Production Networks in Southeast Asia

This book answers the recently topical questions of how China's processed trade affects the trade of Southeast Asia. What is Southeast Asia's role in Factory Asia, the region's complex of cross-border supply chains? What is Southeast Asia's involvement in building or joining production networks in the region? And, most important, how can Southeast Asia increase the value added of its products and improve its competitiveness?

This book provides rigorous analysis of how trade policy affects value added, highly disaggregated at the firm and product level, of the six Southeast Asian countries – Indonesia, Malaysia, the Philippines, Singapore and Viet Nam – and combines this with thorough examinations of their trade, industrial and labour policies.

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Preface

This book was initiated by growing discussions in Southeast Asia on how a developing country can increase its value added. We invited distinguished scholars to write chapters on Malaysia, Indonesia, the Philippines, Singapore and Viet Nam. We also complement the country analyses by adding analyses on Factory Asia, how China affects Southeast Asian trade, and the lessons learnt – the good and the bad – from regional production network in other regions such as Germany, Eastern Europe, and Latin America.

The key message of this book is that trade is growing, production is sliced, and tasks are fragmented: more openness in trade and investment may tend to pull down the ratio of domestic value added but level up the total amount of domestic value added.

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On behalf of the authors, we thank all of our students who keep plying us with challenging questions. To you, please keep asking questions, and for you, this book is presented.

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1 Introduction

Fukunari Kimura and Lili Yan Ing

1. Introduction

East Asia Pacific (EAP) economic growth has outperformed global growth for the past two decades, except from 1997 to 1999, due to the Asian Financial Crisis. Compared with other regions, EAP had the highest growth in 2014, and growth in developing EAP remained strong in 2014, although slowing somewhat following the global financial and economic crisis. Most East Asian economies are well positioned to weather renewed volatility.

The drivers of global economic growth are shifting toward East Asia, and Emerging East Asian economies (EEA) are well situated to benefit from the growing power of Asian economies. Developing East Asia grew by 6.2 percent in 2014, with slower expansion in China pulling down much of the regional aggregate (World Development Indicators provided by the World Bank 2015). The emerging Southeast Asian Economies, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam experienced strong growth in the past two decades – among the highest in the world. The average growth of these economies was 5.2 percent from 2005 to 2015. Despite the recent global crisis in 2008, the five ASEAN countries grew at an average of 5 percent in 2015 (EIU 2013). The growth of Emerging East Asia is estimated to be on a par with China.

East Asia has achieved sustained economic growth by applying development strategies that have aggressively exploited the mechanics of global value chains, and thus it is meaningful to analyze the industrialization process with trade in value added, input–output and firm-level data merged with product-level data.

Section 2 explains trade in a new paradigm. Section 3 draws the new things from this book and outlines short explanations of Chapters 2 to 13.

2. Trade in a new paradigm

2.1 The mechanics of production networks and trade in value added

Trade-in-value-added (TiVA) data provide novel and insightful information on how a country's economy is connected with the rest of the world. We notice that

in the globalization era, tight links with the world economy are essential to economic prosperity, and government policies are the key for it. However, we still do not know exactly what sort of connectivity is effective for economic development and what kind of policies are needed to achieve the goal. TiVA data provide us a novel angle of looking at the nature and characteristics of global value chains (GVCs).

Many scholars and practitioners have tried to develop various methods for exploiting TiVA data, and the development process is still ongoing. Because various indicators, figures and tables generated by TiVA data are so stimulating, there is obviously a great temptation to jump into easy though sometimes misleading conclusions. We would like to list three caveats that we should address, based on the development of analytical tools for TiVA data up to this moment.

First, TiVA data present international industrial linkages, but do not directly tell us the nature of such linkages. Since the mid-1980s, we have observed the emergence of international production/distribution networks (Jones and Kierzkowski 1990; Ando and Kimura 2005) or the second unbundling (Baldwin 2011). These are the international division of labor in terms of production processes or tasks in contrast with the traditional industry-by-industry international division of labor or the first unbundling. With such a new type of international division of labor, international trade in intermediate products and parts and components has explosively increased in contrast to traditional international trade in raw materials and final products.

ASEAN and East Asia are the regions in which international production networks have most advanced in the world, particularly in machinery industries, including general machinery, electric machinery, transport equipment and precision machinery. Of course, production networks are observed in industries such as textiles and garment, cut flowers, software industry and others. However, in these industries, most of the activities still belong to slow value chains or the first unbundling. The difference between slow value chains and production networks or between the first unbundling and the second unbundling ultimately resides in the way of organizing production/distribution chains, rather than being based on industry-by-industry differences.

Second, the decomposition of value added in produced/exported goods into domestic and foreign value added is useful, but we have to be careful in drawing policy implications from it. In the context of a country's economic growth, the value added of the country is certainly a prime target, together with domestic employment. The higher the value added, the higher the national welfare as far as economic efficiency is concerned. We have to note, however, that what is important is the amount of value added rather than the ratio of domestic value added. The trick is that the international division of labor allows countries to import what each country is relatively poor at producing and export what it is relatively good at producing. With enhancing international trade, the world total welfare goes up, and at the same time, in most of the cases, each country's welfare also enhances. Trade and investment liberalization tend to pull down the ratio of domestic value added but push up the amount of domestic value

added. In general, the ratio of domestic value added depends on many factors such as (1) size of the domestic economy, (2) the existence of exporting upstream industries such as agriculture and mining, (3) general openness to trade of the economy concerned, (4) the degree of participation in international production networks or the second unbundling, and (5) the extent of industrial agglomeration. (1) and (2) are supposed to enhance the ratio of domestic value added, which must be adjusted for international comparison. (3) and (4) would lower the ratio of domestic value added, which should be interpreted as rather a good phenomenon. (5) may increase the ratio of domestic value added. The issue in (5) depends on the form of industrial agglomeration. In the old days, many developing countries tried to build up industrial agglomeration by conducting the so-called import substitution strategy with trade barriers and mostly ended up with big failures. We should not follow such steps. In the current ASEAN and East Asian developing economies, industrial agglomeration is formed together with tight and thick connectivity with international production networks. In such a case, the core of industrial agglomeration is the inter-firm (arm's length) division of labor supported by intra-firm supplies from international production networks (Kimura and Ando 2005). Industrial agglomeration provides local firms to participate in production networks, enjoy technology transfer and spillover, and eventually upgrade their capability from process to product innovation. Policies to support the formation of such industrial agglomeration, which is quite different from the import substitution strategy in the past, may result in a higher ratio of domestic value added.

Third, TiVA data are constructed based on international input–output (IO) tables, and thus their reliability depends on the quality of the original statistical information. Each country's IO tables are so-called secondary statistics estimated from "primary" statistics such as production statistics of each industrial sector and other fragmented information. Missing is comprehensive information on the production structure of services subsectors. Although analyses on services ingredients in production are now one of the focal points in the TiVA literature, we must be somewhat conservative in interpreting results of data analyses, particularly for disaggregated services subsectors. In addition, international IO tables, and thus TiVA data, are in nominal prices. We thus have to take into consideration over-time price changes, particularly for fluctuations of energy prices, when making time-series comparisons. Or, even in one-shot analysis, we should notice that price differences across countries are not taken care of. These three caveats are already well recognized among researchers and would eventually be overcome, at least partially. However, we should bear them in our minds for the moment.

3. The new information from this book

This book provides insights on global value chains of Southeast Asia's products by painting an overall picture of it using the available OECD TiVA data, which are complemented by country analyses using input–output and merged firm-level

and product-level data. This is also enriched by lessons learned of improving value added from central Eastern Europe and Latin American countries. This book is concluded by examining thorough industrial policies.

In Chapter 2, Javier López-González and Przemyslaw Kowalski explain the position of Southeast Asia in Asia's factory. The authors demonstrate that the Association of Southeast Asian Nations (ASEAN) has embraced the new opportunities global value chains (GVCs) offer. While Brunei's domestic value added in exports originates overwhelmingly from the primary sector of oil and gas, Singapore is highly specialized in services. The Philippines, on the other hand, has significantly increased its domestic value added embodied in exports of electrical equipment, which is accompanied by significant use of foreign inputs. This complementarity between the use of foreign inputs and domestic specialization is key to understanding global value chain (GVC) participation. In the case of ASEAN, it is shown that there is an element of synchronization in terms of the growing importance of domestic and foreign value added in ASEAN where for all countries, except for Cambodia, a positive correlation emerges between changes in the overall importance of domestic and foreign value added across sectors. This suggests that the sectors, which have a growing share of domestic value added to total exports, tend to have a growing share of foreign value added in inputs. In other words, there is an indication that imported inputs may help developing domestic capacity.

The chapter also challenges what is referred to in the existing literature as the retention of domestic value added and upgrading in GVCs: this should no longer be framed in the context of increasing the *share of the pie* that is occupied by domestic value added in the production of an industry's exports, but rather in the context of how further engagement offers important opportunities for growing the total *value of the pie*. The main drivers of participation in GVC, while mainly structural, such as the size of the economy and the distance to manufacturing hubs, trade and investment openness, as well as logistics performance, hard and soft infrastructure and good governance, also play significant roles. Much progress has been made in the process of completing the ASEAN Economic Community (AEC), but with competitive pressures rising, as other countries increasingly look to join GVCs, there is a strengthened case for continuing the process of reform through further trade and investment openness and domestic regulatory reform.

In Chapter 3, Miaojie Yu and Xiaomin Cui analyze the impacts of the processed trade of China on Southeast Asia's trade. This chapter employs the trade data at the Standard International Trade Classification (SITC) one-digit level from the UN Comtrade database to study the impact of China's trade on ASEAN's trade, and understand how ASEAN countries can improve the value added of their exports and their trade competitiveness. First, they find that on average ASEAN had the strongest revealed comparative advantage (RCA, hereafter) in animal and vegetable oils, fats and waxes, where the RCA index was about 6.2 during the period 2000–2013. ASEAN had an increasing comparative advantage in miscellaneous manufactured articles in the period 2000–2013 and also

suffered a gradual loss in comparative advantage in manufacturing machinery and transport equipment from 2000 to 2011, even though the RCA index recovered slightly in the period 2012–2013. Conversely, from 2000 to 2013, China did not have comparative advantages in agriculture products and crude materials on average. This reflects the structural complementarity of exports between China and ASEAN. However, China remained competitive in manufacturing, with an RCA index for manufacturing machinery and transport equipment increasing steadily from 0.8 to 1.45 from 2000 to 2011. Until 2013, ASEAN also had weak RCA in manufacturing, where China and ASEAN may compete severely.

Second, when it comes to the question of what the impacts are of China's trade on ASEAN's trade, the empirical results show that both complementarity and substitution/competition effects exist. With the gradual deepening and broadening of regional cooperation between China and Southeast Asia, an increase in exports from China to ASEAN will tend to promote ASEAN's exports. However, China's increasing exports to the rest of the world will tend to crowd out ASEAN's own exports. When it comes to the effect of China's exports on ASEAN's value added of exports, the results work in the opposite direction. If ASEAN imports more goods from China, its value added of exports will tend to be lower. Conversely, ASEAN's value added of exports will tend to be higher due to the substitution/competition effect if China's exports to the rest of the world increase. In addition, ASEAN countries can improve their value added of exports and trade competitiveness through trade liberalization and by increasing investment in R&D and training programs for skilled labor.

