Wages, Prices, and Living Standards in China, Japan, and Europe, 1738-1925

Robert C. Allen
Jean-Pascal Bassino
Debin Ma
Christine Moll-Murata
Jan Luiten van Zanden

June 2005

* This paper is part of the NSF grant funded project "Global Prices and Income 1350-1950" headed by Peter Lindert and the Spinoza-premium project on Global Economic History funded by NWO (The Netherlands). We want to thank Peter Lindert for suggestions and encouragements at every stage of this paper. We also want to thank Kishimoto Mio and Lillian Li for pointing to us useful sources of price data and Kariin Sundback for collecting the VOC data. Our paper also benefited from the lively discussion at the 43rd Cliometrics Conference held at Lake Tahoe in June 2005. We also want to express our appreciation to the works of the so-called "California School," particularly to Kenneth Pomeranz, for giving the initial inspiration to this important "Great Divergence" debate.

Wages, Prices, and Living Standards in China, Japan, and Europe, 1738-1925

> "Rice in China is much cheaper than wheat is anywhere in Europe…(p.??)
> The difference between the money price of labour in China and Europe is still greater than that between the money price of subsistence; because the real recompence of labour is higher in Europe than in China."
>
> –Adam Smith, Wealth of Nations, 1776, p. 189.

The comparative standard of living of Asians and Europeans on the eve of the Industrial Revolution has become a controversial question in economic history. The classical economists and many modern scholars have claimed that European living standards exceeded those in Asia long before the Industrial Revolution. Recently, this consensus has been questioned by revisionists (e.g. Pomeranz 2000, Parthasarathai 1998, Wong 1997, Lee and Feng 1999, Li 1998, Allen 2002, 2003, 2004, Allen, Bengtsson, and Dribe 2005) who have suggested that Asian living standards were on a par with those of Europe in the eighteenth century and who have disputed the demographic and agrarian assumptions that underpin the traditional view. The revisionists have not convinced everyone, however (e.g. Broadberry and Gupta 2005).

One thing is clear about this debate, however, and that is the fragility of the evidence that has been brought to the issue. Most of the comparative studies relied on indirect comparison based on scattered output, consumption or demographic data (Pomeranz 2000, Lee and Wang 1999). The few that attempted direct income comparisons were largely based on scraps of information about wages and prices in Asia. Our knowledge of real incomes in Europe is broad and deep because scholars since the mid-nineteenth century have been compiling data bases of wages and prices for European cities from the late middle ages into the nineteenth century when official statistics begin. Apart from Japan, little comparable work has been done for Asia.

This article, by amassing and constructing systematic data on wages, prices and consumption baskets from Imperial ministry records, merchant account books and local gazette, is an attempt to fill that gap for China in the eighteenth and nineteenth centuries.

These data are then compared to the Japanese and European evidence to assess the relative levels of real income at the two ends of Eurasia both in terms of grain wages and the more rigorously defined concept of welfare ratio. The comparisons paint a less optimistic picture of Asian performance than the revisionists suggest.

Our procedure takes the hypothesis of Adam Smith at the head of this paper as its point of departure. We first compare the "money price" of labour in China and Europe. To do this, we express wage rates in grams of silver earned per day in the two regions. Unminted silver measured in taels (of 37 grams) was a universal medium of exchange in this period, and the terms on which they exchanged defined the market exchange rate of European and Asian moneys. Converting silver wages into grain wages with grain prices provides us the first crude quantitative indicator of living standards across Eurasia. Clearly, consumption items across the Continent included more than just grain, we need, as pointed out by Adam Smith, to compare the "money price of subsistence." This is a more complicated problem since the subsistence foods were different in China and Europe. Our approach is to respect the culinary differences by reducing rice and wheat and other foods to calories and protein. Once that is accomplished, we can see how money wages and the costs of subsistence differed between Europe and China and what those differences imply for the "real recompence of labour."

The rest of the paper is divided into two sections with a conclusion. The first section presents extensive but scattered wage data which are used for comparison with Europe in terms of their purchasing power in grain. The second section utilizes consistent time series of wages. For China, we estimate real wage incomes in Canton and Beijing from the mid-eighteenth century to the 1920s and also report estimates for Sichuan from 1875 to 1925 as a comparison. We also include a comparison with Japan by using results for a composite picture of Kyoto-Edo in the eighteenth and early nineteenth centuries and Tokyo for the late nineteenth and early twentieth century, based on Bassino and Ma (2004). Levels of real income in these cities are compared to London, Amsterdam, Leipzig and Milan as worked out in Allen (2001).

I. Wage Levels in 18-19th century China

The contrast between the richness of Chinese wage data and the relative paucity of systematic historical studies is somewhat surprising.[1] The reason partly lies in the nature of available wage data, usually scattered across space and time and over different occupations, and often

[1] For a survey of existing studies on wages and prices, see Kishimoto Mio 1997.

denoted in various currency units.

There are two main sources for these scattered wage data: official regulations of wages paid by the state in government factories and at building projects, and market wages paid in different sectors of the economy. Both have their merits and demerits. The single greatest advantage of government regulation wage data is their use of standardized current unit - silver taels – and their relatively uniform definition of work types, making them ideal for comparison across time and space. Their obvious drawback is the question of how much these regulated wages reflect market forces. Data on actual market wages are also readily available and appeared in numerous studies. But the problem there is a general lack of comparability due to the multiplicity of labor contracts, payment system (in particular, the issue of food allowance) and possibly the most difficult of all, the quotation of various currency units, whose exchange values could both be highly localized and fluctuating over time. Studies not taking full cognizance of these issues could be very misleading.[2] Unfortunately, there is no shortcut around these difficult issues. Our approach below is to utilize the systematic government regulation wages in combination with available market wage data to gauge a reliable range of nominal and grain wages for the 18-19th century China.

The most systematic and detailed source of government regulation wages that we have been able to locate so far is the *Wuliao jiazhi zeli* ("Regulations and precedents on the prices of materials") of 1769, a very detailed government inquiry into prices of buildings materials and the wages paid at construction projects, and an attempt to set these prices and wages for the future.[3] In itself it is testimony of high degree of sophistication of the Chinese state bureaucracy in the (second half of the) 18th century: at the district level detailed information about prices and wages was collected, which was put together at the level of the province, and finally presented to the Emperor in 1769; together with the final memorandum information about 1,557 administrative units was reported in a compilation of 220 chapters. The original memorandum has not been preserved, but we have been able to locate the editions for 15

[2] Hans Vogel (1987) contains the most comprehensive collection of market exchange rates for various provinces in China for the 17-19th centuries. But these exchange rates do not apply to the case of the co-circulation of multiple versions of silver and copper cash within the same locality, an issue pointed out in Kuroda's recent study (2005). For a case of neglecting these complicated currency problems in the study of nominal and grain wages, see Kang Choa 1986.

[3] See appendix 3 for a description of the various sources.; a detauiled description of this source, and the editions of Gansu, Zhili, Yunnan and Hunan can be found on the website of the project 'Staat, Handwerk und Gewerbe in

provinces covering 945 districts. Most contain the daily wages of unskilled and skilled craftsmen for each district; a few are more detailed and present wages for, for example, master sawyers, carpenters, stonemasons, paint-makers and painters, tailors, plasterers, canopy makers, paperhangers, piling labourers for foundation works and cleaners (in Zhili). A few also contain information about additional food provisions and their monetary value, so the total value of wage can be calculated; where no food provisions are mentioned, probably no food allowance was given, as these wage regulations were supposed to cover the whole wage sum of the projects that were monitored in this way.

For each province we calculated for both groups of wage laborers the unweighted average of the wage settings of all districts. Table 1 presents the results of these calculations for 21 regions (Zhili is divided in a number of sub-regions because of the large wage differences within this province). The total population of these regions in 1776 was 214 million (in fact slightly more, because no population data for Xinjiang are available), or 73% of the total population of China of about 293 million (Wang 1973).

Insert Table 1 here

The pattern that emerges from the *Wuliao jiazhi zeli* is that daily wages in parts of Manchuria (Heilongjiang and Jili) – the home territory of China ruling Manchu minority – and the sparsely populated Northwestern frontier of Xinjiang, stand out as the highest, followed by areas in and near the capital city of Beijing. Average daily wages in the rest of China seemed to be fairly uniform with the coastal Fujian province fetching the lowest 0.030 taels for unskilled laborers. Somewhat surprising is the two Lower Yangzi provinces of Jiangsu and Zhejiang, supposedly the most productive parts of the empire, had wage levels slightly below the national average.

Another national scale government regulation wage data is the so-called *Gongbu junqi zeli* (Imperially endorsed regulations and precedents of the Ministry of Public Works concerning military equipment) of 1813. They concern wage data for master artisans and unskilled labor that produced armor, helmets, headgear, uniforms, saddles, arms such as swords, bows, arrows, and various types of tents; only the data for unskilled laborers are

peking 1700-1900' of the University of Tübingen at http://www.uni-tuebingen.de/sinologie/project/shp/databases.html;

reproduced here in the second column of Table 2.[4] This source shows again that, with the exception of Zhili where Beijing is situated, average daily wages in most provinces in 1813 were about 0.04 taels, very close to that in the 1769 regulations.

