Foreign Trade and Economic Performance in China, 1860-1911

Abstract

This research analyses the effect of foreign trade on economic performance of the late Qing China. A new dataset of the adjusted Chinese trade series from 1867 to 1913 has been created using the data from the Chinese Maritime Customs. GDP estimations from 1860 to 1912 are from Ma and de Jong's recent study. Foreign trade of China expanded moderately during the first wave of globalisation, while the exports to GDP ratio shows that exports only made up a small proportion of total production. Nonetheless, the results, obtained from both static and dynamic analysis, are generally supportive of the export-led growth. Interestingly, the unskilled exports and skilled imports played significant roles in promoting growth in the late Qing China, in particular in its modernisation process.

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CHAPTER I
INTRODUCTION

The period after the Opium War (1840-2) marked the first stage of economic opening in the modern China. It was also a crucial part of the years between 1840 and 1939, which Brandt *et al*. describe as the "*Turbulent Century*".[1] Alongside the wars and reforms that characterised a great part of the century, the globalisation of markets, no doubt, was its main manifestation. From the late 19th century onwards, China became more involved in the international trade, began to open up its economy, and started to import new technologies from the rest of the world. The historical literature commonly describes this era as a breakpoint in the Chinese long-term economic development.

However, the effect of foreign trade on the Chinese economy during this period was left largely unexamined. On one hand, there are conflicting views concerning the legacy of the forced opening of China by the foreign powers. Early writings argue that it slowed down the Chinese growth, while more recent findings indicate that China actually benefited from the expansion of trade. On the other, statistics of Chinese agricultural and industrial output were scarce, and estimations of the aggregate output levels on a yearly basis has become available only recently. My research aims to fill this gap by providing the first quantitative study of the magnitude and relevance of the trade-growth nexus in China during the late 19th and early 20th centuries.[2]

Specifically, I intend to answer two sets of questions. First, what was the real growth trend of foreign trade in China? How it was distributed at the commodity level, by trading partners, or by ports? What was the real trend of GDP, and sectoral GDP of the late Qing China? Second, what was the effects of exports and imports on the late Qing growth? Are there any certain effects of skill-intensive or unskilled-intensive trade on GDP?

To answer the first set of questions, I have made several adjustments to foreign trade data from the Chinese Maritime Customs services from 1867 to 1913, and graphed the adjusted trade series with the recent estimations of the late Qing GDP (1860-1912).[3] To answer the second

[1] L. Brandt, D. Ma and T. G. Rawski, 'From Divergence to Convergence: Re-Evaluating the History Behind China's Economic Boom', *Journal of Economic Literature*, 52, 2014, pp. 45–123.
[2] To my best knowledge this is the first quantitative study of trade-growth nexus for this period.
[3] The foreign trade series begin from 1867 because the earlier Customs publications only contains statistics for major ports, but not for the whole country.

set of questions, I have conducted both static and dynamic analysis of multivariate models, employing the real growth rates of GDP as the dependent variable, and exports, imports and other control variables as independent variables, to examine the effect of foreign trade on the late Qing economic performance.

There are two major contributions of this research. First, I have created a new dataset of the adjusted Chinese foreign trade series from 1867 to 1913, as well as an annual index of the number of natural disasters and wars that occurred in China from 1860 to 1911. It is worth noting that although there were previous attempts on showing the aggregate trend of foreign trade series in China during the treaty port era, such as by Keller and Shiue, those attempts were incomplete in the sense that they failed to adjust the certain biases caused by initial calculation errors, changes in valuation methods and price indices.[4] Second, the econometric results illustrate that from 1867 to 1911, exports, in particular the unskilled-intensive exports became a positive and significant factor in the growth performance in the late Qing China. Conversely, I find no significant mutual relationship between imports and growth. At the sectoral level, the results of agricultural and services output were similar to that of the total output. There was a significant growth of modern sector during the late Qing period, despite that it constituted a relatively small proportion of total output. Both skilled and unskilled trade were positively related to mechanised production growth. The elasticities of such growth were higher with respect to skilled trade, such as fuel, machinery and vehicles, than unskilled trade. The dynamic analysis further illustrates the importance of unskilled exports and skilled imports in promoting production, in particular the mechanised production. In sum, my findings provide the first empirical support to the qualitative studies indicating the link between foreign trade and the trend towards a slow modernisation under the treaty port system.

The remainder of this research is structured as follows. Chapter 2 demonstrates the historical background of the first opening of China on trade and the Chinese economy during the first wave of globalisation. Chapter 3 reviews the literatures regarding trade-growth nexus, as well as the legacy of foreign trade and GDP growth under the treaty port system. Chapter 4 shows the newly created dataset. Chapter 5 presents the descriptive analysis. Econometric analysis

[4] W. Keller and C. Shiue, 'China's Foreign Trade: Perspectives from the Past 150 Years', *The World Economy*, 34/6 (2011), pp. 853-92.

and results are illustrated in Chapter 6. The final chapter concludes, and discusses limitations and directions for the future research.

CHAPTER II
HISTORICAL BACKGROUND

China has been engaging in foreign trade since ancient times. The majority of Chinese early trade was with relatively proximate countries in Asia, mostly through the famed Silk Road.[5] Its trade with Europe was initiated in the 16th and 17th century after the European countries explored the sea route to the East. However, prior to the 1840s, Chinese policies on foreign trade were fairly restrictive, often allowing only limited exchange in specific areas. First, China was largely a self-sufficient, agrarian economy. Sir Robert Hart writes that "Chinese have the best food in the world, rice; the best drink, tea; and the best clothing, cotton, silk, fur. Possessing their staples and their innumerable native adjuncts, they do not need to buy a penny's worth elsewhere."[6] Second, the letter from the Chinese Emperor Qianlong to the British King George III, which says: "Strange and costly objects do not interest me. As your ambassador can see for himself we possess all things…have no use for your country's manufactures", demonstrates that the Emperor did not understand comparative advantage.[7] Third, Chinese officials concerned that the potential gains of trade to be small relative to the difficulties of managing the discord between foreigners and native populations.

The trade restrictions in China gave cause for concern. In the absence of appropriate exports to China, European countries found themselves faced with the necessity of taking out huge quantities of silver to finance their purchases of Chinese tea and silk. To counter this trade deficit, a solution was found in the Chinese demand for opium, and soon after, in the early 19th century, the rapid growth of the importation of opium from British India into China reversed the flow of silver. The response of China was to ban the opium trade, and this triggered the First Opium War between China and Britain. The war was concluded by the Treaty of Nanking in 1842. The Treaty abolished the traditional tributary system, liberalised the highly regulated Canton system, and permitted foreign traders to operate in additional ports.[8] Custom duties

[5] M. Greenburg, *British Trade and the Opening of China 1800–42* (Cambridge, 1970), p. 1.
[6] As quoted from R. Hart, *These from the land of Sinim* (New York, 1901), p. 5.
[7] J. Chen, P. Cheng, M. Lestz and J. Spence, *The Search for Modern China: A Documentary Collection* (New York, 2013), p. 93.
[8] The additional ports were Amoy, Foochow, Ningpo and Shanghai.

were capped at 5% on all goods.[9] In the following decades before the World War I, China had a series of armed conflicts with foreign powers, such as the Second Opium War of 1857-60, the Sino-Japanese War of 1894 and the Boxer War of 1900. More than fifty treaties were signed, which shaped the institutional arrangements facilitating Chinese trade and had far-reaching effects on its economy. By the early 20th century, a total of 48 ports were open to trade (Figure 1). As a result of the "most-favoured-nation" clause, all of the treaty powers enjoyed all the commercial privileges stipulated in any of the treaties.

The *Treaty Port System* was hence set up which marked the first opening of China. First, not only were foreigners dominant in Chinese foreign trade and exchange; foreign land renters possessed real estate in trading centres like Tientsin, Hankow, Canton and Shanghai, which were becoming Chinese major cities.[10] Meanwhile, the increasing speed of steamships and extension of the telegraph and cable by degrees from Europe to the East brought Chinese trade more fully into the world market and subject to its vicissitudes.[11]

Second, the treaty tariff strictly limited Chinese taxation of foreign trade. And yet, from an international perspective, the period from 1870 to 1913 was the age of *laissez faire*.[12] Free trade was imposed not only in China, but also in other developing countries such as India, Japan and Latin American countries, through gunboat diplomacy or colonial dominance. In the developed world, however, the trade liberalisation was limited to Europe and lasted for short time.[13] Only Britain and Netherlands continued to practise free trade. Third, foreign goods, upon payment of a 2.5% transit duty, were exempted of *likin* charges. But Chinese goods had to pay often 15%-20% "*likin*" charges if they were transported through several provinces. Chinese cotton mills, for example, could better afford to obtain their raw materials from India than to pay the

[9] Since the price level rose rapidly after 1858, the effective tariff rates were often 3% and were never above 4%. There were also concessions and duty-free treatment. For example, no duties were levied on imports within 33 miles of the frontiers between China and Russia from 1881 to 1913. All goods imported into China from the Chinese Eastern Railway in Manchuria were allowed a one-third reduction of tariff. All goods imported from French Indo-China and Burma enjoyed a 30% reduction of tariff. Y. Ni, *Customs Duties in the Qing Dynasty, ca. 1644–1911* (Beijing, 2017), p. 178.

[10] J. Fairbank, 'The Creation of Treaty System', in D. Twitchett and J. Fairbank (eds.), *The Cambridge History of China, Vol. 10, 1800-1911* (Cambridge, 1978), p. 262.

[11] H. Morse, *The International Relations of the Chinese Empire* (London, 1910), p. 25.

[12] It was also the first era of trade globalisation. Maddison estimates that the annual growth of world trade at 3.9% was much faster than that of world output at 2.5% over this period. D. Nayyar, 'Globalisation, History and Development: A Tale of Two Centuries', *Cambridge Journal of Economics*, 30 (2006), pp. 137-59.

[13] Ibid., p. 138. Between 1875 and 1913, the average level of import duties on manufactured goods rose from 12% - 20% in France and 5% - 13% in Germany.

higher price to ship the cotton from another Chinese province.[14] Nonetheless, the revenue from custom duties may benefit Chinese. In the early 20th century, custom duties had as much fiscal weight as the taxes from the agricultural sector (Table 1). The revenue from customs duties was determined by trade performance, and hence, a rapid growth in duties suggested a market-driven growth. Moreover, most of the customs revenue, paid by foreign traders, were used by Chinese government for legitimate purposes. From 1861-1910, 76.3% of customs revenue were used for government administration. Among them, 30.7% were used for national defence and internal peace-keeping, equivalent to the combined shares for foreign debt repayment and war reparation.[15]

Table 1. *Tax structure of Qing China, 1820-1903.*

	I: Agricultural Taxes		**II: Customs Duties**		**I:II**
	million Taels	Index	million Taels	Index	
1820	30.2	100	2.9	100	10.3
1887	32.8	109	16.4	560	2.3
1903	28.1	93	27.7	943	1.0

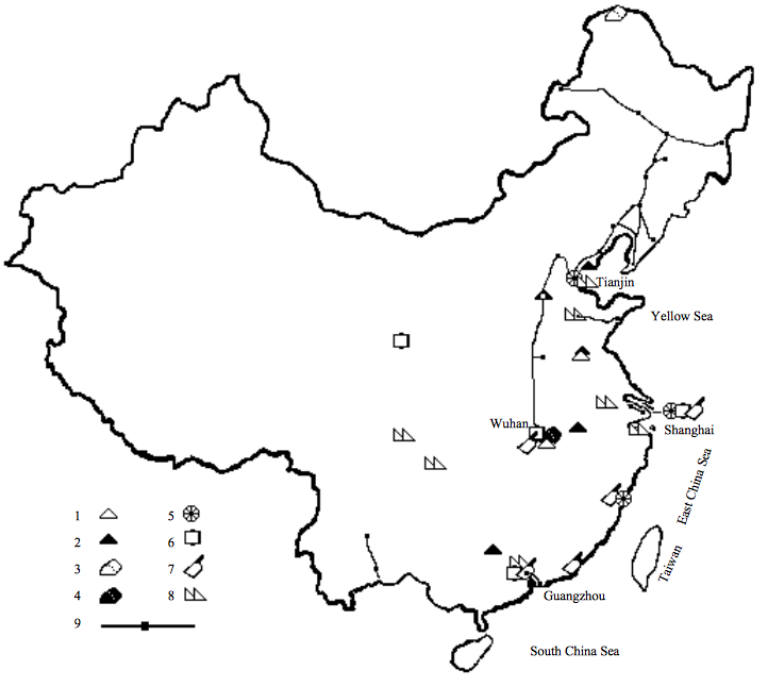
Source: Ni, *Customs Duties*, 2017.

At the heart of the story was the loss of political power, and the weak institutions that denied Chinese autonomy over its economic response to the global economy. Accompanied by the forced opening of China on trade, Chinese political control was cracked as foreign spheres of influence functioned as alternative power centres. The situation had been worsened due to wars and natural disasters. As the silver reserves of Chinese government declined, its capacity to support extra-expenditures was weakened considerably. In particular during the Taiping rebellion (1850-64), most of the wealthy regions in southern China were devastated, and millions of people died of the war and the famines and plagues that went with it. Chinese government only survived with the financial and military assistance from British banks.[16]

[14] Ni, *Customs Duties*, p. 188.
[15] Ibid., p. 208.
[16] X. Tang, *Statistics of Customs Revenue and Distribution in Modern China* (Beijing, 1992), pp. 38-41.

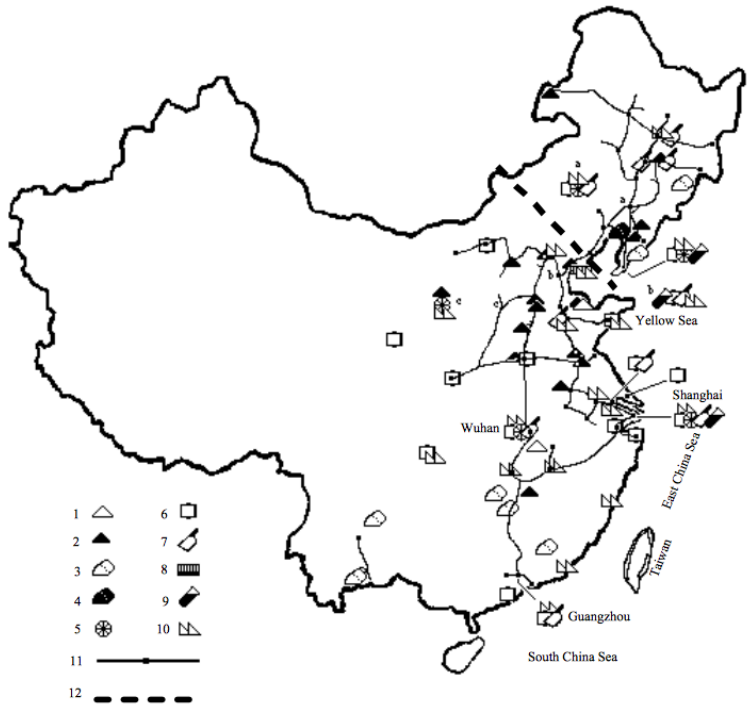
Figure 1. *Treaty Ports.*

Source: Keller *et al.*, 'Shanghai's Trade', 2013.



