Before the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the beginning of the nineteenth century

Bozhong Li and Jan Luiten van Zanden

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Email: jvz@iisg.nl, libzh@tisnghua.edu.cn

Introduction

Since Kenneth Pomeranz' *The Great Divergence* economic historians have devoted much attention to the question how large or small the differences in income per capita and in economic welfare were between China on the one hand, and Western Europe on the other. The standard picture that there already in the 18th century existed large differences between these two parts of Eurasia, was strongly contested by Pomeranz (2000), building amongst others on the detailed research that had been carried out by other scholars ofthe Yangzi delta. One of the most important points made by Pomeranz was that scholars before him tended to compare regions of very dissimilar sizes – China was often compared with the most advanced parts of Western Europe, with England in particular. Within China, a continent size country, there existed huge disparities in level of economic development and of economic structure, as similar differences between England and many other parts of Europe, for example, Poland or Sicily, could be observed. When comparing like with like, eg. England with the most developed part of China, the Yangzi delta, the gap in his view more or less disappeared. He could conclude that in the 'Great Divergence' originated in the 19th century, and that before 1800 China and Europe, or England and the Yangzi delta, were rather similar in terms of economic performance (Pomeranz 2000).

This revisionist interpretation of the income gap between the two different parts of Eurasia, contrasted sharply with the 'orthodox' view that had emerged in the previous decades, which stressed the continuity of European development before 1800, and the fact that a gap in terms of GDP per capita between Europe and China had already emerged in the early modern period. This had been implicit in the writings of Landes, Jones and others on the subject, and made explicit by Maddison's (2003) estimates of GDP per capita in the world economy. He arrived at the conclusion that GDP per capita in Western Europe in 1820 was probably double the level of China, a gap that according to his estimates emerged largely between 1500 and 1800. The difference between China and the UK or Netherlands was even larger – Chinese GDP per capita was perhaps only a third of that of the most prosperous parts of the Western Europe.

The revisionism of Pomeranz and other China-specialists supporting his conclusions has been criticized by a number of scholars working on different aspects of the China-Europe comparison. The evidence presented by Pomeranz was perhaps rather impressionistic – it related to consumption of certain goods (sugar, cotton), not to an integral measure of real incomes, or real wages, and was therefore not fully comprehensive.[1] A number of papers has been written

[1] Pomeranz also included life expectancy as an index of welfare, but we will not go into that part of the comparison.

since focusing on the comparison of real wages between China and Europe. Allen et.al. (2010) concluded that in the 18th and 19th century there was a large gap in the purchasing power of real wages of unskilled labourers between, on the one hand, the most advanced parts of Europe – Flanders, Holland and England – and different parts of China (Canton, Beijing, and the Yangzi delta) on the other hand. Similar work on India and Japan confirms this picture – also in those parts of Asia real wages were much lower than in the North Sea Area (see also Broadberry and Das Gupta 2005). The differences between China and cities in the rest of Europe – in Italy or Germany – were rather small, however; Chinese (and Japanese and Indian) labourers were all very close to the subsistence levels – "the barebones basket" - that was reconstructed in this paper. In the 18th century the real income gap in the world economy was not between Europe and Asia, but between east and south Asia and south and central Europe on the one hand, and North West Europe on the other hand. This began to change during the 19th century, however, as large parts of Europe began to profit from industrialization processes, as a result of which real wages went up – but this did not happen in China (and India).

Real wages are often used in (European) economic history as an index of the standard of living. They are obviously also related to the (marginal) labour productivity in large parts of the economy; when the focus is on unskilled labourers, the real wage probably reflects labour productivity. The underlying assumption is that a large part of the labour force is wage earners, and /or that labour markets are so widespread that wages more or less reflect the opportunity costs of other (male) activities. It is clear, however, also in the European case, that trends in real wages do not necessarily reflect trends in real incomes per capita – due to changes in labour inputs, perhaps related to the 'industrious revolution' (De Vries 1994; Voth 2001). In China (and Japan), labour markets were probably less widespread and more marginal in the economy at large, which may distort the comparison based on real wages (see the discussion in Allen et. al. 2010; Van Zanden 2009), although another point made by the revisionists is that markets for land and labour in China and other parts of Eurasia were perhaps as free as those of Europe, which should increase confidence in the comparison based on wage data.

Another approach to these differences in income and output per capita is via the measurement of productivity levels in a single sector, such as agriculture. In his analysis of levels of agricultural productivity of the English Midlands and the Yangzi delta, Robert Allen (2009) confirmed the view by the revisionists that differences in labour productivity between these very advanced regions were quite small. In fact, land productivity in this part of China was much higher than in any part of Europe, and labour productivity was almost on par with the – by European standards – very high level of the English Midlands. Allen's analysis of outputs of and inputs into the agriculture of the Yangzi delta is largely based on the detailed work by Bozhong Li on this subject, which obviously also forms the basis for the estimates presented here.

In this paper we try to find out how large the economic disparities were between the one of most developed part of China, the Hua-Lou district[2], part of the Yangzi delta, and the Netherlands, which was, with Great Britain, the most developed part of Western Europe. For the period 1823-1829 one of the authors has made detailed estimates of the structure and level of GDP in Hua-

[2] The Hua-Lou district roughly corresponds with modern Songjiang County in the geographic extent. In most of the Qing times (after 1725), this area was divided into two counties of Huating and Lou under the jurisdiction of Songjiang Prefecture. After the demise of the Qing Dynasty in 1912, Lou County was incorporated into Huating County. The new country was renamed as Songjiang County in 1914 and was put under the jurisdiction of Metropolitan Shanghai City in 1958.

Lou (Li Bozhong 2010), which form part of the basis of this paper. The other pillar on which it rests is the comparable estimates of GDP of the Netherlands after 1807, published by Smits, Horlings and Van Zanden (2000), the result of a large research project into economic growth in the Netherlands in the 19th century (see also Van Zanden and Van Riel 2000). This paper presents these two sets of estimates, adds PPP's, to make it possible to compare in some detail the economic structures of these two highly developed parts of Eurasia. Moreover, for key sectors of the economy – agriculture, textiles, printing, and transport – we also try to explain the patterns in relative productivity found. We demonstrate, for example, that the structure of labour productivity in the different sectors of the economy in China (the Yangzi Delta) and the Netherlands differed a lot. In the Netherlands we find the 'usual' pattern of high labour productivity in services, medium levels of productivity in industry and low productivity in agriculture (although the differences are rather mild in international comparative context). One of the main results of our analysis is that this pattern does not occur in China, where labour productivity in agriculture in much higher than in large parts of the industrial sector. This special feature of the Chinese/Yangzi economy helps to explain the paradox mentioned earlier.

The reason for selecting these two regions is that they were both highly developed parts of their respective Chinese and European economies. This can already be read from the level of urbanization. In Hua-Lou in the 1820s 39% of the population of 560,000 lived in towns and cities, of which about 170,000 in the largest city, Songjiang City (which was the capital city of Songjiang Prefecture and is now a satellite town of metropolitan Shanghai). In the Netherlands the level of urbanization was similar at 35%; of the 2,5 million inhabitants about 220,000 lived in the capital city, Amsterdam, the rest of the urban population of some 800,000 was distributed over a large number of small and big towns. They also shared a common geography: the Netherlands is located in the delta of the Rhine and the Meuse rivers, Hua-Lou is part of the Yangzi delta. This common geography meant that, on the one hand, the regions were low lying, relatively flat, with many waterways and easily accessible for (cheap) water transport. The problem of how to manage the water system was quite important in the two regions, but they found a little different institutional solutions for it (in the Yangzi delta, the local governments and local communities led by elites, mainly the "gentry," were working together in managing the water system, while in the Netherlands 'bottom up' institutions – the waterboards - took care of this job). Heavy, alluvial soils, which were difficult to work, but potentially highly productive, were another common feature, although these clay soils covered only about half the Netherlands.[3] Being located in a delta also meant that both regions were gateways to large hinterlands. This created employment in (water) transport, trade, and banking, helping to explain the high level of urbanization. Population density in the Yangzi delta was however much higher than in the Netherlands: about 900 people per km^2 versus 65 in the Netherlands.

This reconstruction of the economic disparities between Hua-Lou and the Netherlands wishes to establish a number of things:

- how large were the differences in income per capita between the two regions – Pomeranz would probably expect them to be close to zero, whereas Maddison would expect large differences (say in the order of two to one);

[3] The average quality of the soil in the Yangzi delta was probably better and its potential output higher than in the Netherlands, cf. Buringh et.al. 1975 for an assessment of the quality and yield-producing capacities of the world's soils.

