CHAPTER 1

Introduction

The main losers in today’s very unequal world are not those who are too much exposed to globalization. They are those who have been left out.

Kofi Annan

Former secretary general of the United Nations, 2000

Adopting a value chain perspective, this thesis investigates the effects of China’s exports on three variables that are related to income. First, the import content of China’s exports and what determines the changes therein.¹ Second, the amount of national income that is exported (i.e. embodied in foreign final consumption). Third, China’s regional GDP and regional income inequality. In doing so, I take full consideration of three typical features of China’s exports. These are: (a) the large scale of processing exports; (b) the important role of Foreign Invested Enterprises (FIEs) in exports; and (c) the unevenly distributed export activities across China’s regions. These characteristics seriously influence the income effect of China’s exports and its dynamics. This thesis therefore takes them into full account. The outline of the research reported in Chapters 2 – 4 is given in Section 1.3. Before that, however, Section 1.1 briefly sketches the research setting. That is, it introduces the general patterns in global trade and the role of China in particular. Section 1.2 then describes the three typical characteristics of China’s exports (a - c) in more detail.

1.1 The global trade pattern and the role of China

Figure 1.1 shows the increase in the world average ratio of exports (for goods and services) to GDP since 1971. The value was only 0.14 in 1971, which increased to 0.26

¹ The import content of the exports is related to income because its counterpart is the amount of domestic value added that is embodied in the exports.
in 2000, rose further to 0.31 in 2008, after which it declined to 0.29 in 2015. In the period of 45 years, we see that the growth rate of the exports (given by the dashed line) is negative only twice. In 1975 due to the oil crisis and in 2009 due to the financial crisis, which sent many countries into a recession and led to a substantial fall in international trade (Sturgeon and Memedovic, 2010).

The exports-to-GDP ratio rebounded to the level before the crisis by 2011, but started to decrease again along with the overall weakness in global economic activity in the last few years (Timmer et al., 2016).

Figure 1.1 The trade of goods and services in the world economy

![Graph showing trade of goods and services in the world economy](image)

Notes: The data are from the World Development Indicators (World Bank, 2019). In some years (e.g., 1978, 1982, 1983, 1985, 1986, 1991, 1993, and 2001) the exports-to-GDP ratio fell whereas the exports showed positive growth. This is because GDP grew more than the exports.

What cannot be seen in Figure 1.1 is that the globalization in recent decades is quite different from earlier globalization. This is because of the fragmentation where production processes became sliced up into many stages. These stages were often located in different countries or regions instead of in a single region and intermediates crossed several national boundaries before ending up in the final product (Hummels et al, 2001). This development has become known as “the second wave of unbundling” or the “global value chain (GVC) revolution” (Baldwin and Lopez-Gonzalez, 2015). Under this new way of trade, the rich-nation firms relocated part of the production to lower-cost developing countries, which opened a new industrialization path for these developing countries. According to Baldwin (2011, p. 2): “in less than a decade, joining
a supply chain transmuted several East Asian industries from uncompetitive, tariff-
sheltered relics into world-class exporters”. This arose the question how international 
trade contributed to the economic development of developing countries in a world 
characterized by GVCs. In this respect, China is an ideal object of study given its 
emergence as the “World’s Factory” after entering the WTO and its growing importance 
in the world economy.

Figure 1.2 sketches the development of China’s trade from 1995 onwards. It shows 
the country’s integration into the global trading system. Following China’s 2001 WTO 
accession, its international trade has boomed. In nominal terms, the export volume 
increased by a factor 10 between 2000 and 2018. This outpaced the three-fold expansion 
of overall global trade during this period. As a result, the share of China’s merchandise 
exports in the global trade rose from 2.9% in 1995 to 12.7% in 2018, as shown in Figure 
1.2.

Figure 1.2 China’s role in world GDP and trade (unit: %)

![Chart showing China's role in world GDP and trade](chart.png)

Note: The data are from the World Development Indicators (World Bank, 2019)

Figure 1.3 zooms in on five broader industries: “Food, textile, and wood”; “Paper”; 
“Chemical products”; “Metal products and nonmetallic mineral products”; and 
“Machinery and equipment”.¹ The figure depicts China’s export shares in the world

¹ The five-industry classification for manufacturing is an aggregation of the industries in the WIOD 2016 release. 
In particular: “Food, textile and wood” includes C10-C12, C13-C15, and C16; “Paper” is an aggregate industry of 
C17 and C18; “Chemical products” includes C19-C22; “Metal products and nonmetallic mineral products” includes 
C23-C25; and “Machinery and equipment” is an aggregate industry of C26-C30.
trade by industry from 2000 to 2014. It shows the increased roles of China in the world exports of all five industries. China’s increased importance in the exports of “Machinery and equipment” is remarkable, with the export share rising from 3.4% in 2000 to 19.2% in 2014.