Note: Contemporary China is taken as a proxy for the Empire. 1) Iron-mining. 2) Coal-mining. 3) Nonferrous metals. 4) Iron and steel. 5) Engineering. 6) Textiles. 7) Food-processing. 8) Others. 9) Railway lines.

(a)



Note: Contemporary China is taken as a proxy for the Empire. Points: a) Shenyang; b) Tianjin; c) Taiyuan. 1) Iron-mining. 2) Coal-mining. 3) Nonferrous metals. 4) Iron and steel. 5) Engineering. 6) Textiles. 7) Food-processing. 8) Chemicals. 9) Building materials. 10) Others. 11) Railway lines. 12) Dividing line between China proper and Japan-controlled Manchuria.

(b)

Figure 2. *Railways and modern industries. (a) 1902. (b) 1937.*

Source: Deng, 'State Transformation', 2003.

Further, the opening of treaty ports and growth of foreign presence in China and trade are regarded as the beginning of a slow modernisation of China. The structure of agricultural production started to change. Non-food crops such as soy beans and oil seeds were produced and exported.[17] There was a growth in modern industries, since the foreign powers enjoyed privileges in railway building within their sphere of interest. The railways effectively shifted the industrial gravity centre from the East and Yangtze region to a vertical belt with a clear bias towards heavy industry (Figure 2). Neither did China remain entirely passive to the foreign powers. The self-strengthening movement (1870-95) was initiated to rebuild military strength and autonomy. The army was re-equipped and a modern standing navy developed. And yet, the movement was discredited after Chinese defeat by the Japanese in 1894. In 1898, China responded to such regression with the one-hundred-day reform which created a stir in the Old Establishment, and the Qing Empire was finally overthrown in 1911. It is worthing noting that no significant economic improvement was found during the late Qing period in historical records, regardless of the economic reforms. Instead, an estimation illustrates that a large proportion of the Chinese population was living at subsistence level.[18] Brandt *et al.* argue that those economic reforms should have benefited the economy in the late 19th century, but the significant economic growth actually took place after the 1978 reforms, which they call the "delay of growth".[19]

[17] D. Xu and C. Wu, *Chinese Capitalism* (New York, 2005), p. 1098.
[18] The average household budget in a five-person family was 63.31 taels in the wealthy Southern region. If food crops were considered as the main part of household budget, the daily energy consumption from food crops was at 1,950 kcal, which is slightly higher than the minimum requirement of 1,680 kcal/day estimated by the FAO. X. Fang, 'Farmers' Consumption in the Qing Dynasty in the Jiang-zhe Region (in Chinese)', *Chinese Economic History*, 1996, pp. 91-8.
[19] L. Brandt, D. Ma and T. Rawski, 'From Divergence to Convergence', p. 55.

CHAPTER III
LITERATURE REVIEW

3.1. Trade-Growth Nexus

Interpretations of the effect of foreign trade on growth, in particular for developing countries, has been a matter of controversy. Many researchers are in favour of the export-led growth argument. Beckerman argues that the expansion of exports leads to production efficiency gains through improving resource allocation.[20] Alternatively, Haberlar emphasises on the improved availability of foreign capital and technology due to the release of the balance of payments constraint.[21] More recently, theories of endogenous growth suggest the concept of dynamic benefits of exports, in a framework characterised by increasing returns to scale and by technological and managerial spill-over effects on other sectors. Helpman and Krugman further develop Beskerman's and Haberlar's theories, illustrating that the initial growth spurt benefited from export expansion via the efficiency and allocation effects will reverberate in better global competitiveness, facilitating a new round of export expansion and leading to a virtuous development path.[22] That being said, no agreement has been reached hitherto on the theoretical appropriateness of the export-led growth argument. In this sense, Gabriele points out two intrinsic problems regarding the attempts to econometrically prove that exports are an important cause of growth. First, the evidence of a correlation between exports and GDP is not sufficient to prove causal relationship which could also exist in the opposite direction.[23]Second, other relevant macroeconomic variables, such as investment, saving, government expenditures are also correlated with GDP growth, and hence, a missing variable problem of model mis-specification is hardly avoidable.[24]

[20] W. Beckerman, Demand, Exports and Growth, in W. Beckerman and Associates (eds.), *The Britain Economy in 1975* (Cambridge, 1965), p. 44-72.
[21] G. Haberlar, *International Trade and Economic Development* (Cairo, 1959), p. 2.
[22] E. Helpman and P. Krugman, *Market Structure and Foreign* (Cambridge, 1985), p. 5.
[23] Trade is an endogenous variable. See the gravity model that uses geographic characteristics as an instrumental variable for trade to solve the endogeneity problem. A. Frankel and D. Romer, 'Does trade cause growth?', *The American Economic Review*, 89/3 (1999), pp. 379–99.
[24] A. Gabriele, 'Exports of Services, Exports of Goods, and Economic Growth in Developing Countries', *Journal of Economic Integration*, 21/2 (2006), pp. 294-317.

The majority of empirical studies on Asian developing countries tend to support the export-led growth argument.[25] Moreover, the evidence found in relation to the Chinese economy is in consistent with the rest of empirical studies. Both bivariate and multivariate models are generally supportive of a Granger casual ordering from exports to growth; whereas, the feedback effect from growth to exports also exists in these studies.[26] One of the most recent example is by Li *et al.*, who adopt time series co-integration analysis and error correction model to demonstrate that in China from 1981 to 2008, exports and GDP are co-integrated, and the long-run causality from GDP to exports is actually stronger than that from exports to GDP. Further, the long-term stationary causality between imports and GDP does not hold.[27] Nonetheless, despite the fact that the trade-growth nexus for the post-1978 China has been extensively studied, such nexus for the late Qing China remains largely untouched. In order to investigate the effect of foreign trade on the late Qing economy, it is firstly necessary to review previous literatures regarding trade and GDP growth under the treaty port system.

3.2. Trade-Growth Nexus Under the Treaty Port System

3.2.1 The Legacy of the First Opening of China

Qualitative Studies

Most of the early writings of the first opening of China regard foreign trade as detrimental to the Chinese economy. Hou summarises them into two arguments.[28] First, the new industrial and commercial system developed in the treaty ports caused the bankruptcy of handicraft industries and disrupted agriculture. Second, foreign trade is alleged to have drained the economy of its wealth because of the unfavourable balance of trade. However, Dernberger illustrates that the extent of foreign penetration was very restricted, and hence, foreign trade was not sufficient enough to counter the forces of Chinese traditional culture and society, as

[25] See for example B. Balassa, 'Exports and Economic Growth: Further evidence', *Journal of Development Economics*, 5/2 (1978), pp. 181-9.
[26] A detailed summary of Chinese empirical studies on export-led growth can be found in J. Shan and F. Sun, 'On the export-led growth hypothesis: The econometric evidence from China', *Applied Economics*, 30/8 (2008), pp. 1055-65.
[27] Y. Li, Z. Chen and C. San, 'Relationship between Foreign Trade and the GDP Growth of China', *Modern Economy*, 1 (2010), pp. 118-24.
[28] C. Hou, *Foreign Investment and Economic Development in China, 1840-1937* (Cambridge, 1965), p. 2-4.

well as government, to lead to faster economic development.[29] In other words, he implies that China would have actually benefited from the increase in foreign trade, was it not too trivial in size to matter for the country. Nonetheless, in these studies, rarely any conclusive evidences are provided to support the claims.

Quantitative Studies

Initially founded by foreign consuls in the 1850s, the Chinese Maritime Customs fulfilled the need to collect custom duties that were going unpaid due to the inability of Chinese officials to collect them during the Taiping Rebellion. It was probably the only bureaucratic institution in China to operate continuously from 1854 to 1949. The Customs was a part of the Chinese government, but its senior management consisted largely of British and later Japanese and American officials. Its responsibilities expanded to involve preparing and publishing trade statistics, managing harbour and waterway, and negotiating foreign loans over time. Many historians have written in details about the institutional aspects of the Customs.[30]

More significantly, the quantitative information from the Customs trade publications helped to better analyse the implications of Chinese foreign trade. The findings by Rawski contrast sharply with the viewpoints taken in the early writings. He shows that foreign traders relied heavily on Chinese agents to conduct their business, and in this sense, indigenous mercantile activities were still of great significance.[31] He also argues that the treaty port commerce had little competition with Chinese traditional economy. Commercial expansion within limits and the adoption of Western-style innovations received huge support among native merchants and aroused little official resistance.[32] Similarly, Cheng also makes an opposite point to the early arguments. In his analysis, the import excess was not large before 1900. The unfavourable trade balance could easily be counter-balanced by homeward remittence of overseas Chinese and the net export of gold and silver.[33] In other words, before 1900, Chinese foreign trade was in the nature of merchandise exchange; and yet, after the turn of the century, the import excess soared.

[29] F. Dernberger, 'The Role of the Foreigner in China's Economic Development', in D. Perkins (ed.), *China's Modern Economy in Historical Perspective* (Stanford, 1975), p. 39.
[30] The two most representative works are: R. Bickers, 'Revisiting the Chinese Maritime Customs Service, 1854–1950', *Journal of Imperial and Commonwealth History*, 36/2 (2008), pp. 221-226; H. van de Ven, Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China (New York, 2014).
[31] T. Rawski, 'Chinese dominance of treaty port commerce and its implications, 1860–1875', *Exploration in Economic History*, 7/1 (1969), pp. 451-73.
[32] Ibid., p. 472.
[33] Y. Cheng, *Foreign Trade and Industrial Development of China, 1840–1948* (Shanghai, 1984), p. 13.

Most of this heavy out-payment was reinvested in China in railway building, or became loans to the Chinese government, to which more political than commercial or financial significance has attached.[34]

More recent studies have turned their interest to study Chinese trade at the commodity or port level. In terms of commodity analysis, Mitchener and Yan finds that Chinese exports became more unskilled-intensive and the imports became more skill-intensive from 1904 to 1928.[35] Their analysis of the factor price effects indicates that an rapid expansion in exports around World War I caused a decline in the skill premium for a developing country.[36] Alternatively, Keller and Shiue adopt an extensive-margin analysis, revealing that there was a significant increase in the diversity of products, with many new goods being imported into China from 1867 to 1930.[37] They argue that the new goods are likely to alter the conditions for innovation and competition, and hence, influence the domestic markets and domestic firms.[38]

In regard to regional analysis, the classic study of Remer explains that Shanghai gradually supersede Hong Kong to be the Chinese dominant trading centre after 1893.[39] Due to the relative importance of Shanghai, Keller *et al*. use the gravity quotation to examine Shanghai's bilateral trade with foreign countries, and they estimate a positive coefficient on foreign GDP and a negative coefficient for distance from 1869 to 1904. Then, they compare the actual trade with predicted trade and find a good fit of gravity equation. Since the gravity equation is derived for models of market economies on the basis of voluntary exchange, this suggests that natural trade flows resulted when ports were opened, and there could be potential gains from trade to China and foreign partners.[40] In another paper, Keller *et al.* employs a general-equilibrium trade model, with data on the flow of goods between fifty major treaty ports, to investigate the size and distribution of welfare effects of trade in 1904.[41] Their finding shows that an increase in productivity for any ports has positive effects for the entire country, which

[34] Ibid., p. 153.
[35] Their classification of skill intensity are based on educational attainment, log wage and capital-labour ratio. K. Mitchener and S. Yan, 'Globalisation, Trade and Wages: What Does History Tell Us About China', *International Economic Review*, 55/1 (2014), pp. 131-68.
[36] Ibid., p. 160.
[37] Keller and Shiue, 'China's Foreign Trade', p. 855.
[38] Ibid., p. 30.
[39] C. Remer, *The Foreign Trade of China* (Shanghai, 1926), pp. 53-7.
[40] W. Keller, B. Li, and C. Shiue, 'Shanghai's Trade, China's Growth: Continuity, Recovery, and Change since the Opium War', *IMF Economic Review*, 61/2 (2013), pp. 336-378.
[41] W. Keller, J. Santiago, and C. Shiue, 'China's Domestic Trade during the Treaty-Port Era', *Explorations in Economic History*, 63 (2017), pp. 26–43.

suggests that technology improvements or trade cost reductions in treaty ports may have a positive welfare effect on large portions of China. The exceptions are Shanghai and Ningpo, and an explanation is given on the re-allocation of production and trade.[42]

Hence, literatures have well documented that foreign trade during the treaty port era could have changed the way how Chinese economy operated, either through its impacts on labour wages or domestic market. However, opinions on whether such impact is positive or negative differ, and the magnitude of such effect remains unexamined.

3.2.2. Economic Stagnation and Its Determinants

It is commonly accepted that the late Qing China was trapped in a long-term low-production equilibrium. Figure 3 summarises the Chinese historical GDP estimates from 1840 to 1940. Until recently, there are only benchmark estimates for specific years or short periods.[43] The recent study by Ma and de Jong reconstructs Chinese GDP and provides time series data.[44] They apply the same approaches and procedures, that have previously been used in historical reconstructions of national accounts of many other countries, particularly the large Asian economies of the 19th century, such as Japan and India.[45] Further, the similar approach has also been applied to reconstruct Chinese GDP in other pre-modern periods.[46] As shown in the graph, the series by Ma and de Jong is generally higher during the late Qing period, with the only exception of Maddison's estimate in 1850. Maddison's 1850 estimate is assumed to be equal to his 1820 estimate to show a higher living standard before the Taiping Rebellion.[47] And yet, Ma and de Jong's estimates are based on quantitative information from the sectoral level,

[42] Low trade costs mean that Shanghai and Ningpo will no longer be the low-cost source of supply due to their high level of labour cost. Further, Shanghai and Ningpo are centrally located in China, so they enjoy a lower transport-cost based advantage compared to other regions after the reduction of trade barriers.

[43] See for example K. Fukao, D. Ma, and T. Yuan, 'Real GDP in Pre-War East Asia: A 1934–36 Benchmark Purchasing Power Parity Comparison with the US', *Review of Income and Wealth*, 53 (2007), pp. 503–37; D. Liu, 'An Estimation of China's GDP from 1600 to 1840, *Economic Research Journal*, 2009, pp. 144-55.

[44] Y. Ma and H. de Jong, 'Unfolding the Turbulent Century: A Reconstruction of China's Historical National Accounts, 1840–1912', *Review of Income and Wealth*, 65/1 (2017), pp. 75–98.

[45] For Japan, see S. Broadberry, K. Fukao, and N. Zammit, 'How did Japan Catch-up on the West? A Sectoral Analysis of Anglo-Japanese Productivity Differences, 1885–2000', *Centre for Economic Policy Research*, Discussion Paper No. 10570, 2015. For India, see S. Broadberry, and B. Gupta, 'The Historical Roots of India's Service-led Development: A Sectoral Analysis of Anglo-Indian Productivity Differences, 1870–2000', *Explorations in Economic History*, 47 (2010), pp. 264–278.

[46] See for example S. Broadberry, H. Guan, and D. Li, 'China, Europe and the Great Divergence: A Study in Historical National Accounting, 980–1850', *Journal of Economic History*, 78 (2018), pp. 955-1000.