Chapters 4 to 9 provide insights on the value added of the six Southeast Asian countries: Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. In Chapter 4, Lili Yan Ing and Chandra Triputra present that imported inputs increase Indonesia's firm productivity via better Indonesian product quality and variety. They argue that trade evolves and production is sliced. Much of production is based in production networks. Imports are largely used as inputs for exports. Many countries are engaged directly and indirectly in producing final products. The development of global production chains, with an increased use of imported inputs, caused a reduction of the domestic value-added content for each unit of manufacturing production and exports. They provide a comprehensive analysis of how imported imports affect Indonesia's product varieties and quality. Their analysis argues that reductions in input tariffs will increase value added via product variety and quality. It shows that a reduction in input tariffs will increase value added, not only via its interaction with importing firms, but also with exporting firms that use imported products as their inputs.

Using the very disaggregated merged Indonesian firm- and product-level data from 2000 to 2010, the findings show that a reduction of 1 percent in input tariffs will increase value added by 0.2 percent, not only via its interaction with importing firms, but also with exporting firms that use imported products as their inputs. A 1 percent reduction in input tariffs will increase product variety and quality by 3.5 percent and 1.5 percent, respectively. Exporting firms tend to have a higher value added than the average of all firms, and they also tend to increase

variety and quality of products. Foreign firms also tend to have a relatively higher value added than the general average, but they do not necessarily have increased product variety and higher quality.

In Chapter 5, Siew Yean Tham and Jia Yi Kam examine the imported contents of Malaysia's manufacturing sector by using Hummel's vertical specialization method employing the input–output tables of Malaysia from 2000 to 2010. The results are then compared with the OECD trade in value-added data for Malaysia for the years 1995, 2000, 2005, 2008 and 2009. The study finds that a decrease in direct and indirect imported inputs based on Hummel's vertical specialization index is interpreted as an increase in the local content of Malaysia's exports. Analyses based on both data sources, input–output and the OECD TiVA data by sectors, show that the highest foreign inputs are found in non-resource manufacturing sectors such as basic metals, machinery and equipment and electrical and optical equipment as compared to resource-based sectors such as food products and wood and paper products. The compressed input–output table showed a decrease in the information, communication and technology (ICT) sector's use of imported inputs. Using a more detailed classification of the electronics sector, two main shifts can be observed in electronics exports from 2000–2013. First, there was a shift toward finished goods in terms of the number of products, but not in terms of export values. Second, there was a shift from electronics manufacturing service (EMS) to semiconductor manufacturing service (SMS) activities. The contraction in the ICT and electronics sector has led to a greater focus on semiconductor manufacturing. The chapter also presents a case study on the ICT sector, and finds, by using revealed comparative advantage (RCA) analysis, that the product groups with the highest RCA are auto electronics and finished goods, followed by electronic data-processing (EDP) and components/devices semiconductor parts.

In Chapter 6, Rafaelita Aldaba examines the extent and depth of participation of the Philippines in the electronics global GVC using trade-in-value-added (TiVA) and extensive margin indicators. The Philippines remains strong in semiconductors, but is lagging behind other ASEAN countries. According to the TiVA database, the level of participation of the Philippines in the electronics GVC increased substantially between 1995 and 2009. The extensive margins show that the Philippines has been regaining its position in regional production networks as indicated by the rising number of exported products to the region. Based on the RCA analysis, it is indicated that the Philippines has remained strong in semiconductors but has been lagging behind Singapore, Malaysia and Thailand. The extensive margin analysis also shows that the Philippines has been regaining its position in the regional production networks as indicated by the rising number of exported products to the region. The foreign inputs in Philippine electronics exports have increased from 51 percent in 1995 to 61 percent in 2000, but this declined to 53 percent in 2008 and 50 percent in 2009. The Philippine electronics industry has been largely dominated by the semiconductor sector. Its participation in global/regional production networks has relied mainly on mature and legacy products and processes focusing on semiconductor assembly

and test services (SATS), which is the back-end part of the semiconductor manufacturing services (SMS). The gradually declining trend in the number of foreign inputs indicates the need to diversify and upgrade the industry's GVC participation through market upgrading characterized by moving from semiconductors to electronic manufacturing services (EMS), particularly in areas with high growth potential such as auto electronics, power electronics, electronic data processing and consumer electronics. The upgrading process will require human resources development, establishing an innovation ecosystem, efficient logistics and infrastructure and developing a parts, supplies and materials sector to support the industry.

In Chapter 7, Mun-Heng Toh reviews the cluster-based development strategy adopted in Singapore. Singapore's development strategy is predominantly based on trade openness and liberal inflows of foreign direct investments. That strategy has enabled Singapore to be plugged into GVAs to benefit from inflows of foreign investment and participation in international trade. The author makes use of information and indicators of GVC participation from the TiVA database with specific reference to Singapore. The results affirm that Singapore has provided an example that success in pursuing a strategy of trade-led economic growth is translated into successful trade in integrated global markets and into upgrades within the GVCs. Participation in the GVCs facilitated by a relatively large network of regional and bilateral FTAs has helped to bring gain to Singapore in terms of improved competitiveness, and better access to global markets and expansion of production and jobs. It has also helped Singapore to increase productivity and avoid the middle-income trap.

The TiVA analysis indicates that services play an important role in global trade, contributing, on average, more than 30 percent of the total value added in manufactured goods. Liberalization of the services trade would allow for more efficient and higher-quality services to enhance the competitiveness of manufacturing activities. In this regard, Singapore's concerted efforts in promoting trade liberalization in services relating to transport, logistics, finance and communication, via the regional and bilateral FTAs, are steps in the right direction. New concepts and the implications of trade in value added are appraised to provide new perspectives of and prospects for continued sustainable growth of Singapore's economy.

In Chapter 8, Patarapong Intarakumnerd illustrates the development of domestic value added in Thailand's automotive industry. Thailand's automotive sector has become a part of the regional production networks of many car manufacturers. Completely built-up (CBU) vehicles and completely knocked-down (CKD) kits are built by local producers, and have been a major export product since 2000. Lately, it has become more 'product-specific'. Rather than producing and innovating varieties of vehicles as in the past, product champions like one-ton pick-up trucks and, subsequently, eco cars have emerged in the past 15 years.

By using the Grubel-Lloyd index calculated based on UN Comtrade data in 1992, 1996, 2002 and 2011, the chapter examines inter-industry trade (one-way trade) and intra-industry trade. The findings show that the degree of intra-industry trade between Thailand and its main auto and auto parts trading partners

(Australia, China, India, Indonesia, Japan, Korea, Malaysia, the Philippines and Viet Nam) has been increasing. The intra-industry trade pattern was mainly one-way trade prior to 1997, and the degree of intra-industry trade increased significantly in 1999. In general, Thailand tends to have higher degrees of IIT in automobile products with Japan and Indonesia. This is because both Thailand (for sedans) and Indonesia (for eight-seat cars) became important bases of Japanese car makers in the region.

Intarakumnerd also explains the different types of government policies in the auto industry, which can be divided into three phases: phase I, 1960–1970, the import substitution regime, which was mainly an import substitution policy and revised investment promotion law to encourage automotive assembly in Thailand; phase II, 1970–1996, which consisted of significant FDI and export promotion; phase III, 1997–2015, which was predominantly further liberalization for FDI and technological upgrading.

In Chapter 9, Tri Thanh Vo, Anh Duong Nguyen and Trinh Bui seek answers to two questions – (1) whether Viet Nam is depending more on imported products to meet its export growth; and (2) whether export growth brings sufficient benefits for the domestic economy. Apart from reviewing trade data and existing literature, the authors calculate domestic value added in Viet Nam's exports by sector, using input–output tables for 2007 and 2011. They found that the inducement impact of exports to the economy and income have decreased in 2007–2011. The domestic value-added content of exports exhibited a complicated pattern, though overall exports increased. The gross benefits are even higher due to the drastic increase in exports.

Instead, export growth stimulated more rapid increase of imports. The domestic value-added content of exports fell almost continuously from 78.9 percent in 1995 to 63.7 percent in 2011, except for a minor, one-off increase in 2009. Still, such a fall was overwhelmed by more drastic increases in gross exports averaged at 21.5 percent per annum during 2002–2006 and 18.0 percent per annum during 2007–2014. This relieves the concern about decreasing benefits from trade. Viet Nam should thus focus more on ensuring better diffusion of exports to domestic aggregate economic activity and return to various production factors. Moreover, Viet Nam should deepen linkages between multinational enterprises and local firms and adopt a more targeted industrial policy.

In Chapter 10, Hal Hill and Archanun Kohpaiboon survey Southeast Asia's experience with industry policy. 'Industry policy', defined as non-neutral inter-industry (and sometimes inter-firm) incentives, remains a contested field. There is much general agreement in the development economics and political economy literatures about the factors that underpin rapid economic development. Key policies include macroeconomic stability; openness to trade, investment and technology; a stable and business-friendly commercial environment; mechanisms that ensure broad-based, 'inclusive' development; and investment in supply-side capabilities, ranging from infrastructure to human capital. The contestation focuses on whether these general, economy-wide approaches are sufficient, or whether in addition there is a role for sector-specific interventions. While the

earlier literature focused on the merits of import-substitution versus export orientation, recognizing the inevitability of global economic integration, the contemporary literature has focused on whether there is a case for 'smart industry policy' in broadly open economies.

Against this backdrop, Hill and Kohpaiboon survey and analyze Southeast Asia's experience with industry policy. They suggest designing policies for industrial progress, rather than 'industry policy'. They adopt a case study approach, investigating cases of sector-specific successes in several countries, and the factors underpinning the success. Examples include the Thai automotive industry, Malaysian higher education, the Philippine BPOs and the Cambodian garments industry. The special case of Indonesia is also examined, a country that has achieved episodes of rapid industrialization, but in which the general policy environment rather than sector-specific factors has been the major driver of growth.

In spite of the significant country and sector differences, several key points emerge from these case studies. The first is openness. All four cases involved export-oriented goods or services, in which foreign investors also played a significant role in transmitting technology and international market information. Second, government policies contributed significantly to the successes in one way or another. Often this simply took the form of a major deregulation that enabled countries to exploit their latent comparative advantages. Third, there were specific country features in all cases that, combined with open policies, underpinned success. For Cambodian tourism, Angkor Wat was obviously the key, combined with the restoration of peace and open policies toward FDI, labour and civil aviation. In the Philippines, it was English language proficiency, aided by an outward-looking and cosmopolitan culture. Malaysia's cultural and linguistic openness to Islam, to Chinese, Indian and Malay communities, and the widespread use of English all contributed to its educational success. Fourth, a measure of good luck (and timing) was present in most of the cases, and it enabled governments to build on reforms that were already under way: like with BPOs in the Philippines, where the government had recently liberalized a chronically repressed telecoms industry just in time to link in to the wave of technologically driven international outsourcing of services. Thailand's liberalization occurred when its three potential Southeast Asian auto rivals had policy regimes that effectively precluded their international participation in the industry. Malaysia opened up a hitherto state-dominated tertiary education system just as the internationalization of higher education was gathering pace.