**Figure 1.3 The share of China’s exports in world trade by industry (unit: %)**

![Graph showing the share of China’s exports in world trade by industry from 2000 to 2014.](image)

Note: Author’s calculation based on WIOD data (Timmer et al., 2016).

Not only the sizes of the export volumes have grown enormously, China’s export composition has also undergone substantial changes. Figure 1.4 shows the export shares of the five industries in China’s total merchandise exports in 2000 and 2014. It is observed that China’s export composition significantly changed from labor intensive industries (*Food, textile, and wood*) towards high-tech industries (*Machinery and equipment*). The developments summarized in Figure 1.3 (changes in export volumes) and Figure 1.4 (changes in export composition) raise the questions how China’s exports contributed to its economic development and how this contribution changed over time?
This thesis aims to answer these questions and investigates the income effects of China’s exports and the dynamics in these effects. More specifically, using a value chain perspective, this thesis studies the export effects on three variables that are related to income. The relationship between exports and economic growth has been examined thoroughly in the literature (Lewer and Van den Berg, 2003). However, there are two shortcomings.

First, most existing studies ignore the indirect effects of exports on income. These indirect effects are due to the production linkages between industries which exist because the production in each industry requires intermediate inputs from upstream industries. A positive demand shock for final products will therefore propagate upstream and affect the production in industries that have to meet the demand for extra intermediate inputs. Consequently, value added (and thus GDP, which equals the sum of values added in all industries) will be affected and the effects will be different across industries. For instance, as shown in Chinese official input-output table in 2012 (NBS, 2015), production in the textiles industry uses more intermediate inputs from the chemistry industry than does production in the agricultural industry. As a consequence, a positive shock in foreign demand (i.e. exports) for textiles will increase—through the production linkages of the input-output model—the value added of the chemistry industry more than an equal shock in the agriculture industry.
This example also shows the second shortcoming. That is, not only a change in the export volume but also a change in the composition of the exports bundle will cause changes in GDP and the composition of the industry contributions. Most macroeconomic studies that investigated the impact of exports on economic development, however, focused only on aggregate exports and ignored the composition of the exports. Adopting a value chain perspective, this thesis takes both shortcomings (i.e. indirect effects and composition effects) into full consideration.

1.2 The role of exports in China’s economy: stylized facts

With the booming of China’s exports, its economy has also experienced unprecedented growth with an average annual growth rate of 9.2% from 2000 to 2018. During the same period, world GDP grew only 2.8% per year. To illustrate the role of exports in China’s economy, Figure 1.5 gives China’s exports-to-GDP ratio from 1995 to 2018. It shows that the ratio has increased since 2001 and reached a peak of 0.36 in 2006. After that, the ratio has declined and eventually fell to 0.20 in 2018. The decline was gradual except for the years following the global financial crisis and may well be the result (at least partly) of China’s policy of stimulating domestic consumption and of increased foreign trade protectionism in recent years.

China’s international trade has several unique characteristics. Three of its most salient features are: the large amount of processing exports; the important role of FIEs in exports; and the uneven distribution of export activities across China’s regions.

First, China’s trade has been dominated by processing trade for years. As Figure 1.6 shows, China’s processing exports accounted for more than half of China’s total merchandise exports between 1996 and 2007. One of the key reasons why processing trade flourished in China is the country’s biased policy favoring this type of trade. For instance, materials imported into China are exempted from tariffs if they are used for processing trade. This policy leads to more imported inputs in the production of

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2 Both world and Chinese GDP growth rates are in real terms and are taken from the World Development Indicators (World Bank, 2019).

3 For example, in 2018 the U.S. enacted several waves of tariff increases on specific products and countries including China, Mexico, and some European countries. Meanwhile, non-tariff barriers (NTBs) have risen after the Global Financial Crisis in 2008 (WTO, 2012). China suffered from increased NTBs in other countries in recent years.
processing exports than in other types of production, such as the production of ordinary exports (Yang et al., 2015). As a consequence, an RMB of processing exports usually generate much less domestic value added (DVA) than an RMB of ordinary exports (Koopman et al, 2011; Chen et al., 2012; Ma et al., 2015; Kee and Tang, 2016).