[47] A. Maddison, *Chinese Performance in the Long Run: 960-2030 AD* (Paris, 2007), p.15.

employing archive data and recent historical studies.[48] At the per capita level, the estimations of Ma and de Jong and Xu *et al.* are very close.[49]

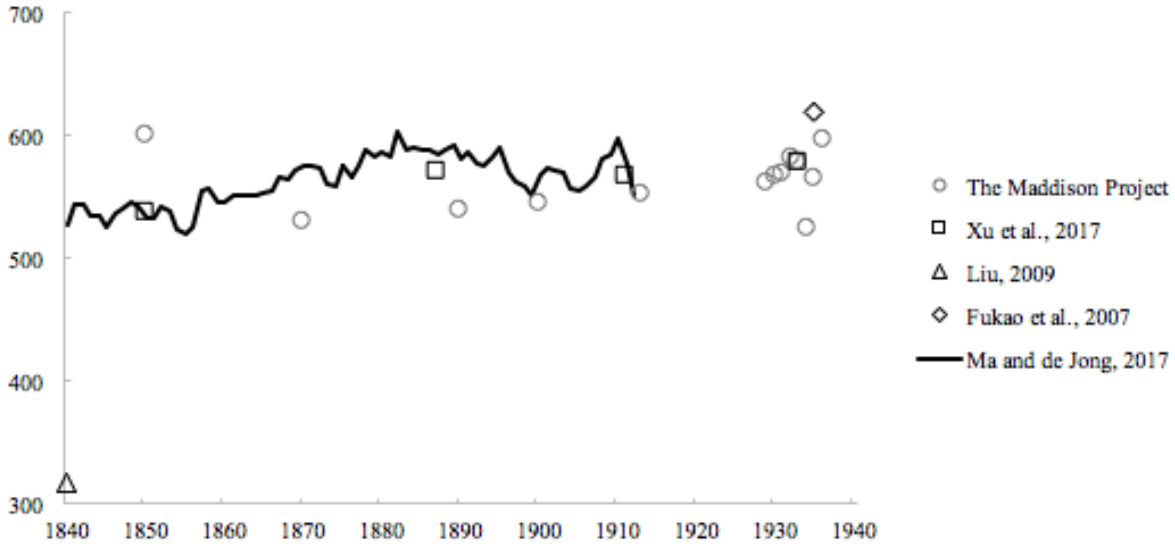


Figure 3. *Estimations of GDP per capita in China, 1840-1940, in 1990 international dollars.*

Sources: Maddison, *Chinese Performance*, 2007; Xu *et al.*, 'Chinese National Income', 2017; Liu, 'An Estimation of Chinese GDP (in Chinese)', 2009; Fukao *et al.*, 'Real GDP in pre-war East Asia', 2007; Ma and de Jong, 'Unfolding the Turbulent Century', 2017.

The tentative nature of Chinese historical data has been a central concern for investigating historical development of the per capita GDP, which leaves significant room for discussions. Perhaps one of the most important is the "Great Divergence" debate, in which the living standards of China and Europe are compared. Earlier authors from the California School, such as Pomeranz, claim that the most advanced sectors of China were economically on par with those in Europe until the 19th century.[50] However, recent study by Broadberry *et al.* illustrates that China has already been surpassed by Europe regarding GDP per capita before the Industrial Revolution.[51] Moreover, Pomeranz, in his later views, is willing to settle for an earlier

[48] Ma and de Jong, 'Unfolding the Turbulent Century', p. 94.
[49] Y. Xu, Z. Shi, B. van Leeuwen, Y. Ni, Z. Zhang and Y. Ma, 'Chinese National Income, ca. 1661–1933', *Australian Economic History Review*, 57/3 (2017), pp. 368–393.
[50] K. Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton, 2000), p. 5.
[51] Ma and de Jong, 'Unfolding the Turbulent Century', p. 90; Broadberry, Guan and Li, 'China, Europe and the Great Divergence', p. 955.

divergence date between 1700 and 1750.[52] A new consensus, hence, emerge from the California School writers such as Pomeranz and economic historians using quantitative methods. The estimations by Ma and de Jong confirm that the Great Divergence continued and grew significantly in the final part of the Qing Empire.

Historically, agriculture has been the largest sector in the pre-modern Chinese economy. Hence, the stagnant cultivated land per capita played a central role in determining the living standards of Qing China. Although there was an increase in the farmland, because the Han Chinese were granted private land ownership in Manchuria from the 1860s, the farmland per capita still slightly declined due to the expansion of population.[53] Meanwhile, there was a large scale of internal migration due to the Qing state policy of "farming by invitation", which resulted in the Chinese resource re-allocation in terms of labour and land. However, Deng regards the internal migration as inherently related to the increase in cultivated land.[54] In other words, the new gains in cultivated land became an effective factor in the economy only because new immigrants settled and farmed the new land.

Few would neglect the frequency of natural disasters and the wars that have been fought on the Chinese soil, for they caused severe problems in regard to socio-economic stability and national security.[55] First, they exerted a double squeeze on the Qing state, which included a decline in revenues and an increase in war expenditures. Both had the effect of reduce the financial ability of the state to attempt development. Second, famines and drought ruined the crops and lowered agricultural output. Third, wars interrupted transportation, the flow of raw materials and commodities, and hence adversely affected production.

Many assumed that the Qing state were politically, administratively and financially too weak for China to effectively gain the potential benefits from the new trade arrangements. On one hand, it had low investment opportunity to sponsor projects and activities in the areas of education, infrastructure build-up, agricultural research and extension.[56] On the other, the state

[52] K. Pomeranz, 'Ten years after: responses and reconsiderations', *Historically Speaking*, 12/4 (2011), pp. 20–25. As noted by Broadberry *et al.*, this is the result of not only factors such as coal and ghost acres, but a longer run dynamic process relating to the institutional difference between China and the Europe.
[53] C. Allen, 'Agricultural Productivity and Rural Incomes in England and the Yangtze Delta, 1620-1820', *The Economic History Review*, 62 (2009), pp. 525–50.
[54] K. Deng, 'China's Population Expansion and Its causes during the Qing Period, 1644-1911', *Population Review*, 58/1 (2009), pp. 20-77.
[55] J. Baten, *A History of the Global Economy* (Cambridge, 2016), p. 206.
[56] P. Nolan, *State and Market in the Chinese Economy: Essays on Controversial Issues* (London, 1993), p. 50.

capacity was constrained by its resistance towards foreign trade and industrialisation, for example, in the processing of agricultural commodities such as soybeans and silk larvae.[57] Perkins challenged this view. He illustrated that many government officials had a working knowledge of the commercial sector, and many were involved in the commercial ventures.[58] During the 19th century, the Qing state launched the policy to reward merchants with high ranks and titles. In the words of a Chinese official, as cited by Perkins, "it may be that in Qing times the social distinctions between officials and rich merchants was more blurred than any other time in Chinese history except for the Mongol Yuan period."[59]

Remer notes that though late Qing economy was stagnant, it had undergone changes towards modernisation. Compared to the total economy, the modern sector is small yet it experienced a continued growth.[60] Chinese railroads increased from almost zero before 1866 to 5,796 miles in 1911. Modern mines, which were non-existent before the 1870s, produced 67% of Chinese coal by 1914.[61] Remer indicates that important links may be found between this development and the penetration of foreign economic forces such as trade and investment.[62] The competition from the Japanese silk and the urging of the foreign buyers of raw silk may contribute to the establishment of the filatures for the reeling of silk from 1885. Two modern cotton mills, one for spinning and one for weaving cotton, were established in Shanghai under foreign management. By 1914, the list of factories in the *Chinese Year Book* included forty flour mills, twenty-five soap and candle factories, eighteen glass factories, thirty-four oil mills, thirteen paper mills, sixteen shipbuilding and engineering establishments, and numerous printing and lithographic works.[63] Comparing to Europe, such step towards the industrialisation was rather small; but comparing to the earlier conditions in China, such change was impressive.

In conclusion, literatures on the late Qing economic performance reveal that despite the general stagnation of output, commercialisation and modernisation were very likely to occur. In this sense, and as informed by those literatures on trade, I intend to investigate the effect of foreign trade in such process. In regard to methodological issues, there are many scholars who focus

[57] Ibid., p. 45.
[58] D. Perkins, 'Government as an Obstacle to Industrialisation: The Case of Nineteenth-Century China', *Journal of Economic History*, 27/4 (1967), pp. 478-92.
[59] Ibid., p. 479.
[60] C. Remer, Foreign Investment in China (Shanghai,1933), p. 69.
[61] Ibid., p.92.
[62] Ibid., p.145.
[63] Ibid., p. 166.

on correlation or regression analysis.[64] However, such method was criticised by others as it may lead to errors while considering the long-term instabilities, and the more recent approach of co-integration analysis with error correction model has been advocated. Li et al. conducted a detailed discussion which suggests that both methods have advantages and disadvantages.[65] Hence, I intend to employ both static and dynamic analysis for examining the relationship between foreign trade and GDP growth of the late Qing China.

[64] For example, Dong argues that in 1978-1998, the correlation of Chinese foreign trade and economic growth was significant, the coefficient was r > 94%. M. Dong 'Relationship of foreign trade and GDP growth of post-1978 China (in Chinese)', *Journal of Chinese Economic Review*, 1 (2002), p. 20-5.
[65] Li, Chen and San, 'Relationship Between Foreign Trade', p. 122.

CHAPTER IV
DATA

4.1. Foreign Trade Series

The foreign trade data is collected from the Chinese Maritime Customs service publications and the volumes which pull together the Customs statistics. The Customs trade publications consisted of the "*trade return*" and "*trade report*". The "*trade return*" recorded the values and quantities of all commodities passing through each treaty ports, and the "*trade report*" documented rich information on many aspects of the Chinese economy affecting trade, such as the natural disasters, agriculture and industry. Both of them were formed in the 1860s, and merged together in 1882. From 1882 to 1931, the Customs provided not only the annual "*trade returns and trade reports*", but also a series of decennial analytical reports covering a wide range of economic, social and cultural transformations in all the port-cities, and in the provinces where they located, in the past decade.

Moreover, the Customs trade publications capturing the critical period of my research have been compiled in two volumes, and their reliability is widely recognised.[66] One is edited by Yang and Hau, which covered 1864 to 1928.[67] The other, by Hsiao, is an extension of the former, concerning 1864- 1949.[68] Data recorded in these two sources are taken directly from the Customs publications, and presented in a consistent and easily accessible framework. These include information on the annual value of Chinese foreign trade; the distribution of foreign trade by 48 ports and by 45 countries; as well as commodity composition, foreign exchange rates and shipping statistics. Each trade record contains imports, exports, and total value. My research concentrates on the analysis of the effect of foreign trade on the 19th and early 20th-century economic development of China. Hence, I construct a new data-set on the real performances of Chinese foreign trade both at country-level and regional-level (1867-1913) from the raw statistics with certain adjustments.[69]

[66] Because of their specialised nature and the lengthy time period involved, I only gathered an incomplete collection of these publications from several sources and libraries, including *Historical Materials of the Chinese Maritime Customs*, Harvard-Yenching Library Collections and Shanghai Customs Archives. This collection has served as data supplement where data were missing from the compilations.
[67] C. Yang and H. B. Hau, *Statistics of China's Foreign Trade during the Last Sixty-five Years* (Beijing, 1931).
[68] L. Hsiao, *China's Foreign Trade Statistics, 1864–1949* (Cambridge, 1974).
[69] Regional-level performance refers to Chinese foreign trade by ports and countries.

First, I correct a total of eighteen copying mistakes and omissions in the raw statistics. For example, in the case of 1876, the imports and exports of Hankow port are recorded as 7,250,763 and 20,688 respectively, but the total value is 9,271,451, which does not match the sum of imports and exports. Comparing with the Customs "*trade return*" of this year, it is suggested that the total value should be 7,271,451 instead, and such case might be a result of transcription error or wrong calculation.

Another type of mistake attributes to the inappropriate treatment of units of measurement. The trade statistics of Shanghai in 1873 recorded in Yang and Hau and in Hsiao are same in values but different in units. Yang and Hau use *Shanghai taels*, while Hsiao presents the data in *haikwan taels*.[70] According to the Customs publications in 1873, such statistics of Shanghai is reported in the table "*Value of the Direct Foreign Trade of Each Port, 1872 and 1873*", and the units should be *Shanghai taels.* This is also supported by Cheng, who indicates that Shanghai had been relying on local tael units for trade statistics until 1875 when China began to use the uniform *haikwan taels* nationwide, after a careful negotiation between the foreign and Chinese officials.[71] The reason for such change was to prevent local corruption at the expense of traders. *Haikwan tael* was in average 10% larger than local taels of various regions of China, and it was designed so as to exclude extra surcharges embedded in local taels as a form of intermediary income for local bureaucrats that never reached the central government under the traditional fiscal regime.[72]

Second, in regard to the change in valuation methods, I adjust the imports and exports data series to make the statistics to be more consistent. Specifically, from 1864 to 1903, the national account of China valued imports and exports in their market value, while from 1904 onwards, the common c.i.f. and f.o.b. approaches were adopted.[73] Differences in the approaches are shown in Appendix 1. Several solutions have been brought forward for data adjustments. Remer argues that the import value should be smaller by 5% during 1902 to 1928, by 7.5% in 1929, and by 10% in 1930.[74] However, this solution does not apply to the overall period of my

[70] Tael refers to a weight measure of silver. 100 *haikwan taels* = 111.4 *Shanghai taels* (1 *haikwan tael* is 37.8 grams).
[71] Cheng, *Foreign Trade*, p. 304.
[72] Ibid., p. 310.
[73] H. Yao, 'Changes in the Method of Compiling China's Trade Statistics After the War and Some Suggestions for its Improvement', *Quarterly Review of Social Sciences*, 10/1 (1948), p. 84.
[74] Remer, *Foreign Trade*, p. 2.

data-set (1864–1911), nor is the solution considered very reliable because Remer's data are obtained from the exporters rather than the Customs. On the other hand, Jamieson proposes two formulas to calculate the adjusted import and export values, which are, *revised imports* equal to original imports minus import duties minus 4% the difference of original imports and import duties; *revised exports* equal to original exports plus export duties plus 4% original exports.[75] The formulas look reasonable, and yet, Jamieson did not specify why he used 4%. A more detailed explanation of this estimate can be found in the Customs "*trade report*", which points out that the fees after landing should constitute 7% the difference of original imports and import duties, and 8% original exports. Therefore, I have used the Customs estimates to adapt Jamieson's formula to calculate the new import and export data series.

