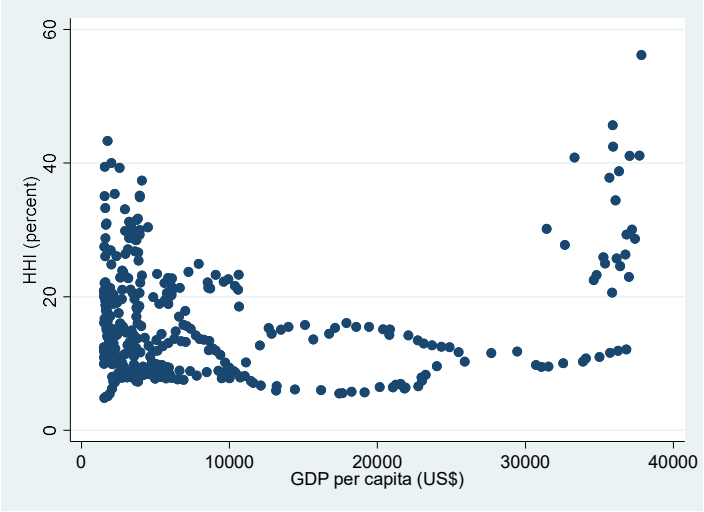
The data in Table 3.4 reveal the level of export diversification is different among the four regions. On average, the level of export diversification is highest in North Asia, followed by Southeast Asia, South Asia, and Central and West Asia. Moreover, the large changes in the level of export diversification for all four regions existed in 1980-2000. But since 2000, the export diversification has not been changing for all subregions. For example, in total non-oil exports, the HHI's South Asia was high at around 34.08% in 1980/81 and fell to 16.49% in 1995/96. However, after 2000 South Asia could not substantially diversify its export basket.

At the country level, GPN exports are generally more concentrated rather than non-GPN exports for only the Asian countries with high engagement in global product sharing. China is also such a case (Table 3.4 (e)). Compared with other commodity groups, the levels of export diversification in China's GPN products is low (the higher value in the HHI). This clearly represents the nature of GPN products, which most countries have no freedom choice for diversifying their products.

In Southeast Asia, all countries tended to diversify their total non-oil exports over the period, except Vietnam. Total non-oil exports in Vietnam became more export concentration , as shown in Table 3.4 (a). The HHI's Vietnam was 12.72% in 2000/01 and increased to 17.87% in 2016/17. However, the main source of its lesser export diversification results from GPN exports, not non-GPN exports. The HHI of GPN exports rose from 17.55% in 2000/01 to 27.05% in 2016/17. Interestingly, Vietnam has experienced rapid export expansion during the period 2000-17, even though its export composition has become relatively more concentrated since 2010.

The relationship between the level of economic development (a measure of per capita GDP) and export diversification measured using the HHI[9] is depicted in Figure 3.3. The relationship is consistent with the hump-shaped relationship between the level of development and the degree of commodity diversification (the inverted U-shaped relationship based on the HHI and the THI uncovered by Cadot, Carrère, & Strauss-Kahn (2011)).

Figure 3.3 Export diversification in total non-oil exports (measured by the HHI)[1] and GDP per capita in developing Asian countries in the period 1976-2017




Source: The Herfindahl-Hirschman index (HHI) is estimated using data from the UN Comtrade database, and data on GDP per capita are from World Development Indicators, World Bank.

[9] See the Theil index (THI) results in Appendix 3.1, which reports only the case of total non-oil export because the HHI and the THI show the close export diversification pattern for all of commodity groups.

At the individual country level, we noticed that only two high-income countries (Hong Kong and South Korea) are currently on the right-hand side of the inverted U-shaped in Figure 3.3. Thus, when GDP per capita increases, both countries tend to re-concentrate their exports. On the other hand, other developing Asian countries are likely to be in the stage of export diversification as GDP per capita rises.

## 3.3 Econometric analysis

### 3.3.1 Model specification

The methodology of this section is to estimate a 'reduced form' export equation with export diversification as an explanatory variable. The control variables are selected guided by previous studies on the determinants of export performances (Goldstein & Khan, 1978, 1985; Bayar, 2018).

The export equation is specified as follow,

$$EXP_{it} = \beta_0 + \beta_1 DIVER_{it} + \beta_2 DIVER_{it}^2 + \beta_3 WD_{it} + \beta_4 GDPC_{it} + \beta_5 REER_{it} + \beta_6 FDI_{it} + \beta_7 TRADE_{it} + \beta_8 CRI2008 + \varepsilon_{it} \quad (3)$$

where EXP is real exports, i = 1,2,…,N is the developing Asian countries, t = 1,2,…,T is the time unit in years. $\varepsilon$ is the error term in the model. The explanatory variables are listed below with the expected sign of the regression coefficient in brackets:

| | | |
|---|---|---|
| DIVER | (- / +) | Export diversification alternatively measured by the HHI and the THI indices |
| WD | (+) | World demand measured as export-weighted GDP of trading partner countries |
| GDPC | (+) | Per capita income of exporting country at constant 2010 US$ |
| REER | (-) | Real effective exchange |
| FDI | (+) | Foreign direct investment |
| TRADE | (+) | Trade policy regime alternatively measured by openness index and trade liberalisation index |
| CRI2008 | (-) | Dummy variable for the global financial crisis in 2008-2009 |

In equation (3), WD represents the weighted income of export-destination countries. The REER captures combined price effect of relative prices and exchange rate (export competitiveness). An increase in REER implies a real appreciation of domestic currency, which causes export more expensive in export markets. On the other hand, the supply side is represented by GDPC and FDI. GDPC represents the stage of economic development, with

higher GDPC indicating the higher advanced stage of economic development. FDI captures the effect of foreign investment on improving export supply capacity.

Trade policy regime (TRADE), in this study, is used by two indices: OPEN and LIB. OPEN is trade openness measured as percentage shares of foreign trade (exports + imports) in GDP. LIB is trade liberalisation index constructed by Sachs and Warner (1995) and updated by Wacziarg and Welch (2008) and Paudel (2014). LIB represents trade openness in terms of policy liberalization. Sachs and Warner (1995) state that a country is classified as having open trade policy if a country exhibit following five characteristics: none of average tariff rates of 40% or more on imports of intermediate and capital goods, none of non-tariff barrier covering 40% or more of imports of intermediate and capital goods, none of black market exchange rate premium of 20% or more, none of a socialist economic system, and none of a state monopoly on major export. We estimate the export model by using both international trade integration for a robustness check.

### 3.3.2 Data

The model is estimated for total non-oil exports and four subcategories (primary products, manufactured products, GPN products and non-GPN products) using panel data for 20 developing Asian countries that have a population of more than one million and covers the period of 1976-2017. The panel data are unbalanced because of limitations on data availability. Roughly, the sample coverage can be separated into three groups (Table 3.5). The first group (10 countries) covers the starting years at the late 1970s. The second group (2 countries) and the third group (8 countries) have the starting years around the 1980s and the 1990s, respectively. The sample covers countries at different stages of economic development and includes natural-resource rich countries such as Indonesia, Vietnam, and Kazakhstan. This would give considerable variability, both over time in a given country and across countries for econometric analysis on the impact of commodity diversification on export growth.

Table 3.5 List of developing Asian countries

| Time range | Number of countries | List of country |
|---|---|---|
| The late 1970s - 2017 | 10 | Bangladesh, Hong Kong, India, Indonesia, South Korea, Malaysia, Philippines, Sri Lanka, Singapore, Thailand |
| The 1980s - 2017 | 2 | China, Pakistan |
| The late 1990s - 2017 | 8 | Armenia, Azerbaijan, Brunei, Cambodia, Georgia, Kazakhstan, Kyrgyzstan, Vietnam |

Source: Author's compilation from the list of developing countries based on the UN country classification.

As already discussed in Section 2, data series for the dependent variable (the HHI and the THI) are computed using data from the UN Comtrade database at SITC five-digit level. World demand (WD) is measured by the weighted average of the GDP of the 20 major export destination countries of each developing Asian country. WD for each country varies by its export market structure. The REER for each country is also calculated using exports weight for the bilateral exchange rates, wholesale price indices for the major export destination countries, and the GDP deflator of each country to measure domestic price level. GDP per capita extracts from a database of the World Bank. REER and FDI are from the French Research Center in International Economics (CEPII) and the UNTAD, respectively. The openness index is from the World Bank database. Finally, LIB (policy liberalization index) is from Sachs and Warner (1995), Wacziarg and Welch (2008), and then Paudel (2014). Export price (unit value) indices from the UNCTAD database are used for constructing real export series (https://unctadstat.unctad.org/). This index constructed at the SITC 3-digit level is available for all countries covered in this study.

### 3.3.3 Estimation method

The traditional panel data estimation is not suitable for this study because of the long-time span (t) in panel dataset (Baltagi, 2001). Specifically, it could encounter the spurious regression problem if the data series are non-stationary. It also fails to capture possible differences between short-run and long-run impact of export diversification on export growth. To avoid the above problems, the study uses the Autoregressive Distributed Lag (ARDL) estimator (Pesaran, 2015).

The ARDL estimator can be used for the data series which are either stationary at the level I(0) or stationary at the first difference I(1). The study uses the Fisher combination test of Im, Pesaran, and Shin (2003), which is applicable to unbalanced panel dataset. Also, this test method is superior because it allows for heterogeneous panel dataset with serially uncorrelated errors, unlike the traditional stationarity test, which assumes homogeneous panel dataset with serially uncorrelated errors. The stationarity test results suggest that all data series are non-stationary at the level but are stationary at first differenced (see Appendix 3.2).

The export equation can be specified in ARDL form,

$$\begin{aligned} EXP_{it} = {} & \alpha_1 DIVER_{it} + \alpha_2 DIVER_{it}^2 + \alpha_3 WD_{it} + \alpha_4 GDPC_{it} + \alpha_5 REER_{it} + \alpha_6 FDI_{it} + \alpha_7 TRADE_{it} \\ & + \alpha_8 CRI2008_{it} + \alpha_1' DIVER_{it-1} + \alpha_2' DIVER_{it-1}^2 + \alpha_3' WD_{it-1} + \alpha_4' GDPC_{it-1} \\ & + \alpha_5' REER_{it-1} + \alpha_6' FDI_{it-1} + \alpha_7' TRADE_{it-1} + \alpha_8' CRI2008_{it-1} + \gamma_i EXP_{it-1} \\ & + \delta_i + \varepsilon_{it} \end{aligned} \tag{4}$$

where $\delta_i$ is country specific effects, and $\varepsilon_{it}$ is the error term. Given that $X$ denotes all exogenous variables in the model, except EXP. The error-correction formulation of equation (4) is as follows:

$$\Delta EXP_{it} = \mu_i (EXP_{it-1} - \beta_i' X_{it-1}) + \lambda_i' \Delta X_{it-1} + \delta_i + \varepsilon_{it} \tag{5}$$

where $\Delta EXP_{it} = EXP_{it} - EXP_{it-1}$, $\mu_i = -(1-\gamma_i)$, and $\beta_i' = \dfrac{\sum_{i=1}^{i=7} \alpha_i + \alpha_i'}{1-\gamma_i}$.

In equation (5), the short-run and long-run coefficients are represented as $\lambda_i'$ and $\beta_i'$, respectively. The study transforms all data series into the natural logarithm form, except only LIB and CRI2008 because these variables are like dummy variables. Thus, the coefficients can be explained as elasticity term. Besides, $\mu$ is the parameter of adjustment toward the long-run equilibrium. To ensure a long run co-integration relationship among the variables, $\mu$ must be negative and statistically significant.

One concern relating to the model specification as equation (5) is the possible endogeneity problem in export value between two periods. However, the "ARDL models have the advantage that they are robust to integration and co-integration properties of the regressors, and for sufficiently high lag-orders could be immune to the endogeneity problem, at least as far as the long-run properties of the model are concerned" (Pesaran, 2015: pp.726). In this study, we use the Akaike information criterion (AIC) as the criteria for choosing sufficiently high

lags-order for ARDL estimation. Based on the AIC, the optimal lag-orders for the dependent variable (p) and independent variables (q) are two lags and one lag, respectively, for all cases except primary products and GPN products. The latter is preferred to the one lag in the dependent variable and independent variables.

The estimation allows heterogeneous characteristics in the panel dataset. We estimate the export equation using the three alternative ARDL estimations: the Pooled Mean Group estimator (PMGE), the Mean Group estimator (MGE), and the Dynamic Fixed Effects estimator (DFEE). These estimations have different assumptions on short-term and long-term coefficients. In the case of the PMG estimation, the PMG allows the short-term coefficients to differ across groups, but the long-term coefficients are identical. However, the MG allows both the short-term and long-term coefficients to differ across groups. The DFEE imposes the constraints of identical coefficients in the short-term and long-term coefficients for across groups.

To choose the preferred estimation among three alternative estimations, we conduct the Hausman test. Regarding the Hausman test results in Appendix 3.2, the dynamic fixed effect estimation (DFEE) is selected as the preferred estimator among the three estimators.

### 3.4 Results

In this section, the results based on the DFEE estimator with HHI as the measure of commodity diversification are reported (Table 3.6). The parameter of adjustment toward the long-run equilibrium $\mu$ is negative and statistically significant. Thus, there is a long-run cointegration relationship between the variables. The result of the alternative estimate of the model with the Theil index of commodity concentration (THI) is used in place of HHI (see Appendix 3.3 for the estimation results based on the THI index) for comparison. Since the two diversification indices are highly correlated, the alternative results are closely similar.

Note that we included DIVER and $DIVER^2$ in the model to check whether commodity diversification has a non-monotonic impact on export growth. However, the experimental regression runs that the coefficient of $DIVER^2$ turned out to be statistically insignificant with dramatic sign changes. Thus, we dropped $DIVER^2$ from the model.

Table 3.6 The estimation results based on the Herfindahl-Hirschman index (HHI)[1]

| **Dependent var.** | **Total non-oil merchandise** | | **Primary** | | **Manufacture** | |
|---|---|---|---|---|---|---|
| **(Real export)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| **Long-run Coefficients** | | | | | | |
| $HHI_{t-1}$ | **0.241***** | **0.395***** | **0.473***** | **0.498***** | **0.391***** | **0.548***** |
| | (0.002) | (0.000) | (0.079) | (0.084) | (0.003) | (0.058) |
| World $demand_{t-1}$ | 0.009 | 0.059 | -0.255*** | -0.235*** | 0.169* | 0.199* |
| | (0.086) | (0.137) | (0.017) | (0.007) | (0.099) | (0.114) |
| $GPDC_{t-1}$ | 1.245*** | 1.306*** | 1.280*** | 1.261*** | 1.125*** | 1.208*** |
| | (0.137) | (0.203) | (0.203) | (0.202) | (0.125) | (0.191) |
| $FDI_{t-1}$ | 0.087* | 0.107 | 0.078** | 0.084*** | 0.087* | 0.134 |
| | (0.051) | (0.095) | (0.038) | (0.031) | (0.049) | (0.092) |
| $REER_{t-1}$ | -0.481*** | -0.864*** | -0.417*** | -0.564*** | -0.360** | -0.894*** |
| | (0.136) | (0.192) | (0.063) | (0.064) | (0.155) | (0.065) |
| $OPENNESS_{t-1}$ | 0.615*** | | 0.139*** | | 0.883*** | |
| | (0.109) | | (0.042) | | (0.084) | |
| LIBER | | 0.264 | | 0.031* | | 0.236 |
| | | (0.422) | | (0.017) | | (0.458) |
| CRI2008 | -0.337*** | -0.532*** | -0.139*** | -0.253*** | -0.315*** | -0.550*** |
| | (0.059) | (0.197) | (0.017) | (0.004) | (0.074) | (0.096) |
| **Adjustment coefficient** | **-0.155***** | **-0.157***** | **-0.311***** | **-0.314***** | **-0.150***** | **-0.152***** |
| | **(0.042)** | **(0.026)** | **(0.011)** | **(0.010)** | **(0.018)** | **(0.006)** |
| **Short-run Coefficients** | | | | | | |
| ΔHHI | 0.204 | 0.186 | -0.084 | -0.098 | 0.109 | 0.092 |
| | (0.246) | (0.244) | (0.059) | (0.061) | (0.174) | (0.180) |
| ΔWorld demand | 0.033 | 0.006 | 0.091*** | 0.083*** | 0.040 | 0.008 |
| | (0.101) | (0.107) | (0.026) | (0.029) | (0.119) | (0.130) |
| ΔGPDC | 0.935*** | 0.990*** | 0.376*** | 0.386*** | 1.387*** | 1.463*** |
| | (0.035) | (0.011) | (0.064) | (0.037) | (0.001) | (0.022) |
| ΔFDI | -0.006 | -0.000 | 0.011** | 0.017*** | -0.004 | 0.001 |
| | (0.009) | (0.001) | (0.005) | (0.004) | (0.013) | (0.004) |
| ΔREER | -0.184 | -0.292*** | 0.007 | -0.008 | -0.250** | -0.358*** |
| | (0.136) | (0.057) | (0.008) | (0.009) | (0.118) | (0.017) |
| ΔOPENNESS | 0.400** | | 0.419*** | | 0.449* | |
| | (0.176) | | (0.027) | | (0.233) | |
| ΔLIBER | | -0.024 | | -0.170*** | | -0.034 |
| | | (0.061) | | (0.009) | | (0.049) |
| ΔCRI2008 | -0.037 | -0.017 | -0.030*** | -0.010 | -0.032 | -0.008 |
| | (0.038) | (0.040) | (0.003) | (0.006) | (0.032) | (0.037) |
| ΔEXP at t-1 | 0.045 | 0.063 | | | 0.048*** | 0.064*** |
| | (0.063) | (0.050) | | | (0.012) | (0.007) |
| Constant | -0.156 | 0.342 | 0.925* | 1.294*** | -0.655*** | 0.098*** |
| | (0.313) | (0.217) | (0.476) | (0.377) | (0.163) | (0.015) |
| Observations | 621 | 621 | 621 | 621 | 621 | 621 |

Table 3.6 (continued)

| **Dependent var.** | **GPN** | | **Non-GPN** | |
|---|---|---|---|---|
| **(Real export)** | **(7)** | **(8)** | **(9)** | **(10)** |
| **Long-run Coefficients** | | | | |
| $HHI_{t-1}$ | 0.414* | 0.494** | 0.282*** | 0.284*** |
| | (0.241) | (0.244) | (0.016) | (0.025) |
| World $demand_{t-1}$ | 0.520*** | 0.494*** | 0.168*** | 0.103 |
| | (0.027) | (0.046) | (0.038) | (0.128) |
| $GPDC_{t-1}$ | 0.900*** | 0.994*** | 1.632*** | 1.763*** |
| | (0.158) | (0.105) | (0.199) | (0.287) |
| $FDI_{t-1}$ | 0.207*** | 0.255*** | 0.027 | 0.037 |
| | (0.057) | (0.020) | (0.113) | (0.121) |
| $REER_{t-1}$ | -0.884*** | -1.076*** | -1.198*** | -1.331*** |
| | (0.153) | (0.093) | (0.157) | (0.026) |
| $OPENNESS_{t-1}$ | 0.687*** | | 0.487** | |
| | (0.117) | | (0.217) | |
| LIBER | | 0.063 | | 0.209 |
| | | (0.161) | | (0.219) |
| CRI2008 | -0.515*** | -0.484*** | -0.191*** | -0.166 |
| | (0.131) | (0.036) | (0.050) | (0.110) |
| **Adjustment coefficient** | **-0.235*** ** | **-0.228*** ** | **-0.263*** ** | **-0.258*** ** |
| | **(0.015)** | **(0.018)** | **(0.069)** | **(0.065)** |
| **Short-run Coefficients** | | | | |
| ΔHHI | 0.028 | 0.023 | 0.236 | 0.245 |
| | (0.173) | (0.162) | (0.265) | (0.272) |
| ΔWorld demand | 0.089*** | 0.082*** | -0.070 | -0.076 |
| | (0.001) | (0.010) | (0.045) | (0.065) |
| ΔGPDC | 1.805*** | 1.882*** | 1.023*** | 1.046*** |
| | (0.011) | (0.001) | (0.217) | (0.227) |
| ΔFDI | 0.051*** | 0.046*** | 0.018*** | 0.016 |
| | (0.017) | (0.008) | (0.006) | (0.011) |
| ΔREER | -0.006 | 0.001 | -0.198 | -0.164** |
| | (0.008) | (0.002) | (0.137) | (0.069) |
| ΔOPENNESS | -0.178 | | -0.132 | |
| | (0.295) | | (0.228) | |
| ΔLIBER | | -0.047*** | | 0.095 |
| | | (0.018) | | (0.070) |
| ΔCRI2008 | 0.034 | 0.036** | -0.022 | -0.019 |
| | (0.030) | (0.015) | (0.035) | (0.046) |
| ΔEXP at t-1 | | | 0.058 | 0.061 |
| | | | (0.083) | (0.078) |
| Constant | -1.441*** | -0.653*** | -0.985*** | -0.339** |
| | (0.241) | (0.231) | (0.226) | (0.152) |
| Observations | 621 | 621 | 621 | 621 |

Note: 1. Standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's estimation.

In Table 3.6, the adjustment coefficients are statistically significant in all equations with the expected negative sign. This indicates that the model can capture the long-term effect of the explanatory variables on export growth. The adjustment coefficient varies in the rage of -0.15 to -0.35, suggesting that the speed of adjustment varies significantly among the product categories. For example, there are vast differences in speed of adjustment towards equilibrium between primary products and manufactured products. The adjustment coefficient of primary products (-0.31) is around twice as the coefficient of manufactured products (-0.15). Primary products have a much slower speed of adjustment towards the long-run equilibrium compared to manufactured products. Within manufacturing, non-GPN products have a higher adjustment coefficient than GPN products. This suggests that GPN products would respond better to any economic shock rather than non-GPN products. In the following discussion, we specifically focus on the long-run regression coefficients based on the adjustment coefficients.

The coefficient of the HHI, the key variable of interest, is positive and statistically significant at the 1% level or better in all equations for the long-term effect. In contrast, the short-term coefficient of the HHI is not statistically different from zero in all cases. This is only to be expected because the relationship between commodity diversification and export performance is effectually a long-term phenomenon.

Therefore, after controlling other variables, more export diversification is associated with negative export growth for only the long-term effect. Interestingly, GPN products have a higher coefficient of the HHI compared to non-GPN products. In Table 3.6, the HHI coefficients are 0.414 and 0.282 for GPN products (column 7) and non-GPN products (column 9), respectively. Thus, a decrease in commodity diversification by 1% would result in an increase in export growth by 0.414% for GPN products and 0.282% for non-GPN products.

To comment on the results for the control variables, the dummy variable for the global economic crisis (CRI2008) has a negative long-term effect on export growth as expected. The coefficient of trade openness measured by the trade to GDP ratio is statically significant with the expected positive sign in all equations. However, the coefficient of the Sachs-Werner index, which is used as an alternative measure of trade openness is not statistically significant in all regressions even though it carries the positive sign as expected. This is presumably because, as a binary variable does not have sufficient variation over time.

The impact of world demand on export growth is positive for all subcategories except primary products. In other words, an increase in world demand results in export growth in the long run. However, Table 3.6 shows that the coefficients of world demand are different among subcategories. A comparison between GPN products and non-GPN products, the coefficients of world demand are 0.520 (column 7) and 0.168 (column 9), respectively. As a result, GPN products would respond more to an increase in world demand compared to non-GPN products. This result clearly confirms the importance of GPN products in export success in developing Asian countries.

The REER coefficient is negative and statistically significant in the long-run for total non-oil exports and all subcategories. As expected, real exchange rate appreciation results in lower export performance. Interestingly, the degree of long-run responsiveness of GPN products (-0.884) is much smaller compared to that of non-GPN products (-1.198). This difference is consistent with the postulate that exports based on global production sharing are relatively less responsive to relative price changes (as the overall production structure is dispersed among many countries) compared to export based on the traditional form of horizontal specialisation (Athukorala & Khan, 2016).

On the supply side, GDP per capita is a vital factor determining export performance in developing Asian countries. The coefficient of GDPC is significant at the 1% level, and it is the largest coefficient compared to that of other explainable variables. The long-term coefficients range approximately between 0.7 and 1.7, while the short-term coefficients range between 1.0 and 2.9. Importantly, the coefficient of GDPC is statistically significant for all cases. Thus, the stage of economic development is essential for improving export performance.

In addition, the FDI coefficient is positive and statistically significant at the 1% level in the short-run and the long-run for only GPN products. Unsurprisingly, most FDI inflow in Asia is relevant to global production sharing. An increase in FDI inflow is associated with higher export growth for GPN products. Thus, FDI inflow is one important channel to boost export performance for the short-run and the long-run.

Lastly, the results suggest that GDP per capita, which captures the state of development of the country, is much more important than world demand in explaining export performance. This result is consistent with the standard small-country assumption relating to export

performance (Athukorala and Riedel, 1996). Thus, the role of supply capability is vital for export expansion. Interestingly, alternative estimates suggest that the results are remarkably resilient to the exclusion of the world demand variable from the model (Appendix 3.4).

## 3.5. Conclusion

This chapter has examined the relationship between export product diversification and export performance in developing Asian countries. The analysis covered total non-oil exports distinguishing between primary products and manufactured goods with the latter further disaggregated into exports within global production networks (GPN products) and non-GPN products.

The key finding is that export diversification has a negative impact on export growth of total non-oil merchandise exports and all subcategories. The results are consistent with the prediction of the standard trade theory, which postulates that a country gains from international trade by specialisation based on its own comparative advantage. Export diversification through policy intervention may not necessarily coincide with a country's comparative advantage. The results are consistent with the finding of Piñeres and Ferrantino (1997) and Newfarmer et al. (2009). Thus, policy to stimulate export diversification may not always be an appropriate choice for developing countries.

In conclusion, government intervention to engineer export diversification may be risky for developing countries. One risk is a big fiscal burden because some new product exports may require a massive budget for setting their fundamental production. New product exports in developing countries have a low chance of survival in the world market (Besedes & Prusa, 2011). Any failure from such government intervention may boost public debt.

# Appendix 3.1

## Export diversification pattern in developing Asian countries by the Theil index

Table 3.A.1 Export diversification pattern by the Theil index[1]

| Total non-oil export | 1980/81 | 1990/91 | 1995/96 | 2000/01 | 2005/06 | 2010/11 | 2016/17 |
|---|---|---|---|---|---|---|---|
| **North Asia** | **29.15** | **26.97** | **26.34** | **28.30** | **32.11** | **30.48** | **29.96** |
| China | n.a. | 26.48 | 20.43 | 21.85 | 24.97 | 23.65 | 22.67 |
| Hong Kong | 28.06 | 24.24 | 25.28 | 27.80 | 33.28 | 32.06 | 34.66 |
| South Korea | 30.23 | 30.19 | 33.32 | 35.25 | 38.08 | 35.73 | 32.54 |
| | | | | | | | |
| **Southeast Asia** | **46.98** | **35.78** | **42.22** | **44.88** | **42.19** | **40.14** | **38.69** |
| Brunei | n.a. | n.a. | 70.87 | 61.83 | 60.34 | 53.55 | 52.00 |
| Cambodia | n.a. | n.a. | n.a. | 62.22 | 65.13 | 63.00 | 53.88 |
| Indonesia | 57.46 | 38.60 | 34.00 | 28.90 | 30.70 | 34.95 | 32.90 |
| Malaysia | 51.60 | 37.65 | 38.10 | 40.11 | 37.30 | 32.75 | 28.60 |
| Philippines | 44.36 | 37.65 | 42.51 | 53.97 | 48.75 | 43.14 | 45.84 |
| Singapore | 28.74 | 31.09 | 36.57 | 40.46 | 30.23 | 29.38 | 28.98 |
| Thailand | 52.72 | 33.93 | 31.24 | 31.53 | 30.18 | 30.28 | 29.69 |
| Vietnam | n.a. | n.a. | n.a. | 40.03 | 34.86 | 34.06 | 37.61 |
| | | | | | | | |
| **South Asia** | **64.08** | **48.68** | **45.52** | **45.01** | **43.48** | **44.56** | **42.89** |
| Bangladesh | 75.90 | 58.24 | 55.16 | 55.87 | 55.91 | 58.62 | 58.06 |
| India | 53.82 | 36.36 | 34.14 | 32.38 | 30.23 | 32.10 | 28.97 |
| Pakistan[2] | 51.32 | 51.64 | 51.03 | 47.85 | 44.11 | 42.18 | 41.52 |
| Sri Lanka | 75.30 | 48.48 | 41.75 | 43.94 | 43.67 | 45.35 | 43.02 |
| | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **50.77** | **51.96** | **53.69** | **53.50** | **51.22** |
| Armenia[3] | n.a. | n.a. | 52.05 | 57.58 | 64.08 | 61.45 | 57.84 |
| Azerbaijan | n.a. | n.a. | 48.36 | 49.02 | 55.00 | 53.93 | 52.65 |
| Georgia | n.a. | n.a. | 47.18 | 50.28 | 52.10 | 57.14 | 52.15 |
| Kazakhstan | n.a. | n.a. | 60.06 | 55.84 | 53.82 | 54.30 | 50.46 |
| Kyrgyzstan | n.a. | n.a. | 46.20 | 47.06 | 43.44 | 40.69 | 43.01 |

Note: 1. n.a. denotes non-available data.
2. Due to lack of observation in 1980/81 for Pakistan, we use observation in 1982 instead of 1980/81.
3. Due to lack of observation in 1995/96 for Armenia, we use observation in 1997 instead of 1995/96.