In Chapter 11, Xiao Jiang and Jose Caraballo conduct a multiregional input–output analysis to estimate the employment outcomes of global value chain participation in the form of trading intermediates inputs for the six Asian economies, namely China, Indonesia, India, Japan, the Republic of Korea and Taiwan, included in the World Input–Output Database (the selection of these countries was mainly due to data availability). They claim that during 1995 to 2008, many Asian countries experienced what they termed 'value-added erosion' to describe the phenomenon of the decline in the sectoral shares of domestic value added in

a country's exports as the country becomes more integrated into the global value chains (GVCs).

Following related theoretical models, they argue that the decline of domestic value-added share in a country's exports is likely to be caused by the expansion of high value-adding activities performed by foreign lead firms in the upper stream of the GVCs. By applying econometric methods to the multiregional global input–output model, they found that there is a relatively robust relationship between the surge in foreign high-skilled labor embodied in exports and value-added erosion, as validated with two cross-sectional dimensions (across industries within many countries and across countries within many manufacturing industries). The decline of domestic value-added share is, to a lesser extent, also related to other variables such as capital intensiveness in industry and labor productivity.

These Asian countries face the challenge of shifting toward production of higher value-added goods and services, bringing them into more direct competition with advanced economies, while at the same time their competitiveness in lower value-added goods and services is being eroded by the increasing presence of lower-labor-cost countries in global markets. In addition, all of these countries, despite their developmental heterogeneity, failed to increase their share of value added in the period 1995–2009.

In Chapter 12, Siwage Dharma Negara explains the endogenous growth theory that innovation is one of the key drivers of technological progress and productivity growth of a country. Technological improvements stemming from firms' innovative activities can contribute to a country's overall productivity and export competitiveness. For innovation to flourish, an environment conducive to firms conducting risky innovative activities is needed. Studies show that public policies, including labor market policies, can influence the operating conditions and institutional structures of firms to foster innovation that leads to productivity gains. However, empirical evidence is mixed on the impact of labor market policies on firms' incentives to innovate.

Negara constructs a set of panel data of 32 countries, including seven ASEAN countries, namely, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam (note: data for Brunei Darussalam, Lao PDR and Myanmar are not available), from 2009 to 2013. This study uses scores data for innovation competitiveness published by the World Economic Forum (WEF) since 2005 as a proxy for innovation capacity. The indicators are derived using a standardized survey targeted to more than 14,000 business executives in 144 countries. In addition to innovation scores data, the chapter uses alternative proxies for innovation, including the number of patents residents filed at the national office, the number of venture capital deals and the number of people employed in knowledge-intensive services from the Global Innovation Index published by Cornell University, INSEAD and the World Intellectual Property Organization (WIPO). It uses scores data for labor market efficiency published by the GCI and cost of redundancy dismissal from the World Bank's Doing Business, as a proxy for labor market policies. Using this balanced panel data, Negara offers simple empirical models to measure the relationship between

labor market policies and innovation capacity; and between innovation capacity and trade competitiveness. The main findings are that countries with more flexible labor market policies have higher levels of innovation competitiveness and that there is a positive correlation between innovation competitiveness and trade competitiveness. The quality of higher education is positively associated with a country's innovation competitiveness. On trade aspects, this chapter finds preliminary evidence that past innovation is positively associated with trade competitiveness. This is in line with previous studies that find a positive link between innovation and exporting.

The final chapter, by Ben Shepherd, illustrates lessons learned from regional production networks in other regions such as central Eastern Europe and Latin America. The author demonstrates that there is clear evidence of increased internationalization of ASEAN value chains, as well as industrial growth. Regional production networks in Latin America have been largely driven by NAFTA, and its trade between Latin America and the United States, and changes have typically been more rapid in Central and Eastern Europe than in ASEAN, probably due to economic transition and joining the European Union. In terms of the cross-regional comparison that is the analytical focus of this chapter, one finding stands out in sharp relief: value chain development has been very intense in CEE, but relatively limited in LAC. This result needs to be interpreted with caution, because the TiVA data are much more complete in their coverage of CEE than of LAC. Based on the available data, however, it appears that regional production networks in LAC remain considerably less than in ASEAN or CEE, and the dynamic of change is much slower.

The story of regional production networks in CEE provides an interesting insight for Southeast Asia. In CEE production networks, Germany plays an important role as an anchor economy – a source of final demand and of technology-rich investment – and ASEAN will need to continue looking to regional economies such as Japan and the Republic of Korea in this light. The emphasis in most ASEAN countries will now need to shift to 'moving up' to higher value-added activities, such as research and development, which have positive spillovers for the rest of the economy.

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3 The impact of China's trade on ASEAN's trade

Miaojie Yu and Xiaomin Cui[1]

1. Introduction

Based on gross domestic product (GDP), China became the second-largest global economy in 2013, with the first and the third economies being the United States (US) and Japan, respectively. In 2013, total GDP of EAP was US$20.5 trillion and that of developing East Asia Pacific (EAP) countries accounted for 55.7 per cent of this total. Export-led growth patterns have played a crucial role in the development of China and most Association of Southeast Asian Nations (ASEAN) countries. By exporting goods and commodities in which they have a comparative advantage, China and ASEAN countries have realized rapid industrialization and development. Since its economic reforms and opening up in 1978, China's annual growth rate of exports has been about 13.7 per cent. Its ratio of exports to GDP has continued to increase, from 7.8 per cent in 1982 to 35.7 per cent in 2006, although decreasing subsequently to 22.6 per cent in 2014. The average ratio of exports to GDP of the six relatively developed ASEAN countries – Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand – was 79.7 per cent from 1990 to 2014, whereas the export ratio of Singapore is close to 200 per cent. The ratio of exports to GDP of the three less-developed ASEAN countries – Cambodia, Lao PDR, and Viet Nam – was 46.2 per cent from 1993 to 2014. The average annual export growth rate of all ASEAN countries, excluding Myanmar, was 8.0 per cent from 1999 to 2013.

Bilateral trade in goods between China and ASEAN has increased dramatically, especially after the launch of the ASEAN–China Free Trade Agreement (FTA) in 2010. Based on 2014 data, China is ASEAN's largest trade partner and ASEAN is China's third-largest trade partner, after the European Union (EU) and the United States, respectively. As shown in Figure 3.1, bilateral trade increased dramatically from 2000 to 2011, but ASEAN's exports to China weakened in 2012 and recovered in 2013. In 2000, China's total exports were $249.2 billion, and only 6.96 per cent of these exports went to ASEAN countries. In 2000, ASEAN's total exports (excluding services) were $330.0 billion, with exports to China comprising only 4.96 per cent. In 2013, China's total exports were $2,209.0 billion, with the share of exports going to ASEAN countries increasing to 11.0 per cent of the total. In 2013, ASEAN's total exports were $941.4 billion, with exports to China accounting for 16.2 per cent.

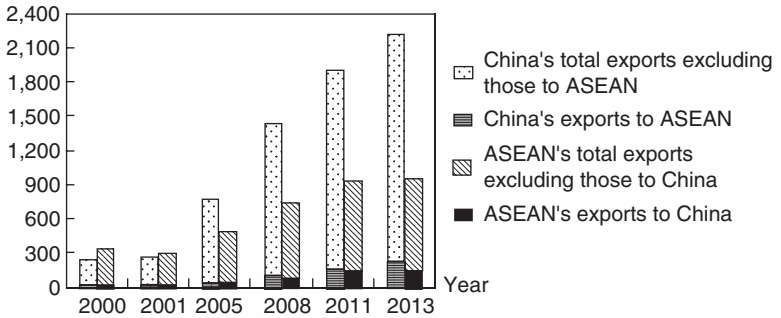


Figure 3.1 ASEAN's and China's bilateral and total exports (in goods, US$ bn)

Source: Data for Viet Nam's exports to China in 2013. Viet Nam's and Brunei's total exports, excluding those to other ASEAN countries in 2012 and 2013, are from the UN Comtrade database. All data come from the CEIC database, if not otherwise specified.

Bilateral imports in goods between China and ASEAN countries also increased steadily. China's imports from ASEAN totalled $200 billion in 2013, accounting for 10.2 per cent of total imports. At the same time, ASEAN, with the exception of Myanmar and Lao PDR, imported $194 billion in commodities from China, or 15.8 per cent of its total imports. Many studies have found that the industrial structures of China and ASEAN are relatively complementary. As imports are largely used as inputs for exports, production networks shared across China and ASEAN countries make it possible to manufacture certain products efficiently and effectively.

Nevertheless, China's export performance has been anaemic since 2007 and has weakened further in recent years. On one hand, its ratio of exports of goods and services to GDP decreased from 34.9 per cent in 2007 to 22.6 per cent in 2014. On the other hand, its annual growth rate of exports of goods and services slowed rapidly – from 35.1 per cent in 2006 to 4.0 per cent in 2014. As China's growth pattern changes as it moves up the income ladder to one that relies more on consumption and less on investment and exports, and more on services and less on industry, opportunities for Southeast Asian countries to expand their economies through trade and investment will emerge. Several questions arise, such as how China's trade impacts Southeast Asia countries. How can Southeast Asia improve its position in international trade by tapping into the opportunities emerging from the rebalancing of growth in China? And how should Southeast Asian countries increase the value added of their products and improve trade competitiveness?

This chapter tries to answer these questions in three ways. First, we study the influence of China's exports on ASEAN countries' exports using econometric analysis, distinguishing the effect of China's exports to ASEAN from its exports to the rest of the world, and considering industrial heterogeneity. Second, we calculate the revealed comparative advantages of China and ASEAN countries,

comparing the relative competitiveness of each industry in ASEAN countries with those industries in China. Third, we calculate the export value-added ratios of China and ASEAN countries, allowing us to study how Southeast Asia can improve value added in exports and its trade competitiveness.

The remainder of this chapter is organized as follows: Section 2 introduces the data sets used in the empirical analysis and describes the measures of key variables; Section 3 presents the empirical evidence for the impact of China's trade on ASEAN's trade; Section 4 provides some robustness checks; and Section 5 concludes.

2. Data and measures

All industry-level trade data for ASEAN and China are from the United Nations (UN) Comtrade database. The UN Comtrade database is a widely used database of trade in various goods and commodities, and provides disaggregated commodity trade data for each country around the world. This database provides trade data based on three international standards – the International Convention for Harmonized Commodity Description and Coding System (HS), the Standard International Trade Classification (SITC), and the Classification by Broad Economic Categories (BEC). This chapter makes most use of data at the SITC one-digit level to identify the industrial heterogeneous effect of China's trade on ASEAN's trade. However, country-level trade data are from the global database,[2] a subset of the CEIC database. The CEIC database also has industry-level trade data, but these data are incomplete and the CEIC does not have trade data at the HS or SITC levels.