Import and export duties used in the formulas above are from the Customs decennial reports and the compilations by Tang and by Ni.[76] Tang summarises customs duties for thirty *Yangguan* and seven kinds of duty charged by the late Qing *Yangguan* from 1861 to 1910. Ni revises and supplements Tang's data with his corrected data for all *Changguan* and *Yangguan* for the entire Qing Dynasty.[77]

Third, I adopt He Lian's index of imports and exports to yield the real foreign trade series. He Lian's index, constructed with data obtained from the Customs statistics, has been widely cited as the only long-run imports and exports index covering the period from 1867 to 1928.[78] It is computed by the link and chain system with Fisher's ideal formula for weighting.[79]

Despite these adjustments made to the raw statistics, my data-set on Chinese foreign trade still has several limitations. A note to the table on "*Imports and Exports, Annual Values from 1864-1868*", in the 1868 Customs "*trade return*", points out that "it has to be remembered that the want of trade statistics at Hong Kong makes the Returns of the treaty ports but an imperfect statement of the imports and exports of China." This note appears every year until in 1886 when two new offices of the Customs were opened at Kowloon and Lappa, and subsequently

[75] G. Jamieson, 'Effects of the Fall in Value of Silver on Prices of Commodities in China', *Reports on Subjects of General and Commercial Interest*, 1962, pp. 9-10.
[76] See in "*Customs Revenue, 1864-1876*", 1876, and the same table in 1886, 1896, 1904 and 1912 reports; X. Tang, *Statistics of Customs Revenue,* p. 2; Ni, *Customs Duties,* p. 159.
[77] Commodity circulation taxes were charged on all commodities in domestic and foreign trade during the Qing. These taxes were collected by two institutions: *Changguan* for domestic trade, and *Yangguan* for foreign trade.
[78] Hsiao, *Foreign Trade Statistics*, p. 273.
[79] L. He, *Index Numbers of the Quantities and Prices of Imports and Exports and the Barter Terms of Trade in China, 1867-1928* (Tianjin, 1930).

the trade carried by junks in Hong Kong and Macao was put under the jurisdiction of the Customs. Smuggling, during the first half century when China was opened to trade, and particularly when opium was contraband, was rampant in these two areas. A rough estimate provided by Cheng states that 15,000 boxes of opium were smuggled into China from Hong Kong and Macao between 1864 to 1887, which was worth about 5,000,000 taels.[80] Although such amount is not insignificant, Cheng does not specify where his estimate comes from, and hence, it is not deemed adequate to be used for adjustments. Further, illicit trade statistics in China were included in the total value of imports and exports in the Customs returns from 1904 to 1908. In the following years, then, they were reported in the footnotes instead. In my data-set, I add up the value of trade by junks into the total value of imports and exports for the years 1909-13 for continuity purposes. But for illicit trades before 1904, no data were available.

Scholars have often questioned the reliability of the Customs statistics. They, after observing the perennial Chinese balance of trade deficits, suspect particularly an undervaluation of export value.[81] Unfortunately, there is no data available to check the accuracy of these records. I am in favour of Hsiao's judgement that the collection and handling of trade statistics were in competent hands from the very beginning.[82] Another important document, a circular from Sir Robert Hart, the Inspector General of the Customs, to his Commissioners in 1875, expresses more explicitly their efforts to ensure data accuracy: "I take this opportunity of enjoining the utmost care in the investigation of Values for the Returns…and it is for you to adopt the best means of securing reliable quotations, and to verify such figures in every possible way." Further, the incentives for the Customs to corrupt were weak, because the role of assessment and payment of customs revenue were separated. The Customs Service reported the assessment to the Chinese government, but the payment was made to Chinese customs banks. Although there are shortcomings in the procedures and coverage of the records, these carefully and

[80] Cheng, *Foreign Trade*, p. 310.
[81] See for example Cheng, *Foreign Trade*, p. 315. Cheng suggests that the f.o.b. value for exports adopted by the Customs does not include the inland freights and other related fees occurred in transporting goods from inland ports to sea ports. Hankow, a Yangtze port, had the value of its exports computed by the Customs f.o.b. from there rather than of f.o.b. Shanghai, where goods left China. The amount of inland freight charges and expenses were adjusted using 4.5% and 1.5% respectively.
[82] Hsiao, *Foreign Trade Statistics*, p. 7. According to Anson Burlingame, the American Minister to Peking, in the 1860s, many English employees of the Customs were young men who were graduates of Oxford and Cambridge and who were selected for the British Service after the severest competitive examination. Later, three Americans were recruited from the graduating class of Harvard and Yale. To Hsiao, the quality of the personnel of the Chinese Customs from 1864 to 1913 was equal to and perhaps superior to its counterpart in the Western trading nations.

systematically complied data, particularly after adjustments, are considered adequate enough for conducting this research.

4.2. GDP Series

GDP series are obtained from the reconstructions by Ma and de Jong.[83] Their new estimates contain a time series of GDP, based on sectoral output and value added, in current as well as in constant prices. Further, they classify all economic activities into three sectors of Chinese economy: agriculture, industry and service. Each sector focuses on main products or sub-sectors of production to ensure representativeness. It is worth noting that Ma and de Jong's work is still preliminary, largely due to the limitation of historical data sources. Most part of their estimation of the agricultural sector, both nominal and real, are from independent sources, but they used the export and import data on cash crops, quantity and export prices. For the industrial and services sector, their estimations of factory production and public administration are from independent sources. For the rest, the estimations rely on secondary sources and population growth.[84]

4.3. Control Variables

My research adopts Maddison's data for population series, which are used in Ma and de Jong's research, for consistency purposes. Second, cultivated land indices are from Ma and de Jong's estimations which were originally based on Qing official figures.[85] Although the Chinese official land figures were recorded for tax purposes, rather than the actual amount of land in production, Perkin indicates that the differences should not big, since farmers need to register their interests to retain ownership rights.[86] Finally, I construct a new disaster and war index from 1860-1911 using the textual records of all natural disasters and human wars of China.[87] The chronological tables recorded the occurrence time, places, and consequences of each natural disasters and human wars. This is also the first attempt in literature to produce an annual index of wars and disasters for this period.[88]

[83] Ma and de Jong, 'Unfolding the Turbulent Century', p. 79.
[84] Ma and de Jong, 'Unfolding the Turbulent Century', p. 80-5.
[85] Ma and de Jong, 'Unfolding the Turbulent Century', p. 80; Liang, Dynastic Data, p. 380-401.
[86] D. Perkins, *Agricultural Development in China: 1368–1968* (Chicago, 1969), p. 217.
[87] G. Chen, Chronological Tables of Chinese National and Man-made Disasters (Shanghai, 1937), pp. 1639-90.
[88] Deng produces a Qing disaster index but only for benchmark estimates. Deng, 'China's Population', p. 36.

CHAPTER V
DESCRIPTIVE ANALYSIS

5.1. Foreign Trade Performance

5.1.1. Aggregate Trend

Foreign trade expanded moderately in China from 1867 to 1913. In 1867, the total of imports and exports amounted to 114.6 million *haikwan taels* as against 973.5 million *haikwan taels* in 1913, which suggested an annual growth of 4.66% (Figure 4a). However, such growth was inflated to a large extent by the devaluation of silver in terms of gold during that period. When the foreign trade series are adjusted and deflated by He Lian's index, the real growth rates were 2.93% per annum for total trade, 2.39% for exports, and 3.42% for imports (Figure 4b).

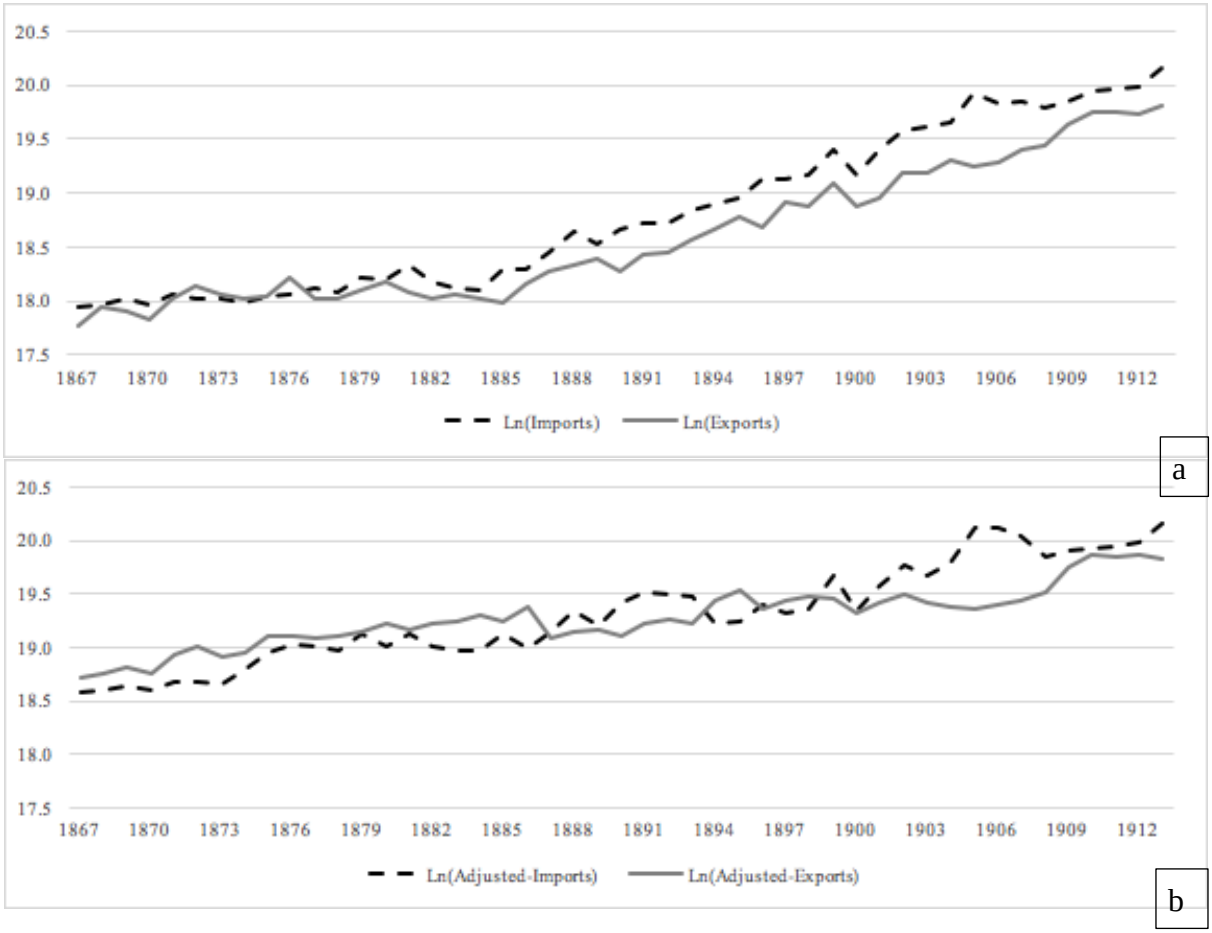


Figure 4. *China's foreign trade, 1867-1913. (a) Original series. (b) Adjusted series.*

Sources: (a) Hsiao, *Foreign Trade Statistics*, 1974. (b) See Section 4.1 for a detailed discussion of sources and adjustments.

Comparing to the world average, Chinese foreign trade growth was relatively slow during the first era of globalisation before World War I: Its share of trade dropped from 2.29% in 1867 to 1.85% by 1913. Table 2 shows that China continued to lose its share of world exports, while China almost caught up with the world's pace of growth in terms of imports. By 1913, China had similar share of world trade as Japan (1.79%), and roughly half of that of India (3.60%). Not surprisingly, Chinese foreign trade fell far behind the industrialised countries such as Britain (15.24%) and Germany (13.12%).[89]

Table 2. *China's share in world trade, 1867-1913.*

	Exports		**Imports**		**Total**
	(million 1913 $)	%	(million 1913 $)	%	%
1867	98.3	2.40%	85.8	2.18%	2.29%
1880	163.1	2.48%	132.3	1.92%	2.19%
1890	143.4	1.59%	196.6	2.11%	1.86%
1900	180.9	1.60%	181.4	1.55%	1.58%
1905	186.7	1.36%	401.9	2.81%	2.10%
1913	299.0	1.60%	416.3	2.07%	1.85%

Sources: World trade data from Federico and Tena, 'World Trade', 2019. Chinese trade data from my adjusted foreign trade series. The exchange rate in 1913 was 1 *Haikwan tael* = 0.73 U.S. Dollar, from Hsiao, *Foreign Trade Statistics*, 1974.[90]

[89] G. Federico and A. Tena-Junguito, 'World Trade, 1800-1938', *Journal of Iberian and Latin American Economic History*, 37/1 (2019), pp. 9-41.
[90] There are differences between Chinese trade data used in Federico and Tena and my adjusted series. But those differences are considered to have little influence on Chinese share of world trade.

Chinese balance of trade could be dealt with in three stages in Table 3. From 1867 to 1887, there was a total excess of exports over imports of 628.5 million *haikwan taels* in 1913 prices. These adjusted values refuse the early statement that China experienced a long period of trade deficit right after the Opium Wars, but rather support more recent findings which suspect the accuracy of the Chinese deficit.[91] From 1888 to 1900, imports began to surpass exports. From 1901 to 1913, then, the import balance totalled 1,618.8 million *haikwan taels*.

Table 3. *China's balance of trade, 1867-1913, in millions of Haikwan taels at 1913 prices.*

Year	Total		Annual Average	
1867 - 1887	+	628.8	+	29.9
1888 - 1900	-	213.4	-	16.4
1900 - 1913	-	1,618.8	-	124.5
1867 - 1913	-	1,203.7	-	25.6

Source: Calculated by the author.

Figure 5 plots He Lian's price index of imports and exports. The index shows the relative price of traded goods that changed over time, and it suggests that from 1867 to 1913, traded goods became cheaper at first. The price drop attributes to the first globalisation, as well as a sharp increase in the silver purchasing power in China that was caused by the rapid silver drain from China in the early 19th century. Soon afterwards, the silver purchasing power began to decline, and therefore, the price index went up.

[91] See for example Cheng, 'Foreign Trade', p. 15.

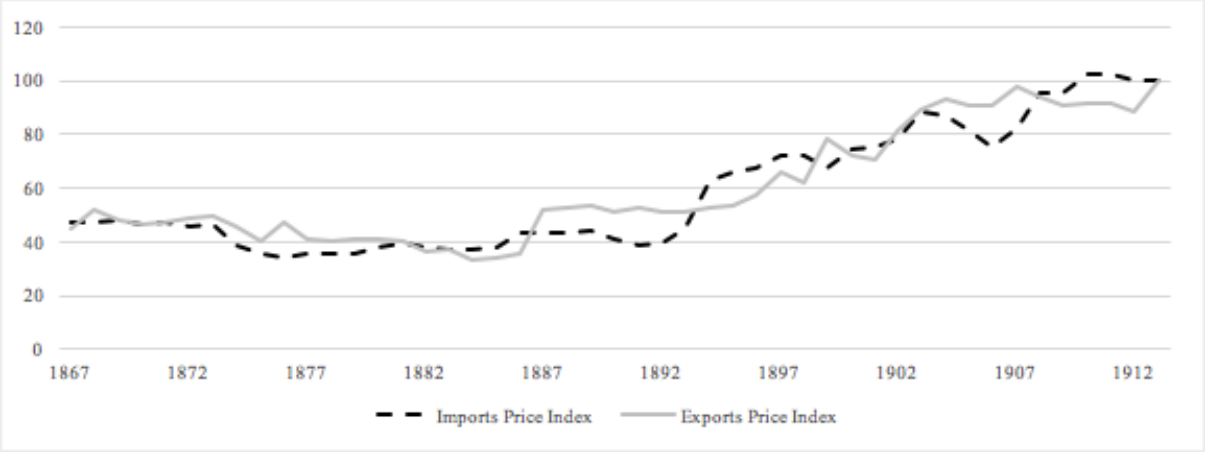


Figure 5. *He Lian's imports and exports index, 1867-1913, 1913=100.*

Source: He, 'Index Numbers', 1930.