Source: Author's computation using the UN Comtrade database.

# Appendix 3.2

## Results of unit root test and Hausman test

Table 3.A.2 Results of the unit root test[1]

| Variable | Level I(0) | | First Difference I(1) | |
|---|---|---|---|---|
| | W-t-bar | p-value | W-t-bar | p-value |
| **Real Export** | | | | |
| Total non-oil merchandise | 3.2043 | 0.9993 | -7.0074 | 0.0000 |
| Total non-oil primary | -1.0556 | 0.1456 | -6.8276 | 0.0000 |
| Total manufacture | 3.1862 | 0.9993 | -6.1229 | 0.0000 |
| GPN (Global Production Network) | 1.6147 | 0.9468 | -5.0500 | 0.0000 |
| Non-GPN (Non-Global Production Network) | 1.7280 | 0.9580 | -6.9212 | 0.0000 |
| **HHI** | | | | |
| Total non-oil merchandise | -0.7963 | 0.2129 | -6.5698 | 0.0000 |
| Total non-oil primary | -2.0240 | 0.0215 | -8.2894 | 0.0000 |
| Total manufacture | -0.5008 | 0.3082 | -7.6920 | 0.0000 |
| GPN (Global Production Network) | -0.7706 | 0.2205 | -7.6358 | 0.0000 |
| Non-GPN (Non-Global Production Network) | 0.0129 | 0.5051 | -7.7406 | 0.0000 |
| **Theil Index** | | | | |
| Total non-oil merchandise | 0.1509 | 0.5600 | -6.5127 | 0.0000 |
| Total non-oil primary | -1.5810 | 0.0569 | -8.2565 | 0.0000 |
| Total manufacture | 0.6403 | 0.7390 | -6.6045 | 0.0000 |
| GPN (Global Production Network) | -1.3903 | 0.0822 | -7.2479 | 0.0000 |
| Non-GPN (Non-Global Production Network) | 0.1110 | 0.5442 | -7.8281 | 0.0000 |
| World demand | -6.8245 | 0.0000 | -10.2172 | 0.0000 |
| GDP per capita | 3.5049 | 0.9998 | -4.5110 | 0.0000 |
| FDI | -1.9681 | 0.0245 | -8.3495 | 0.0000 |
| REER (Real Effective Exchange Rate) | 0.4385 | 0.6695 | -4.7517 | 0.0000 |
| Openness Index | 1.8672 | 0.9691 | -4.1507 | 0.0000 |
| LIBER Index | 1.9058 | 0.9717 | -3.8781 | 0.0001 |
| CRI2008 | -5.4239 | 0.0000 | -13.2856 | 0.0000 |

Note: 1. All variables are transformed into natural logarithm form, except LIBER Index and CRI2008.
Source: Author's estimation.

Table 3.A.3 Results of the Hausman test[1]

| P-value (Chi2) | (1) | | (2) | | (3) | | (4) | | (5) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HHI | Theil | HHI | Theil | HHI | Theil | HHI | Theil | HHI | Theil |
| PMG versus DFE | 1.000 | 1.000 | 1.000 | 1.000 | 0.981 | 0.992 | 0.765 | 0.865 | 0.999 | 0.999 |
| MG versus DFE | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| | HHI | Theil | HHI | Theil | HHI | Theil | HHI | Theil | HHI | Theil |
| PMG versus DFE | 1.000 | 1.000 | 1.000 | 1.000 | 0.981 | 0.992 | 0.765 | 0.865 | 0.999 | 0.999 |
| MG versus DFE | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Note: 1. Column (1) – (5) represent product categorizes as following total non-oil export, primary, manufacturing, GPN, and non-GPN, respectively.
Source: Author's estimation.

# Appendix 3.3

## The estimation results based on the Theil index

Table 3.A.4 The estimation results based on the Theil index (THI)[1]

| Dependent var | Total non-oil merchandise | | Primary product | | Manufacture | |
|---|---|---|---|---|---|---|
| (Real export) | (1) | (2) | (3) | (4) | (5) | (6) |
| **Long-run Coefficients** | | | | | | |
| $THI_{t-1}$ | 0.241*** | 0.395*** | 0.758*** | 0.907*** | 1.114*** | 1.457*** |
| | (0.002) | (0.000) | (0.165) | (0.163) | (0.261) | (0.335) |
| World $demand_{t-1}$ | 0.009 | 0.059 | -0.265*** | -0.246*** | 0.178*** | 0.171*** |
| | (0.086) | (0.137) | (0.015) | (0.004) | (0.040) | (0.037) |
| $GPDC_{t-1}$ | 1.245*** | 1.306*** | 1.299*** | 1.298*** | 1.154*** | 1.276*** |
| | (0.137) | (0.203) | (0.204) | (0.205) | (0.027) | (0.075) |
| $FDI_{t-1}$ | 0.087* | 0.107 | 0.075* | 0.078** | 0.095* | 0.140* |
| | (0.050) | (0.095) | (0.040) | (0.033) | (0.049) | (0.071) |
| $REER_{t-1}$ | -0.481*** | -0.864*** | -0.476*** | -0.643*** | -0.453 | -1.022*** |
| | (0.136) | (0.192) | (0.043) | (0.043) | (0.289) | (0.145) |
| $OPENNESS_{t-1}$ | 0.615*** | | 0.148*** | | 0.904*** | |
| | (0.109) | | (0.044) | | (0.052) | |
| LIBER | | 0.264 | | 0.074*** | | 0.284 |
| | | (0.422) | | (0.015) | | (0.362) |
| CRI2008 | -0.337*** | -0.532*** | -0.146*** | -0.262*** | -0.307*** | -0.545*** |
| | (0.059) | (0.197) | (0.015) | (0.008) | (0.051) | (0.125) |
| **Adjustment coefficient** | **-0.155***** | **-0.157***** | **-0.309***** | **-0.313***** | **-0.151***** | **-0.152***** |
| | (0.042) | (0.026) | (0.014) | (0.013) | (0.026) | (0.016) |
| **Short-run Coefficients** | | | | | | |
| ΔTHI | 0.204 | 0.186 | -0.159 | -0.209 | -0.030 | -0.047 |
| | (0.246) | (0.244) | (0.227) | (0.239) | (0.717) | (0.722) |
| ΔWorld demand | 0.033 | 0.006 | 0.083*** | 0.077*** | 0.034 | 0.003 |
| | (0.101) | (0.107) | (0.027) | (0.029) | (0.108) | (0.120) |
| ΔGPDC | 0.935*** | 0.990*** | 0.366*** | 0.372*** | 1.400*** | 1.463*** |
| | (0.035) | (0.011) | (0.066) | (0.042) | (0.059) | (0.062) |
| ΔFDI | -0.006 | 0.000 | 0.012** | 0.019*** | -0.006 | -0.001 |
| | (0.009) | (0.001) | (0.006) | (0.004) | (0.011) | (0.004) |
| ΔREER | -0.184 | -0.292*** | 0.010 | -0.004 | -0.247** | -0.352*** |
| | (0.136) | (0.057) | (0.007) | (0.008) | (0.116) | (0.023) |
| ΔOPENNESS | 0.400** | | 0.411*** | | 0.435** | |
| | (0.176) | | (0.024) | | (0.219) | |
| ΔLIBER | | -0.024 | | -0.186*** | | -0.047 |
| | | (0.061) | | (0.011) | | (0.040) |
| ΔCRI2008 | -0.037 | -0.017 | -0.029*** | -0.008 | -0.033 | -0.008 |
| | (0.038) | (0.040) | (0.003) | (0.007) | (0.028) | (0.033) |
| ΔEXP at t-1 | 0.045 | 0.063 | | | 0.048*** | 0.065*** |
| | (0.063) | (0.050) | | | (0.017) | (0.014) |
| Constant | -0.156 | 0.342 | 0.971** | 1.359*** | -0.628*** | 0.205 |
| | (0.313) | (0.217) | (0.485) | (0.375) | (0.039) | (0.132) |
| Observations | 621 | 621 | 621 | 621 | 621 | 621 |

Table 3.A.4 (continued)

| **Dependent var** | **GPN** | | **Non-GPN** | |
|---|---|---|---|---|
| **(Real export)** | **(7)** | **(8)** | **(9)** | **(10)** |
| **Long-run Coefficients** | | | | |
| $THI_{t-1}$ | 0.503 | 0.664 | 0.585*** | 0.580*** |
| | (0.395) | (0.406) | (0.108) | (0.099) |
| World $demand_{t-1}$ | 0.505*** | 0.484*** | 0.197*** | 0.129 |
| | (0.049) | (0.063) | (0.035) | (0.126) |
| $GPDC_{t-1}$ | 0.920*** | 1.011*** | 1.622*** | 1.757*** |
| | (0.057) | (0.005) | (0.219) | (0.307) |
| $FDI_{t-1}$ | 0.207*** | 0.268*** | 0.031 | 0.041 |
| | (0.041) | (0.015) | (0.118) | (0.121) |
| $REER_{t-1}$ | -0.869*** | -1.106*** | -1.179*** | -1.308*** |
| | (0.186) | (0.121) | (0.114) | (0.027) |
| $OPENNESS_{t-1}$ | 0.767*** | | 0.499* | |
| | (0.027) | | (0.270) | |
| LIBER | | 0.007 | | 0.218 |
| | | (0.112) | | (0.204) |
| CRI2008 | -0.520*** | -0.500*** | -0.175** | -0.141 |
| | (0.086) | (0.002) | (0.068) | (0.129) |
| **Adjustment coefficient** | **-0.233*****| **-0.224*****| **-0.267*****| **-0.261***** |
| | (0.008) | (0.009) | (0.081) | (0.076) |
| **Short-run Coefficients** | | | | |
| ΔTHI | -0.422 | -0.427 | 0.273 | 0.296 |
| | (0.449) | (0.418) | (0.711) | (0.711) |
| ΔWorld demand | 0.095*** | 0.085*** | -0.078* | -0.080 |
| | (0.000) | (0.011) | (0.041) | (0.063) |
| ΔGPDC | 1.840*** | 1.937*** | 1.106*** | 1.127*** |
| | (0.022) | (0.006) | (0.104) | (0.127) |
| ΔFDI | 0.051*** | 0.045*** | 0.015 | 0.012 |
| | (0.013) | (0.006) | (0.009) | (0.014) |
| ΔREER | 0.000 | 0.008*** | -0.208 | -0.162 |
| | (0.006) | (0.002) | (0.188) | (0.111) |
| ΔOPENNESS | -0.155 | | -0.170 | |
| | (0.253) | | (0.256) | |
| ΔLIBER | | -0.054*** | | 0.069 |
| | | (0.008) | | (0.051) |
| ΔCRI2008 | 0.030 | 0.034** | -0.032 | -0.030 |
| | (0.030) | (0.017) | (0.047) | (0.060) |
| ΔEXP at t-1 | | | 0.060 | 0.062 |
| | | | (0.086) | (0.081) |
| Constant | -1.564*** | -0.671*** | -1.131*** | -0.463** |
| | (0.055) | (0.082) | (0.180) | (0.233) |
| Observations | 621 | 621 | 621 | 621 |

Note: 1. Standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's estimation.

# Appendix 3.4

## The alternative estimation results

Table 3.A.5 The alternative estimation results excluding world demand[1,2]

| Dependent var | Total non-oil | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|
| (Real export) | (1) | (2) | (3) | (4) | (5) |
| **Long-run Coefficients** | | | | | |
| $HHI_{t-1}$ | 0.241*** | 0.549*** | 0.392*** | 0.430* | 0.292*** |
| | (0.015) | (0.081) | (0.005) | (0.240) | (0.006) |
| $GPDC_{t-1}$ | 1.246*** | 1.203*** | 1.164*** | 1.044*** | 1.686*** |
| | (0.117) | (0.195) | (0.110) | (0.201) | (0.187) |
| $FDI_{t-1}$ | 0.085* | 0.061* | 0.092** | 0.233*** | 0.038 |
| | (0.047) | (0.035) | (0.046) | (0.065) | (0.114) |
| $REER_{t-1}$ | -0.502*** | -0.377*** | -0.416 | -1.057*** | -1.231*** |
| | (0.064) | (0.075) | (0.264) | (0.156) | (0.221) |
| $OPENNESS_{t-1}$ | 0.611*** | 0.127*** | 0.885*** | 0.680*** | 0.499** |
| | (0.107) | (0.043) | (0.080) | (0.127) | (0.224) |
| CRI2008 | -0.340*** | -0.135*** | -0.331*** | -0.573*** | -0.197*** |
| | (0.045) | (0.015) | (0.094) | (0.145) | (0.047) |
| **Adjustment coefficient** | -0.155*** | -0.309*** | -0.146*** | -0.222*** | -0.258*** |
| | (0.041) | (0.011) | (0.015) | (0.016) | (0.067) |
| **Short-run Coefficients** | | | | | |
| ΔHHI | 0.204 | -0.102* | 0.112 | 0.032 | 0.238 |
| | (0.250) | (0.060) | (0.173) | (0.172) | (0.263) |
| ΔGPDC | 0.935*** | 0.421*** | 1.373*** | 1.754*** | 1.001*** |
| | (0.043) | (0.067) | (0.008) | (0.009) | (0.212) |
| ΔFDI | -0.005 | 0.011** | -0.003 | 0.053*** | 0.018*** |
| | (0.010) | (0.005) | (0.014) | (0.017) | (0.005) |
| ΔREER | -0.186 | 0.008 | -0.247** | -0.011 | -0.182 |
| | (0.139) | (0.008) | (0.119) | (0.008) | (0.132) |
| ΔOPENNESS | 0.398** | 0.410*** | 0.454* | -0.168 | -0.117 |
| | (0.180) | (0.023) | (0.239) | (0.304) | (0.235) |
| ΔCRI2008 | -0.037 | -0.031*** | -0.033 | 0.032 | -0.022 |
| | (0.039) | (0.003) | (0.034) | (0.029) | (0.035) |
| ΔEXP at t-1 | 0.047 | | 0.049*** | | 0.055 |
| | (0.067) | | (0.018) | | (0.082) |
| Constant | -0.115 | -0.026 | -0.282 | 0.258 | -0.424 |
| | (0.072) | (0.400) | (0.174) | (0.317) | (0.577) |
| Observations | 621 | 621 | 621 | 621 | 621 |

Note: 1. To test sensitivity results, world demand is excluded in the model. The model shows only trade policy regime through trade openness (OPENNESS) because this trade policy variable is statistically significant in all equations. In contrast, policy liberalization index (LIB) is not statistically significant in most cases.
2.Standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's estimation.

# Chapter 4
# The Role of Product Deepening, Emergence, and Failure in Export Performance: A Comparative Study of Developing Asian Countries

**Summary**

This chapter explores the contribution of the deepening of existing products (intensive margin), the emergence of new products (extensive margin) and the demise of existing products (failure margin) to export expansion of developing Asian countries in 1990-2017. Using data based on the Standard International Trade Classification (SITC) revision 3 at the 5-digit level, we find that product deepening plays a crucial role in export success for total merchandise and its subcategories. There is less window opportunity for emergence of new products when a country already has a high number of exported products. The emergence of new products and product failure margins are important for latecomer exporting countries in the region. GDP per capita, world demand, and FDI inflow have a positive impact on deepening of the existing products. Product emergence is significantly aided by FDI inflow and access to bank financing.

## 4.1 Introduction

How can we evaluate the impact of changes in the product mix on export performance of countries? This question is of significant policy relevance given the contemporary policy emphasis on export performance as a critical determinant of inter-country differences in economic performance. One approach, which has gained popularity in the trade literature for addressing this issue is the decomposition of export growth into the role of market penetration of existing exports, and discovery of new products (Evenett & Venables, 2002; Hummel and Klenow, 2005; Besedes & Prusa, 2011; Kehoe & Ruhl, 2013). Here, the intensive margin refers to the growth of exports in existing products or already exported products, while the extensive margin is the changes in exports due to diversifying new products or new market destinations.

Besedes and Prusa (2011) have broadened this decomposition method to incorporate product failure, the demise of the existing products (the failure margin). This extended decomposition permits us to examine the role of survival rate of both existing products and new products in export expansion. The identification of failure margin also helps understanding the stage of a country's exporting maturity.

Understanding the relative importance and the underline cause of the deepening of existing products, emergence of new product, and product death is important for designing appropriate policy for achieving export growth. Suppose in a given country, export expansion has been driven by the deepening of certain products, while new products have disappeared within a few years. This gives clear signals for the government to reconsider its policy stance relating to export promotion. It suggests that either the excising policy environment is not conducive for the emergence of new products which are competitive in the world market or exporters of existing products are successful in sustaining competitiveness on their own without any policy intervention (Rodrik, 1995; Bjorvatn & Coniglio, 2012; Perkins, 2013, Easterly., Reshef, & Schwenkenberg, 2009).

This chapter aims to contribute to this emerging literature through a comparative study of 21 developing Asian countries during the period 1990 - 2017 by using the trade decomposition methodology proposed by Besedes and Prusa (2011). The analysis covers total non-oil merchandise exports disaggregated into four subcategories (primary products, manufactured products, GPN products, and non-GPN products) to examine whether growths of trade in each commodity group have a different pattern of export margins, using data compiled at the 5-digit level of the Standard International Trade Classification (SITC) revision 3.

The results suggest that the intensive margin plays a crucial role in export success for total merchandise and its subcategories. It seems that there is a lesser opportunity for discovering new products when a country already has a high number of exported products. The extensive margin and failure margins play a significant role in determining export performance in latecomer exporting countries in the region. GDP per capita, world demand, and FDI inflow have a positive impact on the intensive margin. The extensive margin is significantly determined by FDI inflow and access to domestic bank financing.

The rest of the chapter is structured as follows. Section 2 provides the literature review and empirical results on trade margins. Section 3 details the method and data used for the decomposition of exports in this study. The results of export decomposition for developing Asian countries are discussed in section 4. The next section explains the model specification for trade margins and the estimation results. The last section provides the conclusion and policy implication.

## 4.2 Related literature

The method of export decomposition is well discussed in the last decade to decompose a country's export growth into two trade components: changes in export of existing products (the intensive margin: IM) and changes in export of new products (the extensive margin: EM). However, the previous studies measure trade margins at differential classifications: the product level, the country level, and the country-product level. The details of measuring trade margin levels are specified in the extensive margin as follows (Besedes & Prusa, 2011).

At the product level, the extensive margin is any products that a country never exports before. However, at the country level, the extensive margin is defined as any products (existing and new products) that a country starts exporting to new markets. Lastly, At the product-country level, the extensive margin is defined as changes in exports which a country exports 'existing products' to new market or exports 'new products' to already existing market destinations and new market destinations. According to previous empirical studies, Amiti and Freund (2008) select the product level approach, while Felbermayr and Kohler (2006) employ the country level. Finally, the most popular method is the product-country level, such as Evenett and Venables (2002), Hummels and Klenow (2005), and Amurgo-Pacheco and Pierola (2008).

The literature on the trade margin studies found two conclusions, as shown in Table 4.1. The first is that the intensive margin is the main component of trade growth (Amurgo-Pacheco & Pierola, 2008; Amiti & Freund, 2008; Brenton & Newfarmer, 2009; Besedes & Prusa, 2011; Gao et al., 2014; Kehoe & Ruhl, 2013) for developing countries and developed countries. For example, the intensive margin accounts for 90% of trade growth in NAFTA country pairs (Kehoe & Ruhl, 2013). Conversely, another one finds the opposite conclusion. The extensive margin plays a vital role in trade growth for developed countries and developing countries (Evenett & Venables, 2002; Hummels & Klenow, 2005; Dutt, Mihov, & Van Zandt, 2013).

Table 4.1 literature review on trade margins

| Study | Data | Classification level | Results |
|---|---|---|---|
| Evenett and Venables (2002) | 23 developing countries (1970-1997) | The product-country level | EM dominate IM. Within EM, new trading partners accounted for about one-third of total export growth. |
| Hummels and Klenow (2005) | 126 developed and developing countries (1995) | The product-country level | EM dominates IM.<br>The IM is dominated by higher quantity margins rather than higher price margins. |
| Felbermayr and Kohler (2006) | The U.S. and the trading partners (1950-1997): Trade in manufactures | The country-level | IM dominates EM. |
| Amiti and Freund (2008) | China (1992 -2005) | The product level | IM dominates EM. |
| Amurgo-Pacheco and Pierola (2008) | 24 developed and developing countries (1990-2005) | The product-country level | IM dominates EM. |
| Bernard, Jensen, Redding, and Schott (2009) | The U.S. and the trading partners (1993-2003): firm-level data | The product-country level | IM dominates EM. |
| Brenton and Newfarmer (2009) | 99 developed and developing countries (1995-2004) | The product-country level | IM dominates EM. The role of new geographic markets is more important than new products. |
| Besedes and Prusa (2011) | 46 developed and developing countries (1975-2003) | The product-country level | IM dominates EM.<br>Export survival has a positive impact on long-run export performance. |
| Bingzhan (2011) | China and the trading partners (2001-2007) | The product-country level | IM dominates EM.<br>China's export growth mainly relies on quantity margin. |
| Dutt, Mihov, and Van Zandt (2013) | 150 developed and developing countries (1962-2010) | The product-country level | EM dominates IM.<br>WTO membership has a positive impact on EM. |
| Kehoe and Ruhl (2013) | NAFTA countries, Chili, South Korea, and China (1995- 2005) | The product-country level | IM dominates EM. |
| Gao, Whalley, and Ren (2014) | China (1995-2010) | The product-country level | - IM dominates EM.<br>- China's export growth relies on more and more on price margin, but less and less on quantity margin. |
| Veeramani, Aerath, and Gupta (2018) | China and India (2000-15) | The product-country level | - EM dominates IM<br>- China outperforms India for rapid export growth due to quantity margin. |

Source: Author's compilation.

Regarding the above cases, the intensive margin plays a crucial role in boosting trade growth compared to the extensive margin. For example, Brenton and Newfarmer (2009) show that the intensive margin contributed to total export growth for 99 developing countries in the period 1995-2004 by 80.4%. However, the extensive margin accounted for only about 19.6% of the total export growth. Interestingly, the most contribution of extensive margin is from exporting existing products into new markets, not from exporting new products. In other words, new market diversification is more crucial than new product diversification as the tool for rapid export growth in developing countries.

More recent studies have further decomposed the intensive margin by two approaches: (1) the decomposition of the intensive margin into price margin and quantity margin (Hummels & Klenow (2005); Veeramani et al. (2018)), and (2) the decomposition of the intensive margin into deepening margin (the expansion of existing products) and survival margin (number of survival products) (Besedes & Prusa, 2011). These two approaches aim to analyse differential determinant factor of the intensive margin as follows.

First, most previous studies further decompose the intensive margin into price margin and quantity margin for measuring the role of increases in price and quantity on the intensive margin growth. For instance, Veeramani, et al. (2018) compare price margin and quantity margin between China and India in the period 2000-2015. Their finding reveals that the expansion along the intensive margin resulted from quantity margin for China, but the price margin for India.

Second, the intensive margin is decomposed into survival margin and deepening margin (Besedes & Prusa, 2011). This approach aims to explain the role of survival products in the growth of the intensive margin because the survival rate of new exports from developing countries is low. For example, the evidence of the US market, the average duration of exporting a product from about 180 countries is about only 2-4 years (Besedes & Prusa, 2006).

In the previous studies, two setting approaches (a comparative static approach and a dynamic approach) are applied to determine existing products and new products. First, a comparative static approach determines two specified time frames to classify existing products and new products for each country (Feenstra,1994; Evenett & Venables, 2002; Amurgo-Pacheco & Pierola, 2008; Brenton & Newfarmer, 2009). This approach chooses arbitrary k years old. Any already exported products, which occur before the random k years, are classified as existing products (the intensive margin). However, any exported products after the arbitrary k years refer to new products (the extensive margin).

In contrast, a dynamic approach does not determine a specified k-year to distinguish between existing products and new products. Indeed, this approach considers the status of survival of exports in any previous year to identify existing products and new products at the current year (Besedes & Prusa, 2011). At the first year, the new product is recognised when it starts exporting for the first time. Then, once it can continue to survive in the second year and

go on, it will become the existing product. However, when the new product cannot stay in the second year, it starts export again at some later year. In the latter case, it is classified as new products too.

## 4.3 Methodology and data

### 4.3.1 Methodology

The methodology of decomposing growth in this study follows Besedes and Prusa (2011) which decomposes total export growth into the intensive margin (IM) and the extensive margin (EM), and the failure margin (FM). The intensive margin consists of the survival and deepening margins. The latter decomposition (survival margin) helps to identify how much exporting opportunities are lost through product failure. The details of the decomposition procedure are as follows. The value of export can be written as

$$V_t = n_t v_t$$

where $V_t$ is the value of exports in year t, $n_t$ is the number of survival exports in year t, and $v_t$ is the average value per survival export. The number of survival exports ($n_t$) consists of the number of survival products ($s_t$) and the number of new products ($e_t$), $n_t = s_t + e_t$. So, the terminology of number of survival products in year t ($s_t$) refers to existing products that can survive from year t-1 to year t. We can rewrite the growth of export between t and t+1 as

$$\begin{aligned} V_{t+1} - V_t &= n_{t+t} v_{t+1} - n_t v_t \\ &= (s_{t+1}+e_{t+1})v_{t+1} - (s_t+e_t)v_t \\ &= s_{t+1}v_{t+1} + e_{t+1}v_{t+1} - (s_{t+1}+d_t)v_t \; ; \; s_{t+1} = \; s_t + e_t - d_t. \\ &= s_{t+1}(v_{t+1} - v_t) - d_t v_t + e_{t+1}v_{t+1} \end{aligned} \quad (1)$$

where $s_{t+1}$ is the number of survival products in year t+1, $(v_{t+1} - v_t)$ represents changes in average exports in the survival products between both years. $d_t$ denotes the number of products that end in year t, and their total failure value is $d_t v_t$. The last term, $e_{t+1}v_{t+1}$, is the total value of new exports in year t+1 with numbers of new products ($e_{t+1}$).

In a dynamic setting, we can define the set of survival rate, failure rate, number of failed products (non-survival products), the average exporting value of survival products at the year of service i as follows.

$$s_t \equiv \{s_t^0, s_t^1, s_t^2, \dots, s_t^i, \dots, s_t^I\}$$
$$h_t \equiv \{h_t^0, h_t^1, h_t^2, \dots, h_t^i, \dots, h_t^I\}$$
$$d_t \equiv \{d_t^0, d_t^1, d_t^2, \dots, d_t^i, \dots, d_t^I\}$$
$$v_t \equiv \{v_t^0, v_t^1, v_t^2, \dots, v_t^i, \dots, v_t^I\}$$

where $h_t$ is the failure rate of products that end between year t-1 and year t. By construction, the failure rate is the flip-side of the survival rate, $h_t = 1 - s_t$. Time of service starts from year 0 to year I, in which I denotes the maximum potential year of service. During the first year of service, the failure rate is zero ( $h_t^0 = 0$). So, by definition, the survival rate will be 1 ( $s_t^0 = 1$) and the number of failed products will be 0 ( $d_t^0 = 0$). At the second year of service, the percentage of survival products between the first year of service and the second year of service is $s_t^1$. Thus, we can write down the number of survival products between year t-1 and t that survive through any year of service i[th]. Finally, we can rewrite equation (1) as follows.

$$V_{t+1} - V_t = \underbrace{\sum_{i=1}^{I}\left[(1 - h_{t+1}^i)n_t^i\right]\left[v_{t+1}^i - v_t^i\right]}_{\text{intensive}} - \underbrace{\sum_{i=1}^{I}\left[(h_{t+1}^i n_t^i)v_t^i\right]}_{\text{failure}} + \underbrace{e_{t+1}^0 v_{t+1}^0}_{\text{extensive (new entry)}} \quad (2)$$

Equation. (2) represents the decomposition of export changes between two periods, t and $t_{+1}$. The first term is the intensive margin (number of survival product times the export expansion of survival products between year t and year t+1). The second term is the failure margin representing the total value of the failed products that cannot survive through year t to year t+1. The last term is the extensive margin (new entry) that denotes the total exporting value of new products at each year t+1. Notice that each summation starts at i = 1 because we evaluate the contribution of products being survived and failure after the first year of service. Also, the superscript i in the last term is 0 because we count 'new products' only being their initial year of service.

### 4.3.2 Data

The empirical analyst is undertaken using export data at the 5-digit level of the Standard International Trade Classification (SITC) Revision 3. The data are extracted from the UN Comtrade database at the 5-digit level in the period 1990 - 2017. The UN Comtrade data reporting system sifted from SITC Rev. 2 to Rev. 3 in 1987. However, we use 1990 as the starting years because most countries moved to the new system with a time lag of one to three years. The countries covered in the study are listed in Table 4.2. These countries are suitable for our main research question because of significant differences in inter-country diversity in export performance during the period under this study.

