Industrialization around the South China Sea in world perspective, ca. 1810-2012

Abstract

For centuries the South China Sea has been the home of a large share of world shipping. These ships did not only carry silver from the Philippines to China, arguably the best known trade, but it was also the way to trade a large share of industrial products such as Chinese and Indonesian textiles. Yet, the importance of this region in terms of industrial production started to decline somewhere in the 18th and 19th century possibly because of rising competition from other regions.

Unfortunately, we hardly have any information of the scale and scope of these developments. The most commonly used estimates, by Bairoch (1982), covering 1750-1980 indeed show a decline in the 19th followed by a resurgence in the 20th century. Due to a lack of quantifiable information, however, this dataset is to a large extent based on some rather strong assumptions. Recent estimates for countries such as England, India, and, more specifically, China and Indonesia, deliver considerably different results. Hence, in this paper we combine newly available estimates of industrialization for a large number of countries in order to arrive at a revision of the role of the South China Sea in world industrialization and find that, due to increased international competition, industrialization around the South Chinese Sea moved in the 19th century into low value added activities. This changed in the 20th century due to deliberate industrial policies combined with a move from industries from Western countries to Southeast Asia.

1. Introduction

Today, the world development of industrialization is a hotly debated topic. Not only is it associated with development policies and is it a "principle economic indicator" within the EU for predicting world economic crises, but more recently it is also linked to environmental degradation and social inequality.

Indeed, the importance of industrialization is difficult to underestimate and its shifting concentration across the globe is therefore important to understand. Indeed, in the 17th and 18th century industry had probably been located mainly around the South China Sea. Which has also been the home of a large share of world shipping. These ships did not only carry silver from the Philippines to China, arguably the best known trade, but it was also the way to trade a large share of industrial products such as Chinese and Indonesian textiles. It is therefore no wonder that the Portuguese and Dutch traders were eager to enter this lively trade in the 17th century. Yet, the importance of this region in terms of industrial production started to decline somewhere in the 18th and 19th century possibly because of rising competition from other regions. Yet, in the 20th century this trend was reversed again with rising shares of industrialization by the countries around this sea. Allen (2011) even called this a "world cycle".

Unfortunately, we hardly have any information of the scale and scope of these developments. The most commonly used estimates, by Bairoch (1982), covering 1750-1980, are at the basis of many of these debates. Yet, Bairoch's estimates, even though they form a bold attempt, are, largely because of lack of data, based on some daring assumption. For example, Chinese industrial output in 1750 is simply assumed to be 10% lower than Europe's. Yet, since this publication, a vast amount of new evidence has come available. We therefore think that it is time to put forward a revision. This is what is done in the following Section. We do find, in accordance with Allen (2011) that the region of the South China Sea went through a full cycle of industrialization with a decline in the 19th and start twentieth century and a resurgence the past decades. We provide a tentative explanation for this pattern in Section 3 and end with a brief conclusion.

2. New estimates: The South China Sea region in a world perspective

Data and Source

Before describing how the data are constructed, it is important to define exactly what we are measuring. Whereas Bairoch used value added in manufacturing, we use vale added in industry as defined in the national accounts, i.e. mining, manufacturing and construction in 2005 international USD. There are several reasons for preferring this measure. First, many of the newly available studies do not distinguish between manufacturing and the other industrial sectors. Secondly, omitting mining and construction is likely to bias our results towards industrial activities in Western countries that are less dependent on these two sectors.

The starting point of our data collection effort are the national accounts statistics of the United Nations (https://unstats.un.org/unsd/snaama/introduction.asp). These contain annual data for all countries in the world back to 1970. These were extended backwards using the *Yearbook of National Accounts* and the *UN Statistical Yearbook*. In turn, these estimates were brought back in time using the industrial production index from Mitchell (2007a, b, c). In some cases Mitchell provided separate series for mining and manufacturing. In those cases, we created one single index using 2005 weights in order to be consistent with the remainder of our series. Finally, we used a number of alternative sources that are in the list of sources at the end of this paper. We are aware that we did not exhaust all possible sources and we will update it in the coming months.