Insert Table 2 here

To what extent these government regulation wages approximate market levels. Thanks to the Imperial Ministry of Justice records explored by, among others, Wei Jinyu (1983) and Wu Liangkai (1983), we do have scattered, but nonetheless extensive wage information of unskilled agricultural day laborers, culled from individual judicial case records across most provinces in 18-19th century China. We converted these wages (mostly in copper cash) to silver taels based on available exchanges rate from Hans Vogel (1987) for the period of 1740-1810 and presented them in the third column of Table 2. Despite the scattered nature of these wage data and the highly heterogeneous currency system in China, we feel they serve as useful broad indicators for the average wage level. In fact, the average daily wages for the 1740-1810 period come out to be 0.045 taels per day, remarkably close to the two sets of average wages from the government regulation record.[5]

However, agriculture wage needs to be interpreted with caution as food provision in addition to cash payments seems to be a widespread practice in China. For the 19th century, studies by Fang Xing et al (2000:1879-1881) demonstrate that the proportion of food allowance was equivalent to about 50-70% of total wage payment for agricultural laborers on annual contract. Presumably, this proportion would be smaller for day laborers. The clearest evidences on the proportion of food allowance in daily agricultural wages came from several massive national level surveys conducted in the 1930s, published in John Buck (1937, vol. 3, Table 12) and Cheng Zheng Mo (1935). Both studies clearly point to a food allowance slightly above 40% of the total wage payment for agricultural day laborers.

Therefore, it seems that the government regulation wages, with the exception of Manchuria, Northwest, and the areas around the capital, are closer to the cash component of the prevailing market wages, or alternatively could be viewed as some kind of wage floor. Urban

[4] Cf. You Zhanhong 游戰洪, "Lun junqi zeli" 論軍器則例 **(**A Study of Regulations and Precedents on Weapons and Military Equipment), in *Chinese Handicraft Regulations of the Qing Dynasty*, p. 13 Wages of craftsmen were .020 or .010 tael higher.

[5] We regression on the agricultural wages reveals that the coefficient on the time trend is statistical insignificant, indicating wages have been largely stagnant over the period of 1740-1810 , a result also verbally confirmed by Wei Jin Yu and Wu LiangKai.

wages are also likely to be higher than rural ones. Wages in Canton paid by the Dutch East India Company, where additional food allowance was not explicitly stated, were .074 to .080 tael for unskilled labourers and .90 or .100 tael for masons and carpenters, about twice the levels set by the 1769 regulation (.040 and .050 respectively). This kind of wage level is also confirmed by the American missionary reports for the early 19th century (The Chinese Repository, vol. 3., Feb. 1835, No. 10, p. 469). It seems that average daily wages in the handicraft sector in coal mining, charcoal mining and construction collected by Peng Zeyi (1962) were also higher than the 0.04 taels in the government regulation, although the variability of wage level there could be due to the skill intensity.

In view of the above, we feel that it is reasonable to assume that daily wages (inclusive of food payments) for unskilled laborers in the late-18th and early 19-th centuries fall in the range between 0.04 and 0.08 taels. Needless to say, wages in China varied widely across locations and by employers. There are various instances of unskilled laborers being content to just work for food and clothing (Chinese Repository vol. 3, Feb. 1835, p. 469). As a benchmark for comparison with European urban wages in the following section, we choose the optimistic version of 0.08 tael of wage rate for the 18th century in order to test the revisionists' claim at its favorable margin.[6]

Using the average Lower Yangzi rice price for the 1740-1813 at 1.92 tael per shi (with 1 shi = 80 kgs.), 0.08 tael could purchase about 3.4 kilograms of rice.[7] This level of rice wage is broadly comparable to those found for daily agricultural laborers in the 1930s (see Buck, Statistical Vol. 3, Table 3; Cheng, 1935; Brandt, p.118, 1989). This rice wage of 3.4 kg per day would also make the Chinese unskilled laborers' grain purchasing power broadly comparable to grain wages in major Southern and Central European cities such as Milan, Barcelona, Lisbon, Augsburg or even Istanbul of the Ottoman empire, but still less than half of those in major cities of Northwestern Europe such as London and Amsterdam at the end of the 18th century (Lindert et al, Table 3, 2004).[8] In the next section, we turn to a comprehensive and

[6] Bozhong Li (1998: 94) seems to also indicate that 17th century nominal wage levels may not be far apart from the 18-19th century. He discusses wage levels in agriculture (and silk production) in the Yangtze Delta, and estimates the average wage in rice cultivation at .06 tael per day, adding "the official standard was .04 tael a day which is a bit low compared to the wages in some farms in Huzhou, Zhejiang province.
[7] Rice prices for the Lower Yangzi from Wang Yeh-Chien, 1987.
[8] It is conceivable that some upward adjustment in Chinese grain wages should be made once rice or wheat prices of each locality instead of the higher-than-average Lower Yangzi rice price average was used; however, the

consistent time series of real wages incorporating both grain and non-grain prices.

II. Wage series 1700-1925: Beijing, Canton and Sichuan

Our Beijing investigation is anchored on the work of Sidney Gamble and his associates (Gamble 1943, Meng and Gamble 1926). Gamble was an American sociologist who lived in China in the 1920s and 1930s. He conducted a survey of workers in Beijing in 1921. This provided the weights for a consumer price index for Chinese capital for 1900-24, and that index, in turn, was used in a study of real wages for the period. Gamble also had historical interests. He studied the account books of a fuel store in the rural area outside Beijing (hereafter referred to as rural Beijing). From these he abstracted the wages of unskilled workers from 1807 to 1902. This is the most consistent wage series for nineteenth century China. Gamble and his associates also recorded wage series for unskilled construction workers in Beijing for 1862-1925 using the records of the Beijing Guilds for construction workers. These are our 'urban Beijing' data.

While Gamble's nineteenth century wage series is the most consistent and comprehensive available, much work remains to be done to adapt it to our purposes. The nineteenth century wage payments were recorded in copper cash, and we need to convert them to silver for comparison with prices and other wages. This helps resolve one of the most difficult problems in interpreting the 1807-1902 wage series. It was broken around the mid-19th century due to the monetary debasement in the period of the Taiping rebellion. We can connect the earlier and later components by converting to silver. This requires knowledge of the silver equivalent of copper cash across the nineteenth century. These conversion factors varied across China, and Gamble reports important information for the Beijing area from the accounts of the fuel store. We derive a consistent copper-silver exchange rate series from this source.

A second issue in interpreting the 1807-1902 series is the question of payments in kind. The fuel store recorded cash wage payments. The question is whether the workers were also given food. Gamble included the value of the food given to construction workers in his 1862-1925 urban Beijing wage series. For the 1807-1902 rural Beijing series, he explicitly stated that food was given in addition to the cash payments but not the amount (1943, p.4). To be consistent with our earlier research on agricultural laborers' wage payment system, we

---

downward adjustment in grain prices, most likely in the 20-50% range is not going to affect the general thrust of

doubled Gamble's 1807-1902 rural Beijing series of cash wages to include food payments in kind. The original wage series and copper-silver conversion rates are presented in Appendix I.

In view of the constancy of the silver wage in the second half of the eighteenth century as shown earlier, we posit a rural Beijing wage of .075 taels per day for unskilled workers outside of agriculture. With the tael equal to 37 grams, the Beijing wage equalled 2.8 grams of silver per day in the eighteenth century.

Our information on Cantonese wages is less comprehensive than our Beijing information. We are on firmer ground for the eighteenth century, for we have collected daily wages paid to Chinese workers employed on Dutch East Indies Company (VOC) ships docked in Canton. They support the view that nominal wages were constant in eighteenth century China. As indicated earlier, the VOC wages were roughly twice that in the 1769 *Wuliao* for southern China. Our next reliable information on Canton wages is for the early twentieth century. We use the simple average of six series of union regulated wage rates for unskilled laborers in the construction sector from 1912 to 1927. For the intervening period, we have no reliable information.[9]

We only have scattered wages and prices for eighteenth century Sichuan, but we have a useful compilation of daily wages and consumer goods prices at ten year intervals from 1875 to 1925 for Hejiang county from the local gazetteer (Chuan and Wang). These provide a valuable extension of the geographic coverage at the end of the period we study.

Our sources report daily wage rates. In the comparisons reported here, our income measure is the annual earnings that a worker could have earned if he worked full time for a year. We assume that one year's work consisted of 250 days. Obviously, people could have worked more or less than that, and we discuss the implications of those possibilities later. The earnings from full time work provide a useful benchmark for comparing Europe and Asia and for defining family economic strategies

---

our comparison.

[9] The Imperial Maritime Customs Returns report Cantonese wages for 1882-1891. Comparison with other wages, however, shows these to be so high as to be incredible, and we exclude them from our analysis.

Wage patterns in Europe and China

Adam Smith thought that the "money price of labour" was higher in Europe than in China. To test that, we compare the Chinese wages with their European counterparts. Here we build on our earlier studies of European wage rates (van Zanden 1999, Allen 2001). For many cities we have assembled daily wages earned by labourers in the building industry. We have been careful to exclude wage quotations where the earnings included food or other payment in kind that could not be valued and added to the money wage. As with China, we have converted the European wages to grams of silver per day by using the market price (in units of account) at which silver coins (of known weight and fineness) could be purchased.