**Figure 1.5 The ratio of exports (goods and services) to GDP, China**

![Graph showing the ratio of exports to GDP in China from 1995 to 2018.](image)

Note: The data are from the World Development Indicators (World Bank, 2019)

**Figure 1.6 Processing exports and FIEs’ exports as a share of China’s merchandise exports (unit: %)**

![Graph showing the share of processing exports and FIEs’ exports in China's merchandise exports from 1995 to 2017.](image)

Note: The data are from China’s National Bureau of Statistics (NBS: http://data.stats.gov.cn/english/).

However, after decades of rapid trade growth, the share of processing exports in China declined slowly but persistently in the last two decades. A likely cause is China’s policy change. Processing exports of several commodities groups was prohibited or
restricted, in order to steer China’s export structure away from “resource-dependent” products. Another possible reason was China’s rapidly rising labor costs since the mid-2000s. They increased the production costs of processing and assembly activities in China and forced foreign enterprises to move them partly outside China. Despite this decline, the share of processing exports in China was still up to 33.5% in 2017 (Figure 1.6). Because processing exports depend largely on imported products and embody relatively little DVA, the decreasing processing export share seriously impacted the overall DVA content of China’s exports.

Second, there is a strong link between China’s inward foreign direct investment (FDI) flows and exports. China is the largest recipient of FDI in the world since 2014. The inward FDI flows into China in 2016 totaled 133.7 billion US$, which constituted 7.7% of the world’s total FDI. These foreign investments are closely related to China’s export activities. The share of FIEs’ exports in China’s merchandise exports was 58.3% in 2005 (and slowly declined to 43.2% in 2017). The role of FIEs is especially remarkable in processing exports (their exports were 83.3% of China’s processing exports in 2017) (Figure 1.6). The reason to focus on FIEs (next to processing exports) is that the value added of FIEs contains profits, part of which the FIEs can repatriate. These profit flows then add to the national income (NI) in the home country. So, the profits are part of China’s DVA but not always of China’s NI. As a consequence, Chinese DVA contained in its exports is not a good proxy for NI contained in exports. Because the profit flows are based on ownership, NI effects of exports cannot be analyzed by looking at processing exports but require looking at FIEs. Figure 1.6 shows that the share of FIEs’ exports in merchandise exports declined since 2007.

The third remarkable feature of China’s exports is its very unbalanced distribution across domestic regions. The map in Figure 1.7 gives the exports per capita at the province level in 2018. It shows a large heterogeneity across provinces with the highest exports per person (7468 US$) in Shanghai and the lowest (55 US$) in Qinghai. Most of China’s exports are concentrated in coastal provinces, especially Guangdong, Jiangsu, and Zhejiang. In 2018, these three provinces were responsible for 58.4% of China’s total merchandise exports. The other coastal provinces accounted for 25.6%

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4 The data are from the United Nations Conference on Trade and Development (UNCTAD) database.
and the inland provinces only accounted for 16.0%. The processing exports are even more concentrated in a few provinces. In 2012, 60.2% of the processing exports were from Guangdong, Shandong, and Jiangsu, and only 12.1% from the inland provinces.

Figure 1.7 Export per capita in China at province level, 2018 (unit: US$/person)

Note: The data are from NBS (2019).

Figure 1.8 plots the GDP per capita against the ratios of exports to GDP at the province level in 2018. It suggests a positive correlation between exports and regional income. In particular, the coastal provinces are more actively participating in the globalization (reflected by larger export-to-GDP ratios) and have higher incomes than the inland provinces. This raises the question whether and how exports contributed to regional inequality, and whether processing exports and non-processing exports have exerted different effects on the regional disparity. China’s high regional inequality makes the questions even more significant (Xie and Zhou, 2014). The analysis in this

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5 The data are from NBS (2019). The other coastal provinces are Fujian (FJ), Guangxi (GX), Hebei (HB), Hainan (HN), Liaoning (LN), Shanghai (SH), Shandong (SD), and Tianjin (TJ). The inland provinces include Anhui (AH), Beijing (BJ), Chongqing (CQ), Gansu (GS), Guizhou (GZ), Henan (HA), Hubei (HB), Heilongjiang (HL), Hunan (HN), Inner Mongolia (IM), Jilin (JL), Jiangxi (JX), Ningxia (NX), Qinghai (QH), Sichuan (SC), Shaanxi (SN), Shanxi (SX), Xinjiang (XJ), Xizang (XZ), and Yunnan (YN). The letters in parentheses give the abbreviation for each province, which are used as province labels in Figure 1.8. The abbreviations for Guangdong, Jiangsu, and Zhejiang are respectively GD, JS, and ZJ.