5.1.2. Composition of Trade

I classify the imports and exports using Mitchener and Yan's methodology based on skill intensity.[92] In regard to exports (Table 4), the share of un-skilled intensive commodities remained at a high level of more than 90%. Tea and silk together made up 94% of Chinese exports in 1867, and this percentage gradually dropped to 34% in 1913. Whereas, the exportation of other low value-added items, such as cotton, coal, minerals, bristles and hides, increased rapidly over the entire period. Exports of seeds, beans and oil products only began to be important after the opening of Manchuria, constituting 7.4%, 5.8%, and 0.4% of total exports in 1913 respectively.

Whereas for imports (Table 5), the principle commodities became more skill-intensive from the 1860s to 1910s. Opium was the leading imports of China in the 1860s, 1870s and 1880s, constituting 30% to 40% of its total value of imports. However, by 1906, the Qing government was able to launch a new anti-opium campaign in the form of an Imperial Edict. In 1907, they signed a treaty with the Great Britain, whereby China agreed to forbid native cultivation and

[92] They grouped the traded commodities into various industries within the Index of Occupations and Industries from the 1950 U.S. Census of Population. Then, they ranked the industries by average education levels. In their analysis, they denote industries where the faction of workers with nine or more years of education exceeded 0.48 as skill-intensive industries. Mitchener and Yan, 'Globalisation, Trade and Wage', Appendix Table A1.

consumption of opium on the understanding that the export of Indian opium would decline in proportion and cease completely in ten years.[93] As a result, the opium imports dropped to 7.4% by 1913, and were almost completely eliminated by 1917. Cotton and cotton yarns ranked second and third in value. The importation of daily necessities, such as rice and sugar, fluctuated over years depending on the crop yields. More importantly, the imports of high value-added goods began to expand. In 1890, China imported 31 million gallons of kerosene, which surged to nearly 200 million in 1913. Chinese defeat in the Sino-Japanese war in 1895 ushered further changes. China became interested in building factories; further, the most-favoured-nation agreements allowed foreign powers to construct railways in their respective spheres of interest. The imports value of machinery and vehicles increased. Overall, there was a substantial increase in the share of skill-intensive imports from 0.95% to 18.64% during the research period (Figure 6).

Table 4. *Percentage of China's principle exports, 1867-1913*

	Un-Skilled Intensive Exports								**Skill-Intensive Exports**			
	Animal Products	Beans	Cereals	Coal	Cotton	Seeds	Silk	Tea	Wheat Flour	Oil	**Others**	**Total**
1867	-	1.0	-	-	0.9	-	39.7	53.8	-	-	4.6	100
1880	0.9	0.2	-	-	0.2	0.1	38.0	45.9	-	-	14.7	100
1890	3.0	0.4	-	-	3.4	0.6	33.9	30.6	0.6	-	27.5	100
1900	6.2	1.9	-	-	6.2	2.5	30.4	16.0	1.6	-	35.2	100
1905	11.2	3.0	-	-	5.3	3.3	30.1	11.2	0.9	0.1	34.9	100
1913	9.8	5.8	1.5	1.6	4.1	7.4	25.3	8.4	1.9	0.4	33.8	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.
Note: See classification details in Appendix 2.

[93] A. Baumler, 'Citizenship, the Nation and the Race: China and the International Opium System', *Frontiers of History in China*, 13/3 (2018), pp. 330-54.

Table 5. *Percentage of China's principle imports, 1867-1913.*

	Un-Skilled Intensive Imports						Skill-Intensive Imports					
	Cereals (Rice)	Cotton	Cotton Yarn	Coal	Sugar	Opium	Wheat Flour	Fuel	Machinery	Vehicles	**Others**	**Total**
1867	0.8	29.0	2.5	2.1	0.8	33.1	-	-	-	-	31.7	100
1880	0.1	24.9	4.6	1.2	0.4	39.3	-	-	-	-	29.5	100
1890	9.6	20.2	15.3	1.6	0.9	19.5	-	3.2	0.3	-	39.0	100
1900	7.0	21.5	14.3	3.1	3.0	14.8	-	6.6	0.7	-	29.0	100
1905	2.9	25.6	15.0	1.6	5.1	7.7	-	4.5	1.2	1.8	34.6	100
1913	5.0	19.3	12.7	1.7	6.4	7.4	0.2	4.5	1.4	0.8	40.6	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.

Note: See classification details in Appendix 2.

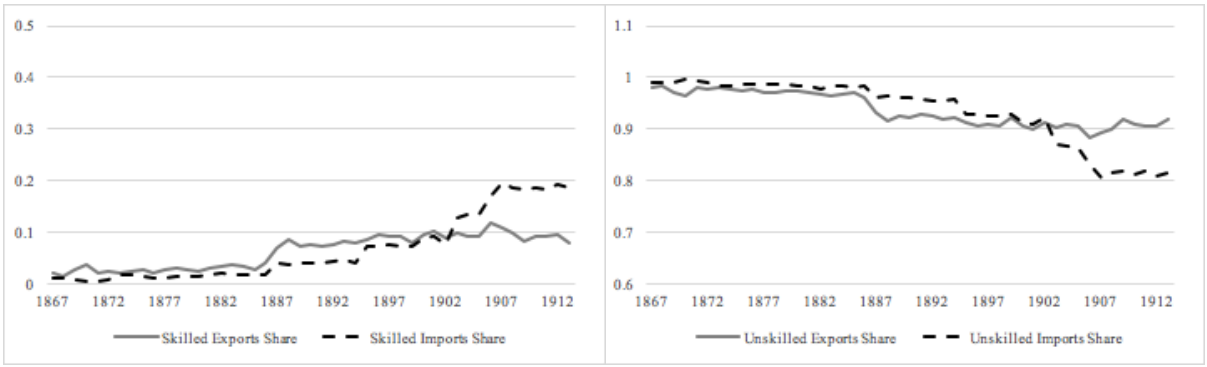


Figure 6. *Share of skilled and unskilled trade, 1867-1913.*

Source: See the above texts for a detailed discussion on classification.

5.1.3. Direction of Trade, by Countries

It is worth noting that Hong Kong played a major role as entrepôt for the foreign trade of China in general and of Southern China in particular. Morse, Statistical Secretary of the Customs,

estimated Hong Kong's share of Chinese trade to different nations (Table 6).[94] Further, Hong Kong's share increased and then decreased over the period, peaked in the 1890s. Two reasons may explain the changes. First, Hong Kong was more accessible for European exporters with limited knowledge of China, but as their Chinese market-specific knowledge accumulated, the exporters would choose to sell directly rather than through intermediaries.[95] Second, big trading nations, like Great Britain, generally export directly to China; whereas Southeast Asian countries with relatively small volume of trade, located closer to Hong Kong, were more likely to ship through the intermediary.[96]

Table 6. *Direction of Hong Kong's share of Chinese trade in 1867.*

	U.K.	India, Singapore and Australia	U.S.A.	Others	Total
Imports from	15%	4%	1%	-	20%
Exports to	9%	2%	1%	2%	14%

Source: Morse, *The International Relations,* 1910.

Despite the lack of adequate "*trade return*" of Hong Kong to adjust its shares, the proportions of trade with principle countries are shown in Table 7 and Table 8. Britain, as well as (British) India, dominated Chinese trade, in particular the exports, with a share of more than 70% in 1867. Japan expanded its trade with China after the Sino-Japanese War, and its shares nearly quadrupled in both imports and exports in less than twenty years from 1895-1913. The States share in exports maintained very stable, ranging from 9% to 13%, while its share in imports made some gains, reaching 16.7% in 1905. Further, China enjoyed a positive trade balance with France, Germany and Australia, which made up about 15% of Chinese exports in 1913. Imports from these countries were kept at a low level. The volume of trade with South Africa were minimal.

[94] Morse, *The International Relations*, pp. 398-9.
[95] Ibid., p. 402.
[96] Ibid., p. 405.

Table 7. *Percentage of China's exports to principle counties, 1867-1913.*

	I			II				III	IV	V		
	HK	IN	JP	GB	FR	DE	RU	U.S.A.	AU	SA	**Others**	**Total**
1867	14.0	0.6	2.0	57.5	-	-	1.6	12.9	4.4	0.1	8.5	100
1880	21.3	1.4	2.8	35.7	-	-	6.9	11.7	2.4	0.1	24.5	100
1890	37.6	1.2	5.5	14.9	-	-	10.1	9.3	1.4	0.2	29.7	100
1900	40.2	1.8	10.7	5.9	-	-	7.8	9.3	0.5	0.1	31.5	100
1905	35.7	1.2	15.6	7.9	8.3	2.4	4.1	11.9	-	-	17.0	100
1913	29.0	1.5	16.3	4.1	10.1	4.2	11.1	9.3	0.1	-	25.3	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.

Note: I) Asia. II) Europe. III) America. IV) Australia and New Zealand. V) South Africa. Abbreviations for countries/commercial areas: HK—Hong Kong, IN—India, JP—Japan, GB—Great Britain, FR—France, DE—Germany, RU—Russia (including all land and European ports), U.S.A.—United States of America, AU—Australia, SA—South Africa.

Table 8. *Percentage of China's imports from principle counties, 1867-1913.*

	I			II				III	IV	V		
	HK	IN	JP	GB	FR	DE	RU	U.S.A.	AU	SA	**Others**	**Total**
1867	19.8	44.6	3.1	26.3	-	-	0.2	1.0	0.8	-	4.3	100
1880	37.1	25.4	4.3	26.8	-	-	0.2	1.5	0.3	-	4.5	100
1890	55.9	8.0	5.7	19.1	-	-	0.7	2.9	0.2	-	7.5	100
1900	42.2	7.6	11.6	20.5	-	-	2.0	7.5	0.2	-	8.4	100
1905	32.1	7.5	13.3	18.7	0.8	3.2	0.4	16.7	0.3	-	6.8	100
1913	29.3	8.2	20.4	16.5	0.9	4.8	3.8	6.0	0.1	-	9.9	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.

Note: See notes for Table 7.

5.1.4. Distribution of Trade, by Ports

Before the Opium War in 1840-42, Canton was the only port for foreign trade. Then, four new ports were opened after the Nanking Treaty, and there were a total of forty-eight treaty ports opened by 1913. As presented in Table 9 and 10, Chinese ports was divided into four regions: Yangtze, South, North China and North East (Manchuria). Shanghai took up roughly 70% of Chinese trade in 1867, and the percentage decreased to 42% in 1913 as more ports were opened. The proportion of Canton also experienced a slow decline, while the share of Hankow, Chinese largest inland river port, and Tientsin, the major North China port, both increased steadily. In terms of regions, Yangtze accounted for 50% to 70% of foreign trade. North Eastern (Manchuria) ports were opened after the Treaty of Shimonoseki in 1900s, but they soon became the major ports of exports of soya beans and other vegetable products.

Table 9. *Percentage of China's exports by principle ports, 1867-1913.*

	I		**II**			**III**		**IV**				
	SH	HW	CT	ST	KL	KH	TS	DR	AT	HB	**Others**	**Total**
1867	56.6	2.0	16.3	0.3	-	-	1.2	-	-	-	23.6	100
1880	46.5	9.8	16.4	1.6	-	-	5.4	-	-	-	20.3	100
1890	37.6	6.5	17.1	1.9	17.0	-	5.3	-	-	-	14.7	100
1900	49.1	3.9	11.9	3.4	13.1	-	0.6	-	-	-	17.9	100
1905	47.4	4.2	16.4	2.7	6.5	1.1	4.6	-	-	-	17.2	100
1913	41.8	4.0	13.2	2.0	3.0	3.1	1.9	11.8	0.9	4.4	14.0	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.

Note: I) Yangtze, II) South III) North China IV) North East. Abbreviations for ports: SH—Shanghai, HW—Hankow, CT—Canton, ST—Swatow, KL—Kowloon, KH—Kiaohow, DR—Dairen, TS—Tientsin, AT—Antung, HB—Harbin. See notes for Table 5a.

Table 10. *Percentage of China's imports by principle ports, 1867-1913.*

	I		II			III		IV				
	SH	HW	CT	ST	KL	KH	TS	DR	AT	HB	**Others**	**Total**
1867	68.8	-	9.6	5.4	-	-	1.6	-	-	-	14.6	100
1880	68.7	-	3.6	10.1	-	-	1.5	-	-	-	16.2	100
1890	51.5	0.1	8.6	6.9	13.9	-	1.4	-	-	-	17.5	100
1900	56.7	0.4	6.2	5.6	9.3	0.1	1.7	-	-	-	20.0	100
1905	56.0	5.7	5.7	3.1	4.9	0.9	6.8	-	-	-	16.8	100
1913	41.7	5.8	5.4	3.4	5.1	2.6	8.8	4.9	1.1	3.4	17.8	100

Source: Calculated from Yang and Hau, 'Statistics of China', 1931.

Note: See notes for Table 9.

5.2. National Accounts, Trade Openness, and Disasters

5.2.1. GDP and GDP Per Capita

Ma and de Jong's estimations of GDP are presented in Figure 7. After the stagnation in the 1860s, an economic recovery in the 1870s-1880s resulted in a total growth of real GDP by 7.3%. At the beginning of the 1890s, then, the Qing economy returned to its pre-rebellion levels. However, the second half of this decade experienced another decline in GDP. Such decline was transitory, and the Qing economy moved back fast to a growth path. Generally, there was a slow growth in total GDP in the late Qing along with the increase in population, but Chinese economy was stagnant at the per capita level.

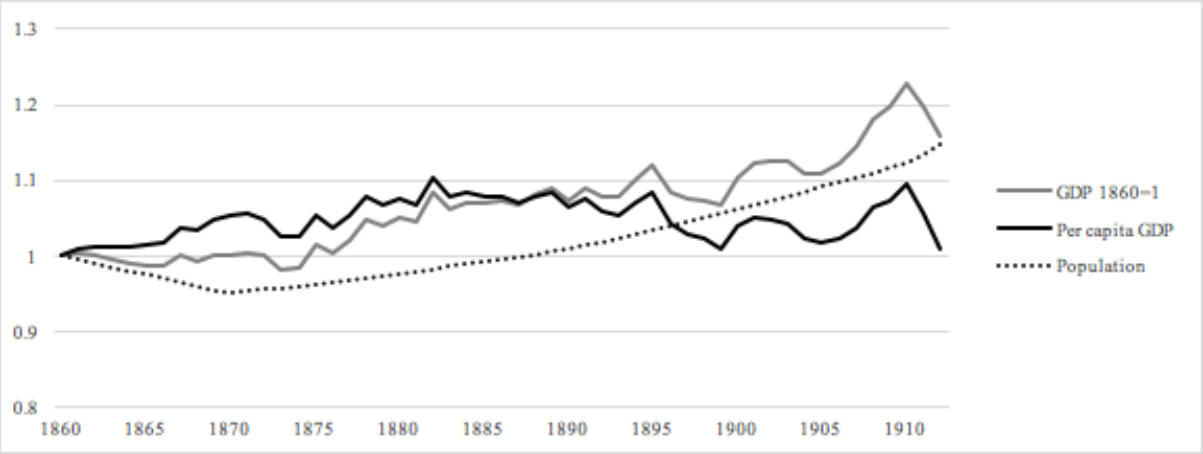


Figure 7. *China's GDP and GDP per capita, 1860-1912, in constant prices, 1912=1.*

Source : Ma and De Jong, 'Unfolding the turbulent century', 2017.