Table 4.2 List of country coverage[1]

| Region | Country |
|---|---|
| North Asia (3 countries) | China (1992), Hong Kong (1992), and South Korea (1990) |
| Southeast Asia (8 countries) | Brunei (2000), Cambodia (2000), Indonesia (1990), Malaysia (1990), Philippines (1991), Singapore (1990), Thailand (1990), and Vietnam (2000) |
| South Asia (5 countries) | Bangladesh (1990), India (1990), Nepal (2000), Pakistan (1990), and Sri Lanka (1990) |
| Central and West Asia (5 countries)[2] | Armenia (2000), Azerbaijan (2000), Georgia (2000), Kazakhstan (2000), and Kyrgyzstan (2000) |

Note: 1. The figure in parentheses denotes the starting year of data in each country.
2. Some countries in Central and West Asia have trade data since the late 1990s. However, there are missing value of trade data in that period. To avoid the poor reliability of data, this study employs the starting year data in 2000 for these countries.

We use data based on SITC rather than data based on the Harmonized System (HS) because the former provides data on a comparable basis for the entire period under the study.[10] One main problem of using HS Classification is that there are major reclassification changes in the trade data in 1996 and 2002 (Amiti & Freund, 2008). These changes in classification can potentially distort estimates of matter trade margins, especially the extensive margin because new reclassification would cause some existing products to erroneously become new products. Also, the five-digit disaggregation of SITC is broadly equivalent to the HS at the 6-digit level.

[10] The Harmonized System (HS) classification has changed product-lists six times during the period under study (1992, 1996, 2002, 2007, 2012, and 2017).

Total non-oil merchandise exports[11] are divided into primary products and manufactured products. Next, we decompose manufactured products into Global Production Network products (GPN) and non-Global Production network products (non-GPN). Table 4.3 shows the definition of each commodity group and the number of product lines. This decomposition aims to examine the role of export margins in total merchandize and its subcategories. This decomposition analysis can also suggest which export margins in each commodity group are essential for high export performance.

Table 4.3 Definition of commodity group

| No. | Commodity | Definition | Number of product lines |
|---|---|---|---|
| 1 | Total non-oil merchandise | SITC section 0 – 8 less SITC 3 | 3,115 |
| 2 | Primary products | SITC section 0, 1, 2, 4 and 68 | 786 |
| 3 | Manufactured products | SITC section 5 + 6 (less SITC 68: nonferrous metals) + 7 + 8 | 2,329 |
| 4 | GPN products | See Appendix 2.1 | 767 |
| 5 | Non-GPN products | Item 3 - 4 | 1562 |

Source: Author's compilation.

There are concerns relating to the definition of 'exported product or export relationship' using the available trade data. First, an exported product is identified when a country exports any product to its partners with positive export value. However, sometimes a zero-value of exports may not necessarily imply the absence of exports because of the minimum cut-off point used by Customs statisticians in recording data (Kehoe & Ruhl, 2013). For example, the US requires only export shipment with greater than US$2,500 being reported. This minimum reporting requirement varies across countries. Second, zero reported value in any products may be simply misreporting.

Because of these concerns, we examine the pattern of the number of exported products using reported zero values as given as well as using two minimum cut-off values: $100 and $1,000 to see the sensitivity of results. We found that the number of exported products significantly changes in some countries for a few years when we use the fixed cut-offs between the value of $0 and the value of $100. Therefore, this study set the fixed cut-off at $100 defining the status of exporting for products.

[11] For the reasons given in the previous chapter the data on total merchandise exports use in this chapter are newt of oil and gas (STIC Section 3).

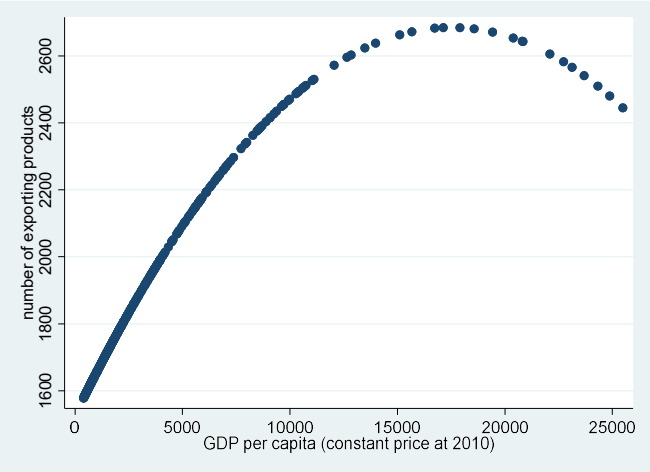
## 4.4 Results

### 4.4.1 Trends and patterns of exported products in developing Asian countries

In order to provide the context for the decomposition of product deepening, emergence and death (intensive, extensive and, failure margins) of export composition, we first examine the number of products in the export basket (identified at the 5-digit level SITC, Revision 3) and the level of development (measured by GDP per capita) of each country (Figure 4.1).

A quadratic polynomial regression estimated for the 21 countries by fitting a quadratic polynomial regression between the number of exporting products and GDP per capita exhibits a hump-shaped pattern (Figure 4.1). It shows that the number of export lines increases as GDP per capita until a turning point of $17,500; the number of export lines will decrease (Figure 4.1). We exclude some outliers (Hong Kong, Singapore, and Brunei) for avoiding the overestimation. Besides, our regression reveals that only South Korea currently experienced reconcentrate in its number of exporting products. Thus, the level of economic development roughly determines a country' export basket that can diversify in a range of the lower turning point and can reconcentrate after the turning point.

Figure 4.1 Relationship between number of exporting products and GDP per capita[1]




Notes: 1. Based on the OLS estimation of $Y_{it} = \alpha_0 + \alpha_1 GDPC_{it} + \alpha_2 GDPC_{it}^2 + \varepsilon_{it}$, with $Y_{it}$ being the number of exported products and GDPC noting as GDP per capita at constant 2010 price. The equation is estimated applying the fixed effect estimator to a panel dataset for 18 developing Asian countries over the period 1990-2017.
Source: Author's calculations using the UN Comtrade database.

On average, North Asia and Southeast Asia have larger diversified export baskets compared to South Asia and Central and West Asia over the period. For example, in 2007, North Asia had the highest number of exported exports (2,651) followed by Southeast Asia (2,213), South Asia (1,975), and Central and West Asia (1,524). However, North Asia and

Southeast Asia conversely experienced a reconcentrated export basket (lesser number of exported products) between 1990 and 2017. In contrast, there was a significant upward increase in the number of exported products in South Asia and Central and West Asia. (Table 4.4).

Table 4.4 Number of exporting products in developing Asian countries[1]

| | 1990-96 | 1997-99 | 2000-04 | 2005-08 | 2009-10 | 2011-13 | 2014-16 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **North Asia** | **2,841** | **2,844** | **2,823** | **2,779** | **2,730** | **2,734** | **2,736** | **2,651** |
| China | 2,991 | 2,975 | 2,952 | 2,897 | 2,834 | 2,823 | 2,827 | 2,749 |
| | (96.0) | (95.5) | (94.8) | (93.0) | (91.0) | (90.6) | (90.7) | (88.3) |
| Hong Kong | 2,791 | 2,789 | 2,756 | 2,693 | 2,623 | 2,632 | 2,613 | 2,511 |
| | (89.6) | (89.5) | (88.5) | (86.4) | (84.2) | (84.5) | (83.9) | (80.6) |
| South Korea | 2,742 | 2,768 | 2,762 | 2,747 | 2,734 | 2,747 | 2,767 | 2,693 |
| | (88.0) | (88.9) | (88.7) | (88.2) | (87.8) | (88.2) | (88.8) | (86.5) |
| **Southeast Asia** | **2,439** | **2,578** | **2,074** | **2,118** | **2,131** | **2,179** | **2,202** | **2,213** |
| Brunei | n.a. | n.a. | 1,090 | 1,129 | 1,455 | 1,425 | 1,414 | 1,408 |
| | | | (35.0) | (36.2) | (46.7) | (45.7) | (45.4) | (45.2) |
| Cambodia | n.a. | n.a. | 593 | 588 | 600 | 714 | 805 | 991 |
| | | | (19.0) | (18.9) | (19.3) | (22.9) | (25.8) | (31.8) |
| Indonesia | 2,226 | 2,515 | 2,801 | 2,747 | 2,665 | 2,609 | 2,590 | 2,537 |
| | (71.5) | (80.7) | (89.9) | (88.2) | (85.6) | (83.7) | (83.2) | (81.4) |
| Malaysia | 2,826 | 2,772 | 2,778 | 2,791 | 2,751 | 2,740 | 2,720 | 2,631 |
| | (90.7) | (89.0) | (89.2) | (89.6) | (88.3) | (88.0) | (87.3) | (84.5) |
| Philippines | 1,490 | 1,904 | 1,927 | 1,933 | 1,779 | 1,939 | 2,019 | 2,073 |
| | (47.8) | (61.1) | (61.8) | (62.1) | (57.1) | (62.3) | (64.8) | (66.5) |
| Singapore | 3,005 | 2,917 | 2,896 | 2,686 | 2,740 | 2,797 | 2,775 | 2,774 |
| | (96.5) | (93.6) | (93.0) | (86.2) | (87.9) | (89.8) | (89.1) | (89.1) |
| Thailand | 2,648 | 2,781 | 2,762 | 2,788 | 2,790 | 2,833 | 2,809 | 2,735 |
| | (85.0) | (89.3) | (88.7) | (89.5) | (89.6) | (90.9) | (90.2) | (87.8) |
| Viet Nam | n.a. | n.a. | 1,747 | 2,285 | 2,271 | 2,371 | 2,485 | 2,551 |
| | | | (56.1) | (73.4) | (72.9) | (76.1) | (79.8) | (81.9) |
| **South Asia** | **1,386** | **1,528** | **1,661** | **1,869** | **1,805** | **1,841** | **2,050** | **1,975** |
| Bangladesh | 328 | 612 | 875 | 1,277 | 1,290 | 1,276 | 1,982 | 2,230 |
| | (10.5) | (19.7) | (28.1) | (41.0) | (41.4) | (41.0) | (63.6) | (71.6) |
| India | 2,603 | 2,758 | 2,890 | 2,936 | 2,853 | 2,854 | 2,841 | 2,763 |
| | (83.6) | (88.5) | (92.8) | (94.3) | (91.6) | (91.6) | (91.2) | (88.7) |
| Nepal | n.a. | n.a. | 1,049 | 1,106 | 1,100 | 1,116 | 1,322 | 847 |
| | | | (33.7) | (35.5) | (35.3) | (35.8) | (42.5) | (27.2) |
| Pakistan | 1,019 | 1,045 | 1,430 | 2,029 | 2,098 | 2,054 | 1,988 | 1,912 |
| | (32.7) | (33.5) | (45.9) | (65.1) | (67.4) | (65.9) | (63.8) | (61.4) |
| Sri Lanka | 1,593 | 1,698 | 2,061 | 1,998 | 1,686 | 1,904 | 2,118 | 2,121 |
| | (51.1) | (54.5) | (66.2) | (64.1) | (54.1) | (61.1) | (68.0) | (68.1) |
| **Central and West Asia** | **n.a.** | **n.a.** | **1,057** | **1,217** | **1,185** | **1,272** | **1,338** | **1,524** |
| Armenia | n.a. | n.a. | 910 | 1,067 | 978 | 1,020 | 1,145 | 1,414 |
| | | | (29.2) | (34.2) | (31.4) | (32.7) | (36.8) | (45.4) |
| Azerbaijan | n.a. | n.a. | 851 | 909 | 828 | 826 | 983 | 1,284 |
| | | | (27.3) | (29.2) | (26.6) | (26.5) | (31.5) | (41.2) |
| Georgia | n.a. | n.a. | 1,001 | 1,238 | 1,273 | 1,458 | 1,564 | 1,636 |
| | | | (32.1) | (39.7) | (40.9) | (46.8) | (50.2) | (52.5) |
| Kazakhstan | n.a. | n.a. | 1,327 | 1,745 | 1,744 | 1,874 | 1,976 | 2,059 |
| | | | (42.6) | (56.0) | (56.0) | (60.1) | (63.4) | (66.1) |
| Kyrgyzstan | n.a. | n.a. | 1,194 | 1,126 | 1,101 | 1,182 | 1,024 | 1,225 |
| | | | (38.3) | (36.1) | (35.3) | (38.0) | (32.9) | (39.3) |

Notes: 1. Number of product lines identified at the SITC 5-digit level is 3,115 products. The figures in parentheses are the share of exported products as % of total number of product lines. n.a. denotes non-available data.

Source: Author's calculations based on the UN Comtrade database.

There are notable differences in the number of exported products among countries in each subregion, except North Asia (Table 4.4). For example, in Southeast Asia, Singapore, Thailand, and Malaysia have diversified export baskets. However, Cambodia and Brunei have a lower number of exported products in this region.

China and India are the top two ranked countries with the highest number of exported products. In 2017, numbers of exported products were 2,749 and 2,763 for China and India, respectively. Interestingly, even though China and India export almost the same number of product lines, their export shares in the world market were extremely different. As shown in Chapter 2, China's export share accounted for around 17% of total world exports. However, India's export share was only 2%. Thus, a highly diversified export basket does not necessarily guarantee higher export performance.

The numbers of export products in primary products, manufactured products, GPN products, and non-GPN products are reported in Appendix 4.1. The data show that North Asia and Southeast Asia have more diversified export baskets in all subcategories compared to South Asia and Central and West Asia, but their number of exported products was decreasing for all subcategories over the period. The commodity mix of GPN exports has changed over time in the former countries. Countries in North Asia and Southeast Asia, on average, have around 600 to 700 GPN products. However, the number of products does not represent these countries engagement in global production networks. For example, even though numbers of GPN products for China and India are almost the same (694 products and 692 products, respective in 2017), GPN export accounts for 27.1% of total export value of China compared to only 0.8% of that of India.

Table 4.5 shows the numbers of survived, failed, and new products based on the methodology developed in Section 3. Note that new products are identified here using 'the first one-year service'. In short, the number of survival exports per year depends on the number of failures and the number of new products each year. Also, the number of failures can indicate the level of survival performance. North Asia has superior survival performance compared to other regions over the period.

Table 4.5 Number of survival, failure (non-survival), and new products

| | number of survival exports | | | number of failure exports | | | number of new exports | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990-99 | 2000-09 | 2010-17 | 1990-99 | 2000-09 | 2010-17 | 1990-99 | 2000-09 | 2010-17 |
| **North Asia** | **2,377** | **2,664** | **2,620** | **81** | **84** | **67** | **243** | **73** | **57** |
| China | 2,280 | 2,890 | 2,795 | 44 | 42 | 33 | 373 | 28 | 22 |
| Hong Kong | 2,113 | 2,655 | 2,549 | 56 | 81 | 73 | 368 | 64 | 58 |
| South Korea | 2,640 | 2,672 | 2,691 | 106 | 86 | 60 | 117 | 81 | 56 |
| **Southeast Asia** | **2,282** | **2,052** | **1,994** | **318** | **275** | **262** | **394** | **322** | **136** |
| Brunei | n.a. | 726 | 1,150 | n.a. | 271 | 278 | n.a. | 414 | 276 |
| Cambodia | n.a. | 324 | 509 | n.a. | 208 | 211 | n.a. | 266 | 262 |
| Indonesia | 2,045 | 2,650 | 2,485 | 220 | 123 | 131 | 318 | 120 | 109 |
| Malaysia | 2,692 | 2,683 | 2,650 | 120 | 102 | 85 | 120 | 97 | 70 |
| Philippines | 1,197 | 1,687 | 1,684 | 214 | 245 | 245 | 431 | 232 | 276 |
| Singapore | 2,936 | 2,743 | 2,740 | 49 | 72 | 34 | 37 | 50 | 42 |
| Thailand | 2,539 | 2,683 | 2,764 | 139 | 90 | 49 | 173 | 91 | 43 |
| Viet Nam | n.a. | 1,597 | 2,273 | n.a. | 191 | 116 | n.a. | 418 | 152 |
| **South Asia** | **1,191** | **1,493** | **1,695** | **210** | **220** | **215** | **253** | **265** | **238** |
| Bangladesh | 239 | 770 | 1,300 | 109 | 278 | 244 | 189 | 304 | 367 |
| India | 2,517 | 2,843 | 2,809 | 120 | 52 | 40 | 156 | 62 | 28 |
| Nepal | n.a. | 711 | 866 | n.a. | 256 | 323 | n.a. | 369 | 288 |
| Pakistan | 726 | 1,402 | 1,795 | 294 | 233 | 245 | 309 | 331 | 225 |
| Sri Lanka | 1,280 | 1,737 | 1,706 | 318 | 280 | 224 | 356 | 261 | 280 |
| **Central and West Asia** | n.a. | **809** | **1,032** | n.a. | **271** | **243** | n.a. | **325** | **285** |
| Armenia | n.a. | 702 | 814 | n.a. | 271 | 243 | n.a. | 281 | 293 |
| Azerbaijan | n.a. | 617 | 669 | n.a. | 261 | 216 | n.a. | 256 | 271 |
| Georgia | n.a. | 798 | 1,216 | n.a. | 300 | 236 | n.a. | 321 | 287 |
| Kazakhstan | n.a. | 1,152 | 1,650 | n.a. | 250 | 230 | n.a. | 390 | 262 |
| Kyrgyzstan | n.a. | 775 | 812 | n.a. | 272 | 291 | n.a. | 379 | 311 |

Source: Author's calculations based on the UN Comtrade database.

Also, all regions experienced a downward trend in a number of new products. In particular, North Asia could introduce 243 new exporting products per year during the period 1990-99. However, its new exporting products significantly decreased to only 57 products per year in 2010-17. In contrast, the number of new products was high for latecomer exporting countries in South Asia and Central and West Asia (Table 4.5).

It is important to note that a country with a highly diversified export basket tends to have lower new exporting products such as China, India, and Singapore. Also, there is a positive relationship between the number of product failures and the number of new products for most countries in South Asia and Central and West Asia. For example, Nepal could launch new exports by 288 products per year in 2010-17. However, it experienced high failed products by 323 products per year. This situation implies that new exports for latecomer exporting countries

are likely to fail rapidly. Thus, the number of exported products in Nepal was increasingly at slow rate because of its high failure rate.

### 4.4.2 The role of trade margins in developing Asian countries

This section presents estimates of trade margins by showing the contributions of the intensive margin, the failure margin, and the extensive margin to changes in total exports. The estimates are presented for four periods: the 1990s, the 2000s, 2010-17, and 1990-2017.

Table 4.6 reports estimates of intensive, failure, and extensive margins for four developing Asian regions: North Asia, Southeast Asia, South Asia, and Central and West Asia. From the methodology, the sum of three-margin contributions is 100% (-100%). The intensive margin can be positive (as higher export deepening) or negative values (as lower export deepening), while the failure margin and the extensive margin are always negative and positive, respectively. The negative failure margin represents the total loss of failure export lines into the country's export changes. The positive extensive margin captures the export expansion of new products.

Exports from countries in North Asia have expanded at a much faster rate compared to other subregions during the last three decades. In North Asia, changes in export values rose from around 440.5 billion US$ in the 1990s to 1,009.5 billion US$ in the 2000s. However, after the world economic crisis, developing Asian countries have not experienced the high export growth as they did in the past. Particularly, Central and West Asia had negative changes in exports during 2010-17 due to the consequence of the World economic crisis.

Table 4.6 indicates that there are notable differences in trade margins among the subregions. However, the intensive margin contributed mostly to changes in total merchandise exports over the period (1990-2017) for all four regions. It accounted for almost 100% or more than 100% in most cases. On the other hand, the extensive margin increased changes in total merchandise exports by lower than 10% for all cases, except Central and West Asia. Lastly, the failure margins were high for some products in some periods, especially during 2000-09.

Table 4.6 The contribution of trade margins in developing Asian countries[1]

| Region | Period | Trade margin | Total merchandise | Primary | Manufacture | GPN | Non GPN |
|---|---|---|---|---|---|---|---|
| North Asia | 1990-99 | Change in export (Billion US$) | 440.5 | 39.1 | 401.4 | 278.3 | 123.1 |
| | | Intensive margin (IM) (%) | 100 | 67.1 | 101.9 | 99.7 | 107.8 |
| | | Failure margin (FM) (%) | -4.2 | -33.4 | -2.5 | -0.3 | -8.2 |
| | | Extensive margin (EM) (%) | 4.1 | 66.2 | 0.6 | 0.6 | 0.4 |
| | 2000-09 | Change in export (Billion US$) | 1,009.5 | 48.7 | 960.7 | 653.1 | 307.6 |
| | | Intensive margin (IM) (%) | 111 | 100.5 | 111.6 | 118.8 | 96.2 |
| | | Failure margin (FM) (%) | -13.0 | -0.8 | -13.6 | -18.9 | -2.3 |
| | | Extensive margin (EM) (%) | 1.9 | 0.3 | 2 | 0.1 | 6.1 |
| | 2010-17 | Change in export (Billion US$) | 611.2 | 35.4 | 575.8 | 283.7 | 292.1 |
| | | Intensive margin (IM) (%) | 116.6 | 119.4 | 116.4 | 125.2 | 107.8 |
| | | Failure margin (FM) (%) | -18.7 | -19.9 | -18.6 | -29.7 | -7.9 |
| | | Extensive margin (EM) (%) | 2.1 | 0.4 | 2.2 | 4.5 | 0 |
| | 1990 - 2017 | Change in export (Billion US$) | 2,632.3 | 151 | 2,481.3 | 1,584.5 | 896.8 |
| | | Intensive margin (IM) (%) | 109.1 | 108 | 109.1 | 113.2 | 101.9 |
| | | Failure margin (FM) (%) | -10.8 | -15.1 | -10.6 | -14.2 | -4.2 |
| | | Extensive margin (EM) (%) | 1.7 | 7.1 | 1.5 | 1 | 2.3 |
| Southeast Asia | 1990-99 | Change in export (Billion US$) | 205.3 | 15.1 | 190.2 | 154.6 | 35.7 |
| | | Intensive margin (IM) (%) | 100.0 | 102.4 | 99.8 | 99.7 | 100.4 |
| | | Failure margin (FM) (%) | -10.5 | -149.6 | -1.1 | -0.6 | -3.2 |
| | | Extensive margin (EM) (%) | 10.5 | 147.2 | 1.2 | 0.9 | 2.8 |
| | 2000-09 | Change in export (Billion US$) | 216.6 | 109.1 | 107.4 | 22.8 | 84.6 |
| | | Intensive margin (IM) (%) | 131.9 | 98.7 | 165.7 | 391.4 | 104.7 |
| | | Failure margin (FM) (%) | -36.5 | -1.3 | -72.2 | -307.1 | -8.8 |
| | | Extensive margin (EM) (%) | 4.5 | 2.5 | 6.6 | 15.7 | 4.1 |
| | 2010-17 | Change in export (Billion US$) | 199.1 | 21.1 | 178.0 | 125.0 | 53.0 |
| | | Intensive margin (IM) (%) | 111.7 | 118.9 | 110.8 | 113.9 | 103.6 |
| | | Failure margin (FM) (%) | -18.0 | -25.8 | -17.1 | -19.5 | -11.4 |
| | | Extensive margin (EM) (%) | 6.4 | 7.0 | 6.3 | 5.6 | 7.8 |
| | 1990 - 2017 | Change in export (Billion US$) | 852.7 | 213.8 | 638.9 | 410.8 | 228.1 |
| | | Intensive margin (IM) (%) | 112.7 | 107.1 | 114.4 | 120.9 | 102.9 |
| | | Failure margin (FM) (%) | -18.2 | -18.5 | -18.1 | -24.2 | -7.2 |
| | | Extensive margin (EM) (%) | 5.5 | 11.4 | 3.6 | 3.3 | 4.3 |
| South Asia | 1990-99 | Change in export (Billion US$) | 27.6 | 2.8 | 24.8 | 11.0 | 13.8 |
| | | Intensive margin (IM) (%) | 100.0 | 100.9 | 99.8 | 99.5 | 100.1 |
| | | Failure margin (FM) (%) | -6.1 | -19.5 | -4.6 | -2.4 | -6.3 |
| | | Extensive margin (EM) (%) | 6.1 | 18.6 | 4.7 | 2.8 | 6.2 |
| | 2000-09 | Change in export (Billion US$) | 123.0 | 24.5 | 98.5 | 39.5 | 59.0 |
| | | Intensive margin (IM) (%) | 99.4 | 100.5 | 99.1 | 99.4 | 98.8 |
| | | Failure margin (FM) (%) | -1.8 | -2.4 | -1.7 | -2.4 | -1.2 |
| | | Extensive margin (EM) (%) | 2.4 | 1.9 | 2.6 | 3.0 | 2.3 |
| | 2010-17 | Change in export (Billion US$) | 92.2 | 4.8 | 87.4 | 50.0 | 37.4 |
| | | Intensive margin (IM) (%) | 106.2 | 182.7 | 102.0 | 97.0 | 108.6 |
| | | Failure margin (FM) (%) | -10.7 | -95.3 | -6.1 | -3.0 | -10.1 |
| | | Extensive margin (EM) (%) | 4.5 | 12.6 | 4.1 | 6.0 | 1.5 |
| | 1990 - 2017 | Change in export (Billion US$) | 291.2 | 47.3 | 243.9 | 111.8 | 132.1 |
| | | Intensive margin (IM) (%) | 101.7 | 108.7 | 100.3 | 98.4 | 101.9 |
| | | Failure margin (FM) (%) | -4.8 | -12.2 | -3.4 | -2.5 | -4.1 |
| | | Extensive margin (EM) (%) | 3.1 | 3.5 | 3.1 | 4.1 | 2.2 |
| Central and West Asia | 2000-09 | Change in export (Billion US$) | 49.4 | 43.1 | 6.2 | 0.8 | 5.5 |
| | | Intensive margin (IM) (%) | 91.7 | 93.9 | 76.0 | 85.4 | 74.7 |
| | | Failure margin (FM) (%) | -2.1 | -0.7 | -11.8 | -65.5 | -4.4 |
| | | Extensive margin (EM) (%) | 10.4 | 6.8 | 35.8 | 80.2 | 29.7 |
| | 2010-17 | Change in export (Billion US$) | -11.7 | -12.9 | 1.2 | 0.5 | 0.7 |
| | | Intensive margin (IM) (%) | -97.6 | -100.0 | 122.9 | 132.7 | 116.1 |
| | | Failure margin (FM) (%) | -15.9 | -3.7 | -110.9 | -130.0 | -97.6 |
| | | Extensive margin (EM) (%) | 13.5 | 3.8 | 88.0 | 97.3 | 81.5 |
| | 2000 - 2017 | Change in export (Billion US$) | 58.6 | 49.6 | 9.0 | 1.5 | 7.5 |
| | | Intensive margin (IM) (%) | 93.7 | 94.7 | 88.0 | 112.1 | 83.2 |
| | | Failure margin (FM) (%) | -5.3 | -1.7 | -25.5 | -87.4 | -13.1 |
| | | Extensive margin (EM) (%) | 11.6 | 6.9 | 37.4 | 75.3 | 29.9 |

Notes: 1. Change in export (billion US$) is the change in export between two years.

Source: Author's calculations from the UN Comtrade database.

North Asia and Southeast Asia experienced high failure margin during 2000-2017, in which their failure margins were greater than 10% for total merchandise export. Also, the failure margins were higher in manufactured products. For example, the failure margin for Southeast Asia was -72.7% of changes in manufactured exports in 2000/09. However, changes in manufacture exports were positive because of the massive increase in their intensive margin. Besides, a comparison between GPN and non-GPN products, the failure margin in GPN products was higher than non-GPN Products. This is unsurprising because each product in GPN is likely to have a higher export value compared to non-GPN products.

In South Asia, the failure margin was lower than in other regions. However, the low percentage share in the failure margin may not guarantee higher export performance. For example, in 1990/2017, shares of the failure margin for total exports were -18.2% and -4.8% in Southeast Asia and South Asia. However, changes in total exports in Southeast Asia (852.7 billion US$) were greater than that of South Asia (291.2 billion US$) by almost three periods.

In Central and West Asia, interestingly, the role of new products in export growth was almost high as the role of existing products for manufactured products, GPN, and GPN products in some periods. For example, in GPN products, the intensive margin and the extensive margin accounted for 85.4% and 80.2% of changes in GPN exports in 2000/09. However, this region had poor export performance because of its high failure margin, especially in 2010-17. Also, the region relied highly on primary products. In the last decade, most countries in the region had recorded negative changes in total exports mainly because of decline in commodity prices (Table 4.6).

Estimates of trade margins for each developing Asian country is provided in Appendix 4.2. At the country level, the intensive margin also has a higher impact on export growth rather than the extensive margin for most cases. The percentage share of failure margin is more increased in newcomer exporters in South Asia (Nepal and Pakistan) and Central and West Asia. In addition, in fact, newly industrialised countries (NICs) and emerging countries in Southeast Asia except Vietnam had a high failure margin since 2000. In Appendix 4.2, it shows that the failure margin resulted from GPN exports, especially Malaysia, the Philippines, and Thailand. In Malaysia, a negative growth of total exports in 2010/17 resulted mainly from adverse changes in GPN exports. This pattern may indicate the reallocation of global production sharing in Southeast Asia, from some GPN products in Malaysia and Thailand to Vietnam.

As already discussed, China and Vietnam achieved high export performance. Appendix 4.2 found that their export successes are due mainly to the intensive margin for all cases. For example, in China, the percentage share of intensive margin accounted almost for 100% or more than 100% in total merchandise exports and its subcategories, except primary products in 1992/99. On the other hand, the shares of extensive margin were less than 5% for most cases. Also, the extensive margin share tended to decrease over time. This implies that the introduction of new products may contribute to less and less export values.