This way of constructing data, by linking various indices, may generate two important type of errors. First, the so-called Gerschenkron-effect in which fast growing sectors get a higher weight and, hence, their growth will be overestimated. Yet, as pointed out before, we link

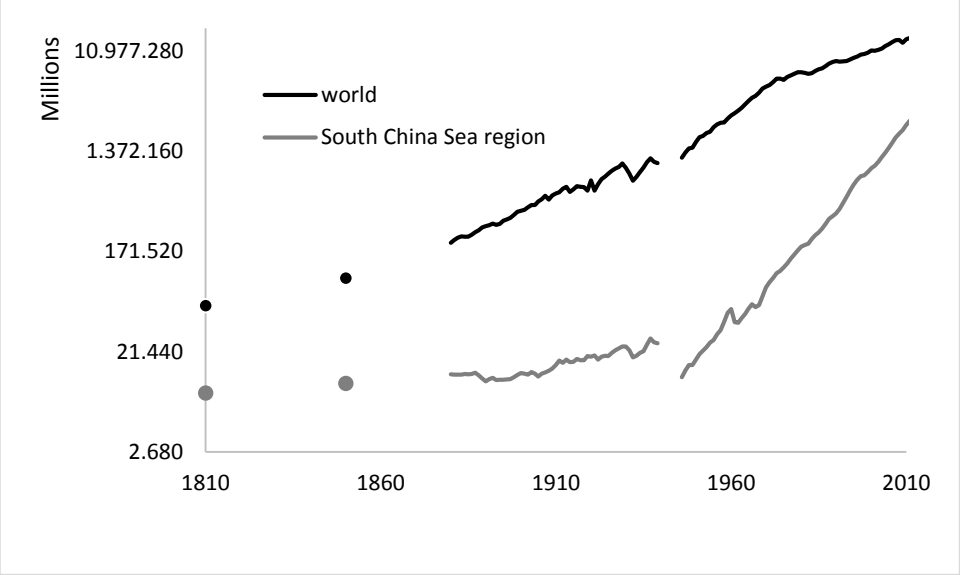
Table 1. Share of direct observations in total world industrial output

1810	41%
1850	55%
1880s	80%
1900s	86%
1920s	88%
1940s	84%
1960s	95%
1980s	100%
2000s	100%

multiple constant price indices together with different base year weights. Even though still likely to generate bias, this bias will be relatively small. Second, the further we go back in time, the more we lack data. Hence, we assumed the countries that did not report data to move in line with comparable countries that have data. Even though this again may introduce a bias, the problem is less severe than might be thought because most of the major industrialized countries report data back to 1810. Table 1 reports the share of total industrial production for which we have direct observations where we can see that at the lowest in 1810 we still have direct observations for 41% of total world industrial production.

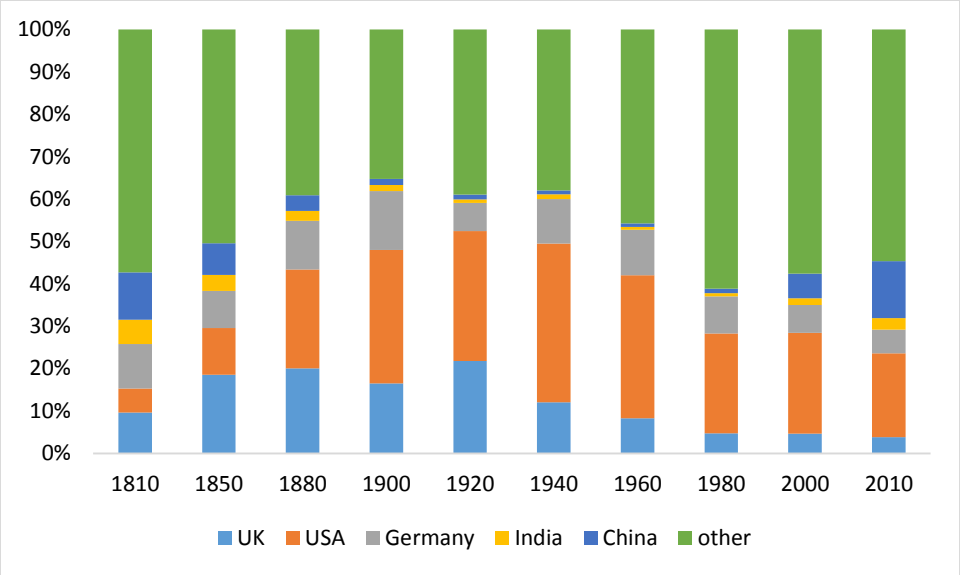
Our results are plotted in Figure 1. Here you can see that the share of the South China Sea region industrial production goes from 16% in 1810, to around 2% around World War II and moves up to around