In addition, data on GDP, value added of manufacturing industries, total labour forces, urban populations, simple average applied tariffs, and ASEAN countries' exchange rates to the US dollar are all drawn from the CEIC database. Labour productivity of the manufacturing sector is equal to the ratio of value added to total labour force of the manufacturing sector. As data for Myanmar's GDP in the CEIC database are collected at the end of March rather than at the end of December, we obtain these data collected at the end of December from the IMF global database. It is worth pointing out that all exports from UN Comtrade and CEIC database only include exports of goods and commodities, excluding services. Henceforth, by 'exports' we mean exports of goods and commodities.[3]

2.1 Export values

After China's accession to the WTO in 2001, ASEAN countries' exports to China increased dramatically. The annual growth rate of ASEAN's exports to China peaked in 2003, at 41.8 per cent; they subsequently decreased gradually until finally turning negative during the global financial crisis, then rebounded significantly in 2010–2011, but steadily became anaemic from 2012 to 2013. According to Table 3.1, ASEAN's exports to China in 2011 were 8.7 times larger than in 2000. In addition, ASEAN's exports to China increased when the Chinese yuan appreciated against the US dollar in 2005. However, during the global financial

Table 3.1 ASEAN's exports to China

Affairs	*Year*	*All 10 countries of ASEAN*			*The six relatively developed countries* ***(Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand)***			*The four less-developed countries* ***(Cambodia, Lao PDR, Myanmar, Viet Nam)***		
		Total exports to China (US$ m)	*Exports to China percentage to total exports (%)*	*Exports to China percentage to its GDP (%)*	*Total exports to China (US$ m)*	*Exports to China percentage to total exports (%)*	*Exports to China percentage to its GDP (%)*	*Total exports to China, US$ m*	*Exports to China percentage to total exports (%)*	*Exports to China percentage to its GDP (%)*
	2000	16,376	4.96	2.68	14,696	4.66	2.60	1,679	11.22	3.59
China access to WTO	2001	16,719	5.57	2.85	15,157	5.33	2.81	1,563	9.75	3.40
CNY appreciates against US$	2005	52,680	10.78	5.69	49,146	10.76	5.81	3,533	11.15	4.38
Global financial crisis	2008	88,997	12.09	5.77	83,412	12.32	5.98	5,585	9.45	3.74
	2011	142,243	15.32	6.44	128,207	15.36	6.42	14,035	14.93	6.60
	2013	152,373	16.19	6.20	135,385	16.63	6.15	16,988	13.34	6.63

Notes: The word 'Exports' in this table only includes exports of goods and commodities, excluding services. If the original data are measured with the national currency, we used the period-average exchange rate to calculate the data measure in US dollars. Total exports of ASEAN, the six relatively developed countries and the four less-developed countries, do not include the trade volume within ASEAN countries.

Source: Data on Myanmar's GDP are from the IMF global database. Data for China's and ASEAN's GDP in 2013 are from the World Bank database. All data come from CEIC database, if not otherwise specified.

crisis (2008–2009), ASEAN's exports to China contracted by 7.1 per cent. In addition, with the exception of 2009, ASEAN's exports to China increased far faster than its total GDP and total exports. As shown in Table 3.1, the ratio of ASEAN's exports to China as a share of its total exports, which excludes exports within ASEAN countries, was 15.3 per cent in 2011. Meanwhile, the ratio of ASEAN's exports to China accounted for 6.4 per cent of its total GDP.

We divide the 10 ASEAN countries into two groups – the six relatively developed countries and the four less-developed countries. From 2000 to 2011, the six relatively developed countries – Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand – all posted consistent increases in exports of goods and services to China. The ratios of these countries' exports to China as a share of total exports and GDP were close to those of all ASEAN countries, and have continued to increase in 2000–2011 except during the global financial crisis. However, the six relatively developed countries' exports to China and the share of GDP weakened in 2012 and recovered slightly in 2013. The six relatively developed countries contributed to about 92 per cent of ASEAN's total exports to China. Although the four less-developed ASEAN countries – Cambodia, Lao PDR, Myanmar, and Viet Nam – only accounted for a small share of total exports, the nominal value of their exports to China increased rapidly from 2007 to 2011, even during the financial crisis. However, the growth rate of the nominal value of their exports slowed in 2012 and rebounded to 17 per cent in 2013. The exports of the four less-developed ASEAN countries to China decreased slightly when China joined the World Trade Organization (WTO) in 2001, but their exports to China as a share of total exports and GDP decreased when the Chinese yuan appreciated against the US dollar. The share of total exports recovered to 11.6 per cent in 2009 and increased steadily until 2011, before declining somewhat in 2012–2013.

2.2 Revealed comparative advantage

According to traditional trade theory, especially the Ricardian model, trade patterns are closely related to each country's comparative advantage. There are many measures of a country's comparative advantage. One of them is the 'revealed comparative advantage', which was initially proposed by Balassa (1969). This defines a country's comparative advantage based on relative exports. The revealed comparative advantage (RCA) index of sector k in country c at time t is:

$$RCA_{kt}^{c} = \frac{EX_{kt}^{c} / \sum_{k} EX_{kt}^{c}}{\sum_{k} EX_{kt}^{c} / \sum_{c}\sum_{k} EX_{kt}^{c}}$$

where, EX_{kt}^{c} is the total exports of sector k in country c at time t. The RCA index measures the relative exports and trade competitiveness of sector k in country c, compared with the average relative exports of sector k in the world. If RCA_{kt}^{c} is larger than 1, then country c has a comparative advantage in industry k at time t. In the case where RCA_{kt}^{c} is less than 1, country c has a comparative disadvantage in this industry.

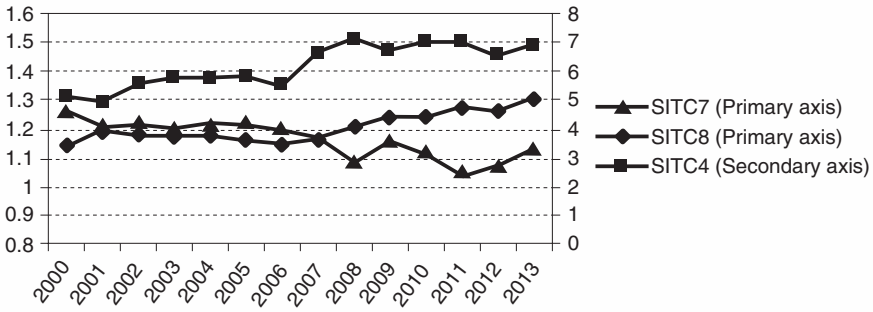


Figure 3.2 The RCA indices of ASEAN's three representative industries from 2000 to 2013

Notes: Lines of SITC7 and SITC8 correspond to the primary axis, while line of SITC4 corresponds to the secondary axis.

Source: UN Comtrade Database.

Because different countries have different comparative advantages, the impact of China's trade on ASEAN's trade should show industrial heterogeneity. Therefore, we measure the RCA of China and ASEAN at the SITC one-digit industry level[4] from 2000–2013. As can be seen in Figure 3.2 and Table 3.2, ASEAN had the strongest RCA in animal and vegetable oils, fats, and waxes, where the RCA index was about 6.2. ASEAN had an increasing comparative advantage in miscellaneous manufactured articles from 2000–2013 and also suffered a gradual loss in comparative advantage in manufacturing machinery and transport equipment from 2000 to 2011, even though the RCA index recovered slightly in 2012–2013. However, ASEAN includes 10 countries and each country has its own comparative advantage. We therefore analyze the comparative advantage of each ASEAN country separately.

Overall, from 2000 to 2013, China did not have comparative advantages in food and live animals, beverages and tobacco, crude materials, mineral fuels and lubricants, animal and vegetable oils, and chemicals, given that the RCA indices of these sectors are all less than 1. In particular, China had the weakest RCA in animal and vegetable oils, fats, and waxes, with an average RCA index of 0.08. Conversely, ASEAN had the strongest RCA in this sector. This reflects the structural complementarity of exports between China and ASEAN. However, China remained competitive in manufacturing, with the RCA index for manufacturing machinery and transport equipment increasing steadily from 0.8 in 2000 to 1.45 in 2011. Until 2013, ASEAN also had weak RCA in manufacturing, where China and ASEAN may fiercely compete.

2.2.1 RCA indices of ASEAN countries before China joined the WTO

As shown in Table 3.3, Cambodia had a strong comparative advantage in miscellaneous manufactured articles in 2000, with an RCA index of 7.5. The reason for this might be that Cambodia had weak comparative advantage in other sectors.

Table 3.2 Revealed comparative advantage of China and ASEAN

Country	*Year*	*SITC0*	*SITC1*	*SITC2*	*SITC3*	*SITC4*	*SITC5*	*SITC6*	*SITC7*	*SITC8*	*SITC9*
China	2000	0.94	0.34	0.59	0.32	0.15	0.54	1.25	0.80	2.81	0.05
China	2005	0.58	0.19	0.31	0.19	0.09	0.44	1.22	1.21	2.20	0.06
China	2008	0.44	0.14	0.23	0.14	0.07	0.53	1.34	1.37	2.26	0.03
China	2011	0.46	0.16	0.18	0.11	0.05	0.56	1.28	1.45	2.25	0.02
China	2013	0.42	0.15	0.16	0.09	0.05	0.50	1.33	1.41	2.32	0.02
ASEAN	2000	1.04	0.27	0.93	0.92	5.14	0.46	0.59	1.27	1.14	0.50
ASEAN	2005	1.04	0.25	1.07	0.97	5.85	0.62	0.57	1.22	1.16	0.66
ASEAN	2008	1.21	0.30	1.01	0.94	7.13	0.56	0.60	1.09	1.21	1.40
ASEAN	2011	1.13	0.38	1.00	0.95	7.03	0.69	0.63	1.04	1.27	1.16
ASEAN	2013	1.06	0.41	0.80	0.88	6.89	0.62	0.67	1.13	1.30	1.00

Notes: ASEAN only includes countries for which we can find data in the UN Comtrade Database. All SITC categories are based on *Standard International Trade Classification, Revision 3*.

Source: UN Comtrade Database.

Table 3.3 Revealed comparative advantage of ASEAN countries in 2000

2000	*SITC0*	*SITC1*	*SITC2*	*SITC3*	*SITC4*	*SITC5*	*SITC6*	*SITC7*	*SITC8*	*SITC9*
Cambodia	0.14	0.22	0.96	0.00		0.00	0.23	0.02	7.49	0.12
China	0.94	0.34	0.59	0.32	0.15	0.54	1.25	0.80	2.81	0.05
Indonesia	1.08	0.43	2.29	2.54	9.40	0.57	1.45	0.42	1.31	0.15
Malaysia	0.33	0.37	0.91	0.97	11.42	0.43	0.50	1.51	0.65	0.20
Philippines	0.65	0.15	0.44	0.13	4.12	0.10	0.27	1.84	0.94	0.10
Singapore	0.24	0.91	0.23	0.74	0.52	0.78	0.28	1.63	0.66	0.81
Thailand	2.69	0.28	1.30	0.32	0.37	0.66	0.85	1.05	1.18	0.67
Viet Nam	4.67	0.14	0.86	2.66	1.41	0.11	0.39	0.21	2.26	0.77

Notes: ASEAN only includes countries for which we can find data in the UN Comtrade Database. All SITC categories are based on *Standard International Trade Classification, Revision 3.*

Source: UN Comtrade Database.