- what were the main differences in economic structure and level of productivity between these two advanced economies;
- can this help to explain the divergent development of the two regions: the Netherlands followed the British lead and embarked on a process of 'modern economic growth', whereas this transition was much more problematic in the case of the Yangzi delta, which did eventually develop (Ma 2008, Bergère 2009), but at a much slower pace during the 19th century; the question is whether the in depth analysis of the structures of the two economies at the advent of industrialization can help to understand why one of relatively successful, whereas the other wasn't.

The Hua-Lou estimates[4]

The main reason of why Hua-Lou was chosen as the area for comparison and 1823-29 as the period of study is the availability of data. As one of the economically and culturally richest areas of China, the Hua-Lou area has boasted abundant local literatures, which contain valuable information on the local economy. An important feature of this study is that it makes use of a wide range of materials from many different kinds of sources. We have relied principally on three types of materials: local histories or gazetteers, agricultural handbooks and modern field investigations:
(1) Gazetteers: It is an old tradition that each province, prefecture and county, even township or village in many cases, in China kept a record of events and data that were considered significant. Compared with gazetteers compiled in most other parts of China, either the quantity or the quality of the gazetteers of this area are obviously better. These gazetteers contain abundant information on the local economy during the late eighteenth and most of the nineteenth century. In addition, information on the Hua-Lou area is also kept in gazetteers of the neighboring areas.
(2) Agricultural Handbooks: In the pre-modern Hua-Lou society, many scholars had strong interests in local affairs, including economic situations. They recorded their observations in their writings, which are very useful to our study. Of these writings, the most important are those "agricultural handbooks", which dealt directly with agriculture, not only farming practice, but also other aspects of rural economy. The most valuable source of the materials crucial to this study is an agricultural handbook entitled *Pumao nongzi* (Report on agriculture in the Huangpu River and Mao Lake area), which carries rich and first-hand information of rural economy of the Hua-Lou area in 1823-34, with a considerable amount of quantitative data (see also Li 1998 and 2010).
(3) Modern field investigations: In the twentieth century, several modern field investigations were made in this area and neighboring areas, both by the Chinese and by foreigners. The major results of the Chinese investigations which relate to this study are available in the 1991 edition of *the Gazetteer of Songjiang County* and other twentieth-century gazetteers of the neighboring areas. Among the investigations carried out by the foreigners, the surveys made by the Japanese South Manchurian Railway Company in 1937-41 stand as the most precise and detailed body of information available on society and economy of the Hua-Lou area in the first half of the twentieth century.

The data in these sources, however, are far from ideal for the purposes of this study. There are many key gaps in the materials, both quantitative and qualitative, and much of the information is not particularly reliable. The validity of data for the period of 1820s has frequently been assessed on whether the data is consistent with those from the materials of the earlier and later periods or from the materials of the neighboring areas, and with historical development in the intervening periods and

[4] This is a summary of Bozhong Li 2010; see also the related papers: Li 2008 and Li 2009.

areas. Another obvious criterium was their internal consistency, totally apart from the twentieth-century figures. For many issues, the comparisons with the data of 1930s, 1940s and early 1950s are crucial.

The Li (2010) study is the first attempt to apply the methods of SNA (historical national accounting) to Chinese economic history prior to the twentieth century. The major methods used in this study are roughly what are used in measuring GDP today, which include the three major approaches--the production, expenditure and income approaches, with thehe production approach being the major one,. There are some problems, however, when we try to apply these methods in a pre-modern economy. First, the GDP is the market value of all final goods and services produced within a region in a given year. In a pre-industrial economy, however, many activities are non-market, but they are still considered as part of national income. Therefore, a value must be calculated even when the good or service has no actual market price. Second and more significantly, no constant and reliable economic statistics are available for the area and period under study. There are many key gaps in the surviving materials, both quantitative and qualitative, and much of the information is not particularly reliable.

These problems can be solved, however, because although the economy under study was still a pre-industrial one, by the early nineteenth century a quite developed market had been the hub of the economic activities in the area. Almost everything, including major productive factors could be (or had to be, in many cases) acquired via the market. For this reason, many important items of goods and services had their market prices which were recorded in *Pumao nongzi* and other literature.

The Netherlands estimates

We will briefly discuss the estimates for the Netherlands, because they have been presented in detail elsewhere, are available online, and have been widely used for economic historical research (see Smits et. al. 2000; also the website: http://nationalaccounts.niwi.knaw.nl/). The results are based on detailed estimates of the output and value added in the most important sectors of the economy (published a.o. in Van Zanden 1985; Knibbe 1993; Smits 1995; Horlings 1995; Jansen 1998). As checks also estimates of the income and the expenditure approach were made (see the discussion in Smits et.al. 2000). The project also included estimates of the structure of the labour force. More recently, this work had been extended into the early modern period, which has resulted in estimates for the growth of the economy of Holland (the largest and most wealthy province of the Netherlands) going back to the early 16th century (cf Van Leeuwen and Van Zanden 2009).

Two regional economies

We start with comparing the structures of the two economies (tables 1 and 2). Hua-Lou has a very modern economy, with only 27% of the labour force active in agriculture, whereas this share in the Netherlands is 41%. This is a striking result. It is one of the paradoxes of Dutch economic development that one of the most important legacies of the Golden Age was a highly productive and export-oriented agriculture. In the 1820s large surpluses of livestock products were sold abroad, in particular to the UK, and the liberalization of international trade during the 1840s resulted in real export boom to that market), which may even have ‘crowded out’ industrial growth in that period (see Van Zanden and Van Riel 2000). The large share of agriculture can therefore not be seen as a sign of backwardness; for the most urbanized part of the Netherlands, Holland (in terms of its absolute size more similar to Hua-Lou), the share of agriculture falls to 21% (in 1807), however. This again demonstrates that the unit of comparison is of crucial importance. Hua-Lou is also more industrialized than the Netherlands, with 53% of employment in the secondary sector, against only 28% in the Netherlands. What has to be added perhaps is that this 28% is a bit a low point in Dutch history, the result of de-industrialization of in particular Holland in the 18th century (in Holland, again, this share was already almost 40% in 1510 (Van Zanden 2002), when the economy of the country was expanding rapidly, but international competition after 1670 brought this level down to 36% in 1807). Textiles dominated the industrial sector in Hua-Lou, but this sector was relatively small in the Netherlands – the textile industry had in fact been the main victim of de-industrialisation in the century and a half before the 1820s (but would emerge strongly again after about 1830, thanks to subsidized exports to Java). The services sector is much larger in the Netherlands, which is completely due to the much larger share of 'other services' in employment; this is a bit of a mixed bag, with, on the one hand, a lot of domestic servants, and, on the other hand, various professionals: notaries, priests and vicars, doctors etc.[5] Another difference between the two economies is the share of labour force in population, which is higher in Hua-Lou than in the Netherlands, mainly due to a larger involvement of women (in textiles, as we will see).

It is impossible on the basis of the comparison of the structures of these two economies, to assess which economy is more 'modern' than the other. The lower share of agriculture in employment suggests that the balance should tip towards Hua-Lou, but a large services sector can also be seen as quite modern (or rather 'post-modern': the large services sector also emerged after a process of de-industrialization).

Table 1 Structure of the Hua-Lou economy (in persons employed and 100 taels), 1823-1829

	Structure of employment	%	Structure of GDP 1000 taels	%	Relative productivity
Agriculture	75000	27%	4002	31%	1,14
Fisheries	3100	1%	166	1%	1,15
Primary sector	78100	28%	4168	32%	1,14
Textiles & cloth processing	112000	41%	1451	11%	0,28
Shipbuilding	3200	1%	141	1%	0,94
Construction	3500	1%	520	4%	3,18
Rest Industry	27000	10%	3031	24%	2,40
Secondary Sector	145700	53%	4482	35%	0,66
Commerce & banking	32100	12%	3120	24%	2,08
Water Transport	4600	2%	251	2%	1,17
Education	5000	2%	358	3%	1,53
Government	3800	1%	843	7%	4,75
Rest Services	6600	2%	277	2%	0,90
Tertiary Sector	52100	19%	4849	38%	1,99

[5] Housing services are not included in both sets of estimates.

Total employment	275900	100%	13500	105%	1,05
Total population	560000				
Participation ratio	0,49				

Source: Li 2010.

Table 2 Structure of the economy of the Netherlands (in persons employed and million guilders), 1823-29

	Structure of employment	%	Structure of GDP million guilders	%	Relative productivity
Agriculture	420300	41%	98,4	23%	0,56
Fisheries	8800	1%	2,3	1%	0,63
Primary sector	429100	42%	100,7	23%	0,56
Textiles & cloth processing	41700	4%	16,8	4%	0,96
Shipbuilding	14000	1%	6,1	1%	1,04
Construction	60000	6%	15,4	4%	0,61
Rest Industry	173800	17%	91,4	21%	1,25
Secondary Sector	289500	28%	129,7	30%	1,07
Commerce & banking	73100	7%	75,8	18%	2,47
Water Transport	32000	3%	42,9	10%	3,20
Education	7100	1%	2,2	1%	0,74
Government	36800	4%	27,4	6%	1,78
Rest Services	158200	15%	51,7	12%	0,78
Tertiary Sector	307200	30%	200,1	46%	1,55
Total employment	1025800	100%	430,5	100%	1,00
Total population	2545000				
Participation ratio	0,40				

Source: Smits et.al. 2000.