Figures 1 and 2 graph the daily wage rates of unskilled workers in London, Amsterdam, Leipzig, Milan, and Beijing from the eighteenth century to the twentieth. Figure 1 shows the series from1738 to 1870. For this period, Adam Smith was half right. Wages were, indeed, highest in London and lowest in Beijing, but the other series show that the world was more complex than Smith thought. The silver wage in Milan or Leipzig was not appreciably higher than the wage in Beijing or Kyoto throughout the eighteenth century. The statistics of other European and Chinese cities show that this similarity was general.

Figures 1 and 2 here

Amsterdam occupies a peculiar position in Figure 1. Nominal wages there were remarkably constant for a century and a half. At the outset the Amsterdam wage was similar to the London wage. The same was true of Antwerp. Indeed, the Low countries and the London region stand out from the rest of Europe for their high wages in the seventeenth and eighteenth centuries. These high wages were probably due to the active involvement of these regions in inter-continental commerce.

But this pattern changed as the nineteenth century advanced. The industrial revolution raised British wages above Dutch levels. Indeed, the early industrialization of Germany is seen in Figure 1 as a rise in the Leipzig wage.

These developments intensified after 1870 as shown in Figure 2. British wages continued to increase. By the First World War, German wages had caught up to the British level, and Dutch wages closed the gap as well. Italian wages were also growing, but the increase was muted compared to the industrial core of Europe. Outside Europe, Japanese wages before 1870 stayed largely flat, in keeping with the low Italian level. After 1890,

Japanese wages, spurred by Meiji Japan industrialization drive, began to drift decisively above that of Beijing, but continued to stay substantially below the rising trend of early 20th century European wages.

Chinese wages, in contrast, changed little over the entire period. There was some increase in the silver wage after 1870, but Figure 2 emphasizes that the gain was of little importance from a global perspective. By the First World War, nominal wages in China were very much lower than wages in Europe generally. Taken at face value, Adam Smith's generalization about Chinese and European wages was more accurate at the time of the First World War than when he penned it in 1776.

Price Indices

What of Adam Smith's second generalization? He remarked that "the difference between the price of subsistence in China and in Europe is very great." (189). Price indices are used to make comparisons of this sort. In modern theory, the problem unfolds like this: Suppose an individual or family receives a particular income and faces particular prices. The income and prices determine the maximum level of utility (highest indifference curve) that the individual can reach. Now suppose that prices change. What proportional change in income would allow the individual to reach the original indifference curve in the new price situation? The price index is supposed to answer that question. Comparing the actual change in income to the index shows whether or not consumer welfare has risen or fallen.

If we compare that theory to the realities of the eighteenth century, we see problems in relating the theory to the world. There are no insuperable problems in applying the theory to real income changes over time in either Europe or Asia provided we have full information about wages, consumer prices, and spending patterns. But how do we compare living standards between Europe and Asia? The pattern of goods–particularly foods–consumed in the two regions was radically different. The standard theory of consumer welfare assumes that all of the goods are available in both regions and that there is a 'representative agent' who would voluntarily choose to consume rice, fish, and sake when confronted with Japanese prices and bread, beef, and beer when confronted with English prices. In fact, all goods were not available everywhere, and, moreover, it is unlikely that there were people with flexible enough preferences to voluntarily shift their consumption between the European and the Asian patterns

in response to changing prices. In that case, how can we compare living standards?

Our solution is to substitute objective equivalence for subjective indifference. Workers and peasants in pre-industrial Europe and Asia spent most of their income on food; much of the rest was spent on a narrow range of goods centred on cloth, fuel, lighting, and housing. We specify quantities or spending shares of these so that consumers in Asia and Europe have the same standards of living in objective terms. This is how we operationalize Adam Smith's notion of the 'money price of subsistence'.

In the case of the non-foods the procedure was simple. Each adult male is assumed to consume the following per year: cloth (cotton or linen): 5.0 square metres; soap: 2.6 kg; candles 2.6 kg; lamp oil:2.6 l; fuel: 3.0 - 5.0 million BTUs; rent: 5% of commodity spending. A range of values was specified for fuel consumption. The high value was used in northern Europe and the low value in southern Europe. Different values were used on the grounds that more fuel was required to reach the same level of utility in the north in view of the colder climate. Southern European values were used for China and Japan.[2]

In the case of food, the procedure was more complicated in view of the radical difference in diet between Europe and Asia. The choices are also of great importance given the large share of spending on food.

The first step was to specify a diet for Europe, which summarizes the spending assumptions for northern Europe (Allen 2001) (Table 3). The diet is late medieval in inspiration in that it does not contain new commodities like sugar and potatoes introduced into Europe after the voyages of discovery. Substitutions were allowed in the diet to adapt it to different parts of Europe. The price of wheat bread, for instance, was used in Mediterranean Europe, while the price of rye bread was used in Germany and Poland. The price of meat used in each city was that of the most common kind. Also, 68.25 litres of wine were used in southern Europe in place of the 182 litres beer for northern Europe. These contain the same quantities of alcohol (8.19 litres) on the assumption that the beer was 4.5% alcohol and the wine 12%. In this way, the same framework was used throughout Europe, but its application was adjusted to each locality studied.

Insert Table 3 here

[2]The discussion of Japan in this paper draws heavily on Bassino and Ma (2004) and their extensions.

The same principle guided the comparison of consumer prices and living standards between Europe and Asia. The diet for Japan and each part of China was specified in terms of the culinary norms of the region, but it was required to yield the same objective characteristics as the European diet shown in Table 3. These characteristics involved calories, protein, and alcohol. The European diet shown in Table 3 yielded approximately 1940 calories per day, and the Asian diets were required to do likewise.

Different diets were specified for different parts of Asia. We designed the Chinese baskets based on a national scale rural consumption survey in the 1930s by the National Agricultural Research Bureau (NARB). Japanese basket is mostly based consumption survey of the 1920s. Rice was a major source of calories in Japan, Canton, and Sichuan. In contrast, little rice was consumed in Beijing. There millet, beans, corn, and wheat were the main sources of calories. The details of the Beijing basket are in Table 4. The specifics of the diet and the annual spending pattern for Canton and Kyoto are shown in Tables 5 and 6. Table 7 provides the conversion standards for calories and proteins.

Insert Tables 4 through 7

The Asian diets were required to yield about 80 grams of protein per day as in the European diet. Asians consumed less meat than Europeans but more beans. Soybeans, in particular, are high in protein, and their consumption allowed the protein requirement to be satisfied without breaching cultural norms.

In addition, the Asian diets were required to yield 8.19 litres of pure alcohol per year. This was presumed to be sake and amounted to 49 litres per year (assuming 16.5% alcohol). Nineteenth century surveys indicate that the Japanese did, indeed, imbibe this much sake, so the requirement is not in conflict with their cultural norms (Bassino and Ma 2004). Surveys for China, however, suggest that consumption there was much lower. Whether this reflects preferences or income is less clear. We will consider the implications of this discrepancy later.

Having specified the consumption 'baskets' in Tables 3-6, we need time series of the prices of the items shown, so that the cost of the baskets can be calculated across the eighteenth, nineteenth, and twentieth centuries. We begin with Gamble's study of retail prices in Beijing in 1900-24 and extend those prices to earlier times and other places using a variety of other sources. These are explained in detail in Appendix II.

The cost of the basket is Adam Smith's 'money price of subsistence' and its history is

plotted in Figure 3 for leading cities in China and Europe in the eighteenth and nineteenth centuries. As Smith claimed, China had much cheaper subsistence. The figure shows the consumer price index for both Beijing and Canton. There was very little difference between the two. This is important because the two cities represent the two agrarian halves of China–the northern small grain region and the southern rice region. Apparently, the integration of China's food markets was close enough to arbitrage away any differences in the price of food when reduced to nutritional characteristics.

There were fewer exceptions to Adam Smith's generalization about consumer prices than there were about wages: In most cities, European goods were more expensive than Chinese goods. Leipzig was almost an exception to this rule, for prices there were very close to those in China during the eighteenth century. Prices were highest in London followed by Amsterdam and Milan. After 1870, silver prices inflated more rapidly in Europe than in China, so the gap between the two widened. Also, there was a convergence of prices in Europe in the run-up to the First World War. By then, Adam Smith's generalization about Chinese and Europe prices was correct, as was the corresponding generalization about wages.

Comparison of Living Standards

The purchasing power of wages is usually measured by the ratio of the wage to the consumer price index. Our procedure elaborates that approach. In constructing the consumer price index, we specified a notional budget that was intended to achieve a particular level of utility. The budget was an annual budget for an adult male. If the man was supporting a family, the expenditures would have been higher, and we multiply the cost of the budget by three to represent the annual budget of a family. This increase is roughly in line with the calorie norms for a man, a woman, and several young children. On the income side, we assume the man worked 250 days in the year–roughly full time work allowing for holidays, illness, and slack periods. The ratio of estimated full time earnings to the annual cost of the family budget is a real wage index, and one that specifically answers the question whether a man working full time could support a family at the specified level of consumption. Real wage indices of this sort are called 'welfare ratios.' As we will see, many men did not earn enough to reach the specified level of consumption–their welfare ratios fell below one–and we will discuss how they adjusted to the deficiency.