Figure 1. World industrial output compared to the output of the South China Sea region, 1810-2010 (1990 GK dollars, log 2 scale)



18% today. Needless to say that China explains the majority of this rise, making up no less than 15% of total world production today. Indeed, looking at Figure 2, we may note that China went through a full cycle, being an industrial leader at the start of the 19th century, then regressed before taking first place again in the 21st century. The explanation of this phenomenon is clearly the Industrial Revolution as it occurred in northwestern Europe in the 19th century. If we combine Figure 1 and 2, we can see that, even

Figure 2. Share of major industrial countries in total world output



though the industrial production in the South China Sea region still grew, its share in world production fell due the massive rise in output in England, Germany, and the USA. The reason why the Industrial Revolution occurred in these countries. is plenty. However, broadly the arguments center on factor prices (Allen 2009; Broadberry and Campbell 2009; Van Zanden 2009), markets (for example in colonies (e.g. Pomeranz 2000), and institutions such as the European marriage pattern (De Moor and Van Zanden 2010), the Enlightenment creating a scientific culture (Mokyr 2010), bourgeois culture (McCloskey 2010), and the inclusiveness of a society (Acemoglu and Robinson 2012). All these factors generated a dynamic of increasing technological innovation and increased capital intensiveness within Western economies. Yet, we will not deal with this fundamental question. Rather, we try to get some insight into how this rise of industrialization influenced industrial production in the South China Sea region.

3. Explaining industrialization: a theoretical framework

The period under study covers the start of mass industrialization in many Western countries with the notable exception of England, and possibly Belgium, which started to industrialize even earlier. This increase in industrialization in the Western countries is beyond doubt: per capita industrialization almost doubled in Britain between 1850 and 1880. At the same time, it more than doubled in the USA and Germany, both countries starting from a lower level.

The question is, of course, how this industrialization in developed economy affected the developing path of the South China Sea region. Indeed, that there was an effect is often taken for granted. Bairoch (1980, 273) even stated explicitly that "after 1813 the total volume of manufacturing production of the Third World was beginning to fall due to the impact of imports

Table 2. Per capita industrial output and world shares in selected countries, 1850-1910

	Britain	Germany	USA	British India	China	Peru
	Industry per capita (2005 Intl. Dollars)					
1850	538.5	335.8	396.8	15.1	17.6	102.4
1880	1,083.4	842.6	929.0	15.6	18.7	47.9
1890	1,158.1	710.2	1,174.9	16.1	18.9	50.6
1900	1,357.7	917.7	1,515.2	17.8	19.3	86.3
1910	1,428.7	1,215.5	2,041.5	22.0	19.7	148.4
	share world industrial output					
1850	18.7%	8.8%	11.1%	3.8%	6.5%	0.21%
1880	20.0%	11.2%	23.6%	2.2%	3.5%	0.07%
1890	17.6%	12.4%	28.2%	1.8%	2.2%	0.06%
1900	16.1%	13.4%	31.7%	1.5%	1.5%	0.08%
1910	12.7%	13.8%	35.9%	1.3%	1.3%	0.11%

from the metropolitan countries."

Yet, irrespective of this firm statement, it remains unclear if (and in what way) the starting industrialization in the Western economies affected the developing countries. Several theories do exist that hypothesize about this relationship. First, there are the Hecksher Ohlin type theories. In those theories it is argued that industries will arise in those regions with cheap factors of n such as capital and raw materials The main idea is that capital is much cheaper than labour in Northwestern Europe and, hence, capital intensive (high value added) production will take place in these countries. The goods will also be exported to the rest of the world which will, hence, focus on the production of labour and raw material intensive (low value added) production (e.g. Helg and Tajoli 2005).

A second theory on the effect of industrial production in Northwestern Europe on industrialization of the rest of the world, based on New Economic Geography, hypothesize that industries will be located close to the markets where they can sell their products. Here, richer regions with bigger consumer markets (i.e. Western economies) will attract more new industries (Krugman and Venables 1995). This type of theory is largely based on transaction costs. As long as these are high, industries will indeed locate in those places with the biggest consumer markets. Yet, when transaction costs will fall, industries are expected to be located in places that have cheap labour and raw materials while their end-products can be cheaply transported to the place with the biggest consumer markets.