Table 3.4 Revealed comparative advantage of ASEAN countries in 2005

2005	*SITC0*	*SITC1*	*SITC2*	*SITC3*	*SITC4*	*SITC5*	*SITC6*	*SITC7*	*SITC8*	*SITC9*
Cambodia	0.10	0.36	0.53	0.00	0.07	0.01	0.09	0.01	8.24	0.13
China	0.58	0.19	0.31	0.19	0.09	0.44	1.22	1.21	2.20	0.06
Indonesia	1.04	0.50	3.31	2.25	15.82	0.49	1.21	0.41	1.04	0.07
Malaysia	0.39	0.40	0.83	1.09	12.41	0.55	0.52	1.41	0.73	0.39
Philippines	0.77	0.57	0.52	0.15	4.54	0.13	0.31	1.94	0.88	0.04
Singapore	0.20	0.66	0.18	0.99	0.30	1.07	0.33	1.53	0.59	1.08
Thailand	2.19	0.29	1.61	0.35	0.42	0.76	0.89	1.17	1.05	0.43
Viet Nam	3.81	0.57	1.19	2.10	0.15	0.15	0.48	0.25	2.77	0.12

Notes: ASEAN only includes countries for which we can find data in the UN Comtrade Database. All SITC categories are based on *Standard International Trade Classification, Revision 3.*

Source: UN Comtrade Database.

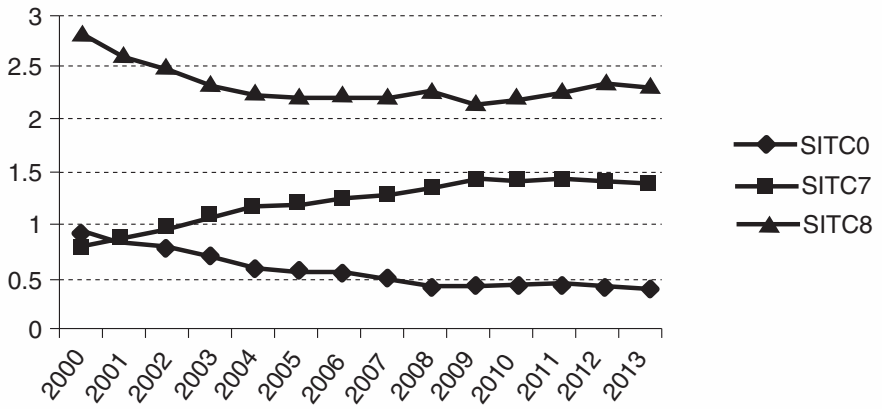


Figure 3.3 RCA indices of China's three representative industries from 2000 to 2013

Notes: More details about China's revealed comparative advantage are listed in Tables 3.2–3.6. Here only three representative sectors are listed.

Source: UN Comtrade Database

Compared with other countries, Indonesia and Malaysia had extremely strong RCAs in animal and vegetable oils, fats, and waxes, with an average RCA index of 10.41. The Philippines also had a strong RCA in this sector. Indonesia had an RCA in crude materials and mineral fuels in 2000. In addition, Malaysia, the Philippines, Singapore, and Thailand all had weak comparative advantages in manufacturing machinery and transport equipment. Thailand and Viet Nam had strong RCAs in food and live animals.

2.2.2 RCA indices of ASEAN countries when the Chinese yuan appreciated

Compared with 2000, the RCA indices of Cambodia and Singapore remained almost the same in 2005, except for a slight increase in Cambodia's RCA in miscellaneous manufactured articles. China had a comparative advantage in manufacturing machinery and transport equipment in 2005, although its RCA index had been less than 1 in 2000. With a slight decrease in its RCA in mineral fuels and lubricants, Indonesia improved its competitiveness in crude materials and in animal and vegetable oils. Malaysia and the Philippines also strengthened their exports in this sector. Thailand and Viet Nam improved their comparative advantage in crude materials, whereas RCA indices in the food and live animals industries decreased. However, Viet Nam saw a significant fall in competitiveness in animal and vegetable oils, fats, and waxes, with an 89 per cent decline in its RCA index.

2.2.3 RCA indices of ASEAN countries during the global financial crisis

In 2008, Cambodia improved its comparative advantage in manufacturing miscellaneous manufactured articles, but its comparative advantage in crude

materials became weak. Since 2005, Indonesia and Malaysia have continued to strengthen their comparative advantage in animal and vegetable oils, fats, and waxes, although their RCA indices decreased somewhat during the global financial crisis. The RCA indices of the Philippines, Singapore, and Thailand changed little in 2008 compared with those in 2005. However, from 2000 to 2008, Viet Nam steadily lost its strong comparative advantage in mineral fuels and lubricants, but improved it in miscellaneous manufactured articles. This is consistent with the rapid expansion of Viet Nam's manufacturing industry in recent years supported by the country's relatively low labour cost.

2.2.4 RCA indices of ASEAN countries from 2000 to 2013

Since 2009, Cambodia has lost its comparative advantage in crude materials. In 2013, the Philippines's comparative advantage in food, live animals, animal and vegetable oils, and fats and waxes strengthened somewhat, compared with 2008. Viet Nam's comparative advantage in mineral fuels weakened significantly in 2010–2013 with its RCA index decreasing to 0.45, although its RCA index was around 2.7 in 2000. From 2000 to 2011, Indonesia's comparative advantage in manufacturing gradually declined despite a mild increase in 2012–2013. Malaysia retained its strong competitiveness in producing animal and vegetable oils, fats, and waxes. Malaysia and Singapore maintained their weak comparative advantage in mineral fuels and machinery and transport equipment. Thailand's RCA index changed little from 2000 to 2013, with the exception that the country became less competitive in producing miscellaneous manufactured articles.

2.3 The value added of exports

Given the increasing prevalence of global production networks and vertical FDI, an increasing number of countries are engaged, both directly and indirectly, in producing final products, with an increasing number of intermediate inputs being transported between countries. Therefore, it is value added that matters most, rather than gross value. In this section, we focus on export value added ratios of China and ASEAN countries. Most papers use input–output tables[5] to calculate export value-added ratios. Koopman and colleagues (2014) calculated the domestic value-added ratios of 41 countries at the industry level. These include Indonesia and China but exclude other ASEAN countries, as input–output data for these countries are lacking in the WIOD database. Therefore, we use the net export ratio as a proxy variable of the export value added ratio.

$$Value\ Added\ Ratio_{ct} = \frac{Export - Import}{Export}$$

We then divided ASEAN countries into three groups – the developed, less developed, and least developed – based on their economic strength, and calculated

Table 3.5 Revealed comparative advantage of ASEAN countries in 2008

2008	*SITC0*	*SITC1*	*SITC2*	*SITC3*	*SITC4*	*SITC5*	*SITC6*	*SITC7*	*SITC8*	*SITC9*
Cambodia	0.04	0.29	1.04	0.00	0.37	0.01	0.05	0.07	8.87	0.07
China	0.44	0.14	0.23	0.14	0.07	0.53	1.34	1.37	2.26	0.03
Indonesia	1.10	0.54	3.09	1.78	20.45	0.48	1.09	0.37	0.90	0.13
Malaysia	0.51	0.49	0.76	1.12	15.40	0.57	0.63	0.96	0.76	2.54
Philippines	0.91	0.65	0.70	0.20	3.93	0.22	0.59	1.95	0.80	0.18
Singapore	0.20	0.83	0.18	1.13	0.34	0.90	0.33	1.47	0.60	1.74
Thailand	2.40	0.38	1.51	0.39	0.68	0.75	0.91	1.23	1.01	0.42
Viet Nam	3.68	0.41	1.12	1.23	0.30	0.22	0.74	0.34	2.95	0.27

Notes: ASEAN only includes countries for which we can find data in the UN Comtrade Database. All SITC categories are based on *Standard International Trade Classification, Revision 3.*

Source: UN Comtrade Database.

Table 3.6 Revealed comparative advantage of ASEAN countries in 2013

2013	*SITC0*	*SITC1*	*SITC2*	*SITC3*	*SITC4*	*SITC5*	*SITC6*	*SITC7*	*SITC8*	*SITC9*
Brunei	0.02	0.02	0.03	5.96	0.00	0.07	0.06	0.03	0.04	0.03
Cambodia	0.62	0.47	0.70	0.00	0.35	0.02	0.12	0.22	7.40	0.01
China	0.42	0.15	0.16	0.09	0.05	0.50	1.33	1.41	2.32	0.02
Indonesia	0.99	0.70	2.63	1.94	20.25	0.56	0.98	0.36	0.83	0.22
Malaysia	0.51	0.68	0.67	1.38	13.68	0.61	0.76	1.14	0.82	0.14
Philippines	1.28	0.83	1.44	0.24	4.51	0.42	0.85	1.64	0.81	0.12
Singapore	0.23	1.13	0.17	1.07	0.13	1.13	0.31	1.39	0.76	1.84
Thailand	1.97	0.70	1.33	0.39	0.66	0.99	1.05	1.25	0.77	0.32
Viet Nam	2.28	0.51	0.89	0.45	0.36	0.27	0.85	0.98	2.50	0.10

Notes: ASEAN only includes countries for which we can find data in UN Comtrade Database. All SITC categories are based on *Standard International Trade Classification, Revision 3.*

Source: UN Comtrade Database.

their export value-added ratios. According to Figure 3.4, the value-added ratio of ASEAN declined dramatically from 2000 to 2013, even though China's value-added ratio has increased significantly in this period. Specifically, the value-added ratio of the developed group, namely Brunei and Singapore, has decreased remarkably in the period 2000–2013. Analogously, the value-added ratios of the less developed group, namely Indonesia, Malaysia, the Philippines, and Thailand, also decreased steadily from 2000 to 2013. Conversely, the value-added ratios of the least developed group, namely Cambodia, Lao PDR, Myanmar, and Viet Nam, were positive and rose significantly in this period, meaning that the growth rate of the nominal value of their exports was higher than that of their imports.

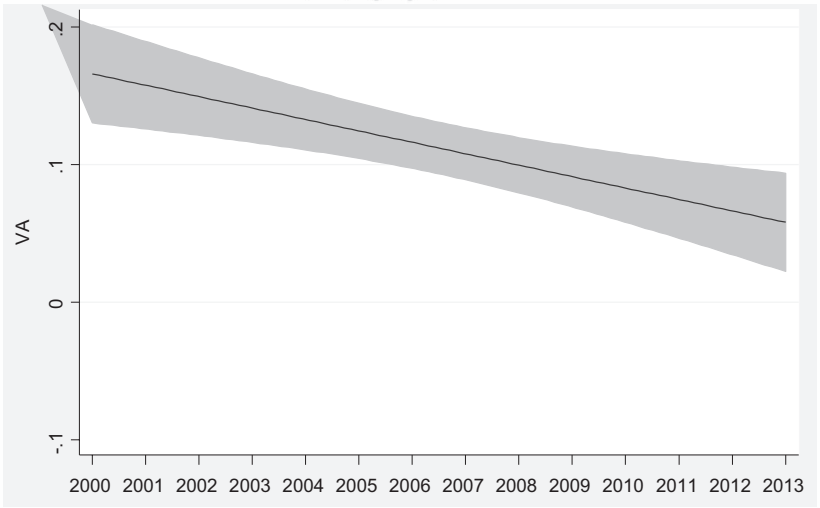
3. Estimation results

The literature states that both competition and complementarity effects of China's trade on ASEAN's trade exist, as these countries have similar cultural and export structures. Competition effects would tend to increase the threat of China's expansion into ASEAN countries. However, similar cultural backgrounds promote regional cooperation between China and ASEAN countries. In addition, China's economic growth has weakened since 2012, which may offer opportunities for Southeast Asia countries. We provide empirical evidence of the relationships between China and ASEAN, and distinguish between the competition and complementarity effects of Chinese expansion. The impact of China's trade on ASEAN countries should be heterogeneous among industries, as each country has its own comparative advantages.