The next step in the analysis is to compare the two economies, via the construction of a PPPs (purchasing power parities). This is an index number that reflects the relative purchasing power of the Chinese and the Dutch currencies during the 1823-29 period; it is an average of the ratio between prices of the same or similar commodities, weighted according to the importance of each commodity in the economies concerned. We were able to collect prices of 10 different commodities, ranging from bread grains to newspapers (Table 3). The details are given in the appendix; the most important assumption underlying this comparison is that we compared the price of the Yangzi delta's staple food, rice, with that of the northern-European standard food, wheat, using their calories as the basis for comparison. The comparison shows that prices of meat and fish were relatively low in the Netherlands, but that other basic foodstuffs were perhaps somewhat cheaper in China than in Western Europe. Differences in the prices of textiles were small; the British revolution in cotton textiles leading to the 'cotton invasion' of the 1820s and 1830s had just started to affect textile prices in the Netherlands and in China. In view of these large scale exports of cotton goods originating from the United Kingdom, cotton prices in North Western Europe had probably for the first time in history fallen below those in East and Southern Asia, which is reflected in the price ratio found (Table 3). We have not found out why a harrow was much cheaper in the Netherlands, whereas a plow was much more expensive there (we checked for different types of plow, and for both regions selected prices of heavy plows, used on clay or similar soils, so quality differences did not play a role). Finally, newspapers were much cheaper in China than in the Netherlands, but the difference was mainly due to the heavy excises on newspapers in the latter country, which lead to a more than doubling of their price.

On average, prices in the Netherlands and in the Yangzi Delta did not differ a lot, which is perhaps a surprising result. This it is more or less consistent with the reconstruction of the value of the 'barebones' consumer baskets by Allen et.al. (2010); as is clear from Figure 1, the 1820s were a period of very low prices in the Netherlands, which therefore fell below the price level estimated for the Yangzi Delta. Figure 1 also demonstrates that prices in England were much higher than in the Netherlands or in the Yangzi Delta, which is again consistent with the results acquired by Allen (2009), who found that agricultural prices in England were higher than those in the Yangzi Delta (but he also compared 1800 prices in England, during the peak years of the Napoleonic period, with prices in the Yangzi during the 1820s, when they had gone down quite a lot in both regions).

Table 3

Prices of commodities in Hua-Lou and Netherlands, 1823-29 (in grammes of silver)

		Yangtze (Yangzi)	Netherlands	N/Y
Rice/Wheat	100 liter	58	65	1,13
Beans	100 liter	61	65	1,07
Meat	100 kg	731	326	0,45
Fish	100 kg	548	151	0,28
Salt	100 kg	122	135	1,11
Cotton cloth	20 yard2	76	65	0,85
Liquor	50 kg	171	120	0,70
Harrow	piece	107	77	0,72
Plow	piece	30	67	2,22

Newspaper	annual subscription	88	192	2,19
median				0,96
average				1,07

Sources: Netherlands: foodstuffs, salt, cloth and liquor: datasets national accounts at www.iisg.nl/hpw; Harrow and Plow: Van der Poel (1953)(1954); Newspaper: Hemels (1969).
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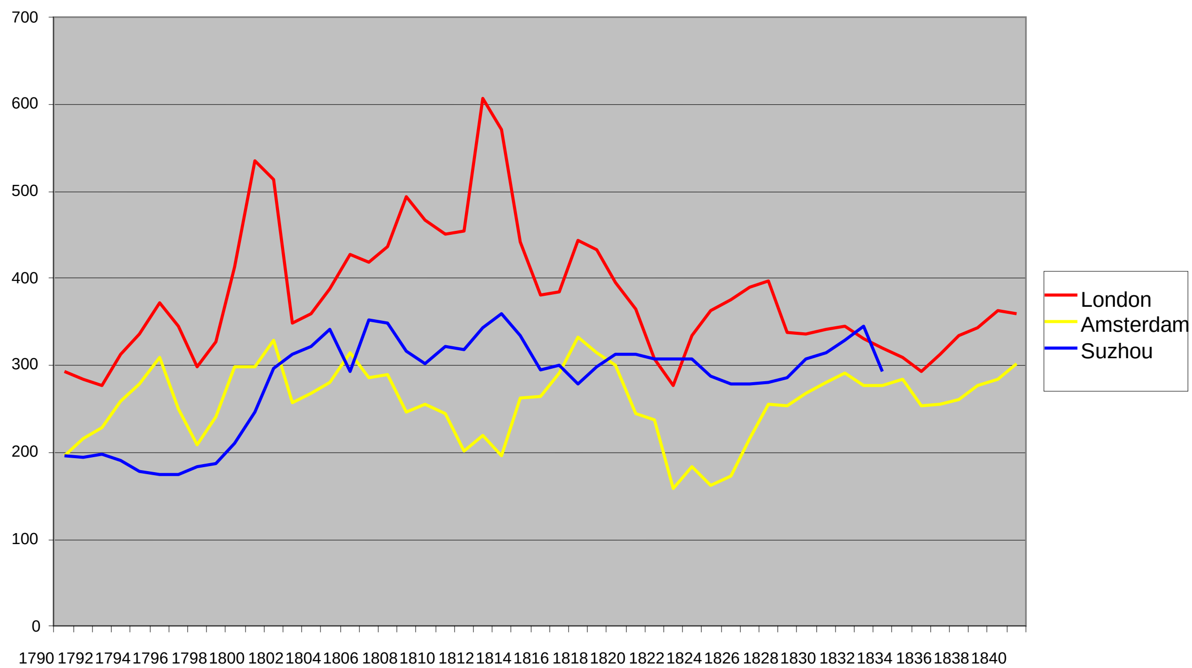
Figure 1 Estimates of the price level of 'barebones' consumer basket in London, Amsterdam, Beijing and the Yangzi Delta (Suzhou), 1790-1840 (in grammes of silver)



Source: Allen et.al. 2010

There are a number of ways in which PPP's can be constructed. One can focus on the structure of the budget of consumers only, arguing that one is interested in the (final) purchasing power of the population, because comparisons of GDP per capita are supposed to measure the relative welfare - the ability to buy goods by consumers – of the regions concerned. An alternative approach is to use the structure of the economy as a whole as a weighting scheme, the argument being that one is interested in relative levels of productivity of the two economies concerned, and therefore an integral PPP, which also takes the prices of, for example, investment goods into account, is to be preferred. These two options are presented in Table 4; in both cases we have tried to establish the stylized structures of the Hua-Lou and the Dutch economy, and had to assume, because of the limited availability of industrial prices, that harrows, ploughs, liquor and cotton textiles more or less represent the whole range of industrial commodities. Fortunately, the differences between the two approaches are relatively small – less than 10% on average – which is not unexpected as consumer demand usually dominates economies. As would be expected, taking budgets from the Netherlands results in a lower PPP (expressed as the ratio between Dutch and Chinese prices), which demonstrates that Dutch consumers tend to concentrate on products which are relatively cheap in the Netherlands (and vice-versa, of course: Chinese consumers focus on goods that are relatively cheap there). More surprisingly, the differences in PPP using Chinese or Dutch budgets or structures were rather small.

For final comparison of the two economies, we used the Fisher average of the expenditure PPP, which seems most appropriate, but the difference with the Fisher average of the output PPP's is only 3%. We can now combine the information from tables 1, 2 and 4 into comparisons of the level of GDP per capita and per person employed, and of the relative labour productivity of the various branches of the economies. From Table 1 we can derive the average income per capita of Hua-Lou of 24 teals, which is 895 grammes of silver (one tael (*kuping liang*, or financial tael) is about 37.3 grammes); income per capita in the Netherlands is 169 guilders, the equivalent of 1620 grammes of silver (a guilder consists of about 9.6 grammes). At the exchange rate – using ratio between the silver contents of the two currencies, the tael and the guilder as the exchange rate – the per capita income gap between the two regions is therefore 81% (the Dutch level is 81% higher than the Hua-Lou level). Because PPP's are very close to 100, the estimate of the difference in real per capita GDP is similar (in fact, using the Fisher average of the expenditure PPP's, we get a result that is one percent higher). Because the labour force is a larger share of the population, the difference in terms of labour productivity (per person employed) is larger (Table 5). We conclude at this point that there is a large gap in terms of GDP per capita between the two economies concerned. The gap in terms of GNP was probably even larger, as the Yangzi delta was the major source of finance for the central government of the Qing Empire in Beijing, which probably resulted in a great net transfers of income to the north. The Netherlands, on the other hand, received large net incomes from its overseas possessions and its investment in the (public) debt of other European countries, as a result of which GNP was as much as 10% higher than GDP (Smits et.al. 2000).