### 4.4.3 Robustness check

Regarding the decomposition of trade margin reported in the previous section, a significant concern is the use of 'one-year' duration for determining the status of new products. To test the sensitivity of estimates, we estimate trade margins by selecting a breaking point that separates all exports into old products (being exported before a breaking point) and new products (being exported after a breaking point) (Amurgo-Pacheco & Pierola, 2008; Brenton & Newfarmer, 2009). However, implementing the same breaking point for all developing Asian countries may not be sensible because of their vast differences in stage of trade development. Since we take into account this concern, we believe that developing Asian countries should be separated into two groups.

The first group (South Korea, Singapore, Hong Kong, China, India, Thailand, Malaysia, and Indonesia) is a high stage of trade development with a relatively high exporting product mix in 1990. We define the already exported products in the year 1990 as existing products, while any new exporting products after starting year is classified as new products[12].

The second group is a low stage of trade development with a relatively low exporting product mix in 1990 or 2000. We employ a similar method from Amurgo-Pacheco and Pierola (2008). We define existing products as all products are exported at least three years in the first five years to deal with the low survival rate of exporting products in developing countries.

[12] Due to data availability, export data for China and Hong Kong start at 1992. Thus, list of existing products for both countries is defined as all exported products in 1992, whereas list of new products is any exported products occurring after 1992.

However, new products are defined as all exporting products are not included in the former list[13].

In our robustness results, we estimate only the intensive margin and extensive margin. The results are reported in Table 4.7 and 4.8. The existing products are more important than the new products. At the regional level, the intensive margin accounted for more than 90% of the total change in exports in most cases, except in some cases in Central and Western Asia. For example, total changes in merchandise exports between 1990 and 2017 in North Asia were mostly relied on total changes in existing exports (99.0%), while the new exports contributed only 1.0% to total change in merchandise exports.

Table 4.7 Weighted average contribution share of trade margins to total export growth between 1990 and 2017 by Asian subregions[1]

| | North Asia | | Southeast Asia | | South Asia | | Central and West Asia[2] | |
|---|---|---|---|---|---|---|---|---|
| | IM (%) | EM (%) | IM (%) | EM (%) | IM (%) | EM (%) | IM (%) | EM (%) |
| Total merchandise | 99.0 | 1.0 | 93.2 | 6.8 | 92.3 | 7.7 | 93.3 | 6.7 |
| Primary | 98.5 | 1.5 | 90.3 | 9.7 | 89.5 | 10.5 | 94.9 | 5.1 |
| Manufacture | 99.1 | 0.9 | 94.2 | 5.8 | 92.9 | 7.1 | 84.7 | 15.3 |
| GPN | 99.0 | 1.0 | 94.6 | 5.4 | 94.2 | 5.8 | 85.1 | 14.9 |
| Non-GPN | 99.2 | 0.8 | 93.5 | 6.5 | 91.8 | 8.2 | 84.7 | 15.3 |

Note: 1. IM and EM denote intensive margin (existing products) and extensive margin (new products), respectively.
2. Due to data limitation for Central and West Asia, these figures are shown the weighted average contribution share of trade margins to total export growth between 2000 and 2017.
Source: Author's calculations based on the UN Comtrade database.

Estimates reported in Table 4.8 show that the existing products play a crucial role in export performance for most cases in developing Asian countries, except for some commodity groups. For example, the extensive margin was significantly high for the Philippines (around 40% and 45% in total merchandise exports and manufactured exports, respectively). In contrast, the increased contribution of new exports could not drive high growth of export for the case of low export survival rate and low deepening rate. For example, Nepal experienced significantly new export growth between 2000 and 2017, around 45 million US$. However, the intensive margin in Nepal decreased by about 57 million US$. As a result, its total merchandise exports slightly fell from 734 million US$ in 2000 to 723 million US$.

[13] Due to data availability, we employ two periods of the first five-year for defining old products for the two groups. The first group (Philippines, Bangladesh, Pakistan, and Nepal) relies on the period of 1990-1994. On the other hand, another group (the rest of sample) use the period of 2000-04 for clarifying their old products.

In sum, the alternative estimates confirm the importance of existing products (the intensive margin) compared to new products (the extensive margin). One reason is that new products tend to fail in a short period and need time for keeping their survival in a highly competitive world market and developing their deepening as well. In the case of Vietnam, the number of new products increased by around 800 products during the period 2000-17. However, its new products contributed only 3.9% of total export growth (Table 4.8).

Table 4.8 Weighted average contribution share of trade margins to total export growth by country[1, 2]

| | Total merchandise | | Manufacture | | GPN | | Non-GPN | |
|---|---|---|---|---|---|---|---|---|
| | IM (%) | EM (%) | IM (%) | EM (%) | IM (%) | EM (%) | IM (%) | EM (%) |
| Brunei (2000) | 93.0 | 7.0 | -30.3 | 130.3 | -102.7 | 2.7 | 55.1 | 44.9 |
| Cambodia (2000) | 81.9 | 18.1 | 84.8 | 15.2 | 88.2 | 11.8 | 4.1 | 95.9 |
| China (1992) | 99.6 | 0.4 | 99.7 | 0.3 | 99.8 | 0.2 | 99.4 | 0.6 |
| Hong Kong (1992) | 99.2 | 0.8 | 99.2 | 0.8 | 99.1 | 0.9 | 99.3 | 0.7 |
| Indonesia (1990) | 89.7 | 10.3 | 88.1 | 11.9 | 90.1 | 9.9 | 85.9 | 14.1 |
| Malaysia (1990) | 98.6 | 1.4 | 99.1 | 0.9 | 100.0 | 0.0 | 97.6 | 2.4 |
| Philippines (1991) | 58.9 | 41.1 | 53.7 | 46.3 | 50.3 | 49.7 | 75.2 | 24.8 |
| South Korea (1990) | 95.5 | 4.5 | 95.2 | 4.8 | 93.5 | 6.5 | 97.8 | 2.2 |
| Singapore (1990) | 99.8 | 0.2 | 99.8 | 0.2 | 100.0 | 0.0 | 99.7 | 0.3 |
| Thailand (1990) | 91.9 | 8.1 | 95.4 | 4.6 | 98.0 | 2.0 | 91.7 | 8.3 |
| Viet Nam (2000) | 96.1 | 3.9 | 96.6 | 3.4 | 98.8 | 1.2 | 89.4 | 10.6 |
| Bangladesh (1990) | 91.5 | 8.5 | 92.5 | 7.5 | 93.9 | 6.1 | 68.0 | 32.0 |
| India (1990) | 93.1 | 6.9 | 93.3 | 6.7 | 94.0 | 6.0 | 93.0 | 7.0 |
| Nepal (2000) | -514.0 | 414.0 | -114.9 | 14.9 | -101.3 | 1.3 | 59.4 | 40.6 |
| Pakistan (1990) | 82.0 | 18.0 | 86.6 | 13.4 | 97.5 | 2.5 | 78.3 | 21.7 |
| Sri Lanka (1990) | 93.9 | 6.1 | 93.4 | 6.6 | 94.0 | 6.0 | 91.0 | 9.0 |
| Armenia (2000) | 92.1 | 7.9 | 79.9 | 20.1 | 73.4 | 26.6 | 85.6 | 14.4 |
| Azerbaijan (2000) | 87.8 | 12.2 | 61.3 | 38.7 | -180.6 | 80.6 | 64.9 | 35.1 |
| Georgia (2000) | 87.0 | 13.0 | 86.5 | 13.5 | 88.4 | 11.6 | 85.5 | 14.5 |
| Kazakhstan (2000) | 95.5 | 4.5 | 86.6 | 13.4 | 94.6 | 5.4 | 85.7 | 14.3 |
| Kyrgyzstan (2000) | 80.1 | 19.9 | 69.9 | 30.1 | 68.6 | 31.4 | 73.5 | 26.5 |

Note: 1. IM denotes for intensive margin (existing products), whereas EM is extensive margin (new products).
2. The figures in parentheses are the starting year for each country in developing Asian countries due to available trade data. Total contribution shares are 100% (-100%) when a country experiences positive changes in exports (negative changes in exports) between two years.

Source: Author's calculations based on the UN Comtrade database.

## 4.5 Determinants of trade margins

### 4.5.1 The Model

In this section, we examine the factors causing trade margins of export performance. The analysis is undertaken by pooling data over the period 1990-2017, for developing Asian countries, excluding Brunei and the small island economies in the Pacific. The export model is specified as follows:

$$\begin{aligned}\ln TRM_{it} = {} & \alpha + \beta_1 \ln GDPC_{it} + \beta_2 \ln WD_{it} + \beta_3 \ln FDI_{it} + \beta_4 \ln REER_{it} \\ & + \beta_5 LIB_{it} + \beta_6 \ln OPEN_{it} + \beta_7 WTO_{it} + \beta_8 \ln TR_{it} + \beta_9 \ln FIN_{it} \\ & + \beta_{10} \ln LA_{it} + \beta_{11} \ln EDU_{it} + \beta_{12} \ln NUM_{it-1} + \beta_{13} TIME_t + \theta_t + \gamma_i + \varepsilon_{it}\end{aligned} \tag{3}$$

In this model, $TRM$ denotes trade margins, including intensive margin ($IM$), extensive margin ($EM$), and failure margin ($FM$). The right-hand side variables consist of GDP per capita ($GDPC$), world demand ($WD$), FDI inflow ($FDI$), real effective exchange rate ($REER$), trade liberalization index based on Sachs and Warner index ($LIB$), trade openness ($OPEN$), the status of membership in WTO ($WTO$), average tariff rate ($TR$), level of domestic credit ($FIN$), number of labour force ($LA$), level of education ($EDU$), and number of exported products ($NUM$). Also, we include time trend ($TIME$) in the model. $\theta$ and $\gamma$ stand for time fixed effect and country fixed effect, respectively. $\varepsilon$ is the error term. Subscript i and t denote country and time, respectively.

GDPC is included to capture the impact of the stage of development on trade margins. World demand (WD) captures the impact of change in global demand. The coefficient of FDI measures the impact of FDI inflow on trade margins, while the coefficient of REER examines the effect of exchange rate changes on trade margins. According to our definition of REER, an increase in REER indicates a real exchange rate appreciation (reduction in international competitiveness). The expected sign of the coefficient of REER is negative. Four trade policy variables, ($LIB$, $OPEN$, $WTO$, and $TR$), are included to capture the effect of trade liberalization on trade margins. The model includes additional three supply-side variables ($FIN$, $LA$, and $EDU$) and number of exported products ($NUM$) representing the stage of export development.

However, the coefficients in the model may be different signs (positive or negative) among the three trade margins. For example, according to our results of trade margin decomposition (Section 4), we found that when a stage of the economy is highly developed, the

intensive margin tends to increase, whereas extensive margin becomes less. Thus, the coefficient of GDPC for the intensive margin and the extensive margin may be positive and negative, respectively.

We observed in Chapter 2 that China had outperformed other developing Asian countries in the term of export expansion during the period 1990-2017. To capture this unique 'China factor', we include the interaction term for China into the three explanatory variables in the model: GDPC, WD and FDI. Thus, with these three interaction variables are added, the trade margin model takes the following form:

$$\begin{aligned}\ln TRM_{it} = {} & \alpha + \beta_1 \ln GDPC_{it} + \beta_2 \ln WD_{it} + \beta_3 \ln FDI_{it} + \beta_4 \ln REER_{it} \\ & + \beta_5 LIB_{it} + \beta_6 \ln OPEN_{it} + \beta_7 WTO_{it} + \beta_8 \ln TR_{it} + \beta_9 \ln FIN_{it} \\ & + \beta_{10} \ln LA_{it} + \beta_{11} \ln EDU_{it} + \beta_{12} \ln NUM_{it-1} + \beta_{13} TIME_i \\ & + \beta_{14}(\mathrm{D}_i \times \ln GDPC_{it}) + \beta_{15}(\mathrm{D}_i \times \ln WD_{it}) + \beta_{16}(\mathrm{D}_i \times \ln FDI_{it}) + \theta_t + \gamma_i + \varepsilon_{it}\end{aligned} \tag{4}$$

where Di is a dummy variable for China which takes the value of one for China and zero for other Asian countries.

In equation (4), we can interpret 'China factor' effect on trade margins as following example. Assume that the coefficient of GDPC is positive and statistically significant for both $\beta_1$ and $\beta_{14}$. This would indicate that an increase in GDP per capita can lead to higher growth along the trade margin for China compared to other developing Asian countries. In other words, $\beta_{14}$ represents the China factor effect on GDPC. However, one concern is that we can analyse the China factor effects only if the non-interaction term and the interaction term must be statistically significant together.

To assess the differential export performance along the different trade margins, we estimate separate regressions for these three dependent variables into total merchandise exports and its subcategories: manufactured exports, GPN exports, and non-GPN exports. We assume the determinant factors in our export model can cause differential impacts on trade margin along with the different commodity groups. Also, we exclude the trade margin model for primary products because primary exports tend to be less important over the period and its growth along the intensive margin and the extensive margin reflects differences in resource endowment among countries.

### 4.5.2 Data

The model (Equation 4) is estimated using unbalanced panel data for the period 1990 -2017. As discussed in Section 4.4, Trade margins were estimated using export data in US$ extracted from the UN Comrade database. For the purpose of the econometric analysis, these are converted into real terms using import price index (as a proxy for world export price) extracted from the US Bureau of Labour database (https://www.bls.gov/). This index is available at the three-digit level of the Harmonised System (HS) of commodity classification. The price indices for the total (non-oil) exports, manufactured exports, GPN exports and non-GPN exports are separately constructed by using the HS-SITC concordance obtained from the database of the UN Statistical Office.

GDP per capita of developing Asian countries, trade openness (the ratio of trade to GDP), average tariff rate, domestic credit (the ratio of domestic credit to private to GDP), number of labour force, and level of education (average years of schooling for the population older than 25 participated in formal education) are obtained from the World Development Indicator database of the World Bank.

World demand (WD) is measured for each country as the export-share weighted average GDP of the 20 major export destination countries. Thus, world demand varies among each country depending on the nature of its geographical profile of exports. FDI inflow is obtained from UNCTAD and is converted in the real term, while REER index is provided from the French Research Center in International Economics (CEPII). Trade liberalization index is a binary index in which takes the value of one for the status of liberalised trade policy regime and zero for otherwise. This index is developed by Sachs and Warner (1995) and updated by Wacziarg and Welch (2008) and Paudel (2014).[14] The status of membership in WTO is from the WTO website.

[14] According to this binary index a country is considered as having a closed economy if it has (1) more than 40% of the average tariff, (2) non-tariff barrier covered more than 40% imports, (3) state monopoly of major exports, and (4) exchange rate black-market premium exceeded 20%.

### 4.5.3 Results

The results for the intensive margin (IM), the extensive margin (EM), and the failure margin (FM) are reported in Table 4.9 to Table 4.11. The interaction terms of China are statistically significant in a few cases, mostly in the case of the failure margin model. Thus, we drop the interaction term of China in most cases in the intensive margin and extensive margin. In other words, China has not marginal effect relative to other developing Asian countries for its export growth along the intensive and extensive margin from our analysis period. However, we include the interaction term of South Korea and Singapore for the only GDP per capita because both countries experienced a lower failure margin compared to other countries.

The overall results show that GDP per capita (GDPC) and world demand are statistically significant for most cases in the intensive margin. However, the extensive margin and the failure margin models are poorly determined by GDP per capita and world demand. FDI inflow and REER are significant in a few cases. Also, most trade policy variables have a statistically significant impact on trade margins, especially openness index and average tariff rate. The supply-side variables are less statistically significant. Finally, lagged number of exported products determines statistically trade margins for many cases. The details of the regression results are as follows.

In the intensive margin model (Table 4.9), GDP per capita and world demand are positively associated with growth along the intensive margin at the 5% significance level for all cases. The coefficient of GDP per capita, on average, is higher than that of world demand. The coefficient of GDP per capita ranges between 0.90 – 2.00, while the coefficient of world demand is between 0.02 – 1.15. In other words, the supply-side factor is more important than external demand for the intensive margin improvement.

Interestingly, an increase in GDP per capita and world demand result in a faster increase in the intensive margin growth of GPN products compared to non-GPN products. For example, the coefficients of GDPC are 3.549 and 1.364 for GPN products and non-GPN products, respectively. Since the intensive margin is in the term of change in the log of variables, thus we can interpret the results that annual change in GDP per capita by 1% results in a yearly change in the intensive margin by around 3.5% and 1.4% for GPN products and non-GPN products, respectively.

## Table 4.9 Determinants of the intensive margin (IM) results[1]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.955*** | 2.290** | 3.531** | 1.364*** |
| | (0.004) | (0.047) | (0.123) | (0.007) |
| World demand | 0.160*** | 0.293** | 0.541** | 0.025* |
| | (0.001) | (0.011) | (0.026) | (0.003) |
| FDI inflow | -0.032** | -0.014** | 0.001 | -0.007 |
| | (0.001) | (0.000) | (0.001) | (0.003) |
| REER | 0.289 | 0.251 | 0.225 | 0.136 |
| | (0.068) | (0.068) | (0.068) | (0.025) |
| Trade liberalization index (Sachs and Warner index) | 0.047** | 0.020 | -0.035 | 0.027 |
| | (0.001) | (0.005) | (0.018) | (0.008) |
| Trade Openness | 0.451* | 0.549** | 0.604* | 0.307 |
| | (0.054) | (0.041) | (0.054) | (0.073) |
| WTO | -0.038 | -0.010 | -0.106 | 0.080** |
| | (0.072) | (0.058) | (0.147) | (0.002) |
| Education | -0.538 | -0.213 | 0.345 | -0.609 |
| | (0.278) | (0.125) | (0.163) | (0.306) |
| Tariff rate | -0.009** | -0.041* | 0.070 | -0.078 |
| | (0.000) | (0.004) | (0.015) | (0.016) |
| Lagged number of exported products | 0.022** | -0.101* | -0.313* | 0.046 |
| | (0.001) | (0.008) | (0.024) | (0.011) |
| Time trend | -0.002** | -0.003*** | -0.004* | -0.004* |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| China*GDP per capita | | | | 1.512* |
| | | | | (0.129) |
| China*World demand | | | | 0.503** |
| | | | | (0.016) |
| China*FDI inflow | | | | -0.264* |
| | | | | (0.021) |
| Constant | 4.117** | 8.318*** | 10.180** | 9.231* |
| | (0.121) | (0.097) | (0.515) | (1.270) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 434 | 436 | 436 | 436 |
| R-squared | 0.330 | 0.307 | 0.312 | 0.219 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's estimation.

Surprisingly, FDI inflow has a negative impact on the intensive margin. The coefficient is negative and statistically significant for only total merchandise and manufactured products, but its magnitude is relatively small. This moderate adverse effect may result from the fact that FDI inflow may be driven by market seeking in some developing countries such as China and India. Also, FDI inflow may stimulate too many existing products which have less contribution to export growth along the intensive margin.

As expected, an increase in tariff rate is negatively associated with the intensive margin expansion. However, the coefficient is statistically and significant for only total merchandise and manufactured products. This finding is understandable because of a decrease in tariff rate resulting in a lower cost of imported materials for domestic firms in developing countries. Thus, domestic firms could expand their production and sale volume.

There are mixed results for the number of exported products (*Number*). An increase in the lagged number of exported products results in higher export growth along the intensive margin for only total merchandise but causes lower export growth along the intensive margin for manufactured products and GPN products. The contradictory results may be explained as follow. The positive coefficient in total merchandise would result from some primary resource products, which could positively contribute to the intensive margin in some periods. In contrast, the negative coefficient for manufactured products may indicate that developing countries have too many existing products. Some existing products may not be consistent with their comparative advantage causing a lesser probability of expanding their export values.

The interaction term in China is statistically significant for only non-GPN products. The result suggests that increases in GDP per capita and world demand can explain the superior growth in China's intensive margin compared to other countries in the region. For example, the annual change in world demand by 1% increases the intensive margin by 0.025%. However, the impact of world demand on China's intensive margin is 0.528 ($\beta_2 + \beta_{15}$), see equation (4). Thus, China's export growth along with the intensive margin increases by 0.528%.

We turn to the extensive margin results (Table 4.10). Among the supply-side determinants, the coefficients of domestic credit and labour force are positive and statistically significant for GPN exports. The results suggest that an increase in domestic credit by 1% leads to an increase in the extensive margin by 0.96%.

Table 4.10 Determinants of the extensive margin (EM) results[1]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | -0.466 | 0.0837 | 0.379 | -0.585 |
| | (0.079) | (0.889) | (0.919) | (0.104) |
| World demand | -0.146 | 0.324 | 1.425** | -0.525 |
| | (0.448) | (0.096) | (0.271) | (1.526) |
| FDI inflow | 0.055 | 0.012 | 0.141 | -0.029 |
| | (0.026) | (0.035) | (0.090) | (0.033) |
| REER | -0.881 | 1.017 | -0.826 | 0.696 |
| | (0.272) | (1.091) | (1.685) | (1.142) |
| Trade liberalization index (Sachs and Warner index) | 1.138* | 0.859** | 2.049*** | 0.648** |
| | (0.178) | (0.055) | (0.197) | (0.015) |
| Trade Openness | -1.452 | -1.406** | -2.555 | -1.397 |
| | (0.289) | (0.093) | (1.345) | (0.727) |
| WTO | -0.692 | -0.738* | -0.872* | -0.074 |
| | (0.139) | (0.113) | (0.255) | (0.196) |
| Financial credit | 0.496 | 0.649 | 0.963* | 0.561 |
| | (0.149) | (0.171) | (0.294) | (0.309) |
| Labour force | 0.205 | 1.138** | 0.882 | 1.228 |
| | (0.385) | (0.031) | (0.659) | (0.930) |
| Education | 0.463 | -0.045 | 0.371 | -1.384 |
| | (0.289) | (0.369) | (0.924) | (1.019) |
| Tariff rate | -0.431** | -0.037 | 0.171 | -0.256*** |
| | (0.033) | (0.011) | (0.199) | (0.000) |
| Lagged number of exported products | -1.078*** | -1.000* | -1.697*** | -0.843 |
| | (0.005) | (0.093) | (0.109) | (0.271) |
| Time trend | 0.060 | 0.057 | 0.031 | 0.034 |
| | (0.025) | (0.087) | (0.028) | (0.026) |
| Constant | -98.220 | -129.600 | -81.680 | -67.690 |
| | (35.330) | (171.900) | (46.070) | (87.540) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 442 | 310 | 434 | 310 |
| R-squared | 0.170 | 0.178 | 0.160 | 0.169 |

Note: 1. All variables are in the term of change in the log of variable, except Trade liberalization index, WTO, and Time trend. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's estimation.

Unsurprisingly, lagged number of exported products is negatively associated with export growth along the extensive margin. A high number of exported products leads to lessor window opportunities for new exported products. Also, when a country highly diversifies its export basket, it may expand its new products towards only lower exporting values compared to its previous new products.

The coefficient of tariff is statistically significant for only total merchandise and non-GPN products. This result is consistent with the intensive margin model. A decrease in average tariff rate encourages domestic firms to import lower cost of materials for producing some new exported products causing higher export growth in the extensive margin.

Results of the failure margin are reported in Table 4.11. The coefficient of GDP per capita is statistically significant at the 10% level with the positive sign in all four equations. Overall, the results suggest that the stage of economic development of a given country does not necessarily ensure the survival of export products. This is understandable because product-specific external factors matter much more than country-specific factors in export success (Daruich et al, 2019). When a country reaches a higher stage of economic development, it could have a high possibility of producing and exporting new products. However, the country may experience higher failure exports when it cannot succeed in its new exports in the long term. Also, a higher stage of economic development leads to changes in their comparative advantages which sometimes cause some existing products less competitive. Thus, the failure margin always occurs all the time for countries with low or high economic development levels.

The coefficient of REER is negative and statistically significant in all cases. This result runs counter to the general perception that maintaining international competitiveness is important for reducing product failure (export success). This negative relationship is a vital issue for further scrutiny. However, this finding is consistent with the emerging literature on the ‘dominant currency paradigm’ (Gopinath, Itskhoki, & Rigobon, 2010; Gopinath, Boz, Casas, Díez, Gourinchas, & Plagborg-Møller 2020). Most of the exports in world trade, in particular exports from developing countries, are involved in the US$. Given the world prices are mostly denominated in the US$ (‘the dominant currency’), the overall real exchange rate (as used in this study) could be largely irrelevant for determining export performance. At the same time, REER appreciation could help export competitiveness by reducing domestic-currency price of imported inputs. This postulate is particularly relevant for GPN exports given

their high import content. Real exchange rate appreciation could reduce the cost of imported parts and components used in GPN production while the export price expressed in dominant current (US$) remain virtually unchanged.

Table 4.11 Determinants of the failure margin (FM) results[1]

| Dep var: FM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 1.061** | 1.863* | 1.666*** | 1.108* |
| | (0.144) | (0.174) | (0.012) | (0.114) |
| World demand | 0.329 | 0.359 | 0.272 | 0.313 |
| | (0.290) | (0.103) | (0.181) | (0.149) |
| FDI inflow | 0.200* | 0.151 | 0.173 | 0.105** |
| | (0.064) | (0.027) | (0.031) | (0.008) |
| REER | -1.095* | -1.941*** | -1.430*** | -1.447** |
| | (0.628) | (0.313) | (0.007) | (0.700) |
| Trade liberalization index (Sachs and Warner index) | -0.467 | -0.243* | -0.380 | -0.372 |
| | (0.618) | (0.030) | (0.141) | (0.183) |
| Trade Openness | -1.669* | -1.853* | -1.540* | -1.882* |
| | (0.421) | (0.146) | (0.226) | (0.226) |
| WTO | -0.357 | -0.312 | -0.510 | -0.280 |
| | (0.244) | (0.363) | (0.206) | (0.728) |
| Lagged number of exported products | 0.211 | 0.245 | 0.329 | 0.364** |
| | (0.236) | (0.127) | (0.179) | (0.016) |
| Time trend | 0.097 | 0.067 | 0.074 | 0.072 |
| | (0.056) | (0.023) | (0.028) | (0.038) |
| China*GDP per capita | -0.842 | -1.085** | -1.009* | -0.060 |
| | (0.319) | (0.076) | (0.108) | (0.340) |
| South Korea*GDP per capita | -2.705** | -1.460** | -1.639** | -0.091 |
| | (0.411) | (0.042) | (0.104) | (0.0405) |
| Singapore*GDP per capita | -3.444** | -1.509** | -1.890** | -0.752** |
| | (0.800) | (0.103) | (0.060) | (0.012) |
| Constant | -18.110 | -15.590* | -18.760* | -15.280 |
| | (13.400) | (2.260) | (1.859) | (3.249) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 444 | 444 | 438 | 443 |
| R-squared | 0.306 | 0.255 | 0.193 | 0.247 |

Note: 1. All variables are in the term of change in log of variable, except Trade liberalization index, WTO, and Time trend. The figures in parentheses represent the robust standard errors. *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's estimation.

The coefficient of the trade openness is significant at the 10% level with the negative sign in all four equations. This result provides moderate statistical support for the hypothesis that trade openness promotes product sustainability. It seems that, in a relatively more open trade regime, entrepreneurs are in a better position to plan in launching new products with a deeper understanding of market prospects based on exposure to international competition and information gained from the interaction with foreign buyers. The results suggest a real exchange rate appreciation promotes (rather than adversely affect) product survival. This result runs counter to the widely helped view that international competitiveness promotes export performance, but it is consistent with the emerging literature on the 'dominant current paradigm'. This is an important issue for further research.

To check the robustness of the results, we estimate the export margins by decomposing the sample into three income-level groups based on the World Bank's income-based country classification in 2017: high income countries, upper middle-income countries, and lower middle-income countries[15]. The results are reported in Appendix 4.3.

In the intensive margin model, the coefficient of GDP per capita is positive and statistically significant in all cases. However, the magnitude coefficients in the upper middle-income countries are comparatively higher than other income-level groups. Also, interestingly, the coefficient of REER is positive and statistically significant in only the high-income countries. This result is consistent with the 'dominant currency paradigm', as previous discussed. While the results of extensive margin model show that only upper middle-income and lower middle-income groups have positive and statistically significant coefficient for the financial credit variable. This result suggests that financial credit is more important for the middle-income countries to promote emergence of new products.

For the failure margin, an increase in GDP per capita would result in a decrease in failure margin for only the case of total merchandise in the high-income countries. In addition, higher

[15] According to the World Bank's income-based country classification in 2017, our developing Asian countries are decomposed into three income-level groups: three high income countries (South Korea, Hong Kong, and Singapore), six upper middle-income countries (China, Malaysia, Thailand, Azerbaijan, Georgia, and Kazakhstan), and eleven lower middle-income countries (Armenia, Bangladesh, Cambodia, India, Indonesia, Kyrgyzstan, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam). In fact, Nepal is classified into low-income countries in 2017. However, we include Nepal into the lower middle-income countries because many countries in the last group was low-income countries before 2010.

trade openness is negatively associated with failure margin in only the upper and lower middle-income countries. Also, the coefficient of REER is negative for most cases. However, the coefficient is negative and statistically significant for only total merchandise and manufacturing exports in the lower middle-income countries (see Table 4.A.5 (C)). Thus, higher real exchange rate appreciation would reduce failure margin for only the lower middle-income countries other than all developing Asian countries as the result shown in Table 4.11.