6 The data are from China’s Customs.
thesis follows a value chain perspective. This allows us to take full consideration of the indirect income effects of the coastal exports on the inland regions, which occurs when the inland regions provide materials and components to the export production in the coastal regions.

**Figure 1.8 China’s regional exports and GDP per capita in 2018**

![Chart](image)

Note: The data (for exports, GDP and population) are from NBS (2019).

### 1.3 Outline of the thesis

This thesis aims to investigate the effects of exports in China’s economy by taking full consideration of the three typical characteristics of China’s international trade and their dynamics. In doing so, it attempts to contribute both methodologically and empirically.

Chapter 2 deals with Vertical Specialization (VS). With the falling trade and communication cost, production processes have been sliced up into many sequential stages often located in many countries with each country specializing in particular stages. This process is known as vertical specialization in trade as proposed by Hummels et al. (2001). Countries rely on imports of intermediate goods to produce exports. As a result, the gross exports of a country do not necessarily reflect economic
growth. This is because only the domestic value added (and not the imports, which is foreign value added) that is embodied in the exports contributes to its GDP.

Hummels et al. (2001) proposed to measure the extent of vertical specialization by the VS share which calculates the average imports embodied in one dollar of exports. A larger VS share implies more dependence of a country’s exports on imported inputs and a smaller DVA share in the exports. Along with the falling trade cost, the world economy became more and more interconnected across countries. As a result, most of the countries experience increasing VS shares over time. However, as an exception, China has seen a decrease in the VS share since 2005. It is important to know why this happened because different answers have different policy implications. The first possible cause is the decreasing share of processing exports in China, which lowers the overall dependence of export production on imported inputs. If this is the case, the decreasing VS shares suggest that the “world’s factory” is moving out of China, in the sense of a shift from import-intensive processing exports to ordinary exports that depend more on domestic inputs. Changes in the input structure are another possible cause for the decreasing VS shares: the production of exports has become less dependent on imports and relies, instead, more on domestic inputs. In this case, decreasing VS shares suggest that China’s role in international fragmentation has been upgraded. This would change the perception that China always resides at the lower end of the global production chain and obtain limited DVA from its exports (Koopman et al., 2012).

Chapter 2 provides annual measurements of China’s VS share during the period 2000-2012. The calculations are based on special input-output (IO) tables that distinguish processing trade from other production. A structural decomposition analysis (SDA) approach is applied to further investigate the major drivers of the VS share changes from 2002 to 2012. For this, I develop a new decomposition, which decomposes the VS share change into 14 components and separates the contribution of the different production types. It distinguishes substitution: between primary and intermediate inputs; between domestically supplied and imported inputs; and between inputs provided by Domestic Enterprises (DEs) and by FIEs. The decomposition provides a much more detailed anatomy of the changes in China’s input structure. The substitution of imported intermediates with domestically produced intermediates was
the main driver for China’s declining VS share. The findings suggest an upgrade of China’s role in the global production network instead of moving the “world’s factory” out of China.

Chapter 3 investigates the NI content in Chinese exports and its dynamics from 2002 to 2012. Different from value added, which accrues to the country where the production factors are employed, NI accrues to the country of which the owners of these production factors are citizens. Given the large share of FIEs in Chinese gross exports, a portion of DVA embodied in exports is owned by foreigners and not part of China’s NI. As shown in Chapter 2, the DVA share in China’s exports has increased quickly since the turn of the millennium. Meanwhile, inward FDI also has undergone a substantial increase during this period. The dynamics of DVA shares and of FDI activities call for a longitudinal analysis of NI contained in Chinese exports. This issue is significant given the fact that NI is more relevant for welfare than DVA.

The chapter splits the DVA by ownership of production factors. By adopting the special IO tables that distinguish the production of processing exports from other production, it quantifies the NI as well as the foreign income generated by China’s exports in 2002, 2007, and 2012. After that, an SDA is applied to explore the underlying drivers behind the changes of the NI share in China’s exports. This share increased only slightly from 2002 and 2007, from which it is concluded that the considerable rise in the DVA share in exports mainly accrued to NIs abroad. From 2007 to 2012, however, the dynamics of NI and DVA in exports show a completely different pattern: the increased DVA share in exports mainly accrued to China and increased its NI. Further decompositions show that this difference is mainly due to changes of the capital income share in value added, which remarkably rose before the crisis but substantially dropped after the crisis.