Perhaps even more interesting than the gap in GDP per capita are the differences in the levels of labour productivity in the various sectors and branches of industry. What is most striking is that in the agricultural sector the gap is very small indeed, which is consistent with the estimates published by Allen (2009) for the comparison between the Yangzi delta and the English Midlands. By contrast, in the industrial sector the differences between the two regions are huge – in particular in textiles, but also in the rest of the secondary sector. Finally, in the tertiary sector, the difference in labour productivity is about average, with a few notable exceptions, such as government, where Hua-Lou seems to be on par with the Netherlands, and water transport, where the difference is again very large. These large disparities in relative labour productivities are already evident from Tables 1 and 2: it is striking that, in Hua-Lou, labour productivity in agriculture is higher than the average for the economy as a whole, and in particular much higher than labour productivity in industry, whereas labour productivity in services is – as usual – substantially higher than the average. In the Netherlands we find the 'usual' pattern, with agriculture having a relatively low output per employee, followed by industry (which is about average), and services (where income are relatively high). This is the 'Kuznetsian' pattern consistent with a positive feedback between economic growth and structural change: a rise in income leads to a transfer of labour from agriculture to industry, which is stimulated by the income gap between the two sectors, and in turn stimulates economic growth as productivity is much higher in the secondary sector (Kuznets 1966). The ‘invers’ pattern found in the Yangzi delta – the result of extremely high productivity in agriculture in combination with relative low productivity in industry – is probably bad for economic growth: there are in such a situation no incentives to move from agriculture to industry, as this will lower the income of those who move, and depress income per capita.[6]

In the rest of this paper we will concentrate on explaining these relative productivities, and their consequences for long-term growth. Are these estimates plausible, in view what is known about production technologies in various parts of the economy? And what may have been the implications for the interpretation of the development trajectories of the two economies involved?

Table 4
PPP's for Hua-Lou and the Netherlands (price level the Netherlands as a percentage of that of Hua-Lou), different weighting schemes

	Structure Budget		Structure GDP	
	Netherlands	Yangzi	Netherlands	Yangzi
Rice/Wheat	25	40	15	20
Beans	15	12	6	6
Meat	15	6	20	5
Fish	3	6	1	1
Salt	5	5	2	2
Cotton cloth	15	19	4	10
Liquor	8	4	14	20
Harrow	6	3	4	3
Plow	6	3	4	3
Newspaper	2	2	2	2
Total	100	100	72	72
PPP’s (price level Yangzi = 100)	100	98	97	107
Fisher average		**99**		**102**

Sources: appendix (prices); Li 2010, Smits et.al. 2000.

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[6] In the Netherlands, during the 1840s and 1850s, there occurred a similar situation in which labour productivity in agriculture (also thanks to changes in relative prices after the liberalization of international trade in the 1840s) was on par with labour productivity in industry; it retarded the process structural transformation and slowed down economic growth in these years; see Van Zanden and Van Riel 2000: 188-198.

Table 5 Comparison of different levels of labour productivity per branch/sector, 1823-1829 (Hua-Lou=100)

	Relative labour productivity
Agriculture	117
Fisheries	131
Primary sector	117
Textiles & cloth processing	828
Shipbuilding	263
Construction	46
Rest Industry	124
Secondary Sector	387
Commerce & banking	283
Water Transport	653
Education	115
Government	89
Rest Services	207
Tertiary Sector	186
Total economy	228
Per capita GDP	186

Sources: tables 1, 2 and 4

Agricultural productivity

One of the striking results of this comparison is the high level of productivity in agriculture in the Yangzi delta; this is not completely unexpected, as Bob Allen's paper on the same subject, also produced very similar results. These results are confirmed when we construct a PPP-index for agriculture only (and ignore the non agricultural prices of Table 3); we get a PPP for agriculture alone of 85 when using Dutch weights, of 107 when applying Chinese weights; the Fisher average is 95, which is not very different to the PPP we used for GDP as a whole. Applying this partial PPP leads to a somewhat higher relative productivity of Dutch agriculture, but the difference is relatively small.

We can dig somewhat deeper into the structure of productivity by including other inputs into the comparison. The total cultivated area of Hua-Lou was about 60.000 hectares; given the much lower population pressure, it is not a surprise that the cultivated area of the Netherlands was more than 31 times that of Hua-Lou at 1886000 hectares. Total value added of agriculture in the Netherlands was only about 6 times the level of Hua-Lou, resulting in a much higher land productivity in the latter region (the Dutch level was about 19% of the Hua-Lou level). Clearly land productivity in the Yangzi delta was much higher than in Western Europe.

It is an interesting question to what extend the small difference in labour productivity was linked to differences in the available draught power. Tony Wrigley (1991) has argued that the very high level of labour productivity in English agriculture at the beginning of the 19th century was linked to the presence of large number of horses on English farms – in contrast to France, for example, where the supply of horse power was much more limited (but see Kander and Warde 2010). We estimate that there were about 34.000 water buffaloes in Hua-Lou district, or slightly more than one buffalo per 2 hectare of cultivated land. In the Netherlands horses were used, but on a much more modest scale: there were probably about 218.000 horses, or about one horse per 9 hectare. Part of the explanation is perhaps that farms were much larger in the Netherlands, making it possible to economize on horse power. Another part of the story is that perhaps as much as 50% of Dutch farms had specialized in livestock farming, and therefore did not need horses for ploughing, harvesting etc. – horses were in those parts of the Netherlands mainly used for transport. The ratio between horse power and labour force did not differ much, however: in Hua-Lou there were 0.45 buffaloes per person employed in agriculture, the Netherlands had slightly more, 0,52 horses per labourer; the difference between the two in fact almost mirrors the difference in labour productivity.

Finally we can compare total factor productivity of the two regions involved; we compare PPP corrected value with the weighted inputs of labour, land, and livestock (as a proxy for capital), using a Cobb Douglas production function with the following share: labour 50%, land 35% and livestock 15%. Hua-Lou had, if we apply this formula, a level of total factor productivity about 75% higher than that of the Netherlands. When correcting for the higher quality of land in the Yangzi delta - the average quality of land in the Netherlands can, following Buringh et.al. (1975), be estimated to be 66% of that of Hua-Lou -, this declines to 50%. Other specifications of the Cobb Douglas function (for example, 60% labour, 30% land, 10% livestock) lead to similar results (in this case a 60/40% gap in tfp).

Agricultural value added per capita in the Netherlands was somewhat higher than in the Yangzi delta: in nominal terms the difference was 43%, and somewhat more corrected for the small difference in price level. How did this translate in consumption per capita? Li (2009) estimated an average consumption of 16.5 kg of meat in Songjiang where Hua-Lou is located in this period; for the Netherlands this estimate is more than double: 35.7 kg per capita (in 1812/13; Van Zanden 1985: 106). In the Dutch menu the potato had become quite important, which meant that per capita consumption of cereals had declined to about 100-120 kg (probably supplemented by about the same quantity of potatoes); Li (2009) estimated a much higher per capita consumption of rice and wheat in the Yangzi delta (216 kg of husked rice plus 41 kg of wheat).

Industry and Services

The gap in labour productivity in agriculture was small. By contrast, in industry, and in particular in textiles, the gap was huge. Part of the explanation for the extremely low level of labour productivity in textiles in Hua-Lou is that the cotton industry was severely depressed in the 1820s, the result of a sudden and strong decline of cotton prices during that decade. This was the beginning, in fact, of the 'cotton invasion', the flooding of non European markets by European, mainly English, textiles. At the same time, the bad weather reduced the production of raw cotton in its neighboring areas which were the major sources of raw cotton of Hua-Lou, the prices of raw cotton went up strongly, which in turn led to strong reduction of margins in this sector. If we, tentatively, compare the value added of the 1820s with what was usual before about 1820, we get the following picture: prices of raw cotton probably doubled between the 1810s and the 1823-1829 period, whereas the price of cotton cloth fell by 40% (from 0.60 tael per bolt to 0.35 tael per bolt) (details in Li 2010). Before 1820, the total value added of this sector was probably about twice the level we included in the estimates of GDP, resulting in a much higher relative income in this sector.