The international comparison of GDP per capita in Table 11 shows clearly that China had already fallen below the European countries in the mid-19th century. Most Asian countries, except for Japan, shared a similar pattern of stagnation of living standards during this period. However, from the second half of the 19th century, Asian economies such as Japan and Indonesia entered into a fast-growth trajectory, while China showed no acceleration of growth in per capita levels. In the 1860s-1880s, the growth of late Qing was comparable with that of India. However, in the 1900s Chinese per capita GDP increased by 5.1% in contrast with a growth of 15.6% in India. This suggests that China was already losing out to other Asian countries in its early stage of industrialisation.

Table 11. *GDP per capita in comparison, 1812-1911, in 1990 international dollars.*

	Asia					Europe				
	China	India	Java	Indonesia	Japan	GB/UK	Holland	Netherlands	Italy	Spain
1812	565	519	507	-	641	2,012	2,408	1,800	1,433	916
1850	532	556	462	-	681	2,718	-	2,371	1,481	1,079
1887	584	526	548	696	952	3,713	-	3,277	1,751	1,585
1911	577	691	-	836	1,356	4,709	-	3,863	2,199	2,017

Sources: Chinese GDP/capita at 1850, 1887 and 1911 are from Ma and de Jong, 'Unfolding the Turbulent Century', 2017. Chinese GDP/capita at 1812, and estimations for other nations are cited in Xu *et al.,* 'Chinese National Income', 2017.
Note: the line breaks indicate Britain (prior to 1870) and the UK (post 1870).

5.2.2. Sectoral GDP

Nonetheless, although the overall economic structure of the late Qing Empire was stable, the sectoral analysis confirms that it experienced a slow modernisation. There are several minor shifts between the sectors of agriculture, industry and service. As shown in Figure 8, the late Qing China was largely an agrarian economy. Its agricultural sector accounted for 71%-72% of total GDP on average in constant prices. There was an increasing share of mechanised production (0%-1%), as well as a decreasing share of traditional production (5%-4%). The percentage of services sector was roughly 23%.

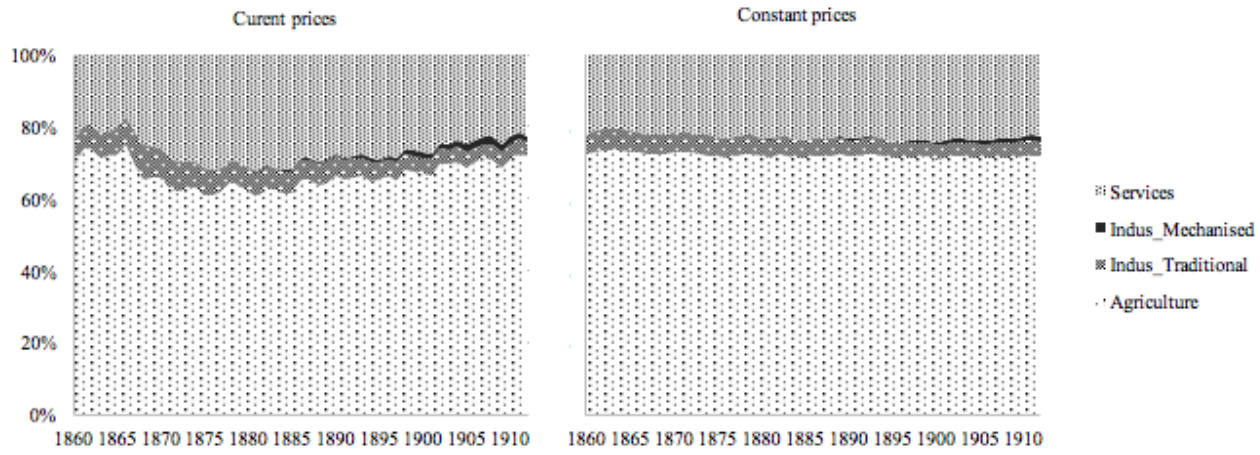


Figure 8. *China's economic structure, 1860-1912, in current prices and constant prices, %.*

Source: Ma and De Jong, 'Unfolding the turbulent century', 2017.

Figure 9a illustrates the movement of sectoral GDP which deserves further explanations. In pre-modern China, its total economy was largely attributable to agricultural production, and further, nearly 80% of agricultural production was attributable to the arable sector. Hence, the movement of agricultural production is close to that of total GDP, and Figure 9b illustrates a similar stagnation in food crops output, such as wheat and rice. One explanation for the stagnant output of food crops was that traditional approaches of agricultural production was labor-intensive.[97] In particular, in the late 19th century, disasters and wars caused huge losses of labor, while static technological development impeded achievement of higher levels of land productivity. Moreover, the domestic production of cotton and tea could have been negatively affected by foreign trade conditions. The rapid growth in the export of India and Cylon teas to the world market handicapped the Chinese tea trade. The building of filatures in Qing China for the reeling of silk in the 1890s was responsible for the significant increase thereafter in the production of steam filature raw silk.[98]

Industrial production of pre-modern China mainly consisted of manufacturing and mining (Figure 9c). Manufacturing of textiles and food processing (oil, flour, tobacco) witnessed a

[97] Z. Shi, 'A Study on Cultivated Land and Grain Production in the Early Qing Dynasty', *Chinese Economic History Review*, 1, 1989, pp. 47-62.
[98] Cheng, *Foreign Trade*, p. 15.

steady growth; whereas, mining, primarily comprised of coal mining, firstly declined and then rose back to the beginning level, along with the expansion of coal usage for the construction of railways which were financed by foreign capital in the early 20th century. Notably, there was an annual growth of around 9% in the mechanised production in the early stage of the Chinese modernisation. However, because of the relatively small share of mechanised production, the total industrial production began to increase only after the 1900s with improving performances of both traditional and new industry (Figure 9e).

Services included the pubic administration, finance and housing, commercial activities and professional work (Figure 9d). The largest sub-sector was commerce services (distribution and transport), and its growth may be caused by the increasing share of marketed products in agriculture and industry.[99] Public spending (military spending, relief funds, administration costs) fluctuated since the Chinese government had difficulties in maintaining its normal operations.[100] Other sub-services generally performed in line with the population growth.

[99] D. Xu and C. Wu, *A History of Capitalism Development in China, 1840–1920* (Beijing, 2003), p. 289. For example, the commercialised share of food crops increased from 10.5% to 21.6%, while that of textiles increased from 60% to 70% from 1840-1920.
[100] Z. Shi and Y. Xu, *Public Finance in the Late Qing Dynasty: 1851-1894* (Shanghai, 2008), p. 25.

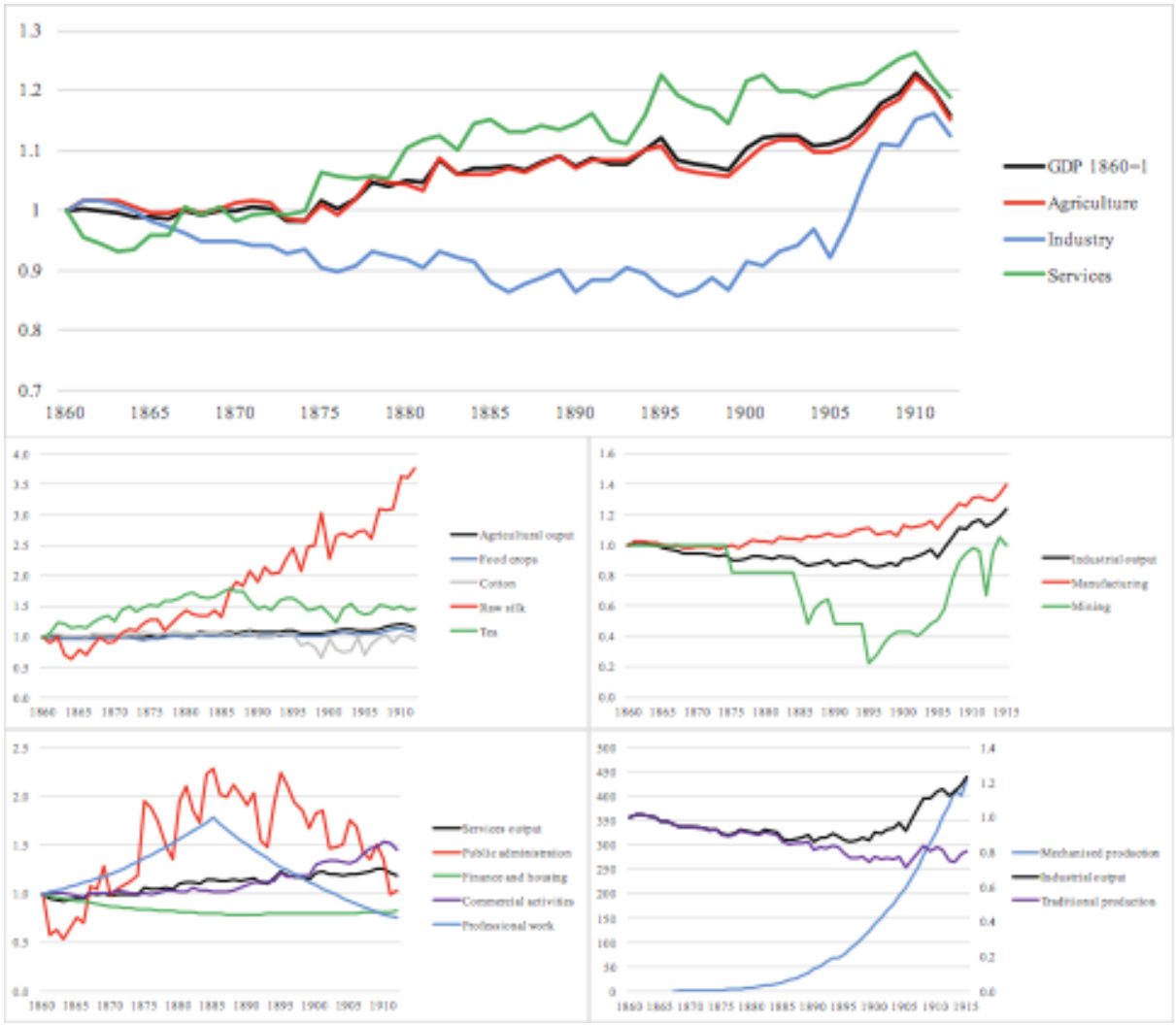


Figure 9. *China's sectoral output, 1860-1912, in constant prices, 1860=1.*

From top to down, from left to right:

(a) agriculture, industry and services.

(b) agriculture and main products, 1860-1912.

(c) industry and major sub-sectors, 1860-1915.

(d) services and sub-sectors, 1860-1912.

(e) traditional and mechanised industrial production, 1860-1915.

Source: Ma and De Jong, 'Unfolding the turbulent century', 2017.

Note: the index of mechanised production is plotted on a secondary axis because it increased 435 times from 1867 to 1915.

5.2.3. Trade Openness

To preliminarily assess the importance of export-led growth, I measure the trade openness ratios: the shares of exports, imports, and total trade in GDP. Figure 10 shows that Chinese exports to GDP ratio increased from 0.93% to 2.53%, while its imports to GDP ratio rose from 0.81% to 2.82%. Figure 11 shows that Chinese exports took up a relatively small proportion of its GDP compared to the industrialised countries such as Britain (17.52%) and Germany (16.10%) in 1913.

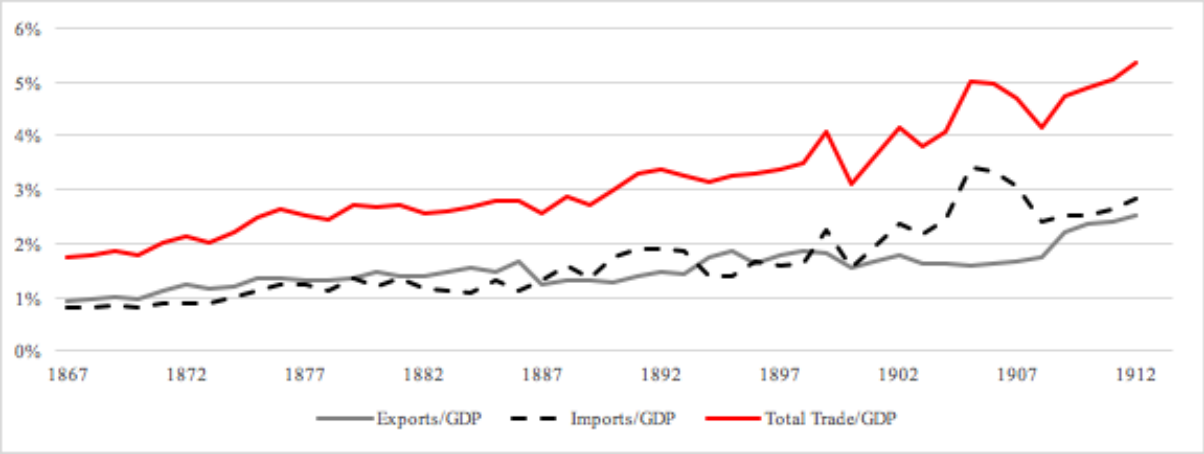


Figure 10. *China's trade ratios, 1867-1912.*

Sources: Trade data from adjusted trade series. GDP data from Ma and De Jong, 'Unfolding the turbulent century', 2017.

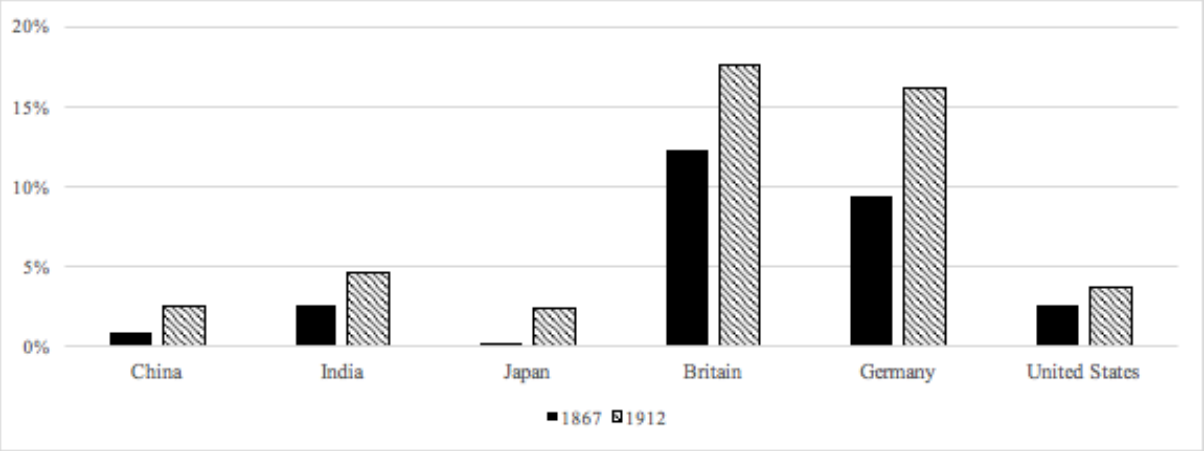


Figure 11. China's exports to GDP ratio in comparison, 1867 and 1912.