A third set of theories hypothesize that for countries that are behind a technological leader it is easier to import modern technologies and, hence, they create economic growth. In other words, differences across countries disappear when a developing countries approaches a technological leader (e.g. Henderson and Russell 2005).

The predictions of these three types of theories can be easily summarized:

a) The factor endowments approach predicts specialization where developing countries will focus on labour intensive production and raw materials. This difference is persistent over time.
b) The economies of scale theories initially have a similar prediction but, with falling transaction costs, expect increasingly equal distribution of industrialization over the world.
c) The institutional theories expect temporary differences as follower countries can cheaply copy already existing technologies and, hence, catch up with technologically leading countries.

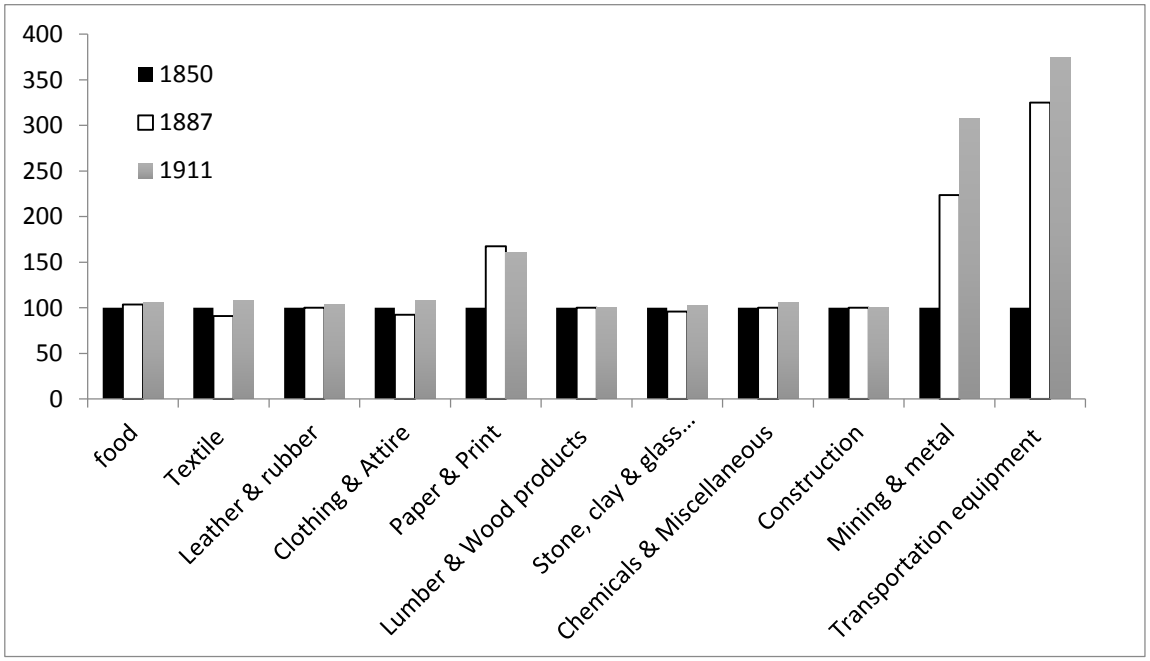
4. Explaining Industrial Development in the Global Perspective

As shown in the previous Section, possible convergence of industrial production depends on either transport and transaction costs or on the ability to implement new technologies from advanced countries. Both factors require interaction among world regions. Hence, we will divide the period under study into three sub-periods based on the level of world integration, i.e,. the Great Specialization (1810-1910), global disintegration (1910-1980), and reglobalisation (1980-…).

The Great Specialization

This period after the mid-19th century, which last until the disintegration of the world economy in World War I, is called the "Great Specialization" (Findlay and O'Rourke 2007).This was the period in which trade was straightforward and in which Western economies took a lead industrialization by making their industries increasingly capital intensive. Simultaneously, it is argued that the industries in developing economies became increasingly more reliant on raw material production and labour intensive production. A clear example of this pattern for the

Figure 3. Output index in different sectors of industry in 1850,1887 and 1911 (1850=100)



Source: Shi Zhihong, Xuyi, Ni Yuping and Bas van Leeuwen (2014)

South China Sea region is given in Figure 3. Here we witness an output index of different sectors in China with 1850 being equal to 100. It is immediately clear from this Figure that with the opening of port cities from the 1880s onwards, China started to increasingly specialize in raw materials and repair services of foreign boats (Peng Zheyi, 1957).