Figure 4 shows welfare ratios for unskilled male workers from 1738 to 1923 in the Europe cities we have been discussing and in Beijing and its hinterland. Several features stand out:

1) Beijing was in a tie for last place with Milan. Italian cities had the lowest standard of living in Europe, so an optimistic assessment of Beijing's performance is difficult. In the late nineteenth century, we have series for both 'urban' and 'rural' Beijing. While the income of 'urban Beijing' was higher than that of more rural areas near the city, some of the gain might be specious since we have not measured house rents, and they are generally higher in the city than the country. In any event, 'urban Beijing' was at the bottom of the European league table.

2) The trend in the standard of living in rural Beijing was generally downward from the early eighteenth century to the beginning of the twentieth. The lowest values of the welfare ratio were reached during the Taiping Rebellion, and the rebound in the index afterwards merely continued the slide that had proceeded the uprising.

3) The urban Beijing index rose noticeably in the early twentieth century and pulled away from the rural index. This may indicate a quickening economy in Beijing that had little impact in adjacent rural areas. The welfare ratios achieved in Beijing in the early twentieth century were still very low on a world scale and only kept pace with the modest gains realized in northern Italy with the onset of its industrialization at the end of the nineteenth century.

4) The most striking feature of Figure 4 is the great lead in living standards enjoyed by workers in the rapidly growing parts of western Europe. The standard of living of workers in London was always much higher than that of workers in Beijing. After the middle of the nineteenth century, London living standards began an upward trajectory and increased the lead over Beijing. While workers in Amsterdam in the eighteenth century also lived better than their counterparts in Beijing, the Dutch economy faltered in the early nineteenth century. By mid-century, however, growth resumed and real wages were climbing to new heights. At the same time, the rapid growth of the German economy was translating into rising real wages for workers in Leipzig. By the First World War, workers in the industrial core of western Europe had greatly increased their standard of living over their counterparts in Beijing. The standard of living there remained low and on a par with the regions of Europe that the industrial revolution had not reached.

Figures 4 and 5 here

Figure 5 tests the generality of these conclusions by including all of the Asian welfare ratios for comparison. There was variation in experience, but that variety does not qualify the conclusion that Asian living standards were at the low end of the European range. The history of living standards in Japan was very similar to Beijing's. For Canton, we chose the VOC wages which were twice the level indicated in the *Wuliao* data. This set the welfare ratio in Canton and Kyoto equal to the level of Beijing, but still low by European standards. Özmucur and Pamuk (2002) have found that real wages in Istanbul were at a low level like China's, so it may have characterized much of the non-industrializing world in the eighteenth century. There is evidence of rising living standards in Beijing, Canton, and Tokyo after 1870, but the gains were not enough to catch up to the standard of mid-eighteenth century London or Amsterdam let alone the much higher standard of living enjoyed by workers in those cities in the early twentieth century. The divergence of Japanese wages from those of China really began after the turn of the century. In particular, there was a rapid surge following the industrialization boom during the WWI so that by the mid-1920s, Japanese welfare ratio was more than twice the levels in China. But even then, the Japanese real wages were still far behind those in most European countries.

The low welfare ratios of Asian cities shown in Figure 5 raise the question of how one survived with a welfare ratio less than one. What that means is that a man working full time could not buy the goods that specify our reference level of well-being. What did low welfare ratios mean? To gain some perspective, we consider two cases.

The first is Sichuan, which had the lowest welfare ratio recorded (about .2). A possible explanation is the additional food allowance. If we assume food allowance roughly doubled the wage payment, welfare ratio there could attain .5, which was not uncommon. A man earning .061 taels per day in c. 1750 in Canton would have had that welfare ratio. At the prevailing prices, it would have taken 82% of the earnings for 250 days to buy the family calorie standard of three times 1940 calories per day over the whole year. Of course, if the man increased his work time to 300 days per year, and his wife worked 200 days at the same wage, they would raise the family welfare ratio to one without any cheapening of the specified consumption basket. Rice wine amounted to one over fifth of spending in the specified budget and contributed little protein and only one tenth of the daily calories. Cutting the rice wine to 10 litres per year in Table 3 and increasing rice consumption to 117 kg would allow them to

reach a welfare ratio of one with 450 days work per year. Chinese and Japanese families in the pre-industrial world could live as well as European labourers in the leading economies–but only by giving up drink and working twice as many days per year. (The same was true, of course, for Italian families.)

These examples indicate the three ways in which people could react to wages that were insufficient to purchase the life style corresponding to a welfare ratio of one. The first was by increasing the number of days worked. Wives worked in nineteenth century China, and their earnings made an important contribution to raising the family's standard of living. The second was by consuming less. By cutting back on non-foods and by concentrating spending on the cheapest sources of calories, a family could sustain itself with less income. Reducing the intake of protein and alcohol was an obvious strategy, and the Chinese budget surveys indicate that less alcohol was consumed than our welfare ratio postulates. The third was by reducing the number of non-earning family members. Fertility control was one option. In extreme cases, the wage might be sufficient only to support the worker himself, and he did not have a family.

Conclusion

Our investigation of Asian and European wages and prices shows that the situation was more complicated than Adam Smith suggested. Money wages in China were certainly less than those in the advanced parts of western Europe in the eighteenth century, but wage levels were similar in China and the lagging parts of the continent. By the twentieth century, however, wages were higher in all parts of Europe than in China. The cost of living was almost always lower in China than in Europe where we have measured it. As with wages, living costs were much higher in the leading parts of Europe than in China, and Europe as a whole inflated more than China at the end of the nineteenth century.

The upshot of the wage and price comparisons is that living standards seemed low in China. In the eighteenth century, advanced cities like London and Amsterdam had a higher standard of living than Beijing or Canton. The standard of living in the Chinese cities we have studied was on a par with the lagging parts of Europe, the Ottoman Empire, and Japan. By the twentieth century, enough progress had occurred in even the backward parts of Europe that their standard of living exceeded that in China. And Chinese regions like Sichuan were poorer still. There seems to have been a decline in the standard of living in China over the eighteenth

and nineteenth centuries, but most of the difference between Europe and China in 1913 was due to European advance rather than Chinese decline.

In spite of the above, a major surprise of our finding is that as poor as they maybe, unskilled laborers in major urban centers of China and Japan were roughly on a par in living standards with their counterparts in Central and Southern Europe for the larger part of the 18th century. Our finding calls into question the fundamental tenet of the large "rise of the West" literature that often view Western Europe as a whole surpassing the rest of the World from the early modern era. Our finding shows that it was only a part of Nortwestern Europe- in particular, England and Holland – that seemed to stand out from the rest – the rest, this time, included not only Asia but also the rest of Europe.

In this regard, Adam Smith neglected regional variation and, thereby, over-generalized the comparison of Europe and China. But our findings also dispute the revisionists' claim that the advanced parts of China such as Lower Yangzi being on a par with England on the eve of Industrial Revolution. It is true that our study has not explicitly compared wages and prices from urban centers in the Lower Yangzi region. But our data reveals that the Lower Yangzi wages for the unskilled laborers in government construction projects, agriculture or other handicraft sectors did not stand out from the rest of China. Clearly, our data base on China could be greatly improved and we do not claim to have given the final answer to this question. But newly discovered data would have to be very different from what is currently at hand to convince us that pre-industrial Chinese living standards were similar to those in the leading regions of Europe. In this regard, Adam Smith's pessimism looks closer to the truth than the revisionists' optimism.

References

Allen, Robert C. (2001). "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War," Explorations in Economic History, Vol. 38, pp 411-447.

_____ (2002). 'Real Wages in Europe and Asia: A First Look at the Long-Term Patterns,' (www.nuff.ox.ac.uk).

_____ (2003). "Agricultural Productivity and Rural Incomes in England and the Yangtze Delta, c. 1620- c. 1820," (www.nuff.ox.ac.uk)

_____(2004). "Mr. Lockyer meets the Index Number Problem: The Standard of Living of Unskilled Workers in Canton and London in 1704," (www.nuff.ox.ac.uk)

_____., Bengtsson, Tommy, Dribe, Martin (2005), editors. Living Standards in the Past: New Perspectives on Well-Being in Asia and Europe, Oxford, Oxford University Press.

Bassino, Jean-Pascal, and Ma, Debin (2004). "Japanese Wages and Living Standards in 1720-1913."forthcoming Research in Economic History, 2005.

Brandt, Loren (1989). Commercialization and Agricultural Development: Central and Eastern China, 1870-1937. Cambridge University Press.

Broadberry, Stephen, and Gupta, Bishnupriya (2005). "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800".

Buck, John L. (1937). Land Utilization in China, vol. 3. Statistics. Nanking, Nanking University Press.

Cheng, Zheng-mo (1935), Gusheng Nonggong Guyong Xiguan ji Xugong Zhongkuang (Employment Practice and Conditions of Supply and Demand for Agricultural Laborers for Various Provinces). Nanjing: Zhong Wenhua Jiaoyu Guan.