## 4.6 Conclusion

This chapter has investigated the role of the expansion of existing exports (intensive margin), the emergence of new exports (extensive margin), and the demise of existing exports (failure margin) on export performance in developing Asian countries during the period 1990-2017. Within total non-oil exports, total manufacturing is further divided into exports within global production networks (GPN exports) and non-GPN exports are treated as separate categories. Following an analytical narrative of intercountry difference in these three sources of export performance, an econometric analysis has been undertaken to explore the underlying economic drivers.

The results suggest that the deepening of existing products is much more important compared to the emergence of new products for export success. Naturally, emergence of new products and product survival are much more important for newcomers to exporting compared to the relatively more established exporting countries. The number of new products is growing slowly when a country already has a broad-based commodity composition.

GDP per capita and world demand are positively associated with export growth along the intensive margin. Also, higher intensive margin growth is determined by the level of trade openness and a decrease in the average tariff rate. Exchange rate depreciation has a positive impact on the intensive margin for export success within global production networks. Domestic credit and trade openness facilitate export expansion based on extensive margin through involvement in global production networks for the extensive margin. High-performing development Asian economies such as South Korea and Singapore have lower failure margin growth compared to other countries. There is evidence that relatively more open trade regime manufactures are in a better position to plan in launching new products with a deeper

understanding of market prospects based on exposure to international competition and information gained from the interaction with foreign buyers.

Relating to policy implications, the results suggest that appropriate government policy relating to export promotion depends on the stage of export development of the given country. For a latecomer developing country, facilitating the emergence of new products is the appropriate policy choice. In this case, promoting FDI and availability of domestic bank financing has a potential role in encouraging new high growth exports. The incidence of product failure tends to naturally decline as a country reaches a higher stage of development. Policies aim at artificially preventing product failure through direct policy intervention are unlikely to help sustaining export growth.

# Appendix 4.1
# Number of exported products in developing Asian countries

Table 4.A.1 Number of exported products in developing Asian countries[1]

Primary products

| | 1990-96 | 1997-99 | 2000-04 | 2005-08 | 2009-10 | 2011-13 | 2014-16 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **North Asia** | **638** | **653** | **640** | **626** | **611** | **614** | **619** | **606** |
| China | 727 | 732 | 716 | 694 | 662 | 659 | 665 | 657 |
| Hong Kong | 636 | 644 | 628 | 601 | 579 | 585 | 574 | 544 |
| South Korea | 550 | 584 | 576 | 582 | 591 | 598 | 618 | 617 |
| | | | | | | | | |
| **Southeast Asia** | **557** | **577** | **451** | **454** | **469** | **478** | **478** | **480** |
| Brunei | n.a. | n.a. | 122 | 133 | 234 | 230 | 225 | 203 |
| Cambodia | n.a. | n.a. | 104 | 104 | 101 | 112 | 137 | 170 |
| Indonesia | 525 | 585 | 675 | 638 | 606 | 566 | 547 | 549 |
| Malaysia | 629 | 617 | 623 | 631 | 633 | 630 | 622 | 606 |
| Philippines | 322 | 349 | 374 | 381 | 397 | 428 | 441 | 448 |
| Singapore | 721 | 696 | 679 | 599 | 618 | 650 | 635 | 629 |
| Thailand | 588 | 636 | 632 | 644 | 657 | 685 | 671 | 658 |
| Viet Nam | n.a. | n.a. | 400 | 503 | 504 | 521 | 545 | 574 |
| | | | | | | | | |
| **South Asia** | **306** | **332** | **359** | **419** | **415** | **419** | **459** | **460** |
| Bangladesh | 64 | 113 | 157 | 268 | 279 | 268 | 443 | 499 |
| India | 516 | 596 | 680 | 714 | 687 | 686 | 675 | 662 |
| Nepal | n.a. | n.a. | 209 | 211 | 227 | 218 | 280 | 257 |
| Pakistan | 219 | 206 | 282 | 434 | 469 | 482 | 448 | 442 |
| Sri Lanka | 426 | 413 | 465 | 470 | 412 | 442 | 448 | 442 |
| | | | | | | | | |
| **Central and West Asia** | n.a. | n.a. | **218** | **250** | **246** | **265** | **288** | **322** |
| Armenia | n.a. | n.a. | 138 | 187 | 201 | 209 | 227 | 263 |
| Azerbaijan | n.a. | n.a. | 167 | 183 | 191 | 179 | 209 | 267 |
| Georgia | n.a. | n.a. | 209 | 240 | 211 | 276 | 306 | 322 |
| Kazakhstan | n.a. | n.a. | 303 | 372 | 360 | 412 | 473 | 486 |
| Kyrgyzstan | n.a. | n.a. | 273 | 266 | 266 | 251 | 224 | 271 |

Manufactured products

| | 1990-96 | 1997-99 | 2000-04 | 2005-08 | 2009-10 | 2011-13 | 2014-16 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **North Asia** | **2,204** | **2,191** | **2,183** | **2,153** | **2,120** | **2,120** | **2,116** | **2,045** |
| China | 2,264 | 2,243 | 2,236 | 2,203 | 2,172 | 2,164 | 2,161 | 2,092 |
| Hong Kong | 2,155 | 2,145 | 2,128 | 2,092 | 2,044 | 2,046 | 2,039 | 1,967 |
| South Korea | 2,192 | 2,184 | 2,186 | 2,165 | 2,143 | 2,150 | 2,149 | 2,076 |
| | | | | | | | | |
| **Southeast Asia** | **1,882** | **2,001** | **1,623** | **1,665** | **1,663** | **1,701** | **1,724** | **1,733** |
| Brunei | n.a. | n.a. | 968 | 996 | 1,221 | 1,195 | 1,189 | 1,205 |
| Cambodia | n.a. | n.a. | 488 | 484 | 500 | 602 | 667 | 821 |
| Indonesia | 1,701 | 1,930 | 2,125 | 2,109 | 2,060 | 2,043 | 2,044 | 1,988 |
| Malaysia | 2,197 | 2,155 | 2,154 | 2,161 | 2,118 | 2,110 | 2,097 | 2,025 |
| Philippines | 1,168 | 1,555 | 1,553 | 1,552 | 1,382 | 1,512 | 1,578 | 1,625 |
| Singapore | 2,284 | 2,221 | 2,217 | 2,087 | 2,122 | 2,147 | 2,140 | 2,145 |
| Thailand | 2,060 | 2,145 | 2,130 | 2,144 | 2,133 | 2,148 | 2,137 | 2,077 |
| Viet Nam | n.a. | n.a. | 1,347 | 1,783 | 1,768 | 1,850 | 1,940 | 1,977 |
| | | | | | | | | |
| **South Asia** | **1,079** | **1,196** | **1,302** | **1,450** | **1,391** | **1,422** | **1,592** | **1,514** |
| Bangladesh | 263 | 499 | 717 | 1,009 | 1,011 | 1,008 | 1,540 | 1,731 |
| India | 2,087 | 2,161 | 2,209 | 2,223 | 2,167 | 2,168 | 2,166 | 2,101 |
| Nepal | n.a. | n.a. | 840 | 895 | 873 | 898 | 1,042 | 590 |
| Pakistan | 800 | 839 | 1,148 | 1,595 | 1,629 | 1,572 | 1,540 | 1,470 |
| Sri Lanka | 1,167 | 1,285 | 1,596 | 1,527 | 1,274 | 1,462 | 1,670 | 1,679 |
| | | | | | | | | |
| **Central and West Asia** | **n.a.** | **n.a.** | **839** | **967** | **939** | **1,006** | **1,051** | **1,202** |
| Armenia | n.a. | n.a. | 772 | 880 | 777 | 811 | 918 | 1,151 |
| Azerbaijan | n.a. | n.a. | 684 | 726 | 637 | 646 | 774 | 1,017 |
| Georgia | n.a. | n.a. | 792 | 998 | 1,062 | 1,182 | 1,257 | 1,314 |
| Kazakhstan | n.a. | n.a. | 1,025 | 1,373 | 1,384 | 1,462 | 1,504 | 1,573 |
| Kyrgyzstan | n.a. | n.a. | 921 | 859 | 836 | 931 | 801 | 954 |

Global production network (GPN) products

| | 1990-96 | 1997-99 | 2000-04 | 2005-08 | 2009-10 | 2011-13 | 2014-16 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **North Asia** | **743** | **745** | **745** | **724** | **700** | **701** | **700** | **683** |
| China | 753 | 756 | 755 | 733 | 711 | 710 | 710 | 694 |
| Hong Kong | 729 | 733 | 730 | 709 | 683 | 684 | 683 | 667 |
| South Korea | 748 | 747 | 749 | 729 | 707 | 708 | 707 | 687 |
| | | | | | | | | |
| **Southeast Asia** | **662** | **711** | **602** | **603** | **591** | **605** | **616** | **618** |
| Brunei | n.a. | n.a. | 453 | 467 | 523 | 514 | 521 | 519 |
| Cambodia | n.a. | n.a. | 248 | 234 | 244 | 288 | 313 | 379 |
| Indonesia | 598 | 685 | 739 | 733 | 714 | 695 | 693 | 676 |
| Malaysia | 750 | 749 | 748 | 746 | 706 | 702 | 694 | 679 |
| Philippines | 483 | 632 | 628 | 605 | 536 | 603 | 642 | 626 |
| Singapore | 751 | 746 | 750 | 688 | 696 | 704 | 702 | 703 |
| Thailand | 727 | 743 | 743 | 730 | 709 | 712 | 708 | 690 |
| Viet Nam | n.a. | n.a. | 504 | 620 | 597 | 625 | 657 | 674 |
| | | | | | | | | |
| **South Asia** | **415** | **464** | **491** | **539** | **509** | **517** | **578** | **537** |
| Bangladesh | 139 | 247 | 323 | 425 | 411 | 410 | 585 | 633 |
| India | 709 | 734 | 741 | 748 | 708 | 708 | 707 | 692 |
| Nepal | n.a. | n.a. | 322 | 354 | 348 | 367 | 424 | 209 |
| Pakistan | 332 | 347 | 451 | 591 | 588 | 553 | 553 | 535 |
| Sri Lanka | 478 | 526 | 620 | 578 | 490 | 545 | 621 | 616 |
| | | | | | | | | |
| **Central and West Asia** | **n.a.** | **n.a.** | **336** | **395** | **386** | **412** | **433** | **492** |
| Armenia | n.a. | n.a. | 308 | 331 | 306 | 335 | 372 | 459 |
| Azerbaijan | n.a. | n.a. | 281 | 298 | 264 | 276 | 342 | 455 |
| Georgia | n.a. | n.a. | 294 | 427 | 447 | 482 | 510 | 534 |
| Kazakhstan | n.a. | n.a. | 422 | 567 | 550 | 583 | 593 | 595 |
| Kyrgyzstan | n.a. | n.a. | 374 | 352 | 361 | 386 | 348 | 418 |

Non-Global production network (non-GPN) products

| | 1990-96 | 1997-99 | 2000-04 | 2005-08 | 2009-10 | 2011-13 | 2014-16 | 2017 |
|---|---|---|---|---|---|---|---|---|
| **North Asia** | **1,461** | **1,445** | **1,439** | **1,430** | **1,420** | **1,420** | **1,416** | **1,362** |
| China | 1,512 | 1,487 | 1,481 | 1,470 | 1,461 | 1,455 | 1,451 | 1,398 |
| Hong Kong | 1,427 | 1,412 | 1,398 | 1,383 | 1,361 | 1,363 | 1,356 | 1,300 |
| South Korea | 1,444 | 1,437 | 1,437 | 1,436 | 1,437 | 1,441 | 1,441 | 1,389 |
| | | | | | | | | |
| **Southeast Asia** | **1,220** | **1,290** | **1,022** | **1,062** | **1,073** | **1,096** | **1,108** | **1,115** |
| Brunei | n.a. | n.a. | 515 | 529 | 698 | 681 | 668 | 686 |
| Cambodia | n.a. | n.a. | 241 | 250 | 256 | 314 | 354 | 442 |
| Indonesia | 1,103 | 1,245 | 1,387 | 1,376 | 1,346 | 1,348 | 1,351 | 1,312 |
| Malaysia | 1,447 | 1,406 | 1,407 | 1,415 | 1,413 | 1,408 | 1,403 | 1,346 |
| Philippines | 685 | 923 | 925 | 947 | 846 | 909 | 936 | 999 |
| Singapore | 1,533 | 1,474 | 1,467 | 1,399 | 1,426 | 1,443 | 1,437 | 1,442 |
| Thailand | 1,333 | 1,401 | 1,387 | 1,414 | 1,424 | 1,436 | 1,430 | 1,387 |
| Viet Nam | n.a. | n.a. | 843 | 1,163 | 1,171 | 1,225 | 1,283 | 1,303 |
| | | | | | | | | |
| **South Asia** | **665** | **733** | **810** | **910** | **882** | **905** | **1,013** | **977** |
| Bangladesh | 124 | 253 | 394 | 584 | 600 | 598 | 954 | 1,098 |
| India | 1,378 | 1,427 | 1,468 | 1,474 | 1,459 | 1,460 | 1,459 | 1,409 |
| Nepal | n.a. | n.a. | 518 | 541 | 526 | 531 | 619 | 381 |
| Pakistan | 468 | 493 | 697 | 1,004 | 1,042 | 1,019 | 986 | 935 |
| Sri Lanka | 689 | 758 | 975 | 949 | 785 | 917 | 1,049 | 1,063 |
| | | | | | | | | |
| **Central and West Asia** | **n.a.** | **n.a.** | **503** | **572** | **554** | **594** | **618** | **710** |
| Armenia | n.a. | n.a. | 464 | 549 | 471 | 476 | 546 | 692 |
| Azerbaijan | n.a. | n.a. | 403 | 428 | 374 | 370 | 432 | 562 |
| Georgia | n.a. | n.a. | 498 | 571 | 615 | 700 | 747 | 780 |
| Kazakhstan | n.a. | n.a. | 602 | 807 | 835 | 878 | 911 | 978 |
| Kyrgyzstan | n.a. | n.a. | 546 | 507 | 475 | 546 | 453 | 536 |

Note: 1. n.a. denotes non-available data.
Source: Author's calculations based on the UN Comtrade database.