A debate has been going on, especially for India, whether this specialization effect might actually have regressed the capital intensive industries in developing economies and, hence,

caused a deindustrialization (e.g. Parthasarathi 2011; Roy 1999).Yet, as shown by Figure 3, this is certainly not the case for China, which is further confirmed by Table 2 for both China and India.

Hence, for the South China Sea region it seems that factor endowments theory did have some influence. This does not, however, exclude both other theories as thye also predict in an early phase of industrialization a divergence. The market in China was initially relatively small for industrial products due to the relatively low per capita incomes, which lead to slower industrial development according to the market potential theories. In addition, being closed to outside innovations, slow growth in China was, especially before the modernization campaign, certainly also due to lack of modern machinery. Hence, institutional factors also did play a role.

Global disintegration

In the previous Section we already noticed that industrialization stayed behind in developing economies. Even though it is difficult to distinguish between the three different theories since they all predict specialization, the case of China showed that all three factors, i.e. factor endowments, economies of scale, and institutions, all played a role. This is most likely also the case of many of the other South China Sea countries in the 19th century.

This all happened during a period of world integration. Yet, two world wars, the crisis of the 1930s, and the rise of socialism, all affected the integration of the world economy in the crucial years 1914-1980. This disintegration affects the predicted outcomes of the different theories. With disintegration of the world economy, the Heckscher-Ohlin type theories predict a limited industrialization of the peripheral countries, most likely via import substitution. However, if economies of scale played a dominant role, we are to expect that the division of industrialization remained as it had been before, i.e. close to the market for end products. Finally, if institutional theories are correct, we expect a reduction in the unequal division of industries if they copy Western type technologies.

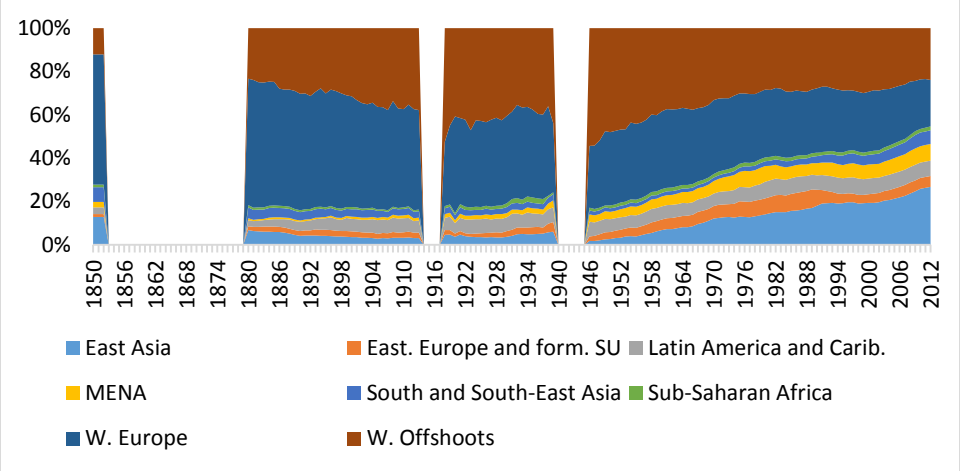
Hence, two out of three theories expect developing economies to increase the speed of industrialization under a disintegration of the world economy. As can be seen in Table 3, per capita industrialization increased more than 10 times in East Asia and sub-Saharan Africa followed by a much slower, even though still spectacular, development in Southeast Asia.

Table 3. Industrialisation per capita (2005 Intl. US dollars)

	East Asia	East. Europe and form. SU	Latin America and Carib.	MENA	South and South-East Asia	Sub-Saharan Africa	W. Europe	W. Offshoots	World
1850	28	12	92		20		333	382	77
1880	32	30	125		25		607	837	151
1890	29	39	213	32	26		679	1,092	182
1900	30	54	325	55	30		820	1,354	233
1910	35	66	430	105	34	36	1,004	1,804	303
1920	49	51	381	141	33	60	924	2,173	321
1930	60	100	513	207	43	119	1,323	2,489	418
1940	97	153	498	294	45	96	1,393	2,712	455
1950	61	190	527	443	39	111	1,749	4,139	601
1960	213	421	700	778	54	191	2,995	4,837	855
1970	546	818	936	1,375	75	266	4,858	7,008	1,287
1980	779	1,298	1,296	1,670	116	279	5,826	7,086	1,443
1990	1,107	1,529	1,249	1,316	166	241	6,733	7,708	1,548
2000	1,369	1,077	1,428	1,545	244	227	7,536	9,057	1,691
2010	2,267	1,881	1,693	2,090	384	298	7,822	8,889	2,029