Chuan, Han-sheng, Wang, yeh-chien (1962). "Jindai Sichuan Hejiangxian Wujia yu Gongzi de Biandong Qushi" (Price and Wage Trends in Modern Hejiang County, Sichuan" in *Journals of the Institute of History and Philology*, vol. 34, pp.265-274.

Chao, Kang (1986). Man and Land in Chinese History:An Economic Analysis, Stanford.

The Chinese Repository (1835). "Diet of the Chinese." Vol. 3, Feb. 1835, No. 10, pp. 457-446.

Department of Crop Reporting, Division of Agricultural Economics, The National Agricultural Research Bureau (NARB). (1937) *Crop Reports* Vol. 5, Issues 7 and 8. Nanjing: The National Agricultural Research Bureau, Ministry of Industry, China.

The Department of Peasantry and Labour, Kwangtung Government, China (1928), The Reports of Statistics, Vol. III, The Wage Indexes of Labourers in Canton China, 1912-1927, June, 1928.

Fang, X., Jin, J.J., Wei, J.Y. (2000), Zhongguo Jinjie Tongshi (General Economic History of China). Vol. on Qing, Part 3. Beijing: Economics Daily Press.

Gamble, Sidney D. (1943). "Daily Wages of Unskilled Chinese Laborers, 1807-1902," The Far Eastern Quarterly, Vol. 3, No. 1, pp. 41-73.

Hsiao, Liang-lin (1974) China's Foreign Trade Statistics, 1864-1949 Cambridge: Harvard University Press.

Horrell, Sara (1996). 'Home Demand and British Industrialization,' Journal of Economic History, Vol. 56, pp. 561-604.

Kuroda, Akinobu (2005) "Copper Coins chosen and silver differentiated: another aspect of the "Silver Century" in East Asia." Acta Asiatica.

Hejiang Xianzhi (1966) Hejiang County Gazette. Taipei: Taiwan Student Publisher.

Horrell, Sara, and Humphries, Jane (1992). 'Old Questions, New Data, and Alternative Perspectives: Families' Living Standards in the Industrial Revolution,' Journal of Economic History, Vol. 52, pp. 849-880.

Jörg, C.J.A. (1982) Porcelain and the Dutch China Trade, Martinus Nijhoff, The Hague.
Lee, James Z., and Feng, Wang (1999). One Quarter of Humanity: Malthusian Mythology and Chinese Realities, 1700-2000, Cambridge, MA, Harvard University Press.

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

Li, Bozhong (2002). 'Involution or Not: A Case Study of Farm Economy in Songjiang, 1823-34,' Convergence and Divergence in Historical Perspective: The Origins of Wealth and Persistence of Poverty in the Modern World, All-U.C. Group in Economic History Conference, University of California, Irvine, November 8-10, 2002.

Li, Lillian M. (1992). "Grain Prices in Zhili Province, 1736-1911: A Preliminary Study," in Thomas G. Rawski and Lillian M. Li, eds., Chinese History in Economic Perspective, Berkeley, University of California Press, pp. 70-100.

Li, W.Z; Wei, J.Y; Jin, J.J. (1983) eds. Ming Qing Shidai de Nongye Zhibun Zhuyi Mengya Wenti. (The Issue of the Capitalist "Sprouts" in Ming and Qing). Beijing: Chinese Social Science Publisher.

Lindert, Peter et al (2004) "Preliminary Global Price Comparisons, 1500-1870" posted at website: http://www.iisg.nl/hpw/conference.html.

Maddison, Angus (1995). Monitoring the World Economy, 1820-1992, Paris, OECD.

Malthus, T.R. (1973) An Essay on the Principle of Population, introduction by T.H. Hollingsworth, London, J.M. Deant & Sons Ltd.

Marx, Karl (1853). 'The British Rule in India' and 'The Future Results of British Rule in India,' in The Portable Karl Marx, ed. By Eugene Kamenka, New York, Penguin Books USA Inc, pp. 329-41.

Meng, T'ien-P'ei, and Gamble, Sidney D. (1926). "Wages, Prices, and the Standard of Living in Peking, 1900-1924," The Chinese Social and Political Science Review, Vol. XX. pp. 1-113.

Özmucur, Süleyman, and Pamuk, Şevket (2002). "Real Wages and Standards of Living in the Ottoman Empire, 1489-1914," Journal of Economic History, Vol. 62, pp. 293-321.

Parthasarathai, Prasanan (1998). 'Rethinking Wages and competitiveness in the Eighteenth Century: Britain and South India,' Past & Present, No. 158, pp. 79-109.

Peng Xinwei (1954) *Zhongguo Huobi Shi* (A Monetary History of China). Shanghai: Xueliang Publisher.

Peng Zeyi, *Zhongguo jindai shougongye shi ziliao 1840–1949* (Materials for early modern Chinese craft history, 1840–1949), Beijing: Zhonghua shuju 1962/1984

Perkins, Dwight H. (1969). Agricultural Development in China, 1368-1968, Edinburgh, Edinburgh University Press.

Pomeranz, Kenneth (2000). The Great Divergence: China, Europe, and the Making of the Modern World, Princeton, Princeton University Press.

Pomeranz, Kenneth (2002). 'Beyond the East-West Binary: Resituating Development Paths in the Eighteenth-Century World,' The Journal of Asian Studies, Vol. 61, pp. 539-590.

Smith, Adam (1776). An Inquiry into the Nature and Causes of the Wealth of Nations, ed. By Edwin Cannan, New York, The Modern Library, 1937.

Timkovski, G. (1827). Voyage à Péking, Paris, Librairie Orientale de Dondey-Dupré Père et Fils.
United Nations, Food and Agricultural Organization (1984-6). Food Balance Sheets, Rome, Food and Agricultural Organization.

Van Zanden, Jan Luiten (1999). "Wages and the Standards of Living in Europe, 1500-1800," European Review of Economic History, Vol 3, pp. 175-98.

Vogel, Hans Ulrich (1987). "Chinese Central Monetary Policy, 1644-1800", Late Imperial China, Vol. 8.2, pp.1-52

Wei, Jinyu (1983) "Ming-Qing Shidai Nongye Zhongdengjixing Guyong Laodong Xian Feidengjixing Guyong Laodong de Guodu" (The Transition from Hierarchical to Non-hierarchical Agricultural Labor Employment during Ming and Qing) in Li, W.Z; Wei, J.Y; Jin, J.J. eds. Ming Qing Shidai de Nongye Zhibun Zhuyi Mengya Wenti. Beijing: Chinese Social Science Publisher.

Wang, Yeh-Chien (1973). Land Taxation in imperial China, 1750-1911. Cambridge (Mass.).Harvard University Press.

_____(1992). "Secular Trends of Rice Prices in the Yangzi Delta, 1638-1935," in Thomas G. Rawski and Lillian M. Li, eds., Chinese History in Economic Perspective, Berkeley, University of California Press, pp. 35-68.

Wu, Liankai (1983) "Qing Qianqi Nongye Gugong de Gongzhi" (Wages in Early Qing) Research on Chinese Social-Economic History vol. 2, 1983.

Yan, Zhongping et al (eds.) (1955) *Zhongguo Jindai Jingjishi Tongji Zhiliao Xanqi* (Selected Statistical Materials on modern Chinese Economic History). Beijing: Science Press.

You Zhanhong 游戰洪, "Lun junqi zeli" 論軍器則例 **(**A Study of Regulations and Precedents on Weapons and Military Equipment), in *Chinese Handicraft Regulations of the Qing Dynasty*.

Zhao Gang, Liu Yongcheng, Wu Hui et al. (1995). Qingdai liangshi muchanliang yanjiu (Research on grain yields in the Qing period). Beijing: Zhongguo nongye chubanshe.

Appendix I The Gamble Wage Series

The Rural Beijing Series:

The wage series in Gamble (1943) which spans almost the entire 19th century, were derived from detailed account books of a fuel store in rural Beijing. Gamble presented three series of average wages for the months of May through August, April through Sept. and Jan. through Dec. respectively (p.61). His careful study reveals the highly seasonal nature in the annual wage patterns which corresponded with the agricultural harvest season. We choose the annual average wage series (Jan. through Dec.) which is the lowest of the three as it includes the rates for the winter slack period. This wage series in copper cash is in the first column of the Appendix Table I below.

The original wage series are all quoted in copper cash. Since Gamble was mainly interested in constructing wage indices, his presented nominal and copper wage indices in Table 6 of his article without explicitly giving the copper-silver conversion rates. Moreover, due to a major debasement around 1860 and a corresponding change of monetary account in the fuel store account books, Gamble broke his silver and copper wage indices at 1860 setting 1845 as a base 100 for the pre and post-1860 respectively. Thus, it is possible to derive the index – not the actual rate – of copper-silver exchange from his copper and silver wage indices.

On p. 44 and 69, Gamble did mention the actual silver-copper rates in numbers of tiao (copper cash) per silver tale for selected years of 1807, 1827, 1862, 1884 and so on. So our procedure for arriving at a consistent series of copper-silver rates for the 19th century is to combine these benchmark copper-silver exchange rates with the derived copper-silver exchange indices.