Sources: Trade and GDP data of foreign countries from the online database of the Groningen Growth and Development Centre.

5.2.4. Disasters

Figure 12 graphs the newly constructed disaster index. It shows that the late Qing Empire suffered from a high number of natural disasters and human wars. Among these disasters, natural factors (floods, drought, locust) accounted for 54%, while human factors (internal rebellion, external wars and inter-ethnic conflicts) accounted for 46% (Figure 13).

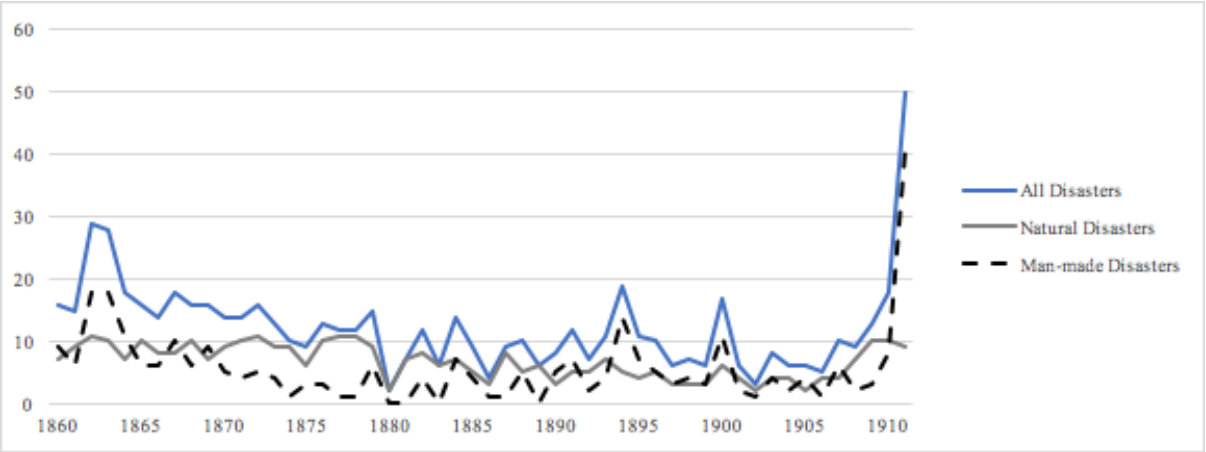


Figure 12. *Number of disasters, 1860-1910.*

Sources: Chen, 'Chronological Tables of Chinese Natural and Man-made Disasters', 1937.

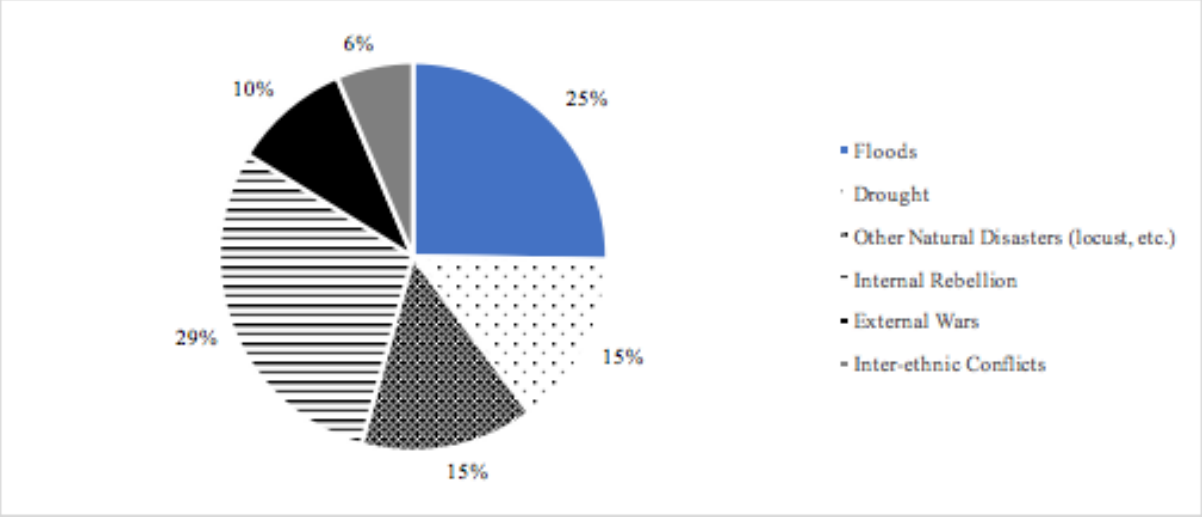


Figure 13. *Distribution of disasters, 1860-1910.*

Sources: Chen, 'Chronological Tables of Chinese Natural and Man-made Disasters', 1937.

CHAPTER VI
EMPIRICAL ANALYSIS

6.1. Effects of Exports and Imports

The first series of regressions are run at the country-level to explore the effects of exports and imports on Chinese GDP from 1867 to 1911, and how they are influenced by the inclusion of other control variables. The equation, with all variables (except for the number of natural disasters and wars) in log forms, is expressed as follows:

(1) $LGDP_t = \alpha + \beta_1 LEXP_t + \beta_2 LIMP_t + \beta_3 LP_t + \beta_4 LLAND_t + \beta_5 ND_t + \beta_6 WAR_t + \varepsilon_t$

Where $LGDP_t$, $LEXP_t$, $LIMP_t$ represent the real growth rates of Chinese GDP, exports and imports respectively. LP_t and $LLAND_t$ are the growth rates of population and land per capita. ND_t and WAR_t are the number of natural disasters and human wars. ε_t is an error term.

Table 12. *Results of equation (1).*

	GDP ($LGDP_t$)			
	(1)	(2)	(3)	(4)
Exports ($LEXP_t$)	0.180***	0.115***	0.085***	0.091***
	(0.013)	(0.018)	(0.017)	(0.017)
Imports ($LIMP_t$)		0.048***	0.013	0.010
		(0.009)	(0.017)	(0.019)
Population (LP_t)			0.431***	0.499***
			(0.159)	(0.175)
Cultivated Land per capita ($LLAND_t$)			0.706***	0.786***
			(0.234)	(0.302)
Natural Disasters (ND_t)				0.001
				(0.001)
Wars (WAR_t)				0.000
				(0.000)
Number of Observations	45	45	45	45
R-squared	0.8213	0.8711	0.9040	0.9170

F Statistic	192.00	121.87	84.58	77.99
Durbin-Watson	0.6613	0.9030	0.7548	0.8719

Note: ***p < .01, **p < .05, *p < .1. Standard errors are in parentheses. This regression, like all the others, is run using heteroscedasticity-robust standard errors.

The results of the estimations of equation (1) are shown in Table 12. As the core explanatory variables are expressed in logarithms, the coefficients β_1 and β_2 can be interpreted as proxies for the elasticity of Chinese GDP with respect to exports and imports. The coefficients of exports show that during the late Qing period, exports had a positive and significant effect on Chinese GDP, after taking into account imports and control variables. However, the export elasticity of GDP is much lower than that of the population and cultivated land per capita. These latter two variables, then, have the highest explanatory power among other variables. This suggests that the late Qing growth was dominated by agricultural activities. And it is in fact within expectation, since the majority of the food crops were produced for domestic consumption, and the effects of exports were mostly relevant to tea and silk, which made up only a small amount of total production. On the other hand, the effect of imports loses its significance after population and land factors enter into the model. Surprisingly, natural disasters and wars did not have significant negative impacts on overall growth performances. One explanation could be that the Qing state offered the relief aid to farmers in the case of famine.[101] Such regime may offset the agricultural loss caused by disasters. The R-squared shows that the goodness-of-fit of the equation is good. Exports, imports and control variables taken together are able to account for 91.7% of variance for GDP growth. Finally, the Durbin-Watson test (d-statistic (7, 45) = 0.8719) suggests the presence of positive serial correlation, which will be discussed again in Section 6.3.

The second series of regressions are run at the sectoral level to explore the effects of exports and imports on the growth of Chinese agriculture, industry and services output from 1867 to 1911. In the form of equations, they are expressed as follows:

(2) $LAGRI_t = \alpha + \beta_1 LEXP_t + \beta_2 LIMP_t + \beta_3 LP_t + \beta_4 LLAND_t + \beta_5 ND_t + \beta_6 WAR_t + \varepsilon_t$

[101] K. Deng, 'State Transformation, Reforms and Economic Performance in China, 1840-1910', in A. Teichova and H. Matis (eds), *Nation, State and the Economy in History* (Cambridge, 2003), pp. 308-331.

(3) $LTIND_t = \alpha + \beta_1 LEXP_t + \beta_2 LIMP_t + \beta_3 LP_t + \beta_4 ND_t + \beta_5 WAR_t + \varepsilon_t$

(4) $LMIND_t = \alpha + \beta_1 LEXP_t + \beta_2 LIMP_t + \beta_3 LP_t + \beta_4 ND_t + \beta_5 WAR_t + \varepsilon_t$

(5) $LSERV_t = \alpha + \beta_1 LEXP_t + \beta_2 LIMP_t + \beta_3 LP_t + \beta_4 ND_t + \beta_5 WAR_t + \varepsilon_t$

Where $LAGRI_t$, $LTIND_t$, $LMIND_t$, $LSERV_t$ are the real growth rates of agriculture, traditional industry, mechanised industry and services sector. The industrial output has been divided into traditional production and mechanised production to have a better understanding on the effect of foreign trade on the modernisation of the late Qing economy. In addition, the factor of cultivated land per capita is removed from the equation (3)-(5) because farmland is assumed to have no direct effect on industrial and services output.

Agriculture was the largest sector of pre-modern China, and the growth trend of agricultural output was close to that of the total output. As expected, the results for agriculture are similar relative to that for the total economy (Table 13). In terms of industrial output, however, the situation is more complicated. Exports only have a positive effect on mechanised production. Further, the coefficient of imports is significantly negative on the traditional industry, but significantly positive on the mechanised industry. This shows that foreign imports in China, in particular the capital goods and energy inputs, may promote the development of modern mechanised production, but these imports may also seize the market share of the traditional mining and manufacturing industry. In terms of services output, exports contribute to more commerce services in transportation and distribution, and hence, exports have a positive effect on services. Natural disasters were detrimental to all other sectoral output except for agriculture since the core farming zones received more disaster aid than the periphery (Table 14). There is a positive relationship between wars and mechanised industry. Given the low-level of industrialisation of the late Qing China, this could be attributed to the incentives from the industrial warfare for the Chinese to modernise their country.

Table 13. *Results of equation (2) - (5).*

	Agriculture ($LAGRI_t$)		Traditional Industry ($LTIND_t$)		Mechanised Industry ($LMIND_t$)		Services ($LSERV_t$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exports ($LEXP_t$)	0.111***	0.084***	-0.032	0.001	2.439***	1.048**	0.130***	0.136***
	(0.202)	(0.019)	(0.047)	(0.051)	(0.467)	(0.456)	(0.029)	(0.023)
Imports ($LIMP_t$)	0.039***	0.013	-0.140***	-0.102**	2.577***	1.970***	0.075***	0.017
	(0.010)	(0.023)	(0.025)	(0.039)	(0.235)	(0.499)	(0.013)	(0.026)
Population (LP_t)		0.440**		-0.482		8.940		0.440*
		(0.219)		(0.377)		(5.398)		(0.256)
Cultivated Land per capita ($LLAND_t$)		0.500**						
		(0.351)						
Natural Disasters (ND_t)		0.003		-0.011**		-0.095***		-0.005***
		(0.001)		(0.003)		(0.024)		
Wars (WAR_t)		0.000		0.000		0.075*		0.000
		(0.000)		(0.001)		(0.024)		(0.001)
Number of Observations	45	45	45	45	45	45	45	45
R-squared	0.8033	0.8621	0.7342	0.8538	0.9272	0.9570	0.8327	0.8956
F Statistic	90.25	93.57	64.44	58.38	383.94	269.14	109.60	121.99
Durbin-Watson	1.0050	1.2702	0.3255	0.9773	0.6988	1.0570	1.0850	1.4562

Note: ***p < .01, **p < .05, *p < .1. Standard errors are in parentheses.

Table 14. *Disaster relief coverage, provincial entries, 1644-1911.*

	Provincial Entries	% in Chinese Total
Northern core farming provinces	693	40.7
Southern core farming provinces	677	39.7

Northern periphery farming provinces	148	8.7
Sourthern periphery farming provinces	170	10.0
Non-farming provinces	16	0.9
Total	1704	100

Source: Deng, 'State Transformation', 2003.

6.2. Effects of Skilled and Unskilled Exports and Imports

The third series of regressions are run at both the country-level and sectoral level to explore respective effects of skill-intensive and unskilled-intensive exports and imports on Chinese output during the late Qing period. The resulting augmented equations are:

(6) $LGDP_t = \alpha + \beta_1 LskillEXP_t + \beta_2 LunskillEXP_t + \beta_3 LskillIMP_t + \beta_4 LunskillIMP_t + \beta_5 LP_t + \beta_6 LLAND_t + \beta_7 ND_t + \beta_8 WAR_t + \varepsilon_t$

(7) $LAGRI_t = \alpha + \beta_1 LskillEXP_t + \beta_2 LunskillEXP_t + \beta_3 LskillIMP_t + \beta_4 LunskillIMP_t + \beta_5 LP_t + \beta_6 LLAND_t + \beta_7 ND_t + \beta_8 WAR_t + \varepsilon_t$

(8) $LTIND_t = \alpha + \beta_1 LskillEXP_t + \beta_2 LunskillEXP_t + \beta_3 LskillIMP_t + \beta_4 LunskillIMP_t + \beta_5 LP_t + \beta_6 ND_t + \beta_7 WAR_t + \varepsilon_t$

(9) $LMIND_t = \alpha + \beta_1 LskillEXP_t + \beta_2 LunskillEXP_t + \beta_3 LskillIMP_t + \beta_4 LunskillIMP_t + \beta_5 LP_t + \beta_6 ND_t + \beta_7 WAR_t + \varepsilon_t$

(10) $LSERV_t = \alpha + \beta_1 LskillEXP_t + \beta_2 LunskillEXP_t + \beta_3 LskillIMP_t + \beta_4 LunskillIMP_t + \beta_5 LP_t + \beta_6 ND_t + \beta_7 WAR_t + \varepsilon_t$

Where $LskillEXP_t$ and $LunskillEXP_t$ are the real growth rates of skill-intensive and unskilled-intensive exports. $LskillIMP_t$ and $LunskillIMP_t$ are the real growth rates of skill-intensive and unskilled-intensive imports.

Table 15 shows that both unskilled and skilled exports have positive effects on production, while the elasticity of production with respect to the growth of unskilled exports is much higher than that of skilled exports. Table 16 illustrates that first, similar to the results of total production, the coefficients of both exports are positive and significant on the agriculture. Second, skilled trade has strong positive effects on mechanised production. In particular, skilled imports, such as fuel, machinery and vehicles, have the highest explanatory power for the growth of modern industry. Third, besides exports, skilled imports also positively relate to services output. This may link to the fact that the imports of more technology-intensive goods, such as better lighting and transportation tools, facilitated the provision of commercial services and other sub-services.