Differences in the structure of the labour force also played a role. The textile industry in China was almost exclusively carried out by rural women, whereas their husbands were occupied in agriculture. In the Netherlands, men dominated the mainly urban textile industry, and the share of women was (only) 28% of the total labour force in this sector (data for in 1849, when we have the first detailed statistics) (Smits et.al. 2000: 112). If we correct for this – assuming that relative wages of women were about 50% of that of men, and that this reflects relative levels of labour productivity (Burnette 2008) – the labour input in Chinese textiles has to be reduced by perhaps as much as 50%[7], whereas that of the Netherlands by only 14%. When we combined these two corrections - for the crisis in textiles in the 1820s and for the 'overrepresentation' of women in this part of the labour force - we get the following results. In Hua-Lou 56.000 male equivalents produced about2,4 million taels in spinning and weaving (the estimate of value added before 1820)[8], which is about 43 tael per man year. As for in the industry as a whole, the average would be 61 taels[9]. This compares well with the average of 66 taels per man year for the economy as a whole (after these corrections have been taken into account)[10]; labour productivity in industry recalculated in this way is 92% of labour productivity in the economy as a whole, which is not implausible.

Still, the problem remains why the labour productivity in large parts of industry and in services was so much lower in the Yangzi delta than in the Netherlands. Relative factor costs may have played a large role here, we think. Interest rates in the Yangzi delta, where they were usually around 2% monthly issued by pawnships in the eighteenth and early nineteenth century or 0.4-0.8% by *piaohao* on commercial loans and mortgages in the mid-nineteenth century (Li Bozhong 2010: appendix 13), were probably higher than in the Netherlands, where they varied between 3 and 5% (on commercial loans, mortgages and on government debt) (Van Zanden and Van Riel 2004: 157-160). On the other hand, nominal and real wages were lower in the Yangzi delta (and in other parts of China). Nominal daily wages of unskilled labourers in the Netherlands were

[7] In the Yangzi delta during the eighteenth century, the return to a woman's workday in cotton cloth production was about three-quarters that of a man's workday in farming in general. (Bozhong Li 1998: 150). If we compare the pre-1820 wage of rural women who were engaged in textile industry (21 taels per person year, see the next footnote) and the 1823-29 wage of long-term hired farm hand (*changgong*) (42 taels per man yer, Li Bozhong 2010: ch 12 and appx.14), the ratio was about 1:2.

[8] Before 1820, the price of cloth was 650 copper coins per bolt, but the price was only about 75 per catty. In contrast, they were 450 and 150 respectively in 1823-29. Therefore, the added value in spinning and weaving was 2,350,000 taels, while the number of the female workers in textile industry was 113,000. Accordingly, the production per woman year was 21 taels, close to the 1823-29 GDP per capita of Hua-Lou. (Li Bozhong 2010: ch 13).

[9] The total number of the workers was 92,000 male equivalents and the value added was 5,625,000 taels before 1820.

[10] Because of bad weather, rice yield dropped from 3 *shi* per *mu* to 1.7 *shi* per *mu* in the period of 1823-29, but the costs of production changed little. The total valued added for the rice reduced was 2,730,000 taels if using the1823-29 price (which is very slightly higher than the pre-1823 price: 2.33 vs 2.29 taels per *shi)* (Li Bozhong 2010: ch 13). If the valued added in rice farming and textile were included, the GDP would be about 17.4 million taels. Accordingly, the production per man year was 66 taels.

about 60% higher than real wages of of long-term hired farm hand in the Hua-Lou (0.75 guilders compared with 0.122 tael[11], or 7,2 grammes of silver versus 4.5 grammes). Because the cost of living in the Netherlands were about the same (Table 4), this implies that real wages were also about 70% higher than in the Yangzi-level. This result is consistent with the estimates by Allen et.al. (2010) about the wage gap between Western Europe and China.

Relative prices affected, not unexpectedly, capital/labour ratio's and the level of labour productivity. Let us give a few examples. In both China and Western Europe there was a large printing industry, catering for the demand for books of a (in both regions) relatively well educated public. But production technologies were quite different: since the middle of the 15th century, Western Europe concentrated on moveable type printing as the most important technology, which was a very capital-intensive process, with high levels of labour productivity. Although this technique was known in China, and was used sometimes in prestige projects sponsored by the emperor and some other persons, most commercial printers preferred to use a more labour intensive technology, woodblock printing, which was also much less capital intensive but also less efficient[12]. Medhurst, a Christian missionary who planned to print the Bible in Chinese in the 1830s, made a detailed comparison of the production costs of the two techniques. He estimated that producing 2000 copies of the Bible with woodblocks would costs 1900 pounds and would take three years to finish the project, during which nine blockcutters and five printers and binders had to be employed, whereas with metal moveable type it would take seven workers one year, at a total cost of 1515 pounds (Reed 2004, 31-32). That in this specific case – perhaps because the missionary had access to relatively cheap capital – moveable type printing was less costly, is not the point we would like to make. Medhurst' data also make it possible to estimate the labour productivity of the two technologies: to make the same 2000 volumes of the Bible, one needed either 42 menyear when using the woodblock technology, or 7 menyear when using metal movable type.

Because of high wage costs, Dutch entrepreneurs had tried to mechanize all kinds of activities which were done by manual labour in most other European countries, and in China. The different solutions they developed for managing water in both regions are telling examples of the effects that relative factor prices had on technologies. The Chinese, of course, had a good knowledge of windmills, but rarely used this technology. The complex water management systems of the Yangzi Delta was almost completely dependent on human power and, on a much smaller scale, on animal power (oxen/buffeloes) –windmills were in use, mainly in pumping water in agriculture and salt industry, in east China () with important improvements technologically[13]. But the use of wind power was very limited and man power was overwhelmingly dominated the scene in the Yangzi delta (Li Bozhong 2000: 275). Picture 1 gives an impression of the kind of technology that was being used here. As is well known, already in the 15th and 16th century the Dutch water management system became increasingly dependent on wind power, captured by large and very capital intensive windmills (such as the one shown on Picture 2). The same difference applies to oil pressing, which was a large industry in both

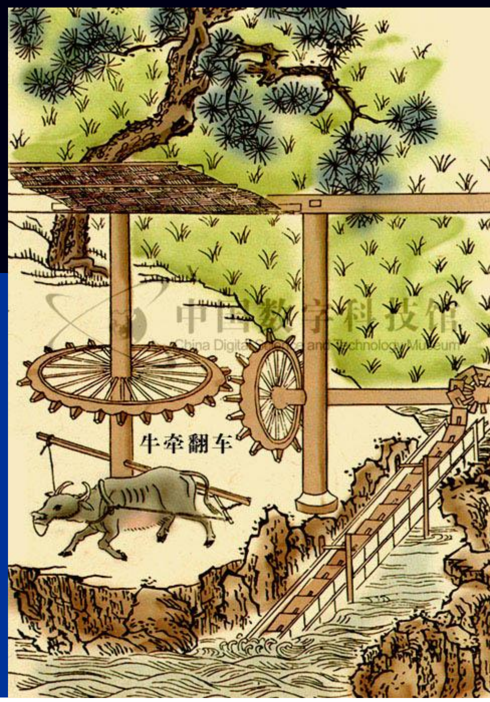
[11] The wage was 42 taels, and the workdays were 345. Li Bozhong 2010: ch 9, 10, appx 4.

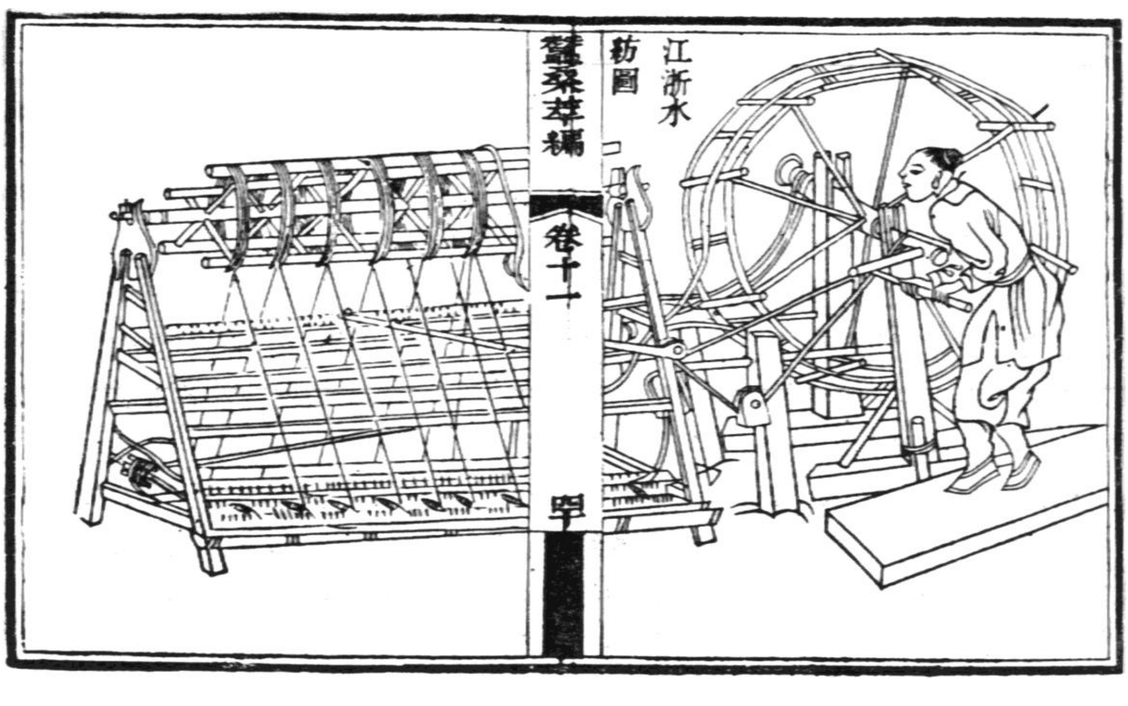
[12] There were a few of records in the Qing liturature. From them it can be seen that the efficiency of type printing was highly appreciated, but was the cost of the machine was so high to allow it be used widely in commercial publication (Li Bozhong 2000:497-498).