But a major hurdle is to interpret the value of "tiao," which usually contains 1000 copper coins but could vary by regions. On p. 44, Gamble remarked that a tiao in that location was equal to 500 copper cash before 1860 and 100 copper cash after 1860. In other words, the copper cash before 1860 circulated in that locality was only half of the value of the official cash. This seems to be corroborated by one of the other rare studies of prices and exchange rates by Yan Zhong-ping et al (1955). Yan et al derived the exchange rate series (1807-1850) from the account books of a merchant store located in Da-Liu Zheng of Ninjing County in Hebei province, about several hundred kilometres away from Beijing. In a footnote to their exchange rate table (Table 31 on p.38), Yan et al pointed out that value of two copper cash was counted as one. We also compared the copper-silver exchange series of Yan et al series and our implicit Gamble series and found that their trends are nearly identical.

Despite their footnote, Yan et al derived their copper-silver series based on the standard rate of one tiao equal to 1000 cash. Our copper-silver exchange rate series in the second column is similarly derived with the standard of one tiao equal to 1000 cash. Thus, the silver wages in taels in the third column of our Appendix are actually twice higher than the level if we use the one tiao equal 500 cash as suggested by Gamble. As Gamble did state on p.41 that workers were also given food, we stick to this high silver wage for that locality by assuming the inclusion of additional food allowance equivalent to half of the value of total wage payment.

Appendix Table I. The Gamble Rural Beijing Wage Series in Copper Cash and Silver Taels 1807-1902

	Copper Wages	Copper Silver Conversion	Silver wages in taels		Copper Wages	Copper Silver Conversion	Silver wages in taels
1807	81	979	0.083	1860	255		
1808	83	1020	0.081	1865	265	5180	0.051
1812	81	1078	0.075	1870	287	5576	0.051
1813	80	1067	0.075	1871	333	5892	0.057
1816	87	1129	0.077	1872	355	6170	0.058
1817	80	1123	0.071	1873	382	6383	0.06
1818	89	1106	0.081	1874	388	6611	0.059
1819	87	1183	0.074	1875	389	6681	0.058
1820	95	1159	0.082	1876	370	7446	0.05
1822	99	1203	0.082	1877	368	8325	0.044
1824	83	1208	0.069	1878	348	8314	0.042
1825	88	1192	0.074	1879	375	8342	0.045
1827	88	1265	0.07	1880	410	8510	0.048
1829	95	1294	0.073	1881	401	8341	0.048
1830	96	1329	0.072	1883	387	7154	0.054
1831	92	1346	0.068	1884	356	6722	0.053
1832	89	1347	0.066	1885	395	7573	0.052
1835	94	1251	0.075	1886	402	6950	0.058
1836	85	1378	0.062	1887	395	7024	0.056
1837	96	1488	0.065	1888	361	7883	0.046
1838	91	1553	0.059	1889	421	7314	0.058

1841	98	1382	0.071	1890	393	7254	0.054
1842	100	1439	0.07	1891	390	7627	0.051
1845	86	1823	0.047	1892	372	7651	0.049
1846	96	2010	0.048	1893	410	7212	0.057
1847	87	2013	0.043	1894	443	6722	0.066
1848	68	2049	0.033	1896	448	6501	0.07
1849	80	2046	0.039	1900	422	5312	0.079
1850	94	1997	0.047	1901	462	5758	0.08
1852	93	2018	0.046	1902	470	6079	0.077
1853	93	2205	0.042				
1854	90	2723	0.033				
1856	110	4970	0.022				
1857	105	3935	0.027				
1858	130	4970	0.026				

The Urban Beijing Series:

The urban Beijing wages series by Gamble composed of two parts. The first part is the 1870-1900 the copper cash wages (inclusive of food money) in Gamble (1943, p.66), converted to silver wages using copper-silver rates from Peng Xingwei (p.548). We use the Peng Xingwei series as we feel it maybe closer to the rates in urban Beijing. This series is then linked with the 1900-1924 series by Peng and Gamble (p.100).

Appendix II

Sources of Chinese Price Series

Beijing

Our series of prices for Beijing begin with Meng and Gamble's (1926) study of wages and prices in Beijing between 1900 and 1924. For that period he collected the retail prices of most elements of our basket detailed in Table 4. We abstracted the following series (Meng and Gamble 1926, pp. 28, 38-9, 51, 59):

wheat flour
Lao Mi (blackened rice)
bean flour
millet
corn flour
pork
sweet oil
peanut oil
foreign cloth
coal balls

We treated 'sweet oil' as 'edible oil' in our scheme and 'peanut oil' as 'lamp oil'. Coal

balls were two thirds coal dust and one third earth, and we converted the price to an energy basis by rating a kilogram of coal balls at two thirds of the energy content of coal, which was itself rated at 27,533 BTU's per kilogram.

To estimate the price of soy beans for 1900-08, we increased the wholesale price per kilogram of black beans by 50% to allow for trade mark-ups and quality differences. The wholesale price was derived from Li (1992), as will be explained. For 1909 onwards (when the Li series ends), we extrapolated the1908 price forwards based on Meng and Gamble's price series for bean flour.

We had no information on the price of candles, and we assumed their price was the same as that of lamp oil. Based on European precedents, we estimated the price of soap at half of the price of lamp oil.

Our next problem was to extend these series back to the pre-industrial period. It should be noted that in several important respects, Meng and Gamble's data were ideal: they were retail prices of goods that consumers actually bought. In contrast, many historical price series are wholesale prices of intermediate goods. Thus, Meng and Gamble recorded the price of wheat flour in a shop, while historians usually must make due with the price of unprocessed wheat in wholesale markets.

We tried to take advantage of these ideal features of Meng and Gamble's data in the following way. There are many studies of wholesale grain markets in China. We used Li's (1992) study of prices in Zhili province, which includes Beijing. From the graphs in her paper, we could read off the prices of wheat, millet, sorghum from 1738 to 1908 as well as the relative price of black beans to wheat. These were five year moving averages, so annual fluctuations are suppressed, but that is off little consequence for our study. (Professor Li kindly supplied us with some of the underlying series, which we used in preference to the graphed data. We are grateful to Professor Li for this material.) With these series we extrapolated the retail prices of wheat flour, millet, corn, bean flour, and soy beans back to 1738. This procedure assumes that the ratio of the retail price of the consumer good to the wholesale price of the unprocessed good remained constant.

The retail prices of other products were extrapolated back to 1738 as follows:
pork, edible oil, lamp oil, candles–using the price of wheat flour
corn flour–using the price of soghum
rice (Lao Mi)–using the price of rice in the Yangtze delta (Wang 1992, pp. 40-7).

Two things can be said in favour of these extrapolations. First, most of the long term agricultural time series inflate at the same rate, so the values projected back into the eighteenth century do not depend critically on which price series is used for the extrapolation. Second, we can check the extrapolations by comparing the values we obtain in the eighteenth century for prices recorded in the VOC records for Canton. The extrapolated prices are similar to prices paid then. This gives us some confidence in our procedure.

The price series of cotton cloth was pieced together from several sources. First, the Beijing retail price of foreign cloth was projected back to 1871 using Feurerwerker's (1970, p. 344) series of the price of cotton cloth imported into China. Imported cloth was measured in pieces which were usually 40 yards long by 1 yard wide (360 square feet). Meng and Gamble's price was the price per hundred feet. We interpret that to mean 100 linear feet from a bolt of cloth, which we assume was three feet wide–a typical width. On those assumptions, the retail price per square foot of foreign cloth in Beijing was about 50% more than the price at which it was landed. This is not an unreasonable markup.

For eighteenth century cloth prices, we reasoned as follows: Pomeranz (2000), who

discussed cloth prices and weaving incomes at length estimated the price in his low price scenario at .5 Taels per bolt[3]. On these assumptions 300 square feet of cloth were worth 4.59 Taels, and we use this as the eighteenth century counterpart to Meng and Gamble's price for a 100 foot length of a piece of cloth 3 feet wide, on our interpretation. Pomeranz (2000, p. 323) claimed that cloth prices were constant across the eighteenth century, and we have assumed the same.

For the years between 1800 and 1870 we were guided by the history of cloth prices in Indonesia. We have a series of the price paid for cotton cloth on Java from 1815 to 1871. From 1815-24, the price was 4.89 grams of silver per square meter, which compares to a Chinese price of 5.12 grams per square meter for the eighteenth century. This correspondence is reassuring since cotton cloth was trade across Asia, so we would not expect extreme differences in its price. Starting in the1830s, the price in Java dropped fairly quickly to a value of about 2.5 grams of silver per square meter and stayed at that level until 1871. That low price is like the value of cloth imported into China–2.36 grams of silver per square meter in 1871. We have assumed that cloth prices in China followed the same temporal pattern as those in Java: we continued the eighteenth century price derived from Pomeranz to 1830 and then interpolated prices linearly between 1830 and 1871.

The price of energy was also pieced together from diverse sources. For the 1739-1769, we used the price implied by charcoal prices in Zhili province in the 1769 *Wuliao*. For 1816, we used the price implied by the price of coal in Beijing given in Timkovski (1827, p. 200). From 1900 onwards, we based our energy price on the price of coal balls. On of the striking features of this scattered information is that they should a fairly constant price of energy. In view of that constancy, we interpolated values for missing years.