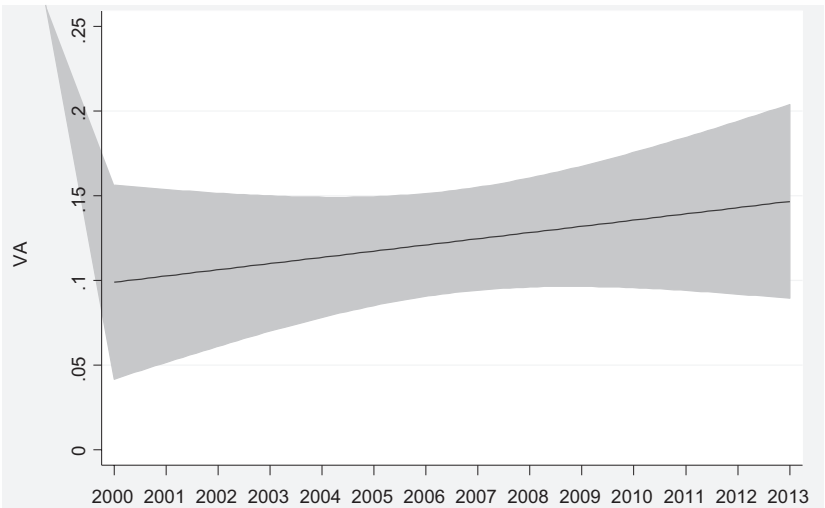
In view of this, we study the heterogeneous effect of China's trade on ASEAN countries empirically at the industry level in three respects. First, we study the influence of China's exports on ASEAN countries' exports, distinguishing China's exports to ASEAN from its exports to the rest of the world. Second, we study the impact of China's exports on ASEAN countries' export value-added ratios. Third, we study how ASEAN countries might seize the opportunity and improve the value-added ratios of their exports and trade competitiveness using a gravity model.

3.1 The impact of China's exports on ASEAN's exports

To separate the competition effect of China's exports from the complementarity effect, we consider two indicators: China's exports to ASEAN countries, and China's exports to the rest of the world. If ASEAN countries import from China, they can choose more intermediate inputs and learn from the technology embedded in the imported goods, which should help them to improve their own productivity and the quality of their finished goods. In this case, China's exports to ASEAN will promote ASEAN's exports. We call this the complementarity effect, reflecting the complementarity between China's and ASEAN's exports. Conversely, ASEAN competes with China in the world market, such



(a) ASEAN



(b) China

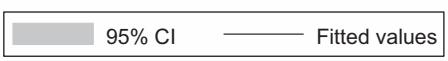


Figure 3.4 Value-added ratios of ASEAN and China from 2000 to 2011

Notes: In the UN Comtrade Database, there are not data for Lao PDR and Myanmar in the period 2000–2013, with the exception of data for Myanmar in 2010. In addition, exports within ASEAN countries are excluded when calculating the value-added ratio of ASEAN.

Source: UN Comtrade Database.

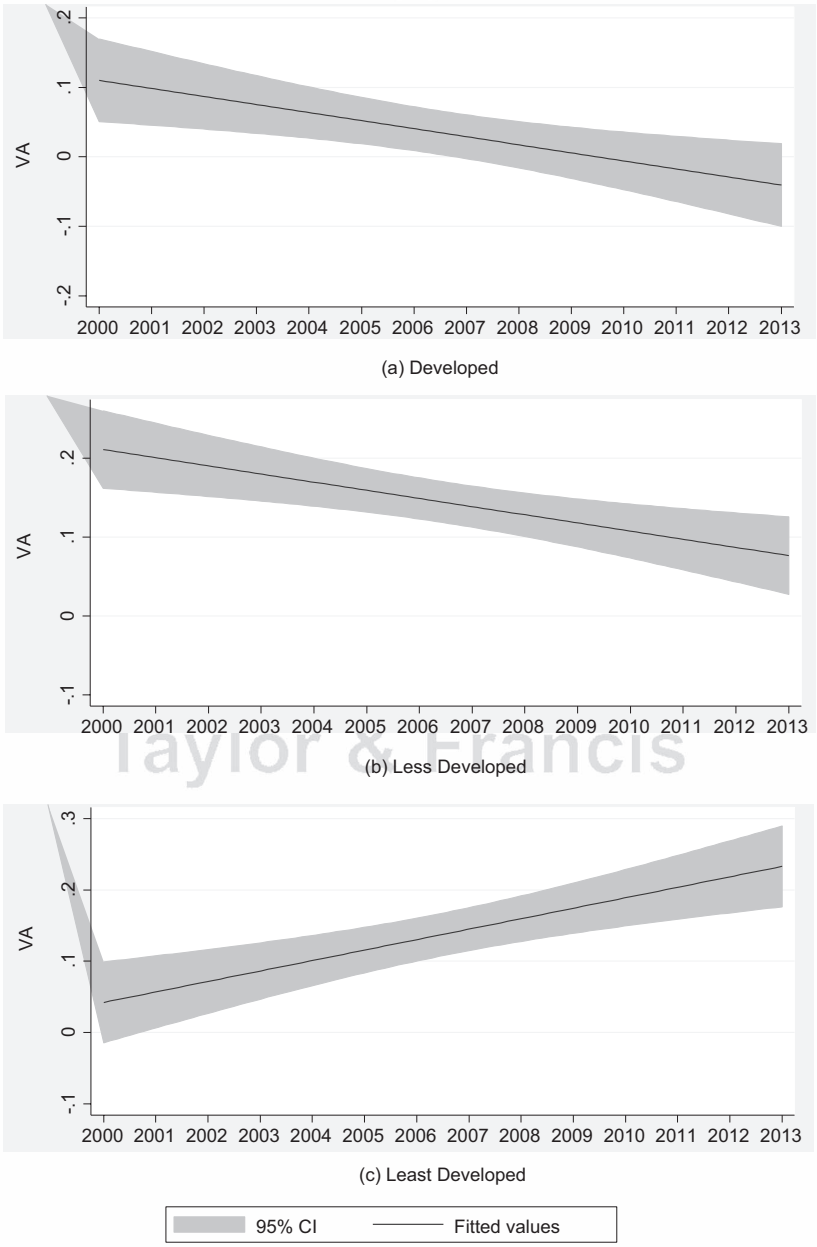


Figure 3.5 Value-added ratios of ASEAN countries from 2000 to 2011

Notes: We divide ASEAN countries into three groups according to their economic power. The developed ASEAN countries include Brunei Darussalam and Singapore. The less developed ASEAN countries include Indonesia, Malaysia, the Philippines, and Thailand. The least developed ASEAN countries include Cambodia, Lao PDR, Myanmar, and Viet Nam. However, in the UN Comtrade Database, there are not data for Lao PDR and Myanmar in the period 2000–2013. In addition, exports within each group are excluded when calculating the value-added ratios.

Source: UN Comtrade Database.

that an increase in China's exports to the rest of the world could crowd out exports from ASEAN countries. We call this the substitution or competition effect, reflecting the direct competition between China and ASEAN countries in the global marketplace.

3.1.1 Empirical specification

To distinguish the complementarity effect from the substitution/competition effect, we make use of the following empirical framework:

$$\ln(EX_{kct}) = \beta_1 \ln(CEX\_ASEAN_{kct}) + \beta_2 \ln(CEX\_ROW_{kt}) + \beta_3 X_{kct} + \alpha_k + \gamma_c + \epsilon_t + \omega_{kct} \quad (1)$$

where $\ln(\cdot)$ means taking the logarithm of the variable in parentheses. EX_{kct} represents the total exports of sector k in ASEAN country c at time t. CEX_ASEAN_{kct} is the exports of China's sector k to ASEAN country c at time t. CEX_ROW_{kt} is the exports of China's sector k to the rest of the world at time t. X_{kct} are covariates, such as the simple average tariff of country c and the exchange rate. α_k, γ_c, and ϵ_t represent the sector-, country-, and year-specific fixed effects, respectively. ω_{kct} represents the heterogeneous shock. β_1 reflects the complementarity effect of China's exports on ASEAN exports, so its estimator should be positive. Conversely, β_2 reflects the substitution/competition effect of China's exports on ASEAN's export, so its estimator should be negative.

3.1.2 Baseline results

In Table 3.7, four regression specifications are considered. All the regressions in Table 3.7 control for year-specific fixed effects. However, only the regressions in columns (2) and (4) control for country- and sector-specific fixed effects. The estimations in columns (3) and (4) consider other variables, including the simple average tariff and the exchange rate of ASEAN countries' currencies against the US dollar. As shown in column (1), an increase in China's exports to ASEAN leads to an increase in ASEAN countries' exports to the rest of the world, consistent with the complimentary effect. However, an increase in China's exports to the rest of the world results in a decrease in ASEAN countries' exports, proving the substitution/competition effect. In addition, the coefficients of year dummies in column (1) are significantly positive and increase steadily, which is consistent with the gradual increase of ASEAN's exports.

After controlling for country- and industry-specific fixed effects in column (2), the coefficient of the logarithm of China's exports to ASEAN decreases significantly by 68.4 per cent. However, the magnitude of the estimator of β_2 increases slightly. Compared with column (1), the regression in column (3) controls for the effect of simple average tariffs and exchange rates. The magnitudes of the two key regression coefficients both descend slightly. The regression in column (4) considers all these factors. Compared with column (2), the complementarity effect weakens slightly,

Table 3.7 The impact of China's exports on ASEAN's exports

Dependent variable: $ln(EX_{kt}^{c})$	*(1)*	*(2)*	*(3)*	*(4)*
ln(China's exports to ASEAN)	0.788***	0.249***	0.686***	0.217**
	(0.059)	(0.072)	(0.068)	(0.090)
ln(China's exports to the rest of the world)	–0.335***	–0.427*	–0.215***	–0.450*
	(0.065)	(0.234)	(0.073)	(0.273)
Tariff simple average			–0.128***	–0.043
			(0.024)	(0.060)
National currency/US$			0.000	0.000
			(0.000)	(0.000)
Constant	14.62***	25.75***	15.380***	26.895***
	(0.813)	(5.027)	(0.886)	(6.109)
Year-specific fixed effect	Yes	Yes	Yes	Yes
Country-specific fixed effect	No	Yes	No	Yes
Industry-specific fixed effect	No	Yes	No	Yes
Adjusted R^2	0.456	0.750	0.502	0.747
Observations	877	877	664	664

Notes: EX_{kt}^{c} represents the total export of sector k in country c in year t; All standard errors of linear regressions in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: UN Comtrade and CEIC Database.

but the substitution/competition effect strengthens. Both of the two coefficients are statistically significant. Specifically, a 1 per cent increase in China's exports to ASEAN countries leads to ASEAN countries' exports increasing by 0.22 per cent on average. Meanwhile, a 1 per cent increase in China's exports to the rest of the world crowds out 0.45 per cent of ASEAN countries' exports.