Hence, it I clear that either the factor endowments theories which predicts import substitution, or the institutional theories which predict copying of modern technologies dominate in this

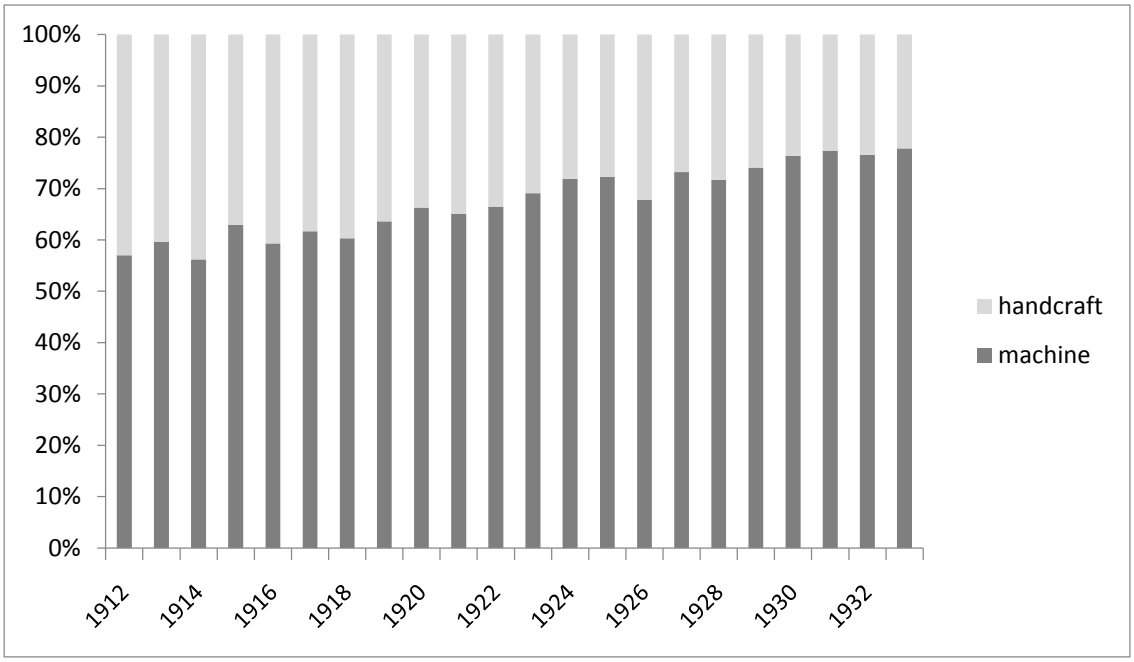
Figure 4. Shares of industrial output by world region



period.

The modernization of the industrial capital stock is difficult to quantify. Nevertheless, as already briefly pointed out in the previous Section, during the transition of 19th and 20th centuries, the Qing government started to introduce some advanced technologies and machines from the West and Japan to modernize China's handicraft manufacture. This was continued by the Republic of China's machines or technologies policies. Till the 1930s, the most successful modernized sectors concentrated on silk reeling and the coal and iron mining sectors. As Ma (2004) showed, local officials founded China's first modern sericultural institute in Hangzhou, Zhejiang province. By 1934, the government founded a national level sericultural research and improvement organization. In the meantime, modern reel factories diffused from Shanghai to the whole Yangtze Delta. Following the developments in the reeling industry, both the coal and iron sectors started to modernize country-wide after 1910. The *General statement*

Figure 5. Share of machine and handcraft in both coal and iron sectors between 1912 and 1933



Source: Ding Wenjiang (1921), Hsieh, C. Y. (1926), Hou Defeng(1929).

on the mining industry, Issue 1-3 published by Geological Survey institute in Ministry of Agriculture and Commerce in Republican China describes the annual share of machine mining, which represented the modernized trend in both coal and iron sectors. (see Figure 5)

Hence, it is clear that modernization occurred in Southeast Asia. But also government industrial policy was strengthened. Initially until about 1957, China witness mass rise of heavy industry due to forced industrialization which is a clear example of import substitution by increasing capital availability with China itself. Yet, this policy changed in the 1970s with a focus on light industries serving also other economic sectors outside industry. This put China again on the road to world specialization or, as phrased by Wu (2002), brings it back to its comparative advantage.