Sichuan

Our wage and price information is from the Hejiang Country Gazeteer (1966 reprint) also used by Chuan and Wang (1962). The rice price in the Gazetter seemed implausibly high, we replaced it with import price from Hsiao (1976). The basket is designed with reference to the "Crop Report" consumption surveys of the 1930s for Sichuan. Caloric and protein contents of nutrients from table 8. The table below is based price data for 1905 converted into silver grams.

Appendix Table II. Basket of Goods: Sichuan

	Quantity per person per year	Price in grams silver per unit	Spending share in %	Nutrients/day Calories	Nutrients/day Grams of protein
Beans	9 kg	2.721	4.1%	28	2
Meat	18 kg	3.451	10.4%	123	10
Soy beans	43 kg	4.112	29.6%	462	40
Rice	109 kg	1.458	26.6%	1048	24
Wheat	10 kg	1.434	2.4%	92	2
Millet	10 kg	0.717	1.2%	92	2
Edible oil	1 l	3.584	0.6%	24	0
Spirit (18°)	41 l	1.457	10.0%	70	0

[3] (Pomeranz 2000, p. 319) decided that a 16 chi length of cloth cost .4 Taels. A bolt of 20 chi was 3.63 square yards according to Li 1998, p.xvii. Hence, the price of cloth was .5 Taels per bolt.

Soap	2.6 kg	1.838	0.8%		
Linen	5 m	6.691	5.6%		
Candles	2.6 kg	3.446	1.5%		
Lamp oil	2.6 l	3.446	1.5%		
Fuel	3.0 M BTU	2.688	0.9%		
Rent		28.673	4.8%		
TOTAL		597.370	100.0%	1941	80

Appendix III Our Sources for Chinese Wages, 1686–1902

Official wage norms

Sun Pei, *Suzhou zizhao ju zhi* (Treatise on the Suzhou Weaving Offices), 1686.
This treatise was written by Sun Pei, the Director of the two Imperial Suzhou silk manufactures, the so-called "Leading Weaving Office" *Zong zhiju*, and the "Weaving and Dyeing Office" *Zhiran ju*. It concerns organization, financing, and the production processes. Information on wages is recorded in a complex way. They are mainly piece wages, but for the most qualified occupations, such as designing the silk patterns, copying them in the pattern books, and installing them on drawing looms, time wages in form of monthly wages are given in chapter 5. Apart from these, the costs per loom and day are mentioned. One weaver and one assistant, the thread-puller, worked on one loom. Moreover, the annual total food provision costs for both Suzhou manufactures including the salaries for the administrative and security personnel are specified. The "Leading Weaving Office" *Zong zhiju* had 85 administrative and 1225 manufacturing positions, and the "Weaving and Dyeing Office" 87 administrative and 1225 manufacturing positions.
The relevant parts on wages are included in Peng Zeyi, *Zhongguo jindai shougongye shi ziliao 1840–1949* (Materials for early modern Chinese craft history, 1840–1949), Beijing: Zhonghua shuju 1962/1984, pp.
For a detailed analysis and complete translation of this text, see Elke Piontek-Ma, *Der Bericht von Sun Pei über die kaiserliche Seidenmanufaktur,* Heidelberg: Edition Forum 1999

Da Qing huidian shili (Collected Statutes of the great Qing dynasty, with factual precedents). 1899. Reprint Taibei, Zhongwen shuju 1963.
This is the most fundamental and extensive set of rules and regulations by the central government. It has been compiled in five editions over the course of the Qing dynasty. The last and most voluminous version has over thousand chapters. Economic matters occur if they were administered by the central administration. Here we find the most basic salaries wages for public construction projects in the capital. However, they are only mentioned for a time range between 1659 and 1736. They are given as daily wages, with specification of summer and winter wages. The regulation that wages were paid according to the length of the workday was discarded in 1736. Apart from those workers that were paid on a daily basis, the so-called "food-provision workers" received much lower money wages, but a considerable food wages in grains.[10] The 1736 wage regulations for construction workers can also be verified in the 1736 *Jiuqing yiding wuliao jiazhi* (Prices of materials decided by the Nine Ministers), Reprint in the collectanea *Gugong zhenben congkan*, Haikou 2000, vol. 317, chap. 4, fol. 317, p. 202. Here we also find a specification for which artisans they were intended: Carpenters, stone-masons, bricklayers, tilers, paint-makers, and painters. Here, for once, the wages are given in copper cash; the 1729 figures mention the conversion ratio 1 tael : 1000 copper cash.

Wuliao jiazhi zeli (Regulations and precedents on the prices of materials). 1769 ff.

[10] *Da Qing huidian shili shili* chap. 952, fol. 4b-5a, pp. 16640-16641.

These norms were set for all central provinces and for some of the border regions. The intention was to come to more realistic calculations of prices and wages in public building than those set at Peking and mainly for Peking, since the inter-provincial and intra-provincial market prices of building materials and the market wages for artisans could vary considerably. The impression conveyed in the introductory memorial to these regulations is that market prices were investigated in the regions; that does not mean, however, that the prices eventually deliberated in the Ministry of Public Works actually were market prices. They are, however, nearer to the market than any previous regulations by the central government. The original of this compilation is declared to have had 220 chapters. However, to our knowledge the work has never appeared in this complete form. We only have separate regulations that were obviously published and printed or hand-copied in the provinces. The provincial editions for Zhili, Henan, Shandong, Shanxi, Shaanxi, Gansu, Jiangsu, Zhejiang, Guangdong, and Yunnan all carry the same introductory memorial dated 1769. Other editions have no preface, such as those for Hunan, which is a fragment, and "Manchuria" (Shengjing/Jilin/ Heilongjiang). In the Fujian edition, the preface of an unrelated set of regulations, the 1792 *Qinding yaoqian huosheng zuofa zeli* (Imperially endorsed regulations and precedents on the manufacture of gunpowder and fuses), was erroneously included. Two editions have editorial information that allows to decide that they are later compilations, such as the 1791 Sichuan and the 1795 Rehe edition.
The listed wage figures are for mostly unspecified "master artisans" (*jiang*) and unskilled helpers (*fu*). Further specifications do occur, such as in some districts of Zhili or Gansu, but they are rare. No special edition was ever compiled for Xinjiang, but a few Xinjiang data are mentioned in the Gansu, Sichuan, and Rehe edition. The wages are given in fractions of silver tael; food provisions are only mentioned in very few instances.

Gongbu junqi zeli *(Regulations and precedents of the Ministry of Public Works concerning military equipment). 1813.*
The Ministry for Public Work, in co-operation with the Ministry of War, was also responsible for the manufacture of armament and army equipment such as armour, helmets, headgear, flags, uniforms, saddles, and various types of tents.[11] The 1813 regulations in their first half contain specifications of the quality and quantity of materials required for the manufacture of these items; in the second half (chap. 43-60), the prices of these materials, much as in the *Wuliao jiazhi zeli*, and the wages of the respective artisans. These prices and wages are specified according to the provinces and registered in silver tael.

Wages on the free market

Ministry of Justice Records (Qingdai xingbu chao'an)
A few sources inform us about market wages, but there are a number of difficulties with the wages mentioned therein. What we find are scattered observations of wages paid in different occupations, in different regions, using different means of payment (silver taels or copper coins), covering different time periods (per day, month or year), and spread over a long period. The most important source used here is Peng Zeyi, *Zhongguo jindai shougongye shi ziliao 1840–1949* (Materials for early modern Chinese craft history), vol. 1, pp. 396–414, which is based on judicial records from the period ca 1740-1820. They are contained in the archival documents of the Ministry of Justice *Qingdai xingbu chao'an* 清代刑部抄案 (Copies of archival materials from the Qing Ministry of Justice) in the collection of the Institute of Economics of the Chinese Academy of Social Sciences.[12] In total 188 observations of actual market wages could be collected.
As indicated in the text, the Ministry of Justice archival records are also the main sources used for agricultural wages presented in the works of Wei Jin-yu and Wu Liang-kai.

[11] Cf. You Zhanhong, "Lun junqi zeli" **(**A Study of Regulations and Precedents on Weapons and Military Equipment), in *Chinese Handicraft Regulations of the Qing Dynasty*, p. 314.
[12] Peng Zeyi, *Zhongguo jindai shougongye shi ziliao 1840-1949*, vol. 1, p. 397, note 2.

VOC

These are all accounts of ships visiting Canton in the period 1729-1772 (with gaps), specifying the goods bought there, workmen engaged etc. The details of the organization of the VOC in Canton are explained in Jörg (1982) pp. 21-73.