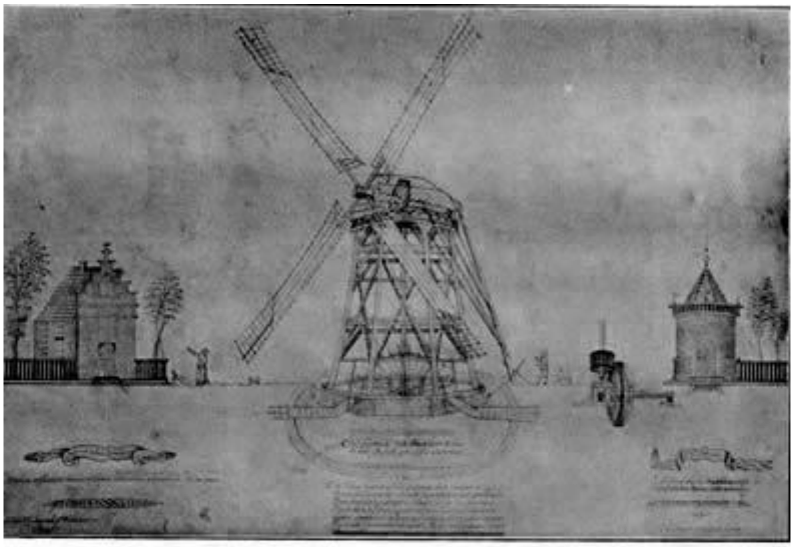
[13] Li Bozhong 2000: 275. Mark Evlin (1973: 127-128) argues that "the Chinese sailing-ship typle of wind pump waws more efficient in light breeze than the European airscrew variety".

regions: the Dutch developed a highly capital intensive windmill-technology to press their oilseeds, the Chinese version of this was driven, again, by humans or oxen.[14]

[14] An additional reason why, perhaps, windmill technology was not used as much in China, may have been related to the climate of the region. In the Netherlands there is almost always some wind, which means that windmills are quite reliable as a source of power. In China – in the Yangzi Delta – there are two mossoon periods of steady winds, but long periods in between with almost no wind. Moreover, the shortage of metals was also an important cause of why wind power or water power were not used widely in the Yangzi delta. The machine driven with wind or water power should be used more efficiently only when some major parts or accessories, say, gears, axletrees, chain wheels, flywheels rocker arms and so on, were made of metals. But metals, in particular iron and copper, were very expensive in the Yangzi delta. Even the most complicated and advanced machines such as the silk spinning machine used in the Yangzi delta (Picture) were made excessively of wood or bamboo in the delta. (Li Bozhong 2000: 305-314, 495-500).


牛牵翻车


江浙水紡圖
蠶桑萃編
卷十一



Reproductie van de origineele penteekening van LEEGHWATER, voorstellende een Beemster molen.
(Voor opschrift zie men bldz. 73).

Other examples of technological choices which may be related to different factor prices are found in the transport sector. In both countries transport along the canals and rivers was a very important part of the economy. In the Netherlands, the system of trekschuiten used horse power to pull the barges (De Vries 1978). Along the Grand Canal, similar barges were pulled by human labour, which was an important source of employment in the region. A boat carried 1500 shi of rice or equivalent (around 110 tons) on average in the early 19th century and was manned with 9 sailors (Li Wenzhi & Jiang Taixin 1995: 459, Li Bozhong 2000: 232-235) . This implies a ton per man ratio of 12. Similar differences existed in international transport. John Crawfurd informs us (writing in the late 1820s) 'A Chinese junk is manned with an extraordinary proportion of hands, as compared to European vessels – a circumstance which chiefly arises from the awkwardness of the rudder, the cable and anchor, and the weight and clumsiness of the enormous square sails which are used of. A junk of 8000 piculs or about 500 tons, requires a crew of ninety men, and the proportion is still greater for vessels of smaller size' (Crawfurd 1830, II: 160).[15] This implies a ton per man ratio of 5.6, and possibly lower on smaller ships. 18th century data for the Indonesian Archipelago also suggest that the ton per man ratio, also on the large Chinese junks, was that low (Knaap and Sutherland 2004). In Dutch shipping, a ton per man ratio of 15 to 25 was already usual in the 18th century (Lucassen and Unger 2000); in 1830 this had increased to 46 ton per sailor, and 56 tonnes in 1840 (Horlings 1995: 401). If Crawfurd is right, and the quality of ships in Europe was much higher than in China, one would expect large differences in construction costs. This seems to be supported by the evidence he presents himself: Chinese junks cost between 20 and 30 tael per ton, the equivalent of 740-1110 grammes silver (in Vietnam and Thailand they were even cheaper, due to the low prices of timber there) (Crawfurd 1830, II: 159). But according the first hand records of the Chinese junks made by the Japanese

[15] There were institutional reasons for the large crew as well; merchants traveled with their own merchandise, or members of family with that of their families, and ships were divided in parts (cabins) rented or owned by a merchant (family) for shipping their own commodities; merchants also often took assistants with them; sailors were therefore at the same time merchants – but this lack of specialization may have hampered productivity growth.

and Korean governments in 1808, 1821, 1827, 1848, an ocean-going Chinese junk was manned with 14 to 17 sailors (Matsuura 2009: 119-122), while the load of a junk was 100-400 tons (Li Bozhong 2000: 238-239). The ton per man ratio was about 20. The comparable price for a Dutch ship in the 1820s was almost 200 guilders per ton, or about 1850 grammes of silver (Jansen 1998: 288-9).[16]
Can we compare freight rates between China and the Netherlands, in order, perhaps, to assess the relative efficiency of the two shipping industries? There is some information on freight rates of the large-scale trade in bean cakes and other agricultural commodities from Machuria (Niuzhuang) to the Yangzi delta (Shanghai), which can be used for a comparison with European freight rate data. Xue (2007) quotes Shi Yanshi saying that the freight rate of a Jiangsu shi (=100 liter) on this trade is 'only a little more than 300 wen', which at the time is almost one half tael (630 wen per tael is mentioned in the text) (Xue 2007: p. 199). More reliable was that the observation made by Qi Yanhuai, a contemporary observer and expert of sea transport in 1820s [17]. According to Qi, the real freight of the shipment of tribute rice by sea from Shanghai to Tianjin was 0.5 taels of silver per *shi* of rice, while the freight by the Grand Canal was at least 1.67 taels of silver per shi of rice. [18] There were different records of the freight fees in sea transportation which are contradictory in some cases caused with the very complicated conversion practices in measures, silver-copper coin exchange and taxation. According to Ni Yuping (2002), the market price of shipment of tribute grain was 0.321 taels per guanshi (official shi) from Shanghai to Tianjin, while the official price was 0.5 taels because the government regulated that the ships could be loaded by only 70% of the capacity if they carried tribute rice to insure the safety of the shipment. The distance between Shanghai and Tianjian, according to Governor Tao Shu who dealt with the tribute grain shipment he 1810s, was a little more than 2000 km.

This implies 7,14 tael per ton, or 0,0055 tael per tonkm, or 0.20 grammes silver per tonkm. [19] The distance is similar to that between Amsterdam and Gdansk, which was the most busy route of Dutch shipping. In 1820, average costs per ton-km were 0.963 cents, in 1830 it had declined to 0,921 cents (as estimated by Horlings, 1995: 399; in most other trades freight rates

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[16] If we, assuming that the quality of these ships were the same, include the prices of ships into the PPP calculations, the average PPP would rise a few percents (as in this case Dutch prices are clearly – assuming similar quality, which is doubtful – higher than those of China), and the gap in terms of GDP per capita would fall somewhat.