Chapter 4 constructs new interregional input-output tables for China, which explicitly differentiate the production of processing exports from other production at the regional level. These are the IRIOP tables. Processing exports comprised a large part of China’s exports, with an extremely uneven distribution over the domestic regions. Processing exports heavily rely on imported materials and only generate limited domestic activities compared with other production. The literature proves that studies failing to separate processing exports from other production will bias the results.
For example, the contribution of China’s exports to economic growth is inflated (Chen et al., 2012; Pei et al., 2012), the damage of international trade to China’s environment is overestimated (Dietzenbacher et al., 2012), and China’s VS share is underestimated (Yang et al., 2015). We expect that the traditional studies on China’s regional growth give misleading conclusions because they use data that fail to separate processing exports. To properly answer this question, we must construct interregional input-output (IRIO) tables that differentiate the production of processing exports from other production.

These tables are termed IRIOP tables. They are constructed in Chapter 4 for 2002, 2007, and 2012, and they have 17 sectors and eight regions. The availability of consistent and reliable data is often regarded as a major barrier to construct a new IO table (Peters et al., 2011). For IRIOP tables, four types of data sources are used: the national IO tables that distinguish production of processing exports from other production at national level (NIOP tables); the traditional IRIO tables; international trade statistics; and the Regional Economic Accounts (REA). However, these data sources conflict with each other. The inconsistencies between the data sources are solved on the basis of certain principles (such as giving the highest priority to the most accurate trade statistics and to the official regional account statistics, and choosing less detailed industry classification in the available IO tables to avoid making additional assumptions to split some industries). After that, I construct the tables step by step by using a semi-survey method, based on a combination of survey data, proportionality assumptions, and RAS procedures. The chapter explicitly describes the data processing, the underlying construction principles and the construction methodology step by step.

Empirically, I investigate whether separating the production of processing exports from ordinary production matters when studying the contribution of exports to regional value added. I compare the empirical results computed with the new tables with the results obtained from the traditional interregional IO tables (which do not single out

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7 Under these principles, when data conflict, we give the highest priority to data from China’s Customs and to the REA. The IRIOP tables are compiled on the basis of the NIOP tables and the traditional IRIO tables. We use the NIOP tables as a benchmark and distribute the two types of production (production of processing exports and other production) over the different regions to construct the IRIOP tables. Note that the industry classifications in the NIOP tables and the traditional IRIO tables are different. The former include 42 industries, while the latter include 17 industries. We have aggregated the 42 industries in the NIOP tables to match the 17 IRIO industries. By doing this, we avoid having to make additional assumptions to disaggregate some of the IRIO industries to match the NIOP industries.
processing trade). I find that the contribution of regional exports to China’s GDP is significantly overestimated if processing trade is not properly included in the models.

Chapter 5 proposes and implements an accounting framework based on value chains to quantify the contributions of exports to interregional labor income inequality. A distinction is again made between processing exports and ordinary exports, and the new IRIOP tables of Chapter 4 were used. The method fully accounts for a region’s indirect exports, which arise through the provision of materials, components, and services to export production activities in other regions.

China’s economy faces a serious regional inequality with the coastal regions growing much more than the inland regions. The unequal income distribution is not only an important economic phenomenon but also a political challenge. The Chinese government attaches much importance to reduce regional inequality. At the 19th National Congress of the Communist Party of China, President Xi stated that “There are still large disparities in development between rural and urban areas, between regions, and in income distribution”. He emphasized that “we will strengthen measures to reach a new stage in the large-scale development of the western region; deepen reform to accelerate the revitalization of old industrial bases in the northeast and other parts of the country; help the central region rise by tapping into local strengths; and support the eastern region in taking the lead in pursuing optimal development through innovation. To this end, we need to put in place new, effective mechanisms to ensure the coordinated development of different regions.” 8 Therefore, investigating the relation of globalization and regional inequality is significant for China’s future sustainable development and has important policy implications.

Empirically, I find that processing exports contribute little, but the DVA embodied in processing exports is unequally distributed among regions. Rather, ordinary exports predominantly contribute to China’s regional inequality. The substantial decline of regional inequality in the period 2002-2012 was not due to changes in exporting activities. Even though the DVA embodied in exports (both processing and ordinary) was distributed more evenly over the regions, the growth in exports still had an inequality-increasing effect. The increased levels of domestic final demands and the changes in ordinary production—which become more domestically fragmented, with

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the inland regions increasingly involved—are the main reasons for the declining regional inequality. In this regard, the outcomes are in line with China’s recent policy of stimulating domestic demand to decrease regional inequality.

Chapter 6 summarizes the main findings of this thesis and discusses its limitations.