3.2 The impact of China's exports on ASEAN's value added of exports

3.2.1 Empirical specification

To continue studying the effect of China's exports on ASEAN countries' value added of exports, the following specification is considered:

$$\ln(EX_{kct}) = \theta_1 \ln(CEX\_ASEAN_{kct}) + \theta_2 \ln(CEX\_ROW_{kt}) + \theta_3 X_{kct} + \alpha_k + \gamma_c + \epsilon_t + \omega_{kct} \quad (2)$$

where VA_{kct} is the export value-added ratio of industry k in ASEAN country c in year t. The definitions of other variables are the same as those in equation (1).

Given their participation in global supply chains, an increase in exports from China to ASEAN will promote exports from ASEAN countries. However, the impact of an increase in exports from China to ASEAN on the export value-added ratios of ASEAN countries should be the opposite. The value added of exporters who are responsible for one or several production stages should be lower than those controlling the whole production process. Therefore, if ASEAN countries import more materials, especially intermediate inputs, from China, their value-added ratios should be lower on average. So we would expect the sign of θ_1 to be negative. China has a strong comparative advantage in labour-intensive industries, so it should be able to export more goods at lower prices. Only the exporters with higher productivity efficiency and value added can compete with China in the world market, and firms with lower productivity and value added will be forced to exit over time. So in contrast to β_2, θ_2 would be expected to be positive.

3.2.2 Baseline results

Similar to Table 3.7, four regression specifications are considered in Table 3.8. The regression in column (1) only considers year-specific fixed effects, finding that the coefficient of the logarithm of China's exports to ASEAN countries is significantly negative, and that the estimator of θ_2 is significantly positive. When controlling for the country- and sector-specific fixed effects in column (2) and considering other covariates in column (3), the results are consistent with those in column (1), except that the magnitudes of these two coefficients increase significantly. The regression in column (4) considers all these factors. In column (4), an increase in exports from China to ASEAN countries would lead to a significant decrease in ASEAN countries' export value-added ratios. Conversely, China's exports to the rest of the world are significantly and negatively correlated with ASEAN countries' export value-added ratios.

It is worth mentioning that the value-added ratios in these estimations could be lower than 0 and larger than 1, as we use the net export ratio as a proxy for the export value-added ratio. Therefore, it is reasonable that the coefficients of the two key variables – China's exports to ASEAN countries and China's exports to the rest of the world – are much larger than 1. However, the magnitudes are less important than the signs in our study. It would require additional data and deepening studies to calculate the true export value-added ratios of ASEAN countries, given that input–output tables do not exist for all ASEAN countries for the period 2000–2011.

3.3 How to improve the value added of ASEAN's exports?

Based on the literature and the empirical analysis as cited earlier, there exist both complementarity and substitution/competition effects from China's exports on ASEAN's exports and value added. China's economic growth rate has been slowing since 2012, creating challenges but also offering opportunities to ASEAN

Table 3.8 China's exports and ASEAN's value added

Dependent variable: VA_{kt}^{c}	*(1)*	*(2)*	*(3)*	*(4)*
ln(China's exports to ASEAN)	−8.130**	−14.22**	−12.42**	−19.94**
	(3.838)	(6.910)	(5.558)	(9.408)
ln(China's exports to the rest of the world)	5.940	30.12**	9.636*	37.48*
	(3.698)	(14.99)	(5.276)	(19.25)
Tariff simple average			−2.799**	−4.766
			(1.198)	(3.548)
National currency/US$			0.001**	−0.010
			(0.001)	(0.009)
Constant	8.768	−444.1*	33.00	−296.0
	(30.02)	(245.3)	(34.11)	(234.3)
Year-specific fixed effect	Yes	Yes	Yes	Yes
Country-specific fixed effect	No	Yes	No	Yes
Industry-specific fixed effect	No	Yes	No	Yes
Adjusted R^2	0.028	0.061	0.048	0.071
Observations	876	876	664	664

Notes: VA_{kt}^{c} is the gross value-added ratio in export of sector k in country c in year t. All standard errors of linear regressions in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: UN Comtrade and CEIC Database.

countries. In view of this, we need to ask how Southeast Asian countries can best use these opportunities to improve their trade competitiveness. With country-level data from the CEIC database,[6] we study this question using a gravity model,[7] which helps to explain international trade flows (Feenstra et al. 2001). Using the gravity model, we add the GDPs of each ASEAN country and global GDP, excluding China's exports to the rest of the world, to the regressions. To study how ASEAN countries can improve their trade competitiveness, we control for manufacturing labour productivity and the logarithm of the labour force.

Four empirical specifications are considered in Table 3.9. All regressions control the year-specific fixed effects, but only regressions (2) and (4) consider the country-specific fixed effects. In addition, regressions in columns (1) and (2) focus on the impact of manufacturing labour productivity on exports. But regressions in columns (3) and (4) study its influence on the value added of exports. As shown in columns (1) and (2), the coefficient of the logarithm of China's exports to ASEAN is similar to that in Table 3.7. The coefficient of the logarithm of China's exports to the rest of the world is still negative but insignificant. According to regressions in columns (3) and (4), the impact of China's exports to ASEAN on ASEAN's value-added ratio of exports is still negative, but its magnitude is

Table 3.9 Export value, value-added ratio, and labour productivity

Dependent variable	$ln(EX_{kt}^{c})$		VA_{kt}^{c}	
	(1)	*(2)*	*(3)*	*(4)*
ln(China's exports to ASEAN)	0.412***	0.305***	–0.183***	–0.095
	(0.021)	(0.075)	(0.024)	(0.066)
ln(China's exports to the rest of the world)	–0.647	–0.969	1.615	1.553
	(1.439)	(0.925)	(1.364)	(1.246)
ln(GDP)	0.178	0.066	–0.308*	–0.035
	(0.125)	(0.229)	(0.180)	(0.279)
ln(World GDP–China's exports to the rest of the world)	0.971	0.984	–4.128	–4.149
	(3.928)	(2.564)	(3.708)	(3.240)
ln(Manufacturing labour productivity)	0.600***	0.900***	0.535***	0.062
	(0.097)	(0.164)	(0.140)	(0.200)
ln(Labour force)	0.248**	3.400***	0.429***	0.553
	(0.096)	(0.553)	(0.142)	(0.798)
Constant	–11.60	–62.40*	45.52	43.48
	(50.10)	(33.81)	(47.40)	(49.64)
Year-specific fixed effect	Yes	Yes	Yes	Yes
Country-specific fixed effect	No	Yes	No	Yes
Adjusted R^2	0.990	0.996	0.648	0.874
Observations	112	112	112	112

Notes: All standard errors in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: CEIC database.

much smaller. In addition, the coefficient of the logarithm of China's exports to the rest world is not statistically significant.

Consistent with the gravity model, the coefficient of the logarithm of GDP is positive in columns (1) and (2), but negative in columns (3) and (4). None of the coefficients of the logarithm of world GDP excluding China's exports to the rest of the world are significant. When controlling for the labour force, the coefficients of the logarithm of manufacturing labour productivity in the four regressions are all positive. Specifically, a 1 per cent increase in ASEAN countries' manufacturing labour productivity will lead to a 0.3 per cent increase of their exports. However, the coefficient of the logarithm of manufacturing labour productivity is insignificant when controlling country-specific fixed effect in column (4). The coefficients of the logarithm of the labour force are also positive. In summary, ASEAN countries could improve their exports and the value added of their exports by improving their labour productivity, especially manufacturing labour productivity.

3.4 How to improve ASEAN's labour productivity?

If ASEAN countries can increase their exports and the value added of their exports by increasing their manufacturing labour productivity, we need to ask how ASEAN countries can improve their labour productivity. There are two possible approaches – trade liberalization and internal improvement. Trade liberalization, such as tariff reductions and free trade agreements, forces domestic firms to face tougher competition from imports. Only firms with high levels of productivity will survive the increased competition, whereas firms with low productivity will be forced to exit over time. As a result of these low-productivity firms' exits, the average productivity of domestic firms will increase and their trade competitiveness will also improve. The other approach is internal improvement, whereby ASEAN countries improve their trade competitiveness through their own efforts, including increasing investment in R&D, and the hiring or training of more highly skilled labour.

In Table 3.10, we use a simple average tariff and urban population[8] to identify these two channels. All the regressions in Table 3.10 control for year- and country-specific fixed effects. Regressions in columns (1) and (2) study the effect of trade liberalization. The regression in column (1) controls for the simple average tariff and finds that a decrease in tariffs will lead to an increase of ASEAN countries' export value-added ratios. However, the estimator is not statistically significant. Compared with column (1), the regression in column (2) controls for the interaction of tariffs and manufacturing labour productivity. However, the coefficient of the interaction term is not consistent with expectation, and its magnitude is quite small.

Regressions in columns (3) and (4) focus on the internal improvement channel. The regression in column (3) controls for the logarithm of urban population, which has a significantly positive effect on ASEAN countries' value added of exports. Furthermore, the regression in column (4) brings in the interaction of manufacturing labour productivity and urban population. The coefficient of the interaction is positive, but not significant. In addition, the coefficient of the logarithm of labour force is both statistically and economically significant. However, the coefficient of the logarithm of manufacturing labour productivity turns negative but insignificant.