[17] But we should note: this was the freight charges of goods shipping from south (Shanghai) to north (Niuzhuang in southern Manchuria). In this route, ships were not of full cargo (the contemporaries called it "idling") when they went north because the major jobs of the ships were shipping beans and beancakes south and cotton cloth north. Because the cloth was much lighter than beans and beancakes, the shipmen had to hire local workers to dig mud in the shore of Shanghai and load a big amount of mud on the ships as the ballasts. In this situation, the goods to ship to north were very welcomed and the charges were very low. Considering this, no scholars have used the figures as real freight charges when they study the sea trade between Manchuria and Jiangnan.

[18] Qi said that when sea-going ships was hired to ship the tribute rice from Shanghai to Tianjin, the ships would be permitted loaded by 70%, to be more prudential. The freight would be 0.5 taels of silver per shi of rice. To recoup the possible loss in the process of shipment, more 0.03 shi of rice would be added to 1 shi of rice shipped when the rice was loaded at Shanghai, while only 0.95 shi of rice would be delivered to the official consignee when the rice was unloaded at the Tianjin. Accordingly, the shipment of 3.5 million shi of tribute rice would cost only 1.7 – 1.8 million taels of silver, less than 30% of the costs through the Grand Canal. (Wei Yuan 2004: 622).

[19] To get an estimate of the freight rate per tonne, we have to multiply this with 15 (100 liter = 67 kg); the total distance was estimated at 701 nautical miles (between the current ports of Ying Kou and Shanghai according to world shipping distances website at http://www.distances.com/), or almost 1300 km.

per km were lower; the average price per tonkm was 0,671 cents in 1820). This translates into about 0,09 grammes of silver.[20] If these calculations are correct, nominal freight rates in the Netherlands were less than half those of overseas shipping in China (0,09 grammes of silver versus 0,2 grammes of silver). A similar price gap can be found in inland transport, comparing transport along the Grand Canal with that on the Rhine.[21] It is therefore a bit puzzling that Chinese markets – at least the market for rice – was highly integrated, 'despite' the fact that apparently transport costs were higher there than in Western Europe (Shiue and Keller 2007). Factor prices are not the entire story, however. If we look at the government sector, and to education, it appears that other causes play a role as well. The value added of tertiary activities are measured by the salaries of their employees (it is still impossible to quantify the output of these government officials in a satisfactory way); the fact that Chinese employees in government are more productive than Dutch employees, is therefore related to their relative remuneration (see Table 4). The government sector was relatively small in the Yangzi Delta, but incomes were relatively high (Tables 1 and 4). By contrast, the Netherlands had a large government sector, dominated by navy and army, but also consisting of a relatively large group of civilian state employees, who, however, received relatively low salaries (Tables 2 and 4). The different political economies of the two regions is behind these differences: in China, the state was a major gateway for upward social mobility. Rich merchants families tried to get access to the state via training their children for the state examinations – and once they were in, a high position in government could be a source of even higher incomes[22]. Dutch civil servants were, on the other hand, paid quite poorly, and so were the soldiers and sailors who manned the army and the navy. Rich merchant families were only rarely interested in a career in public service, as this was badly paid and did not enhance their social standing.

It can also be noticed that the differences in productivity (=salaries per employee) in education are relatively small. Whereas nominal wages of unskilled labourers in the Netherlands were, as we saw already, 70% higher than in the Yangzi region, the difference of the salary of teachers was much smaller – close to zero in nominal terms, which points to a relatively large skill premium (teacher/unskilled labourer) in China.

In industry and services, because of the different factor costs, Chinese entrepreneurs applied more labour intensive and less capital-intensive production techniques, and used much less horsepower, wind power and other capital goods than producers in the Netherlands[23]. We think

[20] In the 18th century, when Dutch ships dominated this trade, freight rates were even lower (Van Tielhof and Van Zanden 2009)

[21] Xue (2007) also points out that sending one shi of rice to Beijing, along the Grand Canal, costs 2 to 3 times the price of the rice … p. 220, a distance of about 1240 km; price of rice 2,31 tael per 100 liter/70 kg = 0,067 tael per tonkm; costs 2,5 * 2,31 tael for whole trip = 5,78 tael, per 70 kg, per 1240 km = 0,067 tael per tonkm = 2,46 grammes silver per tonkm) . On river traffic along the Rhine (from Amsterdam to Cologne – a much shorter distance, with certain political borders which increased costs as a large part of the costs involved was tolls and tariffs), Horlings estimated the average freight rates at 0,115 cents per tonkm upstreams, and 0,082 cents downstream (including duties) (p. 415, average 1820-1829), which is 1,1 and 0,8 grammes of silver. Also for transport along these waterways, we find that nominal freight rates in the Netherlands were less than half – to one third – of those along the Grand Canal.

[22] The income of officials ranked highest among those of the people in all occupations in Hua-Lou, see Li Bozhong 2010: ch 10 and appx 14.

[23] Because the characteristic features, the structure of the economy of the Yangzi delta was called a "superlight structure" by Bozhong Li, which was dominated with manpower and wood-made tools, in contrast to that of British

that this goes a long way to explain the differences in labour productivity we found in these sectors. Differences in real wages were on the one hand causing these differences in choice of technique, but the capital intensive techniques used in the Netherlands also made it possible to pay the high nominal wages there. In China, where the same or similar technologies were often well known (such as the windmill, or moveable type printing), relative prices dictated the choice of much more labour intensive production techniques. In terms of total factor productivity, the gap between the two regions was probably much smaller than in terms of labour productivity; as we saw, in agriculture the Yangzi delta even had a much higher level of total factor productivity than the Netherlands (or England).

Conclusion

We have demonstrated that it is possible to reconstruct the national accounts of one of the most advanced and highly productive parts of China during the 1820s, and compare the structure and level of GDP and GDP per capita with that of other (more or less comparable) societies, such as the Netherlands in the same period. The results we found were a bit puzzling. On average, labour productivity in the Netherlands in the 1820s is more than double the level found in Hua-Lou, the region we concentrated on, and GDP per capita is about 90% higher in this part of Western Europe (the difference being the participation ratio, which is somewhat higher in Hua Lou district). We have suggested a number of explanations for this large difference, which seems to be linked to the fact that real wages in the Netherlands were much higher than in the Yangzi delta, whereas interest rates and capital costs were probably lower. These differences in relative factor costs induced entrepreneurs in the Netherlands to choose a much more capital intensive technology, with a much higher level of labour productivity. The fact therefore that The Netherlands was part of the area of high real wages in North Western Europe, seems to be part of the explanation (although this does of course not explain why real wages were much higher there – but that is another story). There was one, very important exception to this ‘rule’: agriculture; in the primary sector labour productivity in Hua Lou was almost as high as in the Netherlands (which is consistent with Allen 2010). Perhaps even more striking is the fact that within Hua Lou, labour productivity in this sector was much higher than in the industrial sector; although part of this gap was due to the unfavorable prices paid for and received by the large textile industry, the fact that also in the long run labour productivity in agriculture was probably higher than in industry, has a number of consequences for our understanding of the long term evolution of the economy of the region (and, perhaps, of China as a whole). The basic problem is that incentives to move out of agriculture into industry, which were rather strong in the European case where productivity in industry was much higher than in agriculture, were quite weak in the Yangzi Delta. In the Netherlands, during a brief period (between 1840 and 1860), due to very favorable circumstances on international markets for agricultural products (which were booming thanks to the growing demand from Great Britain), and severe competition on the m,arkets for industrial commodities (due to the rise of modern industry in the same country), a similar phenomenon occurred: in current prices, labour productvitiy in agriculture was higher than in industry. This was a period of high incomes in agriculture, but also of stagnation of the process of structural transformation (industrial employment hardly grew at all), of de-urbanisation, and of relatively

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economy in which horsepower and water power as well as metal-made tools were used much more. (Li Bozhong 2000: 470-479).

slow growth (Van Zanden and Van Riel 2004: 188-203). The Dutch economy was, one could argue, for a few decades caught into a high level equilibrium trap, because incentives for structural change were weak. We speculate here that, what was happening in the Netherlands between 1840 and 1860, that a highly productive agriculture was in a way ‘crowding out’ industrial development, may have been a feature of the Chinese economy as well, given what we now know about its structure and development path.