Reglobalisation

Since the 1980s we gain witness an integration of the world economy which, in the case of China, has led to a partial move away from import substitution and towards its comparative advantage. According to the factor endowments theory, this “comparative advantage” would still be light industries, raw materials, and labour intensive, low value added, production more

generally. Yet, the economies of scale theories predict that, due to the past period of fast growth, we should now witness a bigger market and, hence, faster industrialization. Some similar prediction is also made by the institution hypothesis which claims that new technologies can be introduced which increases the value added in industry.

Hence, two out of three theories predict a further catch-up, while one predicts a regression of the share of industries in developing economies making it a priori impossible to

Table 4. Per capita industrial output and world shares in selected countries, 1950-2010

	Britain	Germany	USA	British India	China	Peru
	Industry per capita (2005 Intl. Dollars)					
1950	3,365.9	1,625.7	4,511.2	24.6	7.9	350.1
1960	4,262.7	3,997.4	5,205.8	36.0	24.8	491.0
1970	5,561.1	6,533.3	7,267.7	49.3	32.6	635.0
1980	5,859.0	7,720.8	6,957.2	59.8	67.6	740.0
1990	7,201.6	8,445.8	7,654.1	89.7	165.2	548.4
2000	8,262.2	8,511.0	9,147.4	131.8	496.4	700.9
2010	8,634.0	9,418.2	8,806.7	240.7	1,404.6	1,181.5
	share world industrial output					
1950	10.4%	6.9%	45.2%	0.7%	0.3%	0.2%
1960	8.1%	10.6%	35.4%	0.8%	0.6%	0.2%
1970	6.0%	9.9%	30.1%	0.7%	0.6%	0.2%
1980	4.8%	8.7%	23.8%	0.8%	1.0%	0.2%
1990	4.8%	7.9%	23.2%	1.2%	2.3%	0.1%
2000	4.6%	6.5%	24.8%	1.7%	5.9%	0.2%
2010	3.8%	5.5%	20.0%	2.7%	13.4%	0.2%

determine trends in world industrialization. Yet, from Figure 1 it is clear that the fast increase in industrialization that characterized the developing world between 1910 and 1980 came to an end in the 1980s. Obviously, this does not mean that industrialization as such came to an end, but rather the fast pace that characterized countries before the 1980s.

This seems to indicate that Heckscher Ohlin type forces dominated. Indeed, the transfer of technologies to developing economies does not seem to be big. Rather, even if transfer of capital intensive technologies took place, it basically establishes capital intensive production in a

country that is short of capital and abundant in raw labour. The consequence is that there are is only a very small share of workers active in these high value added industries creating a dual economic structure with a prosperous modern sector and a poor traditional one (Thormann 1979). Likewise transportation costs do not seem to have changed much over the past years for shipping, while airfreight costs have declined substantially (Behar and Venables 2010) removing those two positive forces for Third World industrialization.

Yet, one important exception exist, i.e. East Asia which started to industrialize strongly from the 2000s onwards. Obviously, this region is dominated by China that made up no less than 50% of the industrial output of that region in the 2000s. China experienced truly remarkable growth rates after the reform period of 1978. Even though most would agree that capital investments and the number of workers were important, an IMF team found that most of the growth was caused by increased productivity (Hu and Khan 1997). Even though it was not necessarily modern technologies that improved, the reforms increased efficiency incentives for both agricultural and business enterprises. Indeed, as shown in Table 4, at the start of the reform period, China was still well behind most other countries in terms of industry per capita. Hence, there was much room for improvement.

3. Conclusion

In this paper we made a first attempt to recalculate the role of industrialization in the South China Sea region in a world perspective. For the period 1810-1914, which is called the period of the "Great Specialization", we find fast industrial growth in developed countries and slower growth in developing economies. The latter was mainly driven by mining and low value added manufacturing. Hence, whereas the Western countries specialized in high value added activities, cheap labour and abundant raw materials led the developing countries to specialize in low value added activities.

In the period 1914-1980, the world economy disintegrated because of two world wars, the crises of the 1930s and the expansion of socialism block. This led countries to forcibly industrialize, or, in other causes, focus on import substitution. But in any case, this trend reversed again in the 1980s and we witness yet another move towards specialization in the world as a whole.

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