4. Robustness checks

4.1 Revealed comparative advantage

In studying the effect of China's exports on ASEAN countries' revealed comparative advantage we consider four specifications in Table 3.11. As in Tables 3.7 and 3.8, only regressions in columns (2) and (4) control for the sector- and country-specific fixed effects. Furthermore, only regressions in columns (3) and (4) consider other variables, including the sample average tariff and the exchange rate of the domestic currency against the US dollar. The industry-level data provide the

Table 3.10 Tariff, urban population, and labour productivity

Dependent variable: VA_{kt}^{c}	*(1)*	*(2)*	*(3)*	*(4)*
ln(China's exports to ASEAN)	−0.016	−0.052	−0.130**	−0.121**
	(0.076)	(0.077)	(0.058)	(0.055)
ln(China's exports to the rest of the world)	1.091	1.291	1.454	1.499
	(0.996)	(1.037)	(1.091)	(1.105)
ln(GDP)	−0.182	−0.100	−0.196	−0.161
	(0.234)	(0.240)	(0.232)	(0.239)
ln(World GDP–China's exports to the rest of the world)	−3.115	−3.892	−3.646	−3.977
	(2.739)	(2.867)	(2.962)	(3.074)
ln(Manufacturing labour productivity)	0.086	0.074	−0.069	−0.053
	(0.200)	(0.206)	(0.141)	(0.147)
ln(Labour force)	0.259	0.658		
	(0.804)	0.954		
Tariff simple average	−0.001	−0.007		
	(0.013)	(0.015)		
ln(Manufacturing labour productivity) × Tariff simple average		0.00002*		
		(0.000)		
ln (Urban population)			1.132***	1.218***
			(0.408)	(0.442)
ln(Manufacturing labour productivity) × ln (Urban population)				0.000002
				(0.000)
Constant	37.37	40.86	29.32	32.54
	(41.88)	(43.72)	(38.60)	(39.73)
Year-specific fixed effect	Yes	Yes	Yes	Yes
Country-specific fixed effect	Yes	Yes	Yes	Yes
Adjusted R^2	0.923	0.926	0.882	0.885
Observations	82	82	112	112

Notes: All standard errors in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: CEIC database.

comparative advantage index and China's exports are used in the regressions. In addition, we control for the relative export scale of an industry, which is equal to the ratio between the sector and total exports.[9]

Similar to the impact of China's exports on ASEAN countries' exports, an increase in exports from China to ASEAN will improve ASEAN's exports and RCA. Meanwhile, China's expansion into the world market will tend to crowd

Table 3.11 China's exports and ASEAN's revealed comparative advantage

Dependent variable: RCA_{kt}^{c}	*(1)*	*(2)*	*(3)*	*(4)*
ln(China's exports to ASEAN)	0.033	0.161	0.018	0.082
	(0.054)	(0.101)	(0.078)	(0.124)
ln(China's exports to the rest of the world)	–0.330***	–0.207	–0.230	–0.277
	(0.125)	(0.403)	(0.475)	(0.461)
Relative sector size	1.549*	–6.582	–9.333	–9.620
	0.910	(4.798)	(6.076)	(6.200)
Tariff simple average			–0.013	0.028
			(0.023)	(0.094)
National currency/US$			0.001**	–0.000
			(0.000)	(0.000)
Constant	7.956***	3.062	6.530	6.837
	(2.140)	(9.180)	(11.96)	(12.12)
Year-specific fixed effect	Yes	Yes	Yes	Yes
Industry-specific fixed effect	No	Yes	Yes	Yes
Country-specific fixed effect	No	Yes	No	Yes
Adjusted R^2	0.03	0.274	0.241	0.284
Observations	877	877	664	664

Notes: RCA_{kt}^{c} is the revealed comparative advantage of sector k in country c in time t. Relative sector size is equal to the ratio of $\sum_{k} EX_{kt}^{c} / \sum_{c}\sum_{k} EX_{kt}^{c}$. All standard errors of linear regressions in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: UN Comtrade and CEIC Database.

out ASEAN's exports and ASEAN's RCA index will also decrease. As shown in Table 3.11, the coefficient of the logarithm of China's exports to ASEAN countries is positive, albeit statistically insignificant. In addition, the coefficient of the logarithm of China's exports to the rest of the world is negative, and also insignificant.

4.2 The trade data at the SITC two-digit industry level

Overall, ASEAN countries have relatively strong comparative advantages in animal and vegetable oils, fats, and waxes. However, China has a relatively strong comparative advantage in the manufacture industry. In this section, we only use trade data for the animal and vegetable oils, fats, and waxes industry, the machinery and transport equipment industry, and the miscellaneous manufactured

articles industry to test the robustness of the complementarity and substitution/competition effects. All trade data are at the SITC two-digit level. We study the influence of China's exports to ASEAN and to the rest of the world on ASEAN countries' exports, the value added of exports, and RCA.

All regressions in Table 3.12 consider the year-, industry- and country-specific fixed effects. According to columns (1) and (3) in Table 3.12, SITC two-digit trade data confirm the complementarity effect. The coefficients of exports from China to ASEAN in columns (1) and (3) are strongly positive. However, there is no clear evidence of a competition effect in Table 3.12, as the coefficient of the logarithm of China's exports to the rest of the world is positive and insignificant in column (1). In addition, the effects of trade liberalization and exchange rates on exports in column (1) are all consistent with expectations. However, all coefficients in regression (2) are insignificant. One possible reason for this may be that the net export ratio is not a good proxy of the export value-added ratio. Therefore, we consider other measures of the export value-added ratio in the following robustness checks.

Table 3.12 The impact of China's trade on ASEAN's trade with trade data at the SITC two-digit level

Dependent variable	*(1)*	*(2)*	*(3)*
	$ln(EX_{kt}^{c})$	VA_{kt}^{c}	RCA_{kt}^{c}
ln(China's exports to ASEAN)	0.179***	96.16	0.298***
	(0.047)	(158.8)	(0.095)
ln(China's exports to the rest of the world)	0.022	–855.1	–0.520
	(0.189)	(708.9)	(0.437)
Tariff simple average	–0.087*	–143.6	0.016
	(0.046)	(114.0)	(0.092)
National currency/US$	0.0002*	–0.169	–0.00004
	(0.0001)	(0.135)	(0.0002)
Constant	9.155**	17050	6.092
	(3.647)	(12454)	(8.478)
Year-specific fixed effect	Yes	Yes	Yes
Country-specific fixed effect	Yes	Yes	Yes
Industry-specific fixed effect	Yes	Yes	Yes
Adjusted R^2	0.790	0.045	0.271
Observations	1315	1314	1315

Notes: All standard errors of linear regressions in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: UN Comtrade and CEIC Database.

4.3 Another measure of the export value-added ratio

Normal export firms may use imported intermediate inputs in the production of goods sold onto the domestic market. Therefore, the net export ratio may not be a good proxy variable of the export value-added ratio. In this section, we use the domestic value-added ratio as calculated by Wang and colleagues (2013) and Koopman and colleagues (2014) to study the impact of China's trade on ASEAN's trade. Based on the world input–output database (WIOD), Wang and colleagues (2013) estimate the domestic value-added ratios for 35 sectors across 39 countries, excluding ASEAN countries, with the exception of Indonesia. Due to different classification methods, we cannot merge these data with the trade data from the UN Comtrade database. Therefore, we use the export data from

Table 3.13 Another measure of the export value-added ratio

Dependent variable	*(1)*	*(2)*	*(3)*
	$ln(EX_{kt}^{c})$	VA_{kt}^{c}	
ln(China's exports to Indonesia)	0.019	−0.004*	−0.004**
	(0.041)	(0.002)	(0.002)
ln(China's exports to the rest of the world)	0.434***	−0.011	−0.012
	(0.165)	(0.012)	(0.012)
Tariff simple average	−0.304**	−0.023	
	(0.127)	(0.015)	
National currency/ US$	−0.0004	0.00002	
	(0.0003)	(0.00003)	
ln(GDP)			−1.221***
			(0.242)
ln(World GDP– China's exports to the rest of the world)			−0.774**
			(0.324)
ln(Manufacturing labour productivity)			2.005***
			(0.443)
Constant	10.48**	1.112**	44.34***
	(5.221)	(0.467)	(12.06)
Year-specific fixed effect	Yes	Yes	Yes
Industry-specific fixed effect	Yes	Yes	Yes
Adjusted	0.947	0.920	0.923
Observations	303	303	331

Notes: All standard errors of linear regressions in the brackets are heterogeneous robust. *, **, *** represent 10 per cent, 5 per cent, 1 per cent significance, respectively.

Source: Data of exports are from the world input–output database. Data of value-added come from Wang and colleagues (2013), and other data are from CEIC.

the WIOD, estimated data from Wang and colleagues (2013), and the country-level data from CEIC to study the impact of China's trade.

All regressions in Table 3.13 control for the year- and industry-specific fixed effects. The regression in column (1) focuses on the impact of China's exports on Indonesia's exports. According to column (1), the coefficient of the logarithm of China's exports to Indonesia is still positive, albeit insignificant. In addition, the coefficient of the logarithm of China's exports to the rest of the world is strongly positive. This may be because China's exports to the rest of the world include those to other ASEAN countries, which would promote Indonesia's exports.

Regressions in columns (2) and (3) study the effect of China's trade on Indonesia's value added of exports. The coefficients of China's exports to Indonesia in these two regressions are strongly negative, showing that the export value-added ratio would decrease the more Indonesia imports from China. However, all other coefficients in column (2) are insignificant. The regression in column (3) studies the impact of China's exports under a gravity model. Compared with regressions in Table 3.9, all coefficients are consistent, except the coefficient of the logarithm of China's exports to the rest of the world. In addition, the impact of manufacturing labour productivity is strongly positive. When controlling for the logarithm of labour force, the main results are largely the same.

5. Concluding remarks

To study the impact of China's trade on ASEAN countries' trade, this chapter calculates the RCA indices and the export value-added ratios of ASEAN countries, and then uses trade data at the SITC one-digit level to study this impact empirically. Our research finds that both complementarity and substitution/competition effects exist. This means that, given global supply chains, an increase in exports from China to ASEAN will promote ASEAN countries' exports. However, China also competes with ASEAN countries on the world market. Therefore, an increase in China's exports to the rest of the world will tend to crowd out ASEAN countries' own exports. However, the research on the impact of China's exports on ASEAN countries' export value-added ratio indicates the opposite effect. The average export value-added ratio of an industry in ASEAN countries is lower the more these countries import from China. Meanwhile, China's increasing exports to the world market will promote the improvement of ASEAN countries' export value-added ratios.

Furthermore, we study how ASEAN countries can improve their value-added ratio of exports and trade competitiveness under a gravity model. ASEAN countries can increase exports and value added by increasing their manufacturing labour productivity. In addition, trade liberalization and internal improvements will help ASEAN countries to improve their labour productivity. We study the impact of China's exports on ASEAN countries' RCA using trade data at the SITC two-digit level and another measure of the export value-added ratio to test the robustness of the baseline results. The results show that our conclusions are robust. However, considerable research remains to be undertaken, especially in calculating the true value added of exports.

Notes

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2 We obtain country-level trade data through summing up industry-level data, which should be the same as those from the CEIC database. In fact, CEIC collects these data from the IMF.

3 In fact, data of services trade at the industry level seem to be unavailable.

4 Commodity names of SITC 0–9: 0 — Food and live animals; 1 — Beverages and tobacco; 2 — Crude materials, inedible, except fuels; 3 — Mineral fuels, lubricants and related materials; 4 — Animal and vegetable oils, fats, and waxes; 5 — Chemicals and related products, n.e.s.; 6 — Manufactured goods classified chiefly by material; 7 — Machinery and transport equipment; 8 — Miscellaneous manufactured articles; 9 — Commodities and transactions not classified elsewhere in the SITC. More details about the SITC can be found on its website.

5 More details can be found in Koopman and colleagues (2014).

6 There is a lack of industry-level data about industrial characteristics.

7 We could also study the heterogeneous impact of China's exports under a gravity model. However, this would not affect the main results, as GDP and distance can be controlled for by the year- and country-specific fixed effects.

8 We use urban population as a proxy variable for the size of skilled labour, as we cannot find data for the true size of skilled labour for most ASEAN countries.

9 While we do not control for the relative size in these regressions, this would not affect the main results, as it can be controlled for in the year- and country-specific fixed effects.

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