# Appendix 4.2

## The contribution of trade margins in developing Asian countries

Table 4.A.2 The contribution of trade margins in developing Asian countries

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| South Korea | 1990-99 | Change in export (billion US$) | 73.5 | 7.8 | 65.8 | 46.5 | 19.3 |
| | | Intensive margin (IM) (%) | 98.7 | 52.8 | 104.1 | 99.9 | 114.4 |
| | | Failure margin (FM) (%) | -7.4 | -31.0 | -4.6 | -0.3 | -14.9 |
| | | Extensive margin (EM) (%) | 8.7 | 78.2 | 0.5 | 0.5 | 0.5 |
| | 2000-09 | Change in export (billion US$) | 138.2 | 9.0 | 129.3 | 85.2 | 44.1 |
| | | Intensive margin (IM) (%) | 117.8 | 99.8 | 119.0 | 132.1 | 93.9 |
| | | Failure margin (FM) (%) | -21.4 | -0.4 | -22.9 | -32.2 | -4.9 |
| | | Extensive margin (EM) (%) | 3.7 | 0.6 | 3.9 | 0.2 | 11.1 |
| | 2010-17 | Change in export (billion US$) | 33.2 | 5.7 | 27.4 | -8.1 | 35.5 |
| | | Intensive margin (IM) (%) | 147.0 | 105.8 | 155.6 | 45.5 | 109.9 |
| | | Failure margin (FM) (%) | -50.4 | -6.2 | -59.6 | -159.0 | -9.9 |
| | | Extensive margin (EM) (%) | 3.4 | 0.4 | 4.0 | 13.4 | 0.0 |
| | 1990-2017 | Change in export (billion US$) | 345.7 | 22.8 | 322.9 | 192.1 | 130.8 |
| | | Intensive margin (IM) (%) | 112.9 | 109.2 | 113.2 | 120.3 | 102.7 |
| | | Failure margin (FM) (%) | -16.6 | -36.1 | -15.2 | -21.1 | -6.6 |
| | | Extensive margin (EM) (%) | 3.6 | 26.9 | 2.0 | 0.8 | 3.8 |
| Hong Kong | 1992-99 | Change in export (billion US$) | 54.2 | 0.2 | 54.0 | 43.2 | 10.8 |
| | | Intensive margin (IM) (%) | 101.3 | 96.9 | 101.3 | 99.9 | 106.7 |
| | | Failure margin (FM) (%) | -1.6 | -9.5 | -1.5 | -0.1 | -7.1 |
| | | Extensive margin (EM) (%) | 0.3 | 12.7 | 0.2 | 0.2 | 0.4 |
| | 2000-09 | Change in export (billion US$) | 34.7 | 3.8 | 30.9 | 27.2 | 3.7 |
| | | Intensive margin (IM) (%) | 229.8 | 102.9 | 245.5 | 263.7 | 111.8 |
| | | Failure margin (FM) (%) | -133.0 | -4.1 | -148.9 | -164.3 | -35.8 |
| | | Extensive margin (EM) (%) | 3.2 | 1.2 | 3.5 | 0.7 | 24.0 |
| | 2010-17 | Change in export (billion US$) | 33.5 | 2.5 | 31.1 | 28.3 | 2.8 |
| | | Intensive margin (IM) (%) | 144.6 | 141.4 | 144.8 | 147.9 | 113.7 |
| | | Failure margin (FM) (%) | -58.2 | -42.5 | -59.4 | -63.8 | -14.9 |
| | | Extensive margin (EM) (%) | 13.6 | 1.1 | 14.6 | 15.9 | 1.2 |
| | 1992-2017 | Change in export (billion US$) | 201.8 | 9.8 | 192.0 | 155.8 | 36.2 |
| | | Intensive margin (IM) (%) | 130.3 | 117.0 | 131.0 | 137.2 | 104.3 |
| | | Failure margin (FM) (%) | -33.2 | -18.1 | -34.0 | -40.3 | -7.0 |
| | | Extensive margin (EM) (%) | 2.9 | 1.1 | 3.0 | 3.1 | 2.7 |
| Singapore | 1990-99 | Change in export (billion US$) | 60.7 | -0.1 | 60.8 | 51.4 | 9.4 |
| | | Intensive margin (IM) (%) | 101.5 | 1,168.5 | 99.9 | 99.5 | 102.4 |
| | | Failure margin (FM) (%) | -31.2 | -23,739.6 | -1.1 | -0.9 | -2.6 |
| | | Extensive margin (EM) (%) | 29.7 | 22,471.1 | 1.2 | 1.4 | 0.2 |
| | 2000-09 | Change in export (billion US$) | 19.0 | 4.5 | 14.5 | -11.4 | 25.9 |
| | | Intensive margin (IM) (%) | 409.7 | 109.4 | 502.9 | 373.0 | 118.2 |
| | | Failure margin (FM) (%) | -328.3 | -16.3 | -425.3 | -493.8 | -21.6 |
| | | Extensive margin (EM) (%) | 18.7 | 7.0 | 22.3 | 20.7 | 3.4 |
| | 2010-17 | Change in export (billion US$) | 18.2 | 4.2 | 14.0 | -3.7 | 17.8 |
| | | Intensive margin (IM) (%) | 85.3 | 99.9 | 80.9 | -99.1 | 84.7 |
| | | Failure margin (FM) (%) | -1.9 | -0.5 | -2.3 | -4.0 | -1.0 |
| | | Extensive margin (EM) (%) | 16.7 | 0.7 | 21.4 | 3.0 | 16.3 |
| | 1990-2017 | Change in export (billion US$) | 147.9 | 3.2 | 144.7 | 73.7 | 70.9 |
| | | Intensive margin (IM) (%) | 143.7 | 401.8 | 137.9 | 172.0 | 102.5 |
| | | Failure margin (FM) (%) | -61.2 | -853.8 | -43.4 | -77.0 | -8.5 |
| | | Extensive margin (EM) (%) | 17.5 | 552.1 | 5.5 | 5.0 | 6.0 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| China | 1992-99 | Change in export (billion US$) | 109.6 | 5.0 | 104.7 | 73.8 | 30.9 |
| | | Intensive margin (IM) (%) | 100.3 | 88.6 | 100.9 | 99.5 | 104.1 |
| | | Failure margin (FM) (%) | -3.3 | -38.0 | -1.7 | -0.5 | -4.5 |
| | | Extensive margin (EM) (%) | 3.0 | 49.4 | 0.8 | 0.9 | 0.4 |
| | 2000-09 | Change in export (billion US$) | 836.5 | 36.0 | 800.5 | 540.7 | 259.8 |
| | | Intensive margin (IM) (%) | 105.0 | 100.4 | 105.2 | 109.4 | 96.4 |
| | | Failure margin (FM) (%) | -6.6 | -0.5 | -6.8 | -9.4 | -1.4 |
| | | Extensive margin (EM) (%) | 1.6 | 0.2 | 1.6 | 0.0 | 5.0 |
| | 2010-17 | Change in export (billion US$) | 544.5 | 27.2 | 517.3 | 263.5 | 253.7 |
| | | Intensive margin (IM) (%) | 113.0 | 120.3 | 112.6 | 117.5 | 107.5 |
| | | Failure margin (FM) (%) | -14.3 | -20.7 | -14.0 | -20.3 | -7.5 |
| | | Extensive margin (EM) (%) | 1.4 | 0.4 | 1.4 | 2.7 | 0.0 |
| | 1992-2017 | Change in export (billion US$) | 1,881.6 | 92.1 | 1,789.4 | 1,121.8 | 667.7 |
| | | Intensive margin (IM) (%) | 106.1 | 106.7 | 106.0 | 108.6 | 101.6 |
| | | Failure margin (FM) (%) | -7.3 | -9.6 | -7.2 | -9.3 | -3.6 |
| | | Extensive margin (EM) (%) | 1.3 | 2.8 | 1.2 | 0.7 | 2.0 |
| Brunei | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 3.6 | 3.8 | -0.2 | -0.1 | 0.0 |
| | | Intensive margin (IM) (%) | 99.9 | 100.0 | -102.9 | -103.1 | -102.1 |
| | | Failure margin (FM) (%) | -8.9 | -0.2 | -198.8 | -186.9 | -235.3 |
| | | Extensive margin (EM) (%) | 9.0 | 0.2 | 201.7 | 190.0 | 237.4 |
| | 2010-17 | Change in export (billion US$) | -3.4 | -3.5 | 0.1 | -0.1 | 0.2 |
| | | Intensive margin (IM) (%) | -93.3 | -100.0 | 270.4 | -98.8 | 200.4 |
| | | Failure margin (FM) (%) | -11.0 | -0.2 | -273.9 | -104.6 | -119.4 |
| | | Extensive margin (EM) (%) | 4.3 | 0.2 | 103.4 | 103.4 | 19.0 |
| | 1990-2017 | Change in export (billion US$) | 2.0 | 1.9 | 0.1 | -0.2 | 0.3 |
| | | Intensive margin (IM) (%) | 113.6 | 100.0 | 356.8 | -72.7 | 174.5 |
| | | Failure margin (FM) (%) | -37.5 | -0.8 | -697.7 | -198.6 | -122.4 |
| | | Extensive margin (EM) (%) | 24.0 | 0.8 | 440.9 | 171.3 | 47.9 |
| Cambodia | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 3.5 | 0.1 | 3.4 | 1.6 | 1.8 |
| | | Intensive margin (IM) (%) | 100.5 | 93.9 | 100.6 | 100.6 | 100.7 |
| | | Failure margin (FM) (%) | -4.1 | -26.2 | -3.6 | -3.5 | -3.7 |
| | | Extensive margin (EM) (%) | 3.7 | 32.3 | 3.0 | 2.9 | 3.0 |
| | 2010-17 | Change in export (billion US$) | 11.4 | 1.3 | 10.1 | 11.2 | -1.1 |
| | | Intensive margin (IM) (%) | 93.9 | 78.5 | 95.9 | 98.5 | -121.0 |
| | | Failure margin (FM) (%) | -2.7 | -5.0 | -2.4 | -1.1 | -11.2 |
| | | Extensive margin (EM) (%) | 8.8 | 26.5 | 6.5 | 2.6 | 32.2 |
| | 1990-2017 | Change in export (billion US$) | 15.6 | 1.5 | 14.1 | 13.5 | 0.6 |
| | | Intensive margin (IM) (%) | 95.5 | 79.8 | 97.1 | 98.7 | 59.7 |
| | | Failure margin (FM) (%) | -3.0 | -6.0 | -2.7 | -1.4 | -33.9 |
| | | Extensive margin (EM) (%) | 7.5 | 26.2 | 5.6 | 2.7 | 74.3 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Indonesia | 1990-99 | Change in export (billion US$) | 21.4 | 4.5 | 17.0 | 8.6 | 8.3 |
| | | Intensive margin (IM) (%) | 99.1 | 98.2 | 99.4 | 99.0 | 99.7 |
| | | Failure margin (FM) (%) | -2.6 | -3.7 | -2.3 | -0.9 | -3.8 |
| | | Extensive margin (EM) (%) | 3.5 | 5.5 | 2.9 | 1.9 | 4.1 |
| | 2000-09 | Change in export (billion US$) | 54.4 | 43.1 | 11.3 | 5.2 | 6.1 |
| | | Intensive margin (IM) (%) | 98.5 | 96.9 | 104.5 | 109.4 | 100.3 |
| | | Failure margin (FM) (%) | -1.7 | -0.3 | -7.0 | -10.4 | -4.0 |
| | | Extensive margin (EM) (%) | 3.2 | 3.4 | 2.5 | 1.0 | 3.7 |
| | 2010-17 | Change in export (billion US$) | 6.2 | -3.6 | 9.7 | 4.7 | 5.0 |
| | | Intensive margin (IM) (%) | 185.3 | -45.1 | 133.9 | 127.2 | 140.2 |
| | | Failure margin (FM) (%) | -98.5 | -64.5 | -38.7 | -32.3 | -44.8 |
| | | Extensive margin (EM) (%) | 13.2 | 9.7 | 4.8 | 5.0 | 4.6 |
| | 1990-2017 | Change in export (billion US$) | 131.8 | 75.9 | 55.9 | 29.6 | 26.3 |
| | | Intensive margin (IM) (%) | 105.4 | 102.0 | 109.9 | 108.4 | 111.7 |
| | | Failure margin (FM) (%) | -8.5 | -4.8 | -13.6 | -10.9 | -16.6 |
| | | Extensive margin (EM) (%) | 3.1 | 2.7 | 3.6 | 2.6 | 4.9 |
| Malaysia | 1990-99 | Change in export (billion US$) | 54.7 | 2.9 | 51.8 | 43.7 | 8.1 |
| | | Intensive margin (IM) (%) | 99.5 | 86.3 | 100.2 | 100.2 | 100.0 |
| | | Failure margin (FM) (%) | -0.8 | -0.5 | -0.8 | -0.5 | -2.6 |
| | | Extensive margin (EM) (%) | 1.3 | 14.2 | 0.6 | 0.2 | 2.6 |
| | 2000-09 | Change in export (billion US$) | 30.7 | 24.3 | 6.4 | -8.5 | 14.8 |
| | | Intensive margin (IM) (%) | 114.9 | 100.0 | 172.3 | -47.5 | 101.0 |
| | | Failure margin (FM) (%) | -16.0 | -0.2 | -76.9 | -53.0 | -2.7 |
| | | Extensive margin (EM) (%) | 1.1 | 0.2 | 4.6 | 0.5 | 1.7 |
| | 2010-17 | Change in export (billion US$) | -1.0 | -0.6 | -0.4 | -1.4 | 1.0 |
| | | Intensive margin (IM) (%) | 74.2 | -56.5 | 272.6 | -149.7 | 325.9 |
| | | Failure margin (FM) (%) | -556.8 | -62.5 | -1,306.8 | -221.7 | -231.0 |
| | | Extensive margin (EM) (%) | 382.6 | 19.1 | 934.2 | 271.4 | 5.1 |
| | 1990-2017 | Change in export (billion US$) | 133.3 | 42.5 | 90.8 | 58.4 | 32.3 |
| | | Intensive margin (IM) (%) | 105.3 | 102.2 | 106.8 | 106.6 | 107.2 |
| | | Failure margin (FM) (%) | -9.1 | -3.5 | -11.7 | -13.2 | -8.8 |
| | | Extensive margin (EM) (%) | 3.7 | 1.4 | 4.8 | 6.6 | 1.6 |
| Philippines | 1991-99 | Change in export (billion US$) | 26.0 | 0.0 | 26.1 | 25.4 | 0.7 |
| | | Intensive margin (IM) (%) | 98.5 | -564.7 | 99.1 | 99.8 | 75.8 |
| | | Failure margin (FM) (%) | -1.4 | -294.6 | -1.0 | -0.5 | -17.8 |
| | | Extensive margin (EM) (%) | 3.0 | 759.2 | 1.9 | 0.8 | 42.1 |
| | 2000-09 | Change in export (billion US$) | 0.4 | 2.4 | -2.0 | -3.1 | 1.1 |
| | | Intensive margin (IM) (%) | 23.9 | 88.6 | -102.2 | -99.9 | 95.8 |
| | | Failure margin (FM) (%) | -60.2 | -1.7 | -10.6 | -2.5 | -12.3 |
| | | Extensive margin (EM) (%) | 136.3 | 13.1 | 12.8 | 2.4 | 16.5 |
| | 2010-17 | Change in export (billion US$) | 15.5 | 4.6 | 10.9 | 9.3 | 1.5 |
| | | Intensive margin (IM) (%) | 190.4 | 94.2 | 231.1 | 254.1 | 91.4 |
| | | Failure margin (FM) (%) | -104.8 | -4.8 | -147.2 | -168.1 | -19.3 |
| | | Extensive margin (EM) (%) | 14.4 | 10.5 | 16.0 | 14.1 | 27.9 |
| | 1991-2017 | Change in export (billion US$) | 42.4 | 8.8 | 33.7 | 29.1 | 4.6 |
| | | Intensive margin (IM) (%) | 131.4 | 94.3 | 141.1 | 148.9 | 91.5 |
| | | Failure margin (FM) (%) | -40.3 | -6.8 | -49.1 | -54.8 | -12.7 |
| | | Extensive margin (EM) (%) | 8.9 | 12.5 | 7.9 | 5.8 | 21.2 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Thailand | 1990-99 | Change in export (billion US$) | 33.6 | 5.2 | 28.4 | 20.6 | 7.8 |
| | | Intensive margin (IM) (%) | 99.9 | 99.3 | 100.0 | 99.6 | 101.2 |
| | | Failure margin (FM) (%) | -0.8 | -0.4 | -0.8 | -0.2 | -2.4 |
| | | Extensive margin (EM) (%) | 0.8 | 1.0 | 0.8 | 0.6 | 1.3 |
| | 2000-09 | Change in export (billion US$) | 65.8 | 17.2 | 48.6 | 23.4 | 25.2 |
| | | Intensive margin (IM) (%) | 110.9 | 99.2 | 115.1 | 132.0 | 99.4 |
| | | Failure margin (FM) (%) | -12.7 | -0.4 | -17.1 | -32.6 | -2.7 |
| | | Extensive margin (EM) (%) | 1.8 | 1.2 | 2.0 | 0.6 | 3.3 |
| | 2010-17 | Change in export (billion US$) | 36.8 | 6.9 | 29.9 | 18.8 | 11.1 |
| | | Intensive margin (IM) (%) | 115.0 | 133.8 | 110.6 | 113.7 | 105.3 |
| | | Failure margin (FM) (%) | -17.7 | -33.9 | -13.9 | -18.8 | -5.7 |
| | | Extensive margin (EM) (%) | 2.7 | 0.1 | 3.3 | 5.1 | 0.3 |
| | 1990-2017 | Change in export (billion US$) | 183.0 | 38.2 | 144.9 | 87.0 | 57.8 |
| | | Intensive margin (IM) (%) | 107.3 | 107.6 | 107.3 | 111.5 | 100.9 |
| | | Failure margin (FM) (%) | -8.7 | -8.3 | -8.8 | -12.9 | -2.6 |
| | | Extensive margin (EM) (%) | 1.4 | 0.7 | 1.5 | 1.4 | 1.7 |
| Viet Nam | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 39.2 | 13.7 | 25.4 | 15.7 | 9.8 |
| | | Intensive margin (IM) (%) | 99.0 | 99.8 | 98.5 | 102.2 | 92.8 |
| | | Failure margin (FM) (%) | -3.9 | -2.4 | -4.7 | -6.2 | -2.3 |
| | | Extensive margin (EM) (%) | 4.9 | 2.6 | 6.2 | 4.1 | 9.5 |
| | 2010-17 | Change in export (billion US$) | 115.4 | 11.7 | 103.7 | 86.1 | 17.6 |
| | | Intensive margin (IM) (%) | 99.9 | 99.7 | 99.9 | 99.9 | 99.9 |
| | | Failure margin (FM) (%) | -0.4 | -0.9 | -0.3 | -0.3 | -0.4 |
| | | Extensive margin (EM) (%) | 0.5 | 1.1 | 0.4 | 0.4 | 0.5 |
| | 1990-2017 | Change in export (billion US$) | 169.1 | 28.4 | 140.8 | 108.6 | 32.2 |
| | | Intensive margin (IM) (%) | 99.6 | 99.7 | 99.6 | 100.2 | 97.8 |
| | | Failure margin (FM) (%) | -1.2 | -1.5 | -1.1 | -1.2 | -1.0 |
| | | Extensive margin (EM) (%) | 1.6 | 1.9 | 1.5 | 1.0 | 3.2 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Bangladesh | 1990-99 | Change in export (billion US$) | 3.7 | 0.1 | 3.6 | 3.5 | 0.1 |
| | | Intensive margin (IM) (%) | 98.4 | 105.0 | 98.1 | 99.1 | 53.0 |
| | | Failure margin (FM) (%) | -6.1 | -38.5 | -5.1 | -1.6 | -177.3 |
| | | Extensive margin (EM) (%) | 7.8 | 33.5 | 6.9 | 2.6 | 224.3 |
| | 2000-09 | Change in export (billion US$) | 9.9 | 0.4 | 9.4 | 8.5 | 0.9 |
| | | Intensive margin (IM) (%) | 99.7 | 87.3 | 100.2 | 99.7 | 105.1 |
| | | Failure margin (FM) (%) | -2.9 | -7.6 | -2.6 | -1.0 | -18.8 |
| | | Extensive margin (EM) (%) | 3.2 | 20.3 | 2.4 | 1.2 | 13.7 |
| | 2010-17 | Change in export (billion US$) | 20.8 | -0.6 | 21.4 | 21.0 | 0.4 |
| | | Intensive margin (IM) (%) | 100.0 | -101.0 | 100.0 | 100.1 | 95.4 |
| | | Failure margin (FM) (%) | -1.3 | -19.6 | -0.8 | -0.5 | -18.9 |
| | | Extensive margin (EM) (%) | 1.4 | 20.6 | 0.8 | 0.4 | 23.5 |
| | 1990-2017 | Change in export (billion US$) | 38.2 | 0.4 | 37.8 | 35.8 | 1.9 |
| | | Intensive margin (IM) (%) | 99.6 | 89.2 | 99.7 | 99.8 | 98.3 |
| | | Failure margin (FM) (%) | -2.2 | -52.7 | -1.7 | -0.7 | -20.2 |
| | | Extensive margin (EM) (%) | 2.6 | 63.5 | 2.0 | 0.9 | 21.9 |
| India | 1990-99 | Change in export (billion US$) | 18.5 | 2.3 | 16.3 | 4.4 | 11.9 |
| | | Intensive margin (IM) (%) | 101.2 | 105.0 | 100.6 | 99.6 | 101.0 |
| | | Failure margin (FM) (%) | -4.1 | -10.5 | -3.2 | -1.7 | -3.7 |
| | | Extensive margin (EM) (%) | 2.9 | 5.5 | 2.5 | 2.1 | 2.7 |
| | 2000-09 | Change in export (billion US$) | 104.0 | 21.1 | 83.0 | 29.2 | 53.7 |
| | | Intensive margin (IM) (%) | 99.4 | 100.2 | 99.2 | 99.8 | 98.8 |
| | | Failure margin (FM) (%) | -0.6 | -0.5 | -0.6 | -0.9 | -0.5 |
| | | Extensive margin (EM) (%) | 1.2 | 0.3 | 1.5 | 1.1 | 1.7 |
| | 2010-17 | Change in export (billion US$) | 67.0 | 4.3 | 62.7 | 25.1 | 37.6 |
| | | Intensive margin (IM) (%) | 109.1 | 198.4 | 103.0 | 94.4 | 108.8 |
| | | Failure margin (FM) (%) | -13.2 | -99.0 | -7.4 | -5.1 | -9.0 |
| | | Extensive margin (EM) (%) | 4.1 | 0.5 | 4.4 | 10.7 | 0.2 |
| | 1990-2017 | Change in export (billion US$) | 227.1 | 40.8 | 186.3 | 64.9 | 121.4 |
| | | Intensive margin (IM) (%) | 102.5 | 110.6 | 100.7 | 97.7 | 102.3 |
| | | Failure margin (FM) (%) | -4.5 | -11.2 | -3.1 | -2.5 | -3.4 |
| | | Extensive margin (EM) (%) | 2.0 | 0.5 | 2.4 | 4.8 | 1.1 |
| Nepal | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | -0.09 | 0.03 | -0.12 | -0.18 | 0.05 |
| | | Intensive margin (IM) (%) | -122.5 | 95.3 | -116.0 | -98.2 | 58.9 |
| | | Failure margin (FM) (%) | -130.7 | -138.7 | -66.2 | -13.4 | -103.0 |
| | | Extensive margin (EM) (%) | 153.2 | 143.4 | 82.2 | 11.5 | 144.1 |
| | 2010-17 | Change in export (billion US$) | -0.03 | 0.09 | -0.12 | -0.02 | -0.10 |
| | | Intensive margin (IM) (%) | -39.4 | 93.0 | -77.8 | -66.0 | -80.1 |
| | | Failure margin (FM) (%) | -215.5 | -13.6 | -51.4 | -67.1 | -48.3 |
| | | Extensive margin (EM) (%) | 154.9 | 20.5 | 29.2 | 33.1 | 28.4 |
| | 1990-2017 | Change in export (billion US$) | -0.01 | 0.11 | -0.12 | -0.17 | 0.04 |
| | | Intensive margin (IM) (%) | -94.3 | 92.9 | -93.0 | -94.7 | 99.6 |
| | | Failure margin (FM) (%) | -1,847.0 | -47.8 | -121.3 | -23.6 | -275.3 |
| | | Extensive margin (EM) (%) | 1,841.3 | 54.8 | 114.3 | 18.2 | 275.7 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Pakistan | 1990-99 | Change in export (billion US$) | 2.8 | 0.1 | 2.7 | 1.1 | 1.6 |
| | | Intensive margin (IM) (%) | 93.7 | 28.2 | 97.1 | 98.8 | 95.9 |
| | | Failure margin (FM) (%) | -17.2 | -123.2 | -11.8 | -6.8 | -15.3 |
| | | Extensive margin (EM) (%) | 23.5 | 194.9 | 14.7 | 8.0 | 19.4 |
| | 2000-09 | Change in export (billion US$) | 7.6 | 2.0 | 5.6 | 1.5 | 4.0 |
| | | Intensive margin (IM) (%) | 98.6 | 104.7 | 96.4 | 91.8 | 98.1 |
| | | Failure margin (FM) (%) | -13.8 | -17.8 | -12.4 | -34.7 | -4.0 |
| | | Extensive margin (EM) (%) | 15.2 | 13.1 | 16.0 | 42.9 | 5.9 |
| | 2010-17 | Change in export (billion US$) | 1.5 | 0.4 | 1.1 | 1.8 | -0.7 |
| | | Intensive margin (IM) (%) | 77.7 | 32.4 | 95.1 | 101.9 | -111.5 |
| | | Failure margin (FM) (%) | -24.6 | -40.3 | -18.6 | -4.1 | -16.2 |
| | | Extensive margin (EM) (%) | 46.9 | 107.9 | 23.5 | 2.2 | 27.7 |
| | 1990-2017 | Change in export (billion US$) | 16.0 | 3.5 | 12.5 | 5.4 | 7.1 |
| | | Intensive margin (IM) (%) | 95.9 | 91.8 | 97.0 | 97.6 | 96.6 |
| | | Failure margin (FM) (%) | -12.0 | -19.9 | -9.8 | -12.7 | -7.6 |
| | | Extensive margin (EM) (%) | 16.2 | 28.1 | 12.8 | 15.1 | 11.0 |
| Sri Lanka | 1990-99 | Change in export (billion US$) | 2.6 | 0.3 | 2.3 | 2.0 | 0.3 |
| | | Intensive margin (IM) (%) | 100.3 | 101.7 | 100.2 | 100.7 | 96.8 |
| | | Failure margin (FM) (%) | -8.3 | -35.6 | -5.3 | -2.6 | -22.7 |
| | | Extensive margin (EM) (%) | 7.9 | 33.9 | 5.1 | 1.9 | 25.8 |
| | 2000-09 | Change in export (billion US$) | 1.6 | 1.0 | 0.7 | 0.4 | 0.3 |
| | | Intensive margin (IM) (%) | 102.1 | 104.3 | 99.1 | 93.9 | 105.3 |
| | | Failure margin (FM) (%) | -8.7 | -6.6 | -11.8 | -11.6 | -12.0 |
| | | Extensive margin (EM) (%) | 6.6 | 2.3 | 12.7 | 17.7 | 6.6 |
| | 2010-17 | Change in export (billion US$) | 3.0 | 0.6 | 2.4 | 2.1 | 0.2 |
| | | Intensive margin (IM) (%) | 97.2 | 111.0 | 93.6 | 92.7 | 102.1 |
| | | Failure margin (FM) (%) | -10.0 | -13.1 | -9.1 | -2.3 | -69.3 |
| | | Extensive margin (EM) (%) | 12.8 | 2.1 | 15.5 | 9.6 | 67.3 |
| | 1990-2017 | Change in export (billion US$) | 9.2 | 2.3 | 6.8 | 5.5 | 1.3 |
| | | Intensive margin (IM) (%) | 99.8 | 104.6 | 98.2 | 97.7 | 100.2 |
| | | Failure margin (FM) (%) | -7.6 | -10.0 | -6.8 | -3.4 | -21.0 |
| | | Extensive margin (EM) (%) | 7.8 | 5.4 | 8.6 | 5.7 | 20.8 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Armenia | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 0.4 | 0.3 | 0.1 | 0.0 | 0.1 |
| | | Intensive margin (IM) (%) | 106.8 | 109.1 | 98.2 | 13.9 | 101.7 |
| | | Failure margin (FM) (%) | -26.2 | -16.3 | -63.7 | -595.6 | -41.1 |
| | | Extensive margin (EM) (%) | 19.5 | 7.2 | 65.6 | 681.7 | 39.3 |
| | 2010-17 | Change in export (billion US$) | 1.0 | 0.8 | 0.2 | 0.2 | 0.0 |
| | | Intensive margin (IM) (%) | 104.6 | 100.6 | 122.2 | 92.3 | 242.1 |
| | | Failure margin (FM) (%) | -16.0 | -2.9 | -73.9 | -33.0 | -237.6 |
| | | Extensive margin (EM) (%) | 11.4 | 2.3 | 51.7 | 40.7 | 95.6 |
| | 1990-2017 | Change in export (billion US$) | 1.7 | 1.4 | 0.3 | 0.2 | 0.2 |
| | | Intensive margin (IM) (%) | 104.0 | 102.1 | 112.3 | 87.8 | 133.7 |
| | | Failure margin (FM) (%) | -16.0 | -5.3 | -61.2 | -48.6 | -72.2 |
| | | Extensive margin (EM) (%) | 12.0 | 3.2 | 48.9 | 60.8 | 38.5 |
| Azerbaijan | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 11.9 | 11.6 | 0.3 | 0.1 | 0.2 |
| | | Intensive margin (IM) (%) | 99.6 | 99.4 | 104.2 | 124.2 | 89.8 |
| | | Failure margin (FM) (%) | -3.8 | -0.3 | -122.8 | -267.4 | -18.5 |
| | | Extensive margin (EM) (%) | 4.2 | 0.9 | 118.6 | 243.3 | 28.7 |
| | 2010-17 | Change in export (billion US$) | -6.7 | -6.6 | -0.1 | -0.2 | 0.1 |
| | | Intensive margin (IM) (%) | -97.6 | -100.8 | 91.1 | 22.2 | 108.6 |
| | | Failure margin (FM) (%) | -6.3 | -1.4 | -299.9 | -158.5 | -110.2 |
| | | Extensive margin (EM) (%) | 3.9 | 2.2 | 108.9 | 36.3 | 101.5 |
| | 1990-2017 | Change in export (billion US$) | 12.0 | 11.7 | 0.3 | 0.0 | 0.3 |
| | | Intensive margin (IM) (%) | 102.1 | 99.2 | 216.8 | 3,837.2 | 96.2 |
| | | Failure margin (FM) (%) | -8.5 | -1.2 | -293.1 | -8,391.3 | -34.8 |
| | | Extensive margin (EM) (%) | 6.4 | 2.1 | 176.3 | 4,454.0 | 38.5 |
| Georgia | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 0.7 | 0.3 | 0.4 | 0.1 | 0.2 |
| | | Intensive margin (IM) (%) | 101.2 | 102.9 | 99.9 | 98.3 | 100.8 |
| | | Failure margin (FM) (%) | -25.2 | -16.7 | -32.1 | -42.3 | -25.6 |
| | | Extensive margin (EM) (%) | 24.0 | 13.7 | 32.2 | 44.1 | 24.7 |
| | 2010-17 | Change in export (billion US$) | 1.1 | 0.7 | 0.4 | 0.1 | 0.3 |
| | | Intensive margin (IM) (%) | 90.6 | 89.1 | 93.3 | 86.9 | 94.9 |
| | | Failure margin (FM) (%) | -13.5 | -9.5 | -20.6 | -52.7 | -12.4 |
| | | Extensive margin (EM) (%) | 22.9 | 20.4 | 27.4 | 65.8 | 17.5 |
| | 1990-2017 | Change in export (billion US$) | 2.3 | 1.1 | 1.1 | 0.4 | 0.7 |
| | | Intensive margin (IM) (%) | 96.0 | 93.9 | 98.1 | 98.2 | 98.1 |
| | | Failure margin (FM) (%) | -14.8 | -10.2 | -19.2 | -28.3 | -14.3 |
| | | Extensive margin (EM) (%) | 18.8 | 16.4 | 21.1 | 30.1 | 16.2 |

Table 4.A.2 (continued)

| Country | Period | Export margins | Total merchandise | Primary | Manufacture | GPN | Non-GPN |
|---|---|---|---|---|---|---|---|
| Kazakhstan | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 36.2 | 30.9 | 5.3 | 0.4 | 4.9 |
| | | Intensive margin (IM) (%) | 88.7 | 91.7 | 71.6 | 61.7 | 72.3 |
| | | Failure margin (FM) (%) | -0.7 | -0.5 | -1.6 | -7.4 | -1.1 |
| | | Extensive margin (EM) (%) | 11.9 | 8.8 | 30.0 | 45.7 | 28.8 |
| | 2010-17 | Change in export (billion US$) | -7.6 | -8.1 | 0.6 | 0.3 | 0.2 |
| | | Intensive margin (IM) (%) | -97.9 | -98.5 | 106.5 | 102.7 | 111.3 |
| | | Failure margin (FM) (%) | -10.9 | -3.0 | -105.5 | -83.0 | -134.4 |
| | | Extensive margin (EM) (%) | 8.8 | 1.5 | 99.0 | 80.2 | 123.1 |
| | 1990-2017 | Change in export (billion US$) | 41.9 | 35.0 | 6.8 | 0.6 | 6.2 |
| | | Intensive margin (IM) (%) | 90.6 | 93.0 | 78.4 | 79.9 | 78.3 |
| | | Failure margin (FM) (%) | -2.6 | -1.2 | -9.9 | -44.2 | -6.3 |
| | | Extensive margin (EM) (%) | 12.0 | 8.2 | 31.4 | 64.3 | 28.0 |
| Kyrgyzstan | 1990-99 | Change in export (billion US$) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Intensive margin (IM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Failure margin (FM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | | Extensive margin (EM) (%) | n.a. | n.a. | n.a. | n.a. | n.a. |
| | 2000-09 | Change in export (billion US$) | 0.16 | 0.03 | 0.13 | 0.11 | 0.02 |
| | | Intensive margin (IM) (%) | 97.4 | 74.9 | 103.1 | 99.8 | 122.4 |
| | | Failure margin (FM) (%) | -61.0 | -73.0 | -58.1 | -13.4 | -326.9 |
| | | Extensive margin (EM) (%) | 63.6 | 98.1 | 55.0 | 13.5 | 304.6 |
| | 2010-17 | Change in export (billion US$) | 0.42 | 0.20 | 0.22 | 0.13 | 0.08 |
| | | Intensive margin (IM) (%) | 104.6 | 98.7 | 109.9 | 80.4 | 157.2 |
| | | Failure margin (FM) (%) | -72.5 | -30.7 | -110.2 | -32.1 | -235.5 |
| | | Extensive margin (EM) (%) | 67.9 | 32.0 | 100.3 | 51.7 | 178.3 |
| | 1990-2017 | Change in export (billion US$) | 0.69 | 0.29 | 0.40 | 0.30 | 0.10 |
| | | Intensive margin (IM) (%) | 102.2 | 96.2 | 106.4 | 92.2 | 146.9 |
| | | Failure margin (FM) (%) | -58.8 | -29.7 | -79.8 | -20.7 | -248.1 |
| | | Extensive margin (EM) (%) | 56.7 | 33.4 | 73.3 | 28.5 | 201.2 |

Notes: 1. Change in export (billion US$) is the change in export between two years.

The summation of IM (Intensive margin) - Failure + EM (Extensive margin) is 100% (-100%) when growth of export is positive (negative). We calculate these contribution shares by using total average margin divided total growth of export in each period. For example, IM contribution share between 1990 and 1999 is estimated by $\sum_{t=1990}^{t=1999} IM_t / \sum_{t=199}^{t=1999} GX_t$ where $\sum_{t=199}^{t=199} GX_t = X_{1999} - X_{1990}$ and GX and X are growth of export and export value, respectively.

n.a. denotes non-available data.

Source: Author's calculations based on the UN Comtrade database.

# Appendix 4.3
# Determinants of export margins: Robustness check

Table 4.A.3 Determinants of intensive margin: Robustness check

Table 4.A.3 (A) The results of intensive margin model for high-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.508* | 1.050*** | 1.018** | 1.085*** |
| | (0.275) | (0.388) | (0.480) | (0.237) |
| World demand | 0.0911 | 0.624*** | 0.808*** | 0.168 |
| | (0.165) | (0.201) | (0.250) | (0.124) |
| FDI inflow | 0.007 | 0.005 | 0.002 | 0.014 |
| | (0.014) | (0.021) | (0.026) | (0.013) |
| REER | 0.449*** | 0.653*** | 0.732*** | 0.418*** |
| | (0.150) | (0.216) | (0.268) | (0.132) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | 0.296** | 0.670*** | 0.667*** | 0.690*** |
| | (0.130) | (0.184) | (0.228) | (0.113) |
| WTO | 0.058 | 0.039 | 0.057 | 0.002 |
| | (0.045) | (0.071) | (0.086) | (0.045) |
| Education | 0.590 | 0.743 | 1.124 | 0.276 |
| | (0.475) | (0.687) | (0.840) | (0.425) |
| Tariff rate | -0.027 | -0.428 | -0.451 | -0.287 |
| | (0.026) | (0.308) | (0.376) | (0.189) |
| Lagged number of exported products | -0.596 | 0.202 | -0.629 | 0.163 |
| | (0.375) | (0.533) | (0.740) | (0.429) |
| Time trend | -0.002** | -0.001 | -0.005 | -0.0002 |
| | (0.001) | (0.002) | (0.003) | (0.001) |
| Constant | 10.550** | 2.018 | 14.390 | -0.593 |
| | (5.130) | (7.353) | (10.520) | (4.944) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | No | No | No | No |
| Observations | 77 | 79 | 79 | 79 |
| R-squared | 0.401 | 0.472 | 0.409 | 0.645 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. High income countries are as follows: South Korea, Hong Kong, and Singapore.

Source: Author's estimation.

Table 4.A.3 (B) The results of intensive margin model for upper middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 1.738*** | 3.262*** | 4.685*** | 3.151** |
| | (0.491) | (0.906) | (1.098) | (1.300) |
| World demand | 0.019 | 0.125 | 0.802* | -0.460 |
| | (0.206) | (0.376) | (0.455) | (0.541) |
| FDI inflow | -0.068*** | -0.045 | 0.001 | -0.061 |
| | (0.023) | (0.041) | (0.051) | (0.059) |
| REER | 0.301 | 0.052 | -0.377 | 0.098 |
| | (0.271) | (0.489) | (0.593) | (0.704) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | 0.988*** | 1.094*** | 0.293 | 1.430** |
| | (0.214) | (0.387) | (0.470) | (0.558) |
| WTO | -0.095 | -0.059 | -0.101 | -0.109 |
| | (0.084) | (0.152) | (0.184) | (0.218) |
| Education | -0.484 | 0.431 | 1.251 | 0.280 |
| | (0.642) | (1.163) | (1.415) | (1.674) |
| Tariff rate | 0.021 | 0.035 | 0.163 | -0.026 |
| | (0.064) | (0.090) | (0.109) | (0.130) |
| Lagged number of exported products | 0.055 | -0.294** | -0.544*** | 0.136 |
| | (0.066) | (0.121) | (0.121) | (0.170) |
| Time trend | -0.003 | -0.003 | -0.002 | -0.004 |
| | (0.002) | (0.004) | (0.005) | (0.006) |
| Constant | 6.013 | 8.650 | 7.377 | 7.087 |
| | (5.026) | (9.083) | (11.030) | (13.090) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | No | No | No | No |
| Observations | 127 | 127 | 127 | 127 |
| R-squared | 0.382 | 0.335 | 0.442 | 0.169 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Upper middle-income countries are as follows: China, Malaysia, Thailand, Azerbaijan, Georgia, and Kazakhstan.

Source: Author's estimation.

Table 4.A.3 (C) The results of intensive margin model for lower middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.783*** | 1.517*** | 1.323*** | 1.597*** |
| | (0.294) | (0.393) | (0.440) | (0.603) |
| World demand | 0.113 | 0.154 | 0.150 | -0.105 |
| | (0.114) | (0.152) | (0.171) | (0.234) |
| FDI inflow | -0.012 | -0.001 | 0.003 | 0.015 |
| | (0.013) | (0.016) | (0.018) | (0.025) |
| REER | 0.299** | 0.256 | 0.099 | 0.336 |
| | (0.143) | (0.190) | (0.213) | (0.291) |
| Trade liberalization index (Sachs and Warner index) | 0.048 | 0.048 | 0.062 | -0.031 |
| | (0.059) | (0.079) | (0.089) | (0.122) |
| Trade Openness | 0.493*** | 0.570*** | 0.571*** | 0.356* |
| | (0.101) | (0.134) | (0.151) | (0.205) |
| WTO | 0.041 | 0.011 | -0.017 | 0.068 |
| | (0.041) | (0.054) | (0.061) | (0.083) |
| Education | -0.479* | -0.390 | 0.129 | -1.089* |
| | (0.286) | (0.381) | (0.428) | (0.584) |
| Tariff rate | 0.004 | -0.118* | -0.062 | -0.044 |
| | (0.021) | (0.062) | (0.070) | (0.095) |
| Lagged number of exported products | 0.001 | -0.001 | -0.071 | 0.048 |
| | (0.035) | (0.049) | (0.065) | (0.065) |
| Time trend | -0.002 | -0.003* | -0.001 | -0.006** |
| | (0.001) | (0.002) | (0.002) | (0.003) |
| Constant | 4.214 | 7.475* | 3.071 | 12.090** |
| | (2.877) | (3.886) | (4.277) | (5.984) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | No | No | No | No |
| Observations | 230 | 230 | 230 | 230 |
| R-squared | 0.194 | 0.221 | 0.149 | 0.114 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Lower middle-income countries are as follows: Armenia, Bangladesh, Cambodia, India, Indonesia, Kyrgyzstan, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam.

Source: Author's estimation.

## Table 4.A.4 Determinants of extensive margin: Robustness check

### Table 4.A.4 (A) The results of extensive margin model for high-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | -1.582 | 11.930 | 17.340 | -4.400 |
| | (18.740) | (7.938) | (19.100) | (7.094) |
| World demand | 0.161 | -5.859 | -5.736 | -0.633 |
| | (2.659) | (2.005) | (2.246) | (1.464) |
| FDI inflow | 0.734*** | 0.935 | 1.766* | 0.622* |
| | (0.009) | (0.387) | (0.251) | (0.056) |
| REER | 3.428 | 7.225 | 2.022 | 5.162 |
| | (8.849) | (3.254) | (0.631) | (5.998) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | 1.827 | 0.800 | -4.628 | -1.781 |
| | (2.501) | (1.476) | (7.973) | (4.827) |
| WTO | 1.990 | 2.588 | 5.947 | 0.560 |
| | (0.870) | (1.015) | (2.596) | (1.457) |
| Financial credit | -1.616 | -3.075 | -3.833 | 0.488 |
| | (5.986) | (2.776) | (3.776) | (3.411) |
| Labour force | -3.474 | -21.560** | -27.760 | -1.174 |
| | (4.239) | (0.673) | (13.800) | (2.063) |
| Education | 1.738* | 8.487 | 5.375 | 4.645 |
| | (0.251) | (1.408) | (2.879) | (0.989) |
| Tariff rate | -0.639* | -2.542** | -3.943* | 0.266 |
| | (0.051) | (0.132) | (0.384) | (0.130) |
| Lagged number of exported products | -4.423 | -4.605 | -23.530 | -21.550 |
| | (2.213) | (1.893) | (5.029) | (10.07) |
| Time trend | 0.083 | 0.093 | 0.024 | -0.070 |
| | (0.494) | (0.210) | (0.220) | (0.150) |
| Constant | -90.910 | 103.600 | 455.200 | 335.800 |
| | (817.600) | (312.100) | (517.000) | (67.810) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 78 | 79 | 74 | 78 |
| R-squared | 0.563 | 0.598 | 0.599 | 0.658 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. High income countries are as follows: South Korea, Hong Kong, and Singapore.

Source: Author's estimation.