Finally, what can we say about the big question raised by Pomeranz about the relative levels of real income in Western Europe and China? Our results show that GDP per cpaita in the Netherlands was 86% higher than in the Hua-Lou district. Moreover, if we accept Angus Maddison’s (2003) estimates for Europe in 1820, the average level of GDP in Western Europe (excluding central Europe and Russia) was 1194 dollars (in 1990 dollars), or 65% of the level of Dutch GDP in the same year, which was, again according to Maddison, 1838 dollars. The level of the GDP per capita in Hua Lou would then be 988 dollars (or 54% of the Dutch level). We do not know, however, the ratio between the real income in this part of the Yangzi Delta, and that of China as a whole. Ma (2008) has estimated that both in the late 18th century and in the 1930s the average real income for the Yangzi delta was about 40-50% higher than that of China as a whole (a ratio which, by the way, is almost identical to that between the Netherlands and Western Europe as a whole). If we apply such a ratio, we get an estimated GDP per capita for China as a whole of 659 to 706 dollars, which is ‘only’ 10 to 20% higher than the level estimated by Maddison (which is 600 dollars). These results appear to confirm the view that there existed large differences in GDP per capita between these two parts of Eurasia. Perhaps the gap between theYangzi and the rest of China is smaller (although it was an important point in the debate opened by Pomeranz (2000) that there was a substantial gap). One reason for this may be that labour productivity in agriculture was higher than in industry, implying that the more agrarian parts of the country could perhaps have relatively high levels of income. The data on wages that have been published by Allen et.al. (2010) suggest something similar: nominal wages in Yangzi delta are not higher than elsewhere (which may mean that also nominal incomes are not higher) – the only exception is the north (Zhili, with Beijing), where nominal wages are much higher than in the south. If our estimates of cotton and rice consumption per head of the population in Hua Lou district are compared with estimates of national averages of the same commodities, it also appears that the differences are small: for cotton: 2.2 bolts in Hua Lou district versus 1,7-1,8 bolts according to Xu Xinwu (1992: 228), and rice/wheat: 3,6 shi versus 3.4 shi (according to Perkins (1968)). Perhaps, therefore, the income gap between the Yangzi delta and the Chinese average was smaller than 40-50% suggested by Ma (2008).

References

Allen, Robert C. (2009) Agricultural productivity and rural incomes in England and the Yangtze Delta, c.1620-c.1820 *Economic History Review*,vol. 62, issue 3, pp. 525-550.

Allen, Robert C., Jean-Pascal Bassino, Christine Moll-Murata and Jan Luiten van Zanden (2010) "Wages, Prices, and Living Standards in China, Japan, and Europe, 1738-1925" Forthcoming in *Economic History Review*.

Bergere, Marie Claire (2005): Shanghai shi: zouxiang xiandai zhilu (History of Shanghai), Shanghai: Shanghai shehuikexue chubansheBuringh, Pieter, H.D.J. van Heemst and G.J. Staring. 1975. *Computation of the absolute amaximum foord production of the world*. Wageningen: Agricultural University.

Burnette, Joyce (2008) *Gender, Work and Wages in Industrial Revolution Britain*. New York: Cambridge University Press.

Crawfurd, John (1830) *Journal of an Embassy to the Courts of Siam and Cochin-China, exhibiting a view of the actual State of these Kingdoms*. II volumes. London: Colburn and Bentley.

Hemels, J.M.H.J. (1969) *De Nederlandse pers voor en na de afschaffing van het dagbladzegel in 1869.* Assen: Van Gorcum.

Horlings, E. (1995), *The Economic Development of the Dutch Service Sector 1800-1850*. Amsterdam: NEHA.

Jansen, M. (1998), *De Industriële Ontwikkeling in Nederland, 1800-1850.* Amsterdam:NEHA.

Kander, Astrid and Paul Warde (2010) 'Energy availability from livestock and agricultural productivity in Europe, 1815-1913: a new comparison'. To be published in *Economic History Review*.

Knaap, Gerrit and Heather Sutherland (2004) *Monsoon Traders. Ships, skippers and commodities in eighteenth century Makassar*. Leiden: KITLV Press.

Knibbe, M. (1993), *Agriculture in the Netherlands 1851-1950.*Amsterdam: NEHA.

Kuznets, S. (1966), *Modern Economic Growth. Rate, Structure and Spread.* New Haven.

Li, Bozhong (1998). *Agricultural Development in Jiangnan, 1620-1850*. New York: St. Martin's Press.

Li, Bozhong (1998). *Jiangnan de zaoqi gongyehu, 1550-1850* (The early industrialization in the Yangzi delta, 1550-1850), Beijing: Shehui kexue wenxian chubanshe.

Li, Bozhong (2008) 'Wages in Huating-Lou counties in the 1820s', *Frontiers of History in China*, 3(4) 578-611.

Li, Bozhong (2009). 'Food Consumption in Early-Nineteenth Century Songjiang' paper seminar Warwick University. Available at ****

Li, Bozhong (2010). *Zhongguo de zaoqi jindai jingji: 1820 niandai Huating-Louxian diqu GDP yanjiu* (An early modern economy in China--A study of the GDP of Huating-Lou area, 1820s), Beijing: Zhonghua shuju

Li, Wenzhi & Jiang Taixin (1995): *Qingdai caoyun* (The tribute transportation in the Qing dynasty), Beijing: Zhonghua shuju

Lucassen, Jan, and Richard W. Unger (2000), 'Labour productivity in ocean shipping, 1450-1875', *International Journal of Maritime History* 12/2, pp. 127-141.

Ma, Debin (2008) "Economic Growth in the Lower Yangzi Region of China in 1911–1937: A Quantitative and Historical Analysis". *The Journal of Economic History*, Vol. 68, Issue 2, June 2008, pp. 355-392.

Maddison, A. (2003). *The world economy: historical statistics.* OECD, Paris.

Matsuura, Akira (2009), Qingdai fanchuan dongya hangyun yu zhongguo haishang haidao yanjiu (A study of junk transportation in East Asia and Chinese sea merchants and pirates), Shanghai: Shanghai cishu chubanshe

Niu, Yuping (2002): "Qi Yanhuai yu daoguang chunian caoliang haiyun" (Qi Yanhuai and the sea transportation of the tribute grain in the Daoguang reign). *Lishi dang'an* (Beijing), No. 1, 2002.

Perkins, Dwight (1968) *Agricultural Development in China, 1368-1968*, Chicago: Aldine Publishing Company.

Poel, J.M.G. van der (1953/54) ‘De landbouw-enquête van 1800’ *Historia Agriculturae* 1 (1953), 48-194; 2 (1954), 45-233.
Pomeranz, K., 2000. The Great Divergence. China, Europe and the Making of the Modern World Economy. Princeton U.P.
Reed, C. A. (2004). *Gutenberg in Shanghai. Chinese Print Capitalism 1876-1937.* Honolulu : University of Hawai’i Press.
Smits, J.P.H., *Economische Groei en Structuurveranderingen in de Nederlandse dienstensector 1850-1913* (Amsterdam 1995).
Smits, J.P.H., E. Horlings and J.L. van Zanden (2000), *Dutch GNP and its components, 1800-1913*. Groningen: Growth and Development Centre.
Van Dyke, P. A. (2005). *The Canton Trade. Life and Enterprise on the China Coast*, *1700-1845*. Hong Kong: Hong Kong University Press.
Voth, H-J. (2001) *Time and Work in England, 1750-1830*, Oxford: Oxford University Press .
Vries, J. de. (1978). *Barges and Capitalism. Passenger transportation in the Dutch Economy (1632-1839).* Utrecht: Hes Publishers.
Vries, J. De (1994). ‘The Industrial Revolution and the Industrious Revolution’. *Journal of Economic History* 54, pp. 249-70.
Xu Xinwu (1992) *Jiangnan tubushi* (A history of cotton cloth in Jiangnan), Shanghai shehui kexue chubanshe.
Xue, Yong (2007) ‘A "Fertilizer Revolution"?: A Critical Response to Pomeranz's Theory of "Geographic Luck"’, *Modern China* 33: 195-229.
Wei, Yuan (2004), *Wei Yuan quanji* (the complete works of Wei Yuan), Changsha: Yuelu shushe
Wrigley, E.A. (1991), ‘Energy availability and agricultural productivity’, in Campbell, B.M.S. & Overton, M., *Land, labour and livestock.* Manchester: Manchester UP, pp.323-39.
Zanden, Jan Luiten van (1985) *De economische ontwikkeling van de Nederlandse landbouw in de negentiende eeuw 1800-1914*. Wageningen.
Zanden, J.L. van (2002), ‘Taking the measure of the early modern economy. Historical national accounts for Holland in 1510/14’, *European Review of Economic History* 6, 3-36.
Zanden, J.L. van. and Riel, A. van. (2004). *The strictures of inheritance. State, economy and institutional change in the Netherlands 1780-1914*. Princeton: Princeton U.P
Zanden, Jan Luiten van, and Milja van Tielhof, 'Roots of Growth and Productivity Change in Dutch Shipping Industry, 1500-1800', *Explorations in Economic History*, 46 (2009) 389-403.