Table 15. *Results of equation (6).*

	GDP ($LGDP_t$)			
	(1)	(2)	(3)	(4)
Un-Skilled Intensive Exports ($LunskillEXP_t$)	0.096***	0.0877***	0.070***	0.069***
	(0.019)	(0.019)	(0.019)	(0.019)
Skill-Intensive Exports ($LskillEXP_t$)	0.035***	0.016	0.018*	0.024**
	(0.005)	(0.011)	(0.010)	(0.010)
Un-Skilled Intensive Imports ($LunskillIMP_t$)		-0.005	-0.005	-0.013
		(0.025)	(0.024)	(0.011)
Skill-Intensive Imports ($LskillIMP_t$)		0.013	0.002	0.008
		(0.009)	(0.012)	(0.011)
Population (LP_t)			0.417*	0.534**
			(0.250)	(0.252)
Cultivated Land per capita ($LLAND_t$)			0.501*	0.621**
			(0.271)	(0.510)
Natural Disasters (ND_t)				0.002
				(0.001)
Wars (WAR_t)				0.000
				(0.000)

Number of Observations	45	45	45	45
R-squared	0.8734	0.8860	0.9064	0.9219
F Statistic	113.30	74.18	83.67	78.92
Durbin-Watson	0.5689	0.6008	1.0393	1.0209

Note: ***p < .01, **p < .05, *p < .1. Standard errors are in parentheses.

Table 16. *Results of equation (7) - (10).*

	Agriculture ($LAGRI_t$)		Traditional Industry ($LTIND_t$)		Mechanised Industry ($LMIND_t$)		Services ($LSERV_t$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Un-Skilled Intensive Exports ($LunskillEXP_t$)	0.091*** (0.021)	0.057*** (0.022)	0.053 (0.041)	0.029 (0.038)	0.832** (0.310)	1.022*** (0.139)	0.068** (0.032)	0.116*** (0.025)
Skill-Intensive Exports ($LskillEXP_t$)	0.013 (0.013)	0.029** (0.10)	-0.064 (0.019)	-0.037 (0.020)	1.146*** (0.127)	1.143*** (0.346)	0.042** (0.014)	0.027* (0.014)
Un-Skilled Intensive Imports ($LunskillIMP_t$)	-0.003 (0.030)	-0.028 (0.029)	-0.065 (0.050)	-0.032 (0.040)	0.264** (0.099)	0.320* (0.144)	0.008 (0.031)	-0.019 (0.033)
Skill-Intensive Imports ($LskillIMP_t$)	0.010 (0.009)	0.018 (0.013)	-0.005 (0.015)	-0.009 (0.015)	0.757** (0.285)	0.529** (0.298)	0.011 (0.011)	0.0268* (0.017)
Population (LP_t)		0.630** (0.297)		-0.249 (0.436)		0.439 (3.586)		-0.242 (0.342)
Cultivated Land per capita ($LLAND_t$)		0.592** (0.289)						
Natural Disasters (ND_t)		0.005 (0.001)		-0.009*** (0.003)		-0.031* (0.016)		-0.003** (0.001)
Wars (WAR_t)		0.000		0.001		0.009**		0.000

		(0.000)		(0.001)		(0.004)		(0.000)
Number of Observations	45	45	45	45	45	45	45	45
R-squared	0.8098	0.8721	0.8231	0.8757	0.9835	0.9863	0.8799	0.9145
F Statistic	45.11	81.66	61.53	48.18	638.10	738.63	71.13	56.56
Durbin-Watson	0.8612	1.3546	0.7654	1.7017	1.1601	1.6444	1.0278	1.2706

Note: ***p < .01, **p < .05, *p < .1. Standard errors are in parentheses.

6.3. A Dynamic Analysis

Despite that the above static analysis sheds light on the magnitude and relevance of export-led growth, it could suffer from dynamic mis-specifications. Due to this concern, the Durbin-Watson statistics are reported, and the results suggest that there is positive serial correlation. Hence, below shows an attempt towards a more dynamic analysis using the techniques of co-integration and error-correction models on the most interesting cases, which are the effects of skilled and unskilled trade on GDP and mechanised production. The error correction models are structured as below:

$$d\,L(*)_t = \alpha + \Sigma\beta_1 d\,L(*)_{i,\,t-1} + \Sigma\beta_2\, d\,L(**)_{i,\,t-1} + \Sigma\beta_3\, d\,L(***)_{i,\,t-1} + \lambda\, ECT_{t-1} + \varepsilon_t$$

(11) (*), (**), (***) separately represent GDP, exports and imports
(12) (*), (**), (***) separately represent mechanised production, exports and imports

$$d\,L(*)_t = \alpha + \Sigma\beta_1 d\,L(*)_{i,\,t-1} + \Sigma\beta_2\, d\,L(**)_{i,\,t-1} + \Sigma\beta_3\, d\,L(***)_{i,\,t-1} + \Sigma\beta_4\, d\,L(****)_{i,\,t-1} + \Sigma\beta_5\, d\,L(*****)_{i,\,t-1} + \lambda\, ECT_{t-1} + \varepsilon_t$$

(13) (*), (**), (***), (****), (*****) separately represent GDP, unskilled exports, skilled exports, unskilled imports and skilled imports
(14) (*), (**), (***), (****), (*****) separately represent mechanised production, unskilled exports, skilled exports, unskilled imports and skilled imports

where *d* represents first difference. ECT_{t-1} represents the error correction term which is the lagged value of residuals gained from the co-integration regression of the dependent variable on the regressors. λ is the speed of adjustment parameter.

First, the stationarity of each time series variable is examined by performing unit root tests. This step is important in the sense that standard econometric strategies assume stationarity in the time series, while they are actually non-stationary. For example, the ordinary least squares (OLS) estimations in presence of non-stationary variables may lead to spurious regressions if the variables are not co-integrated.[102] Table 17 shows the results of unit root tests obtained using the augmented Dickey-Fuller test. The results show that all variables are not stationary at level but at their first difference. The variables are all integrated of order one, I(1).

Table 17. *Augmented Dickey-Fuller unit root tests.*

	Level		First Difference	
	ADF	Lag	ADF	Lag
LGDP	-2.400	1	-7.236***	0
LMIND	0.200	2	-3.213**	1
LEXP	-2.593	1	-7.674***	0
LIMP	-3.093	1	-8.542***	0
LunskillEXP	-2.546	1	-7.508***	0
LskillEXP	-1.664	3	-7.143***	1
LunskillIMP	-3.052	1	-8.634***	0
LskillIMP	-3.044	1	-6.891***	0

Note: *** and ** denote statistical significance at the 1% and 5% levels. The number of lags are selected based on Akaike Information Criterion (AIC). The null hypothesis is that the series is non-stationary and the rejection of null hypothesis for ADF test is based on the Mackinnon critical value.

[102] S. Johansen, 'Estimation and Hypothesis Test of Cointegrating Vectors in Gaussian Vector Autoregressive Model', *Econometrica*, 59 (1991), pp. 1551–1580.

Second, the Johansen co-integration test is applied to check whether the variables are co-integrated. Table 18 shows that results from both the λ-trace and λ-max statistics illustrate that the variables in the models have a long-run relationship. The existence of co-integrating relationship then implies that an error correction model is appropriate.

Table 18. *Johansen co-integration tests.*

	Model 11	Model 12		Model 13	Model 14
Co-integrating rank	λ-trace	λ-trace	Co-integrating rank	λ-trace	λ-trace
r=0	20.7737**	27.7988**	r=0	56.0191**	73.4022**
r≤1	8.2939	12.0338	r≤1	29.1291	42.6315**
r≤2	0.0656	3.7613	r≤2	13.4866	21.1081
			r≤3	5.7702	11.2010
			r≤4	0.0043	2.9972
	λ-max	λ-max		λ-max	λ-max
r=0	18.4799**	17.7650**	r=0	26.8900**	30.7708**
r≤1	8.2282	8.2725	r≤1	15.6425	21.5234
r≤2	0.0656	3.7613	r≤2	7.7164	9.9071
			r≤3	5.7659	8.2038
			r≤4	0.0043	2.9972

Note: ** denotes rejection of the null hypothesis of co-integration rank at the 5% significance level.

Hence, the error correction models are estimated and the Granger causality tests are adopted to investigate dynamic effects. Table 19 reports the short-run Granger causality through the joint significance tests of the lagged-differenced coefficients and long-run causality results through a lagged error-correction term. A statistically significant lagged error-correction term coefficient shows that past equilibrium errors affect current outcomes. Results from the dynamic analysis indicate that there is Granger causality from exports to GDP and the reverse

short-run causation from GDP to exports is also supported. The mechanised production and exports are also mutually caused. Moreover, there is no mutual relationship found between imports and production. Generally, my findings on the effects of imports and exports are consistent with Li *et al.*'s findings for the post-1978 China. However, the findings are different regarding skilled trade. My results show that both the unskilled exports and skilled imports have mutual causation with production, whereas Li *et al.* report that exports of manufactured goods is negatively related to GDP, since Chinese export-oriented strategy focused on extensive and quantitative growth, and failed to achieve technological progress or improve the quality of export products.[103] The situation in late Qing China is different, despite unskilled-intensive exports grew faster than skill-intensive exports, the latter still increased steadily. Finally, the dynamic analysis further confirms an important implication from the static analysis: besides unskilled exports which played a crucial role in stimulating growth, the skilled imports were also important in enhancing productions of the late Qing China, in particular in its modernisation process.

Table 19. *Granger causality test based on error correction models.*

(Model 11)

	Dependent Variables		
	GDP	Exports	Imports
GDP	-	1.41**	0.06
Exports	0.85**	-	0.34
Imports	0.16	0.09	-
Lagged ECT	[-0.359***]	[-0.431**]	[1.557]

(Model 12)

	Dependent Variables		
	Mechanised Production	Exports	Imports
Mechanised Production	-	3.86**	0.08
Exports	1.68**	-	0.29
Imports	0.06	0.02	-

[103] Li, Chen and San, 'Relationship Between Foreign Trade', p. 122.

Lagged ECT	[-0.007***]	[-0.012*]	[0.001]

(Model 13)

	Dependent Variables				
	GDP	Unskilled Exports	Skilled Exports	Unskilled Imports	Skilled Imports
GDP	-	2.87**	1.55*	0.10	2.32*
Unskilled Exports	2.69**	-	0.52	0.00	0.47
Skilled Exports	0.93	0.87	-	0.39	0.02
Unskilled Imports	1.59	0.55	0.13	-	0.52
Skilled Imports	2.66**	7.52***	0.05	0.02	-
Lagged ECT	[-0.149***]	[0.636**]	[0.911*]	[1.055**]	[-1.485*]

(Model 14)

	Dependent Variables				
	Mechanised Production	Unskilled Exports	Skilled Exports	Unskilled Imports	Skilled Imports
Mechanised Production	-	2.08*	1.22*	0.13	1.90*
Unskilled Exports	2.14*	-	0.60	0.06	0.89
Skilled Exports	0.66	0.48	-	0.88	0.11
Unskilled Imports	0.33	1.06	0.72	-	1.45
Skilled Imports	2.49*	4.44*	0.00	0.16	-
Lagged ECT	[-0.179**]	[0.648*]	[0.322*]	[0.162*]	[-0.346]

Note: *, ** and *** denote significance at the 10%, 5% and 1% levels respectively. Values in brackets are estimated t-statistics for co-integration equations. All other values show Granger causality tests on lagged explanatory variables.

CHAPTER VII
CONCLUSION

A significant fact of the period of late 19th and early 20th centuries was the penetration into China of foreign trade. This penetration brought about important changes in the commercial and, to some extent, in the industrial life of the country. The purpose of my research has been to analyse the effect of foreign trade on Chinese economic performance during the late Qing period. Chinese foreign trade grew at an annual rate of 2.93% after the adjustment, and such growth, however, was indeed slightly slower compared with the world average in the first wave of globalisation. In addition, exports to GDP ratios indicate that exports only made up a small percentage of production. Nonetheless, both the static and dynamic analysis presented in this research are generally supportive of the export-led growth in China from 1867 to 1911. A special feature of this period is found that skilled imports promoted growth, along with the unskilled exports, in particular the growth of the modern sector. A tentative explanation for these results is as follows. The late Qing was still dominated by unskilled-intensive exports such as tea and silk. While there was a slow trend towards industrialisation, the proportion of modern sectors in the total economy was relatively small compared to the agriculture. That being said, such trend was highly likely to be positively influenced by the imports of skilled products such as machinery and railway materials.

There are also several limitations of my research, and they point to the directions of future studies. First, there is a lack of data on regional economic activities which handicapped the possibility of a panel data analysis. Such data are, however, theoretically available from a working paper by Yan, which uses the wage data from the Chinese Maritime Customs to construct wage series, and the hedonic regression approach that Yan used would also yield regional wage indices.[104] Unfortunately, Yan's data were not available for use at this moment. In the future, I intend to replicate Yan's method to re-construct the regional wage series in order to better understand the relationship between trade and growth from a panel data analysis. Second, this research shows an attempt towards dynamic analysis, but more efforts could be made to estimate the error correction model with control variables. The recent development of the auto-regressive distributed lag co-integration approach would allow the variables to be

[104] S. Yan, 'Real Wages and Skill Premia in China, 1858-1936', Available at SSRN 1785230, 2011.

integrated of order one, order zero or fractionally integrated. Third, the relationship between foreign trade and growth is complicated in history, and hence, it might help to investigate this relationship in several shorter periods or in certain regions. Finally, the results of the trade-growth relationship in the late Qing could also be compared with that of the post-1978 China, to shed light on the recent rapid economic development of China.

Appendix

Appendix 1. Adjustment of valuation method.

Valuation Method				Adjustment
1864-1903	Import	Market Value	(goods value, shipping, insurance, duties, fees after landing)	c.i.f. = market value - duties - fees after landing = import value - import duties - (import value - import duties)*7%
	Export	Market Value	(goods value)	f.o.b. = market value + duties + fees before boarding = export value + export duties + export value*8%
1904-	Import	c.i.f.	(goods value, shipping, insurance)	/
	Export	f.o.b.	(goods value, duties, fees before boarding)	/

Source: see the text, constructed by the author.

Appendix 2. Foreign trade commodities, industries and their skill categories.

Product	Industry	Educational Attainment	Category
Animal products (bristles, hides, buffalo, cow, wool)	Agriculture	0.22	Un-skilled Intensive
Beans	Agriculture	0.22	
Cereals	Agriculture	0.22	
Cotton and cotton yarn	Miscellaneous textile mill products	0.42	
Coal	Coal mining	0.2	
Ores	Metal mining	0.41	
Seeds	Agriculture	0.22	
Silk and silk products	Miscellaneous textile mill products	0.42	
Sugar	Confectionary and related products	0.47	
Tea	Agriculture	0.22	
Opium	Opium and tobacco manufactures	0.3	
Flour	Grain-mill products	0.51	Skill-Intensive
Fuel (kerosene)	Petroleum refining	0.59	
Oil	Oil products*	0.53	
Machinery	Miscellaneous machinery	0.54	
Vehicles	Vehicle equipment	0.49	

Source: Mitchener and Yan, 'Globalisation, Trade and Wages', 2014.
Note: The industry of "oil products" does not have an educational attainment figure, however, it was classified into skill-intensive industry using the 1928 Shanghai Survey data and capital-labour ratio in Table A3 of Mitchener and Yan's paper.

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