Table 4.A.4 (B) The results of extensive margin model for upper middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 1.926* | 0.905 | 4.265 | 0.568 |
| | (0.199) | (0.546) | (1.606) | (0.604) |
| World demand | 1.262 | 3.874 | 6.116 | 1.103 |
| | (0.323) | (1.024) | (1.251) | (0.834) |
| FDI inflow | 0.011 | -0.001 | -0.103 | -0.007 |
| | (0.074) | (0.019) | (0.074) | (0.003) |
| REER | -5.002* | 0.851 | -4.029 | -1.443 |
| | (0.780) | (2.903) | (6.928) | (2.267) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | -2.213 | -0.117 | -5.829* | 1.094 |
| | (1.388) | (1.230) | (0.899) | (1.468) |
| WTO | -1.641 | -0.925 | -2.698 | 0.476 |
| | (0.583) | (0.530) | (1.208) | (0.512) |
| Financial credit | 0.504 | -0.661 | 0.0401 | -0.251 |
| | (0.255) | (0.485) | (0.167) | (0.893) |
| Labour force | -2.919 | 3.587 | -1.455 | 3.205 |
| | (2.210) | (3.089) | (4.695) | (3.589) |
| Education | 3.369 | 3.085 | 9.321 | -3.969 |
| | (1.162) | (1.652) | (3.762) | (0.685) |
| Tariff rate | 0.0897 | -0.182 | -0.299* | -0.120 |
| | (0.255) | (0.126) | (0.029) | (0.041) |
| Lagged number of exported products | -2.435*** | -1.998** | -2.142** | -1.311 |
| | (0.023) | (0.156) | (0.084) | (0.456) |
| Time trend | -0.044 | -0.055 | -0.192 | -0.070 |
| | (0.026) | (0.016) | (0.082) | (0.031) |
| Constant | 151.200*** | -0.946 | 327.100* | 86.630 |
| | (1.338) | (51.610) | (37.750) | (18.450) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 128 | 128 | 124 | 128 |
| R-squared | 0.427 | 0.376 | 0.451 | 0.309 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Upper middle-income countries are as follows: China, Malaysia, Thailand, Azerbaijan, Georgia, and Kazakhstan.
Source: Author's estimation.

Table 4.A.4 (C) The results of extensive margin model for lower middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.001 | -0.327 | 0.429 | -2.470* |
| | (1.208) | (1.305) | (1.578) | (1.410) |
| World demand | -0.356 | -0.267 | -0.074 | -0.966 |
| | (0.711) | (0.776) | (0.937) | (0.839) |
| FDI inflow | 0.099 | 0.176 | 0.087 | 0.190 |
| | (0.120) | (0.126) | (0.151) | (0.135) |
| REER | -0.406 | -0.106 | 1.267 | -1.444 |
| | (1.244) | (1.354) | (1.642) | (1.462) |
| Trade liberalization index (Sachs and Warner index) | 0.694 | 0.430 | 1.413* | 0.230 |
| | (0.653) | (0.681) | (0.816) | (0.735) |
| Trade Openness | -1.298*** | -1.237*** | -1.667*** | -1.634*** |
| | (0.440) | (0.467) | (0.565) | (0.503) |
| WTO | -0.749* | -0.693 | -0.789 | -0.382 |
| | (0.437) | (0.474) | (0.574) | (0.511) |
| Financial credit | 0.608** | 0.670** | 0.930*** | 0.601** |
| | (0.255) | (0.275) | (0.338) | (0.297) |
| Labour force | 2.996 | 2.594 | 5.087** | -0.0807 |
| | (1.843) | (2.054) | (2.422) | (2.202) |
| Education | -1.007 | -1.705 | -1.888 | -1.836 |
| | (1.095) | (1.192) | (1.445) | (1.287) |
| Tariff rate | -0.104 | -0.003 | 0.103 | -0.056 |
| | (0.232) | (0.079) | (0.096) | (0.085) |
| Lagged number of exported products | -0.738* | -0.900* | -1.905*** | 0.041 |
| | (0.430) | (0.465) | (0.659) | (0.425) |
| Time trend | 0.021 | 0.041 | -0.036 | 0.142* |
| | (0.069) | (0.075) | (0.091) | (0.081) |
| Constant | -71.920 | -107.000 | -1.379 | -236.200* |
| | (112.900) | (122.900) | (148.600) | (132.700) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 236 | 236 | 236 | 236 |
| R-squared | 0.187 | 0.201 | 0.288 | 0.231 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Lower middle-income countries are as follows: Armenia, Bangladesh, Cambodia, India, Indonesia, Kyrgyzstan, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam.

Source: Author's estimation.

## Table 4.A.5 Determinants of failure margin: Robustness check

### Table 4.A.5 (A) The results of failure margin model for high-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | -14.460* | -12.750 | -13.200 | -6.886 |
| | (8.452) | (8.616) | (8.117) | (7.974) |
| World demand | -0.200 | -5.237 | -7.749* | -2.474 |
| | (4.099) | (4.128) | (4.448) | (3.901) |
| FDI inflow | 0.707 | 0.575 | 0.262 | 0.444 |
| | (0.797) | (0.802) | (0.867) | (0.757) |
| REER | -0.201 | -2.810 | -1.297 | -0.890 |
| | (5.368) | (5.441) | (5.609) | (5.180) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | 2.458 | 3.307 | 8.073 | 2.515 |
| | (5.451) | (5.498) | (5.844) | (5.227) |
| WTO | -152.000*** | -159.400*** | -183.300*** | -146.100*** |
| | (50.15) | (50.60) | (54.80) | (47.99) |
| Lagged number of exported products | 24.380 | 26.500 | 70.810*** | 18.200 |
| | (18.530) | (18.870) | (24.250) | (22.250) |
| Time trend | 6.414*** | 6.766*** | 7.845*** | 5.990*** |
| | (1.995) | (2.012) | (2.168) | (1.905) |
| Constant | -1,867*** | -1,916*** | -2,453*** | -1,723*** |
| | (570.000) | (574.500) | (620.500) | (548.700) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 79 | 79 | 78 | 79 |
| R-squared | 0.605 | 0.565 | 0.608 | 0.586 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. High income countries are as follows: South Korea, Hong Kong, and Singapore.

Source: Author's estimation.

Table 4.A.5 (B) The results of failure margin model for upper middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.728 | 1.277 | 0.112 | 2.186 |
| | (1.444) | (1.595) | (2.320) | (1.526) |
| World demand | 0.844 | 1.427 | 0.960 | 1.147 |
| | (1.284) | (1.417) | (1.996) | (1.354) |
| FDI inflow | 0.123 | 0.195 | 0.267 | 0.138 |
| | (0.236) | (0.261) | (0.364) | (0.250) |
| REER | -1.494 | -2.058 | 0.091 | -3.206 |
| | (2.582) | (2.856) | (4.009) | (2.740) |
| Trade liberalization index (Sachs and Warner index) | | | | |
| Trade Openness | -2.952** | -3.456*** | -4.264** | -3.018** |
| | (1.129) | (1.249) | (1.760) | (1.209) |
| WTO | -0.313 | -0.455 | 0.048 | -1.197 |
| | (0.832) | (0.919) | (1.277) | (0.882) |
| Lagged number of exported products | 0.706 | 0.954 | 0.615 | 0.677 |
| | (0.774) | (0.859) | (0.970) | (0.803) |
| Time trend | 0.126 | 0.106 | 0.163 | 0.095 |
| | (0.081) | (0.089) | (0.128) | (0.086) |
| Constant | -27.750 | -34.730 | -35.120 | -30.410 |
| | (24.330) | (26.910) | (38.750) | (25.800) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 128 | 128 | 123 | 127 |
| R-squared | 0.499 | 0.464 | 0.387 | 0.427 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Upper middle-income countries are as follows: China, Malaysia, Thailand, Azerbaijan, Georgia, and Kazakhstan.

Source: Author's estimation.

Table 4.A.5 (C) The results of failure margin model for lower middle-income countries[1/2]

| Dep var: IM | total merchandise | manufacture | GPN | non-GPN |
|---|---|---|---|---|
| GDP per capita | 0.198 | 0.199 | 1.012 | -1.051 |
| | (1.065) | (1.173) | (1.516) | (1.225) |
| World demand | -0.111 | 0.0455 | -0.0137 | -0.230 |
| | (0.776) | (0.863) | (1.104) | (0.905) |
| FDI inflow | 0.302** | 0.260* | 0.326* | 0.151 |
| | (0.122) | (0.136) | (0.174) | (0.142) |
| REER | -2.593* | -2.749* | -1.541 | -1.396 |
| | (1.333) | (1.481) | (1.905) | (1.554) |
| Trade liberalization index (Sachs and Warner index) | -0.069 | 0.294 | -0.697 | 0.616 |
| | (0.680) | (0.749) | (0.949) | (0.784) |
| Trade Openness | -1.577*** | -1.723*** | -1.066* | -1.736*** |
| | (0.447) | (0.496) | (0.636) | (0.516) |
| WTO | -0.413 | -0.293 | -0.791 | 0.138 |
| | (0.445) | (0.494) | (0.638) | (0.519) |
| Lagged number of exported products | 0.040 | -0.045 | 0.245 | 0.218 |
| | (0.413) | (0.470) | (0.716) | (0.421) |
| Time trend | 0.096** | 0.087* | 0.046 | 0.091* |
| | (0.047) | (0.052) | (0.067) | (0.054) |
| Constant | -1.331 | -0.007 | -6.166 | 3.332 |
| | (13.440) | (14.910) | (19.160) | (15.660) |
| Country fixed effect | Yes | Yes | Yes | Yes |
| Time fixed effect | Yes | Yes | Yes | Yes |
| Observations | 237 | 237 | 237 | 237 |
| R-squared | 0.326 | 0.285 | 0.208 | 0.268 |

Note: 1. All variables are in the term of change in the log of variable, except the lagged number of exported products, liberalization index, WTO, and Time trend. This is because this form can solve the negative value of the intensive margin in some periods. The figures in parentheses represent the robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1.
2. Lower middle-income countries are as follows: Armenia, Bangladesh, Cambodia, India, Indonesia, Kyrgyzstan, Nepal, Pakistan, Philippines, Sri Lanka, and Vietnam.

Source: Author's estimation.

# Chapter 5
# Export Orientation, Productivity, and Foreign Ownership in Manufacturing Industry in Thailand

**Summary**
This chapter investigates the relationship between export orientation and productivity of manufacturing firms by testing two competing hypotheses — 'exporting by self-selection' and 'learning by exporting'— using a new panel dataset for the manufacturing industry in Thailand. The two hypotheses are tested using a simultaneous equation model that helps directly addressing the well-known endogeneity issue involved in the relationship between productivity and export performance. The results indicate that the relationship between firm productivity and export orientation is positive and statistically highly significant as suggested by the self-selection hypothesis. However, interestingly, foreign ownership is far more important in explaining export orientation than productivity. Put simply, foreign ownership is the key explanatory variable of the Thai export orientation, which is strongly associated with productivity in domestic manufacturing.

## 5.1 Introduction

There are two competing hypotheses of the relationship between productivity and export performance: 'exporting by self-selection' and 'learning by exporting'. The former hypothesis postulates that productivity is a key determinant of a firms' success in penetrating global markets whereas, according to the latter hypothesis, exporting is a key determinant of the learning process of a firm that enhances its productivity. A number of studies have tested these two hypotheses separately using data from both developing and developed countries.[16] The results of these studies are generally mixed, but relatively more studies have come up with results in support of the self-selection hypothesis. All these studies have used a single-equation approach. Some of these studies have simply reported single-equation results while completely overlooking the endogeneity issue, and others have attempted to address this issue using instrumental variable estimation with arbitrarily selected external instrumental variables.

[16] Greenaway and Kneller (2007) provide a comprehensive survey of studies published until about 2005. More recent studies include Blalock and Roy (2007), De Loecker (2007), Andersson, Lööf, and Johansson (2008), Cole, Elliott, and Virakul (2010), De Loecker (2013), and Benkovskis, Masso, Tkacevs, Vahter, and Yashiro (2020).

The purpose of this chapter is to test the self-selection and learning by exporting hypothesis using a new firm-level panel data set for the manufacturing industry in Thailand. The study has two methodological advances compared to the previous studies. First, for the first time in this literature, the two hypotheses are tested by estimating a carefully specified simultaneous equation model using the two-stage least square estimator. This approach has the advantage of addressing the simultaneity issue without relying on arbitrarily selected external instruments. Second, foreign ownership of firms is included in the model as a key variable that impacts on the relationship between export-orientation and productivity. This variable is central to understanding the relationship between productivity and export performance in developing countries where foreign direct investment (the role of multinational enterprises, MNEs) plays a crucial role in export-oriented manufacturing (Athukorala, 1995; Athukorala, Jayasuria and Oczkowski, 1995; Siddharthan & Nollen, 2004). The model is estimated using a new firm-level panel dataset compiled from the unpublished returns to the industrial censuses of 2007, 2012, and 2017 conducted by the National Statistical Office of Thailand.

Thailand is an ideal case study of this subject. Export-oriented manufacturing has played a key role in industrialisation and economic dynamics in the country since the mid-1970s (Doner, 2009; Kohpaiboon, 2007). Export-orientation of the Thai economy, measured by the export to GDP ratio increased from less than 10% to over 50%, and the share of manufacturing in total merchandise exports increasing from 25% to over 85% between the early 1970s and the late 2010s.[17] Subsidiaries of multinational enterprises operating within global production networks of electronics, electrical goods and automotive have played a key role in export-oriented industrialisation in the country (Athukorala, 2007 in Chapter 3; Kohpaiboon & Jongwanich, 2013; Jongwanich & Kohpaiboon, 2015). While MNE subsidiaries play an important role in some industries, there are a sizeable number of domestic firms operating side-by-side with foreign firms in most industries.

To preview the key findings, the impact of productivity on export orientation is positive and highly statistically significant, as suggested by the self-selection hypothesis. Both foreign ownership and total factor productivity are statistically significant explanatory variables in the export equation. However, after controlling for the other relevant variables, foreign ownership

[17] Data compiled from Bank of Thailand, *Annual Reports* (various years).

has greater explanatory power on export performance compared to productivity. Put simply, foreign firms play a key role in export-orientation of Thai manufacturing through the productivity channel.

The rest of the chapter is organised as follows. The next section reviews the literature on the relationships between productivity, export, and foreign ownership under hypotheses of 'exporting by self-selection' and 'learning by exporting'. Section 3 describes the simultaneous equation model addressing the relationship between export-orientation and productivity. Section 4 explains the data source and variable construction. In section 5, we provide the first look at the data. The results of firm's productivity trend in Thailand's manufacturing and model estimation are represented in section 6 and 7, respectively. Lastly, the key findings and policy implications are summarised in the concluding section.

## 5.2 Related literature

A sizeable empirical literature studying 'self-selection' and 'learning by exporting' for both developed and developing countries has emerged over the past two decades. This research interest has been propelled by three main factors. First, as an extension to the new trade theory, there has been notable theoretical advances that place emphasis on firm heterogeneity in explaining trade patterns. Second, improvement of the methodology of estimating total factor productivity starting with the seminal paper by Olley and Pakes (1996) has strengthened the empirical foundation for testing the hypotheses using firm-level data. Finally, empirical analysis has also been facilitated by the increased availability of digitized firm-level longitudinal data because of the improvement is data complication and reporting systems in several countries (Doms & Jensen, 1998).

The 'exporting by self-selection' hypothesis is originated in Militz (2003) and Helpman, Melitz, and Yeaple (2004), who incorporated firm heterogeneity for modeling a firm's export decision in an imperfectly competitive market setting. According to this hypothesis, sunk cost of exporting and firm heterogeneity explain why some firms export and other firms do not export in the same industry, even though some firms have common characteristics of sunk cost and firm characteristics. The key determinant of exporting is, therefore, firm's productivity.

The idea that export orientation contributes to productivity improvement of countries is not new to the literature on foreign trade regimes and economic development (Little, 1982; Bhagwati, 1988; Krueger, 1997). However, the relationship between export orientation and productivity was first formalized and tested at the firm level under the now-popular label of 'learning by exporting' by Clerides, Loch, and Tybout (1998). The hypothesis postulates that firms can improve productivity by facing competition from exporters from other countries and domestic firms in the given export market, learning best practice in marketing management from buyers, and attaining economies of scale by expanding production beyond the national boundaries.

Give the presence of these two competing hypotheses, the direction of causality between productivity and exporting is a debatable empirical issue. The causality can run either from productivity to exporting or from exporting to productivity.

Among the existing empirical studies, Alvarez and Lopez (2005), Van Biesebroeck (2005), Greenaway and Kneller (2008), Bigsten and Gebeeyesus (2009), and Newman, Rand, Tarp, and Anh (2017) have found evidence in support of for both self-selection and learning by exporting. In contrast, Clerides et al. (1998), Bernard and Jensen (1999), Delgado, Fariñas, and Ruano (2002), and Vu, Holmes, Tran, and Lim (2016) found evidence of self-selection but not of learning by exporting.

The control variables used in the testing of the two hypotheses vary notably among studies depending on data availability. However, foreign ownership of firms which is presumably a key variable impacting on both productivity and export orientation in developing countries in this era of internationalisation of production has been used as a key control variable only in a few studies because of data are difficult to come by. The superior productivity performance and export-orientation of MNE affiliates compared to local firms result from their better management skills, superior knowledge of production process, advanced technology, business practices, and access to marketing networks (Caves, 2007; Harris & Robinson, 2003).

The empirical works find the existence of significant higher productivity for foreign affiliates compared to local firms such as in the US (Doms & Jensen, 1998), in the U.K (Girma, Greenaway, & Wakelin, 2001), in Belgian (De Backer & Sleuwaegenc, 2003), in Turkey (Yasar & Paul, 2009), and in Vietnam (Ramstetter & Ngoc, 2013). Also, foreign ownership

positively associated with higher exporting is found in many studies such as Bernard and Jensen (1999), Aw, Chung, and Roberts (2000), Blalock and Roy (2007), Cole et al. (2010), Bajgar and Javorcik (2020). Kimura and Kiyota (2006) found that Japanese firms engaging in export and FDI had the most productivity growth compared to Japanese firms engaging either export or FDI, and neither export nor FDI. Thus, export activity is another vital heterogeneous factor for foreign affiliates.

Among the other control variables include firm size, firm age, export intensity and variables to captures the business environment of the given host country (Blalock & Gertler, 2004; Damijan & Kostevc, 2006; De Loecker, 2007; Silva, Afonso, & Africano, 2012). Most studies have found a statistically significant effect of firm size on export performance and productivity. The results relating to the age variable is mixes.

Market size of export destinations matters for productivity and innovation. Melitz & Redding (2014) provide a theoretical framework that higher productivity of exporters relative to non-exporters is determined by market size and trade liberalization. Thus, exporters can gain productivity improvement from different market destinations. For example, Lileeva and Trefler (2010) find that Canadian firms achieved significant productivity improvements by expanding exports to the US market after the elimination of US tariffs on imports from Canada. Also, expansion of the export market is associated with higher R&D investment and productivity improvement in Taiwanese electronics industry (Aw, Roberts, & Xu, 2011).

### 5.3 The model

By drawing on the literature on testing 'exporting by self-selection' and 'learning by exporting' hypotheses, the simultaneous equation model is specified as follows.

$$XOR_{it} = \beta_0 + \beta_1 \ln TFP_{it} + \beta_2 FOW_{it} + \beta_3 \ln Size + \beta_4 \ln Age + \beta_5 MDR + \beta_6 \ln HHI_{it} + \beta_7 LBOI_{it} + \beta_8 R\&D_{it} + \beta_9 trend_t + \gamma_i + \varepsilon_{it} \quad (1)$$

$$\ln TFP_{it} = \alpha_0 + \alpha_1 XOR_{it} + \alpha_2 FOW_{it} + \alpha_3 \ln Size + \alpha_4 \ln Age + \alpha_5 MDR + \alpha_6 \ln HHI_{it} + \alpha_7 LBOI_{it} + \alpha_8 R\&D_{it} + \alpha_9 trend_t + \gamma_i + \nu_{it} \quad (2)$$

where XOR is export orientation (export intensity) measured by the export-output ratio, TFP is total factor productivity. j=1, 2,…,m denotes firm, t is the time unit. $\gamma$ is the firm's fixed effect and $\varepsilon$ is the error term assumed to be independent and identically distributed. Note that

XOR is appeared as an explanatory variable of the TFP question and vice versa to capture the bidirectional relationship between the two variables.

Foreign ownership (FOW) is included as a key control variable because there is consensus in the trade and development literature that it is a significant determinant of both productivity and export performance, particularly in developing countries. Foreign direct investment is a vital channel of technology transfer and hence increasing manufacturing productivity. At the same time, foreign investors help opening new market channels, in addition to product adaptation and quality improvement required for successful export performance. Foreign ownership is included in the models as a binary variable with 1 for firms with foreign capital participation and 0 for all other firms. The available data do not permit separating foreign firms into fully owned and joint-venture firms. However, the available evidence suggests that the overwhelming majority of foreign firms in Thailand are fully foreign-owned (Kohpaiboon, 2007; Jongwanich, & Kohpaiboon, 2015). The other control variables are listed below with their expected signs in brackets.

| | |
|---|---|
| SIZE (+) | firm size measured by number of workers |
| AGE (+/-) | number of operation years |
| MDR (+) | Import intensity measured as imported inputs as a percentage of gross output |
| HHI (+/-) | Herfindahl-Hirschman Index of concentration index (measured at 2-digit level) |
| LBOI (+) | A dummy variable that is 1 for local firms approved by the Thailand Board of Investment and 0 for other firms |
| R&D (+) | A dummy variable that is 1 for firms which invest in R&D activity and 0 otherwise. |

Firm size (SIZE) captures the impact of production capacity on firms' productivity and export intensity. In general, large firms can have a lower production cost due to the benefit of economies of scale. Size, thus, is positively associated with productivity and export. Firm age (AGE) is included to capture a firm's unobserved managerial decision between younger and older firms. Sometimes younger firms can have superior productivity compared to older firms due to faster adoption in innovation (Caves & Barton, 1990). In contrast, older firms can produce with greater productivity due to their longer learning experiences in production and consumer information. Firm age also influences the decision of exporting for firms because it can represent firm's experience in domestic and export markets or management team's well-developed thinking on exporting decision.

MDR is included to capture the impact of imported inputs on firm's productivity and export intensity. Accession to imported inputs can result in firms' productivity improvement because of low-priced imported inputs. Imported inputs allow firms to overcome export fixed costs due to their greater quality and technology required in export markets (Bas and Strauss-Kahn, 2014).

HHI captures the impact of market competition on firm's productivity. Greater market competition can result in productivity improvement due to firms' competition in adopting new technologies for competing market share (Nickell, 1996). In contrast, lower market competition can lead to greater productivity. This is because, with lower market competition, a firm can gain monopoly rent for investing in R&D. Also, a firm can assure higher expected profit in the future after investing in R&D (Grossman & Helpman, 1991). In addition, market competition in domestic market may determine firm's export-orientation. Sometimes greater domestic market competition may force domestic firms to seek new customers in lower market competition in some export markets.

Thai Board of Investment (BOI) provides local export-oriented firms with a package of incentives including tax holiday, duty free access to imported machinery and inputs. LBOI is included to capture the effect of this incentive package on firms' export performance. This variable is separately specified for local firms because BOI approved export-oriented firms are automatically eligible for these incentives.

R&D is included to capture the impact of research and development on improving firms' productivity and increasing competitiveness of exports (Kleinknecht & Oostendorp, 2002).

### 5.4 Data source and variable construction

The data are compiled from unpublished returns to the Industrial Censuses of 2007 (2006 data), 2012 (2011 data), and 2017 (2016 data) conducted by the National Statistic Office of Thailand. Each census has covered over 100,000 establishments. Based on a careful inspection of the unpublished returns, 6346 firms for which the data are available for the relevant variables are selected for this study. These firms account for 34% of total output (value-added), 22% of employment, and 32% of the capital stock of Thai manufacturing. Foreign firms (MNE-officiated firms) account for 40% of the total output of sample firms. The shares of these firms

in total employment and capital stock of sample firms are 28.5% and 34.5%, respectively (Table 5.1).

Table 5.1 Key indicators of sample firms in Thailand's manufacturing[1]

| | number/share (%) |
|---|---|
| **Number of plants in the sample** | 6,346 |
| **Shares in total manufacturing (%)** | |
| Gross output (value-added) | 34.2 |
| Employment | 22.1 |
| Capital stock | 32.3 |
| **Shares of foreign firms in the sample (%)** | |
| Gross output (value-added) | 40.0 |
| Export value | 60.0 |
| Employment | 28.5 |
| Capital stock | 34.5 |

Note: 1. The figures are average values for the three years (2006, 2011, and 2016).
Source: Author's computation.

Data for all variables are compiled from the industrial census database. Total factor productivity (TFP) is estimated using the methodology proposed by Ackerberg, Caves, and Frazer (2015) (ACF method), which is an improved procedure compared to the original Olley and Pakes (1996) method for controlling for possible correlation between unobservable productivity shocks and the input variables in estimating the production function. The methodology is spelled out in Appendix 5.1. The ACF procedure for TFP estimation is undertaken using the Stata subroutine *acfest* developed by Manjón and Mañez (2016).

To estimating firm's total factor productivity, we employ real value-added output, labour input, real capital stock. The value-added output is defined as output minus material input. Then, the value-added output is deflated by the producer price index at the Thailand Standard Industrial Classification at the 2-digit level at 2010 prices.

Export orientation is measured as the ratio of gross exports to gross manufacturing output. Firm ownership is measured using a binary dummy variable which takes value one for foreign-owned firms and 0 for fully locally owned firms. Due to a small sample of fully foreign owned firm, we do not separate foreign firms into joint-venture firms and fully foreign owned firms. Another reason is that the available literature on the ownership structure of Thai manufacturing suggests that the bulk of firms with foreign capital participation in Thai

manufacturing are fully foreign owned because there is no ownership restriction in investment approval in Thailand (Kohpaiboon, 2006).

Firm size (SIZE) is measured using the number of workers. Firm age (AGE) is measured using the number of operation years. Import intensity (MDR) is measured as the share of imported inputs in total intermediate inputs. BOI status is measured using a binary dummy variable, which takes value one for firms approved by the Thai Board of Investment and 0 for otherwise. Herfindahl-Hirschman Index of concentration is measured at the 3-digit level of the industry classification using firms' total sales.

Real capital stock is computed by deflating the book nominal capital stock by the implicit deflator of total manufacturing fixed capital formation at 2010 prices. Labour input is measured in the term of number of workers employed.

### 5.5 First look at the data

The data on the three key variables of the analysis—total factor productivity, export orientation (XOR) and the share of foreign with foreign capital participation ('foreign firms') in manufacturing output —are summarised at the 2-digit industry level in Table 5.2, 5.3 and 5.4.

Overall, the level of total factor productivity (TFP) ranges between 4.1 and 11.5 among industrial sectors. This implies differences in technology production functions among industrial sectors. Also, the compound annual growth rate in Thai manufacturing during the period of 2006-2016 was only 0.24%. However, there were vast differences in TFP growth among industries. 14 industrial sectors experienced productivity improvement during the decade at compound growth rates between 0.02% and 2.14%. However, only five industrial sectors had TFP growth by more than 1%. The highest productivity improvement was in chemical products (2.14%), followed by textiles (1.83%), transport equipment (1.68%), and furniture (1.53%). On the other hand, five industrial sectors had a decline considerably in the level of TFP in the period of 2006-2016. Their compound growth rates of TFP were negative, ranging between -0.06% and -0.66%.

Table 5.2 Total factor productivity (TFP) in Thai manufacturing[1]

| ISIC | Industrial sector | the level of TFP* | | | Compound growth rate |
|---|---|---|---|---|---|
| | | 2006 | 2011 | 2016 | 2006/16 |
| **All** | **Total manufacturing** | **8.32** | **8.53** | **8.50** | 0.24 |
| 15 | food and beverages | 8.11 | 7.72 | 8.37 | 0.37 |
| 17 | textiles | 3.92 | 4.35 | 4.35 | 1.83 |
| 18 | wearing apparel | 8.90 | 9.06 | 9.44 | 0.80 |
| 19 | leather luggage, handbags, and footwear | 8.96 | 9.56 | 9.52 | 0.83 |
| 20 | processed wood except furniture | 5.22 | 5.44 | 5.23 | 0.02 |
| 21 | paper and paper products | 8.58 | 9.19 | 9.04 | 0.69 |
| 22 | printing and publishing | 11.40 | 11.62 | 11.33 | -0.06 |
| 24 | chemicals and chemical products | 8.00 | 8.34 | 8.97 | 2.14 |
| 25 | rubber and plastics products | 8.94 | 9.77 | 9.24 | 0.39 |
| 26 | non-metallic mineral products | 7.45 | 7.37 | 7.29 | -0.20 |
| 27 | metals | 9.53 | 9.51 | 10.38 | 1.35 |
| 28 | fabricated metal products | 9.65 | 9.24 | 9.83 | 0.20 |
| 29 | machinery and equipment | 9.19 | 8.05 | 8.24 | -0.66 |
| 30-31 | office and computing and electrical machinery | 7.43 | 8.05 | 7.94 | 0.94 |
| 32 | radio, television, and communication equipment | 9.12 | 10.02 | 8.42 | -0.55 |
| 33 | medical, precision, and optical instruments | 11.56 | 10.33 | 10.46 | -0.63 |
| 34 | motor vehicles, trailers, and semi-trailers | 7.77 | 8.07 | 8.16 | 0.63 |
| 35 | other transport equipment | 7.63 | 8.04 | 8.42 | 1.68 |
| 36 | furniture | 8.14 | 8.35 | 8.93 | 1.53 |

Note: 1. The figures are the weighted average value of TFP by using shares of firm's real gross output.
Source: Author's computation.

Foreign firms (subsidiaries of MNEs) account for 40% of total manufacturing output (value-added) (Table 5.3). Among individual industries, the shares vary from 5.8% to 84.2%. Medical equipment (ISIC33) has the highest share, followed by television and communication (ISIC32), Motor vehicles (ISIC 34), and machinery and equipment (ISIC30-31). These are the industries in which account for the bulk of manufacturing exports from Thailand. By contrast, foreign firm's involvement is much smaller in domestic-market oriented industries such as processed wood (ISIC20), food processing (ISIC 15), printing and publishing (ISIC22), and furniture (ISIC 34).

Data relating to the export orientation of Thai manufacturing are summarised in Table 5.4. The average export-output ratio of Thai manufacturing is 30.2%. Foreign firms are significantly more export oriented compared to pure locally owned forms with an export-output ratio of 46%. A comparison of data in Table 5.3 and 5.4 clearly show that inter-industry differences in foreign ownership and export orientation are positively correlated. In particular, both indicators are much higher than the industry averages in medical equipment (ISIC33), television and communication (ISIC32), machinery and equipment (ISIC30-31), automobile (ISIC 36) exhibit average both.

Table 5.3 The share in output of foreign firms in Thai manufacturing[1]

| ISIC code | Industrial sector | Share in output (value-added) (%) |
|---|---|---|
| **All** | **Total manufacturing** | 40.0 |
| 15 | food and beverages | 17.9 |
| 17 | textiles | 20.4 |
| 18 | wearing apparel | 17.9 |
| 19 | leather luggage, handbags, and footwear | 27.8 |
| 20 | processed wood except furniture | 5.8 |
| 21 | paper and paper products | 35.5 |
| 22 | printing and publishing | 6.9 |
| 24 | chemicals and chemical products | 39.5 |
| 25 | rubber and plastics products | 24.4 |
| 26 | non-metallic mineral products | 17.8 |
| 27 | metals | 43.2 |
| 28 | fabricated metal products | 37.2 |
| 29 | machinery and equipment | 78.1 |
| 30-31 | office and computing and electrical machinery | 60.5 |
| 32 | radio, television, and communication equipment | 81.2 |
| 33 | medical, precision, and optical instruments | 84.2 |
| 34 | motor vehicles, trailers, and semi-trailers | 48.0 |
| 35 | other transport equipment | 38.4 |
| 36 | furniture | 29.2 |

Notes: 1. Averages computed from data of the three manufacturing censuses.
Source: Author's computation by using average value in the three years (2006, 2011, and 2016).

Table 5.4 Export orientation of Thai manufacturing

| ISIC code | Industrial sector | All firms (%) | foreign firms (%) |
|---|---|---|---|
| **All** | **Total manufacturing** | **30.2** | **46.0** |
| 15 | food and beverages | 23.5 | 47.8 |
| 17 | Textiles | 21.3 | 36.9 |
| 18 | wearing apparel | 41.5 | 62.7 |
| 19 | leather luggage, handbags, and footwear | 34.6 | 68.1 |
| 20 | processed wood except furniture | 27.9 | 44.7 |
| 21 | paper and paper products | 10.8 | 14.6 |
| 22 | printing and publishing | 2.1 | 6.7 |
| 24 | chemicals and chemical products | 21.0 | 32.5 |
| 25 | rubber and plastics products | 43.7 | 54.8 |
| 26 | non-metallic mineral products | 17.0 | 49.6 |
| 27 | metals | 14.6 | 22.9 |
| 28 | fabricated metal products | 19.9 | 32.3 |
| 29 | machinery and equipment | 50.1 | 65.7 |
| 30-31 | office and computing and electrical machinery | 35.5 | 44.4 |
| 32 | radio, television, and communication equipment | 48.1 | 52.5 |
| 33 | medical, precision, and optical instruments | 54.7 | 56.5 |
| 34 | motor vehicles, trailers, and semi-trailers | 20.0 | 52.1 |
| 35 | other transport equipment | 47.8 | 42.0 |
| 36 | furniture | 35.6 | 52.7 |

Source: Author's computation by using average value in the three years (2006, 2011, and 2016).

## 5.6 Estimation method

As discussed in Section 2, causality between productivity and export-orientation can run either direction. The 'self-selection hypothesis postulates that more productive firms tend to decide to export and hence causality relationship runs from firm's productivity to exporting. However, during pre-entry in export market, exporting firm may not possess any superior technology and management or may conduct R&D to improve its productivity before exporting. Also, after entry in export market, exporting firm may get access to foreign intangible assets (technology and marketing knowledge) which promote its productivity (Sun & Hong, 2011). Thus, the causality relationship can run from exporting to firm's productivity.

To assess the impact of the simultaneous issue in testing the two hypotheses, first, we estimate the model using ordinary least square (OLS) and two-stage least square (2SLS) and then compared the two estimates by testing endogeneity of TFP and XOR in the two equations and the validity of the instruments used. To estimate the self-selection equation (Equation 1), we instrument lnTFP by using all exogenous variables in the specified equation and lagged lnTFP. The instruments used for XOR in the productivity equation (Equation 2) are all exogenous variables in the equation and lagged XOR. Both OLS and 2SLS estimates are included the firm fixed effects to allow for firm-specific effects which are not captured by the explanatory variables included in the model. Estimation was done using the Stata subroutine 'xtivreg'.

The choice between the OLS and 2SLS estimates is made by testing endogeneity using Durbin–Wu–Hausman test and validity of instruments is tested using the Cragg-Donald weak identification test. If the model has an endogeneity problem, 2SLS estimation is preferred to OLS estimation, provided of course the instruments used are valid. Acceptance of the validity of instruments requires rejection of the null hypotheses that instruments are weak. Rejection of the hypothesis implies that instrumentals are significantly correlated with the endogenous variable but not correlated with the error term of the model.

## 5.7 Results

Descriptive statistics of the variables are presented in Table 5.5 to facilitate interpretations of the results. The fixed effect 2SLS estimates of the model are reported in Table 5.6, while the fixed effect OLS estimates are reported in Table 5.7 for comparison.[18]

Table 5.5 Descriptive statistics

| Variable | Definition | Observations | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|
| XOR | Export-output ratio | 19,949 | 0.105 | 0.258 | 0 | 1 |
| lnTFP | Firm's productivity | 19,949 | 1.984 | 0.183 | 0.459 | 2.569 |
| FOW | Foreign ownership dummy | 19,949 | 0.099 | 0.298 | 0 | 1 |
| lnSize | Firm's size (number of workers) | 19,949 | 3.884 | 1.430 | 0.693 | 9.548 |
| lnAge | Firm's age (number of operating years) | 19,949 | 2.826 | 0.606 | 0.693 | 4.595 |
| MDR | Import-output ratio | 19,949 | 0.088 | 0.217 | 0 | 1 |
| lnHHI | Herfindahl-Hirschman Index | 19,949 | -3.672 | 0.813 | -4.725 | -0.991 |
| LBOI | Investment promotion dummy | 19,949 | 0.141 | 0.348 | 0 | 1 |
| R&D | R&D dummy | 19,949 | 0.114 | 0.318 | 0 | 1 |

Source: Author's computation.

For the self-selection model, the null hypothesis of no endogeneity of TFP variable is not rejected in terms of the Durbin–Wu–Hausman test (Equation 1, Table 5.6). Thus, the results based on both OLS and 2SLS estimators are statistically valued for this model. On the other hand, the hypothesis is rejected at the 1% level for the learning by exporting model (Equation 2, Table 5.6). Thus, only the results based on the 2SLS estimator is statistically acceptable for this model. Both equations pass the Cragg-Donald Wald F statistic test. Therefore, the instruments used for estimating both equations reported in Table 5.6 are valid. In the discussion below, we focus on 2SLS estimates.

We start with the determinants of exporting (self-selection effect) equation. The relationship between firm's productivity and firm' exporting is positive and statistically significant at the 5% level. However, the magnitude of the impact of productivity after controlling for the other relevant variables is rather small. An increase in TFP by 1% raises firm's export intensity by approximately 0.052%. The coefficient of FOW is positive and significant at the 1% level. On average, the level of export intensity in foreign firms is greater than that of domestic firms by 18.2%. This estimate, combined with the analytical narrative of

[18] Note that R&D variable has been dropped for Equation 1 in both tables because of its high linearity with the TFP variable.

the role of foreign firms in manufacturing production and exports in Section 5, supports the vital role played by foreign ownership in manufacturing export expansion from Thailand.

Table 5.6 Determinants of export-output ratio (XOR) and firm's productivity (TFP): the fixed effect 2SLS estimates[1]

| **Dependent var.** | self-selection in exporting | learning by exporting |
|---|---|---|
| | XOR | lnTFP |
| | (1) | (2) |
| Ownership with domestic firm as the base dummy | | |
| FOW (foreign-owned dummy) | 0.182*** | 0.016 |
| | (0.019) | (0.012) |
| lnTFP (total factor productivity) | 0.052** | |
| | (0.026) | |
| XOR (export-output ratio) | | 0.113*** |
| | | (0.037) |
| lnSize (number of workers) | 0.016*** | -0.065*** |
| | (0.004) | (0.003) |
| lnAge (number of operative years) | 0.014** | 0.011** |
| | (0.006) | (0.004) |
| MDR (import dependence ratio) | 0.304*** | -0.025 |
| | (0.027) | (0.017) |
| lnHHI | 0.001 | -0.001 |
| | (0.006) | (0.006) |
| Local BOI dummy (Local firms promoted by BOI) | 0.105*** | 0.031** |
| | (0.022) | (0.012) |
| R&D dummy | | 0.025*** |
| | | (0.007) |
| Time trend | -0.010*** | 0.018*** |
| | (0.003) | (0.002) |
| Constant | -0.131* | 2.147*** |
| | (0.067) | (0.031) |
| Firm fixed effect | Yes | Yes |
| Observations | 10,777 | 10,777 |
| **Test of endogeneity and instrument validity** | | |
| (1) Endogeneity Test (Durbin–Wu–Hausman test: Chi-square) | 0.290 | 5.230*** |
| (2) Weak identification test (Cragg-Donald Wald F statistic) | 1047.370*** | 315.990*** |

Note: 1. The robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's estimation.

Table 5.7 Determinants of export-output ratio (XOR) and firm's productivity (TFP): the fixed effect OLS estimates [1]

| **Dependent var.** | self-selection in exporting | learning by exporting |
|---|---|---|
| | XOR | lnTFP |
| | (1) | (2) |
| Ownership with domestic firm as the base dummy | | |
| FOW (foreign-owned dummy) | 0.220*** | 0.025*** |
| | (0.012) | (0.005) |
| lnTFP (total factor productivity) | 0.016 | |
| | (0.012) | |
| XOR (export-output ratio) | | 0.008 |
| | | (0.006) |
| lnSize (number of workers) | 0.021*** | -0.051*** |
| | (0.003) | (0.002) |
| lnAge (number of operative years) | -0.000 | 0.014*** |
| | (0.003) | (0.002) |
| MDR (import dependence ratio) | 0.254*** | 0.002 |
| | (0.015) | (0.006) |
| lnHHI | 0.005 | -0.005* |
| | (0.005) | (0.003) |
| Local BOI dummy (Local firms promoted by BOI) | 0.220*** | 0.024*** |
| | (0.010) | (0.004) |
| R&D dummy | | 0.017*** |
| | | (0.004) |
| Time trend | -0.000 | 0.004*** |
| | (0.001) | (0.001) |
| Constant | -0.047 | 2.106*** |
| | (0.036) | (0.018) |
| Firm fixed effect | Yes | Yes |
| Observations | 19,949 | 19,949 |

Note: 1. The robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's estimation.

As expected, the coefficients on firm size and number of operative years are positive and significant. The import dependence ratio is positively associated with export intensity. An increase in firm' import dependence ratio by 1% leads to an increase in firm's export intensity by 0.304%. The incentive package offered by the BOI for domestic firms seems to have a statistically positive impact on export intensity.

Turning to the learning by exporting model (Equation 2, Table 5.6), the key explanatory variable of productivity (TFP) is export intensity (XOR). The coefficient of XOR, which is statistically significant at the 1% level, indicates that 1% increase in the degree of export orientation of firms is associated with 0.113% increase in total factor productivity.

The coefficient of foreign ownership (FOW) is positive but not statistically significant. This finding is consistent with the pattern of MNE-led export orientation in Thai manufacturing (Doner, 2009; Kohpaiboon & Jongwanich, 2013). Export within global production networks (parts and components, and final assembly within vertically integrated global industries) dominate manufacturing exports from Thailand. Productivity improvements (technological progress) in these industries generally occur with the wider global production networks, not specifically within a given host country. Foreign firms' contribution to host country productivity improvement takes place predominantly through their engagement in export-oriented production within the global production networks. As discussed, the results for the self-selection model provide strong evidence that MNE subsidiaries play a vital role in export orientation of Thai manufacturing industry.

Among the control variables, as expected, R&D is highly statistically significant and positive. R&D is one channel to improve firms' productivity. In Table 5.6, we expect that after controlling other variables, firms with R&D activity tend to have more total factor productivity by 2.5% compared to firms without R&D activity[19]. Thus, R&D activity has a substantial impact on firms' productivity. The coefficient of Firm age is statistically significant, suggesting that firms' maturity contributes to productivity improvement. There is no evidence to suggest that market concentration has a significant impact on productivity. Surprisingly, firm size is negatively associated with firm's productivity. An increase in firm size by 1% is associated with a decrease in firm's productivity by 0.065%.

[19] The figure is calculated from the following formula '(exp (0.025) - 1)*100'. The coefficient represents percentage change in the firm's total factor productivity (TFP) if the firm does R&D activity.

## 5.8 Conclusion

This chapter examines the relationship among firm's productivity, exporting and foreign ownership by using a manufacturing firm-level dataset for Thailand in 2006, 2011, and 2016. The main focused on testing the self-selection and learning by exporting hypotheses of the relationship between export orientation and total factor productivity by paying attention to the endogeneity issue. For testing these two hypotheses, we include foreign ownership as the key determinant of export orientation, which has been a missing link in previous studies testing these hypotheses. Thailand is an ideal case study of this empirical analysis. Export-oriented manufacturing has played a key role in industrialisation and economic dynamics in the country since the mid-1970s, which multinational enterprises paying a key role in linking the domestic manufacturing industry to global production networks.

The results indicate that the relationship between productivity and export orientation is positive and highly statistically significant, as suggested by the self-selection hypothesis. However, after controlling for the other relevant variables, foreign ownership has greater explanatory power of export performance compared to productivity. In the productivity equation, export orientation is by far the most significant explanatory variable supporting the hypothesis leaning by exporting hypothesis. Taken together, the results suggest that foreign firms play a key role in productivity improvement in Thai manufacturing through the export-orientation channel. Learning by exporting is an effective way of improving the productivity of domestic manufacturing in Thailand. The role of foreign direct investment plays a vital role in this learning process. Causation seams run mainly from export orientation to productivity, with foreign firms playing a key role in demining export orientation.

## Appendix 5.1

## Estimation of total factor productivity (TFP)

Total factor productivity (TFP) is estimated based on the standard production function:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \eta_{it} \quad (1)$$

In equation (1) $y_{it}$ is the log of output (value added), $k_{it}$ is the log of capital input, and $l_{it}$ is the log of labour input. Value-added output is computed as total output minus total materials. TFP is given by $\hat{\beta}_0 + \hat{\eta}_{it}$. $\hat{\beta}_0$ captures the mean efficiency level across firm while $\hat{\eta}_{it}$ is the firm efficiency deviation from the mean efficiency level.

Equation (1) raises an endogenous problem in estimating TFP because of correlation between input level and firm productivity. In other words, the error term ($\hat{\eta}_{it}$) is determined by the level of output in each firm. For example, high productive firms are likely to use more levels of inputs. This problem occurs because of the unobservable productivity shocks, which are observed by only the firms, not econometricians.

Thus, Olley and Pakes, 1996 (henceforth OP), and Levinsohn and Petrin, 2003 (henceforth LP) propose the control method for the correlation between the unobservable productivity shocks and the input levels by revising the standard production function as follows.

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \omega_{it} + \varepsilon_{it} \quad (2)$$

where $\eta_{it}$ is assumed to be additively separable into a transmitted component $\omega_{it}$ and an i.i.d component $\varepsilon_{it}$. The term of $\omega_{it}$ captures the unobservable productivity shocks observed by only the firms. This term represents firm's productivity due to its technical knowledge and managerial ability. On the other hand, the term of $\varepsilon_{it}$ is the unobservable productivity shocks due to expected breakdown, defect, or rainfall amounts in a given year.

To control the correlation between unobservable productivity shocks and input levels, OP (1996) and LP (2003) address the method of using a proxy variable for the unobservable productivity shocks ($\omega_{it}$) by using a firm's investment and a firm's materials, respectively. These two proxy variables can capture the input levels depending on a firm's productivity. Thus, the term of $\omega_{it}$ can be observed by researchers.

According to OP and LP, both methods assume that there are two types of inputs; labour and intermediate inputs (the choice of these inputs does not matter a firm's cost in the future), and state variable such as capital investment (the choice of state variable have an impact on a firm's cost in the future. Thus, the equation (2) can be rewritten as follows.

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + \omega_{it} + \varepsilon_{it} \quad (3)$$

where $v_{it}$ is labour and intermediate inputs, $s_{it}$ is the state variable (capital investment). Also, the unobservable productivity shocks ($\omega_{it}$) is determined by a proxy variable and we can rewrite equation (3) as follows

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}, l_{it}) + \varepsilon_{it} \quad (4)$$

where $h_t(s_{it}, d_{it}, l_{it})$ is the function of a proxy variable determined by state variable ($s_{it}$), demand function ($d_{it}$), and labour input ($l_{it}$).

Ackerberg, Caves and Frazer (2015) (henceforth ACF) argue that the approaches of OP and LP suffer from an identification issue because of treating labour as a state variable. In other words, a serious collinearity between labour and non-parametric productivity function occurs in the first step from OP and LP methodologies[20]. Thus, ACF (2015) proposes that labour input is allowed to have a dynamic effect by putting the labour input in the demand function. Therefore, there are two steps in estimating a firm's productivity.

*Step 1*: Insert the inverse of the demand function for the proxy variable:

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}, l_{it}) + \varepsilon_{it} \quad (5)$$

To obtain the estimate of the composite term:

$$\theta_t(v_{it}, s_{it}, d_{it}) = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + h_t(s_{it}, d_{it}, l_{it}) \quad (6)$$

*Step 2*: With this estimate, $\widehat{\theta_t}(v_{it}, s_{it}, d_{it})$, estimate all parameters using the equation:

$$y_{it} = \beta_0 + \beta_v v_{it} + \beta_s s_{it} + \tilde{g}\left(\widehat{\theta_{t-1}} - \beta_0 - \beta_v v_{i,t-1} - \beta_s s_{i,t-1}\right) + \xi_{it} + \varepsilon_{it} \quad (7)$$

[20] From OP and LP methodologies, there are also two steps in estimating firm productivity. The first step is to apply semiparametric on unobserved productivity shock and related input for obtaining labour coefficient. Then second step recovers the rest of coefficients in production function such as capital and material inputs. However, these methodologies impose no dynamic effect of labour input.

After obtaining consistent estimators for $\beta_v$ and $\beta_s$, the level of productivity is estimated as equation (8):

$$\widehat{TFP}_{it} = exp\,(\hat{y}_{it} - \hat{\beta}_v v_{it} - \hat{\beta}_s s_{it}) \quad (8)$$

Firm productivity is estimated by estimating Equation (8) at the two-digit industry level. The coefficients of capital and labour variables of the production functions are reported in Table 5.A.1. In this section, we will provide the results of the input coefficient in production function level and firm's productivity at 2-digit industrial level.

According to Table 5.A.1, the input coefficients are statistically significant at 1% level for most cases. This result confirms that the proxy variable (materials) in the previous section is valid for estimating firm's productivities. The labour coefficients are larger than the capital stock coefficients for all cases. This implies that labour is the most important source for firm productivities for all industries in Thailand. The coefficients of labour range between 0.77 and 0.99, whereas the coefficients of capital stock lie between 0.22 and 0.53. The sum of both input coefficients is approximately 0.8 – 1.4. These figures are consistent with other studies (Pavcnik, 2002; Van Beveren, 2012).

Table 5.A.1 Results of input coefficients in production function at 2-digit industrial level[1]

| ISIC | Industrial sector | Capital stock | labour |
|---|---|---|---|
| 15 | food and beverages | 0.409*** | 0.741*** |
| 17 | textiles | 0.535*** | 0.858*** |
| 18 | wearing apparel | 0.220*** | 0.988*** |
| 19 | leather luggage, handbags, and footwear | 0.320*** | 0.708*** |
| 20 | processed wood except furniture | 0.498*** | 0.843*** |
| 21 | paper and paper products | 0.355*** | 0.732*** |
| 22 | printing and publishing | 0.138*** | 0.955*** |
| 24 | chemicals and chemical products | 0.382*** | 0.829*** |
| 25 | rubber and plastics products | 0.297*** | 0.898*** |
| 26 | non-metallic mineral products | 0.400*** | 0.857*** |
| 27 | metals | 0.268*** | 0.981*** |
| 28 | fabricated metal products | 0.251*** | 0.969*** |
| 29 | machinery and equipment | 0.365*** | 0.866*** |
| 30-31 | office and computing and electrical machinery | 0.372*** | 0.864*** |
| 32 | radio, television, and communication equipment | 0.342*** | 0.918*** |
| 33 | medical, precision, and optical instruments | 0.220** | 0.799*** |
| 34 | motor vehicles, trailers, and semi-trailers | 0.392*** | 0.808*** |
| 35 | other transport equipment | 0.325*** | 0.966*** |
| 36 | furniture | 0.320*** | 0.855*** |

Note: 1. *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's estimation.

# Chapter 6
# Conclusion

Promoting export performance is a key goal of policy makers in developing countries. The evidence from the newly industrialized countries in East Asia (South Korea, Taiwan, Hong Kong and Singapore), the second-tier export-oriented economies in the region (Thailand and Malaysia) as well as the latecomer exporting countries in the region such China and Vietnam demonstrate that economic growth and development are significantly underpinned by export success. Also, there is evidence that high export performance is correlated with indirect growth-stimulating effects including scale economies associated with world market penetration, productivity gains from exporter to foreign competition, technology transfer, and learning effects resulting from foreign firms' involvement in domestic export production. However, the debate on the appropriate policy choice for designing export development strategy is far from settled. This thesis aims to contribute to this debate by undertaking a comparative study of export performance of developing Asian countries with emphasis on the role of product diversification, the role of existing products and new products, and the role of firm's productivity in export performance.

Developing Asian countries provides an ideal 'laboratory' for the study because of the following three reasons. First, as a region developing Asia stands out among other geographical regions in the world for its outstanding export performance. Second, there are significant differences among the countries in the region, both in terms of the timing of policy shifts in favour of export orientation and export performance including high export performance and low export performance. Lastly, given their increasing engagement in global production sharing, developing Asia provides a valuable opportunity for examining the role of global production sharing and production network in the expansion of manufacturing exports.

In this chapter, we will bring together all major issues addressing in the thesis: key findings, policy recommendations, and suggestions for further research from Chapter 2-5. Chapter 2 investigates the comparative survey of export performance in developing Asian countries. This chapter shows that there are notable differences among countries in the region, in terms of the timing of reforms, comprehensiveness of the reforms package, incentive bias in favour of export orientation, and the degree to which the manufacturing industry is integrated

within global production networks. Moreover, total merchandise exports in developing Asian countries have been characterised by a palpable shift in export composition away from traditional primary products and towards manufacturing products. The engagement in production sharing within global production networks has been the key driver of the rapid expansion of manufacturing exports. Openness to trade and FDI inflows jointly determined export performance. However, beneath this impressive overall picture, there are notable differences in export performance among countries in the region, with China and Vietnam as the two outstanding success cases in the last two decades.

Chapter 3 addresses the recent trade policy debate on the potential positive impact of product diversification on export growth. This policy concern is prominent in policy circles in developing countries because most economists widely believed that more product diversification would lead to new potential export incomes. However, export diversification policy is not consistent with the standard trade theory: the Ricardian and the Heckscher-Ohlin models. These standard trade theories postulate that export patterns should evolve naturally on specialisation based on countries' comparative advantage.

This chapter examines the relationship between export product diversification and export performance in developing Asian countries. The analysis covers total non-oil exports distinguishing between primary products and manufactured goods with the latter further disaggregated into exports within global production networks (GPN products) and non-GPN products.

The key finding is that export diversification has a negative impact on export growth for total exports and all subcategories, except GPN exports. The results are consistent with the prediction of the standard trade theory, which postulates that a country gains from international trade by specialisation based on its own comparative advantage. Export diversification through policy intervention may not necessarily coincide with a country's comparative advantage. The results are consistent with the finding of Piñeres and Ferrantino (1997) and Newfarmer et al. (2009). Thus, policy to stimulate export diversification may not always be an appropriate choice for developing countries.

Government intervention to engineer export diversification may be risky for developing countries. One risk is a big fiscal burden because some new product exports may require a

massive budget for setting their fundamental production. New product exports in developing countries have a low chance of survival in the world market (Besedes & Prusa, 2011). Any failure from such government intervention may boost public debt.

Chapter 4 deals with another dimension of changing export patterns: the relative importance of the deepening of existing products (intensive margin), the emergence of new products (extensive margin) and the demise of existing products (failure margin) in determining export performance. To address this issue, export growth is decomposed into these three components over the period 1990-2017 using international data based on the Standard International Trade Classification (SITC) revision 3 at the 5-digit level. The analysis covers total non-oil merchandise exports disaggregated into four subcategories (primary products, manufactured products, GPN products, and non-GPN products) to examine whether growths of trade in each commodity group have a different pattern of export margins.

In addition, this chapter investigates the determinant factors of each export margin. Understanding the relative importance and the underline cause of the deepening of existing products, emergence of new product, and product death are important for designing appropriate policy for achieving export growth.

Based on our methodology, we found that product deepening plays a crucial role in export success for total merchandise and its subcategories. There is less window opportunity for emergence of new products when a country already has a high number of exported products. The emergence of new products and product failure margins are important for latecomer exporting countries in the region.

The findings of the econometrics analysis of the chapter indicate that GDP per capita and world demand are positively associated with export growth along the intensive margin. Also, higher intensive margin growth is determined by the level of trade openness and a decrease in the average tariff rate. Exchange rate depreciation has a positive impact on the intensive margin for export success within global production networks. Looking at the extensive margin, our econometrics results show that domestic credit and trade openness facilitate export expansion based on extensive margin through involvement in global production networks for the extensive margin. For the failure margin, higher GDP per capita would lead to less failure margin. However, this evidence exists when a country reaches a

higher stage of development; only South Korea and Singapore have lower failure margin growth compared to other countries when GDP per capita increases.

Relating to policy implications, the results suggest that appropriate government policy relating to export promotion depends on the stage of export development of the given country. For a latecomer developing country, facilitating the emergence of new products is the appropriate policy choice. In this case, promoting FDI and availability of domestic bank financing has a potential role in encouraging new high growth exports. The incidence of product failure tends to naturally decline as a country reaches a higher stage of development. Policies aim at artificially preventing product failure through direct policy intervention are unlikely to help sustaining export growth.

Chapter 5 investigates the relationship between export orientation and productivity of manufacturing firms by testing the self-selection and learning by exporting hypotheses of the relationship between export orientation and total factor productivity by paying attention to the endogeneity issue. In testing these two hypotheses, we introduce foreign ownership as the key determinant of export orientation, which has been a missing link in previous studies testing these hypotheses. Thailand is an ideal case study of this empirical analysis. Export-oriented manufacturing has played a key role in industrialisation and economic dynamics in the country since the mid-1970s, which multinational enterprises paying a key role in linking domestic manufacturing industry to global production networks.

The results indicate that the relationship between productivity and export orientation is positive and highly statistically significant, as suggested by the self-selection hypothesis. However, after controlling for the other relevant variables, foreign ownership has greater explanatory power of export performance compared to productivity. In the productivity equation, export orientation is by far the most significant explanatory variable supporting the hypothesis leaning by exporting hypothesis. Taken together, the results suggest that foreign firms play a key role in productivity improvement in Thai manufacturing through the export-orientation channel. Learning by exporting is an effective way of improving the productivity of domestic manufacturing in Thailand. The role of foreign direct investment plays a vital role in this learning process. Causation seams run mainly from export orientation to productivity, with foreign firms playing a key role in demining export orientation.

In policy implication, the findings suggest that investment incentives provided by the Board of Investment (BOI) are positively associated with higher export intensity. There is, however, no evidence that these incentives have a significant magnitude impact on firms' productivity compared to firm's export intensity. Therefore, the investment incentives by BOI should reconsider this issue to enhance the firm's productivity improvement in Thailand's manufacturing.

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