National Archives The Hague, Archives VOC, no, 4373, 4376, 4378, 4381, 4382, 4386, 4388, 4390, 4392, 4395-4401, 4403, 4405, 4408, 4409.

able 1 Nominal wages of construction workers in '1769' according to the *Wuliao jiazhi zeli* (in tael per day)

	Unskilled	Skilled	N=	Population (millions in 1787)
Manchuria and Mongolia				
Heilongjiang	.100	.191	2/6	
Jilin	.095	.160	6	1.0***
Liaoning	.057	.100	13	
Xinjiang	.097	.110	3	?
The North				
Rehe*	.066	.120	7	
Beijing*	.077	.141	24	
Tianjin/Baoding*	.071	.112	34	23.0****
Hebei*	.054	.081	82	
Gansu	.044	.054	48	15.2
Shanxi	.054	.073	85	13.2
Shaanxi	.044	.050	74	8.4
Shandong	.045	.061	50	22.6
Middle				
Henan	.037	.039	106	21.0
Jiangsu**	.040	.051	63	31.4
Zhejiang**	.040	.060	63	21.7
Hunan	.039	.050	10	16.2
Sichuan	.048	.062	47	8.6
Yunnan	.048	.068	84	3.5
South				
Fujian (including Taiwan)	.030	.050	9	12.0
Guangdong	.040	.050	89	16.0
Average (unweighted)	.053	.081		
Average (weighted by N)	.047	.065	901/905	
Average (weighted by population)	.044	.060		214

* part of the province of Zhili (there is a separate regulation for Rehe)

*** Manchuria as a whole

**** Zhili as a whole

N number of districts for which data are available

Sources : wages : see note 1; population: Wang 1973: 87.

Table 2 Nominal wages of construction workers in '1769' and arms manufacture in 1813 compared with wages in agriculture and in (in tael per day)

	'1769'Regulations Unskilled	Arms manufacture 1813(unskilled)	Agriculture (1740-1810)*
The North			
Zhili	.062	.060	.053[7]
Gansu	.044	.040	
Shanxi	.054	.040	.045[9]
Shaanxi	.044	.040	.041[3]
Shandong	.045	.040	
Middle			
Henan	.037	.040	
Jiangsu	.040	.040	.046[14]
Zhejiang	.040	.040	.037[3]
Hunan	.039	.040	
Sichuan	.048	.040	
Yunnan	.048	.030	
Guizhou		.040	
Jiangxi		.030	.036[1]
Hubei		.040	
South			
Fujian	.030	.040	
Taiwan	.030		
Guangdong	.040	.040	.06[1]
Guangxi		.040	
Average (weighted by n)	.047	.040**	.045[37]*

* 37 observations spread over 1748-1792;
** unweighted average

Table 3. Basket of Goods: Northern Europe

	Quantity per person per year	Price in grams of silver per unit	Spending share in %	Nutrients/day Calories	Nutrients/day Grams of protein
Bread	182 kg	.693	28.9%	1223	50
Beans/peas	52 l	.477	5.7%	160	10
Meat	26 kg	2.213	13.2%	178	14
Butter	5.2 kg	3.470	4.1%	104	0
Cheese	5.2 kg	2.843	3.4%	53	3
Eggs	52 each	.010	1.3%	11	2
Beer	182 l	.470	19.6%	212	1
Soap	2.6 kg	2.880	1.7%		
Linen	5 m	4.369	5.0%		
Candles	2.6 kg	4.980	3.0%		
Lamp oil	2.6 l	7.545	4.5%		
Fuel	5.0 M BTU	4.164	4.8%		
Rent			4.8%		
TOTAL		414.899	100.0%	1941	80

Note:
(1) Where oil and wine were consumed instead of butter and beer, 5.2 litres of olive oil were substituted for the butter and 68.25 litres of wine for the beer. 5.2 litres of olive oil yields 116 calories per day and no protein; 68.25 litres of wine gives 159 calories per day and no protein. In Strasbourg, the average prices 1745-54 were 7.545 grams of silver for olive oil and .965 grams of silver for wine.
(2) M BTU = millions of BTUs
(3) prices are in grams of silver per unit. Prices are averages for Strasbourg in 1745-54. The total shown in the price column is the total cost of the basket at the prices shown.

Table 4. Basket of Goods: Beijing

	Quantity per person per year	Price in grams of silver per unit	Spending share in %	Nutrients/day Calories	Nutrients/day Grams of protein
Beans/peas	15 kg	1.053	3.7	46	3
Eggs	52	0.047	0.6	11	1
Meat	20 kg	2.025	9.6	137	11
Soy beans	36 kg	0.833	7.1	387	34
Rice	5 kg	1.418	1.7	48	1
Wheat	38 kg	1.374	12.3	351	9
Millet	60 kg	1.029	14.6	554	14
Corn	34 kg	0.665	5.3	314	7
Edible oil	1 l	3.983	0.9	24	0
Spirit (18°)	41 l	1.971	19.1	70	0
Soap	2.6 kg	1.644	1.0		
Linen	5 m	6.109	7.2		
Candles	2.6 kg	3.286	2.0		
Lamp oil	2.6 l	3.286	2.0		
Fuel	3.0 M BTU	11.133	7.9		
Rent		20.292	4.8		
TOTAL		422.7	100.0	1942	80

Note:
(1) Consumption pattern consistent with information provided by Gamble and consumption surveys of the 1930s (Study of the consumption of staple food products in rural China, in Crop Reports, Vol. VI, n° 10, pp. 115-117).
(2) Caloric and protein contents of nutrients; see table 8.
(3) Based on price data in Beijing in 1745-54; for eggs estimated assuming same ratio of eggs' price to rice price as in VOC data for Canton (33 eggs for one kg).
(4) Meat is pork and mutton; spirit is rice wine or other grain wine (see appendix II).
(5) Fuel is coal ball (see appendix II for details).

Table 5. Basket of Goods: Canton

	Quantity per person per year	Price in grams of silver per unit	Spending share in %	Nutrients/day Calories	Nutrients/day Grams of protein
Meat	18 kg	2.447	10.8%	123	10
Eggs	52 pieces	0.042	0.5%	11	1
Soy beans	33 kg	0.856	9.0%	354	31
Rice	115 kg	1.407	34.3%	1106	25
Wheat	12 kg	1.407	3.6%	111	3
Millet	10 kg	1.126	1.8%	92	2
Fish	16 kg	2.753	8.8%	46	8
Edible oil	1 l	3.365	0.7%	24	0
Spirit (18°)	41 l	1.407	12.2%	70	0
Soap	2.6 kg	1.682	0.9%		
Linen	5 m	6.109	7.6%		
Candles	2.6 kg	3.365	1.9%		
Lamp oil	2.6 l	3.365	1.9%		
Fuel	3.0 M BTU	8.799	1.2%		
Rent		22.607	4.8%		
TOTAL		471.0	100.0	1938	80

Note:
(1) Consistent with consumption patterns reported in consumption surveys of the 1930s
(2) Caloric and protein contents of nutrients; see table 8.
(3) Based on VOC prices in 1757 (assuming 20 eggs per kg); price for meat is based on VOC data for beef; price of edible oil is proxied by lamp-oil price.
(4) price of linen is Beijing price in 1745-54.

Table 6. Basket of Goods: Kyoto-Edo

	Quantity	Price	Spending	Nutrients/day	Nutrients/day

	per person per year	in grams of silver per unit	share in %	Calories	Grams of protein
Meat	2 kg	5.022	1.8%	14	1
Eggs	52	0.229	2.1%	6	1
Soy beans	44 kg	1.490	11.8%	473	41
Rice	100 kg	1.490	26.9%	962	22
Barley	20 kg	0.760	2.7%	185	5
Buckwheat	20 kg	0.617	2.2%	185	6
Fish	8 kg	2.176	3.1%	17	4
Edible oil	1 l	5.658	1.0%	24	0
Spirit (18°)	41 l	1.950	14.4%	70	0
Soap	2.6 kg	2.829	1.3%		
Linen	5 m	5.827	5.3%		
Candles	2.6 kg	5.658	2.7%		
Lamp oil	2.6 l	5.658	2.7%		
Fuel	3.0 M BTU	31.31	17.0%		
Rent		26.6	4.8%		
TOTAL		553.5	100.0%	1945	80

Note:
(1) Basket constructed on the basis of per capita consumption data in Japan in the early 1920s.
(2) Caloric and protein contents of nutrients; see table 8.
(3) Calculation based on retail price data in Kyoto 1745-54 (Mitsui Bunko; cf Bassino-Ma 2005), except eggs and meat price extrapolated from LTES data (weighted average price of poultry 0.5 kg, beef 0.5 kg, and pork 1 kg in 1915) by relying on a CPI for 1740-1915 using unit prices for rice, soy sauce, soy paste, sake and charcoal.
(4) Spirit is *sake* (rice wine), which was relatively expensive compared to *shochu* (substitute largely available in Meiji Japan that was made of distilled alcohol obtained from the fermentation of cereals other than rice, sweet potatoes, or buckwheat (see appendix II for details). Price series are unavailable for spirits other than *sake*.
(5) Fuel is charcoal

Table 7. Caloric and Protein Contents

	Unit (metric)	Calories per unit	Grams of protein per unit

Bread	Kg	2450	100
Beans	Litre	1125	71
Meat	Kg	2500	200
Butter	Kg	7268	7
Cheese	Kg	3750	214
Eggs	Kg	79	6,25
Beer	Litre	426	3
Soy beans	Kg	3920	343
Rice	Kg	3510	80
Wheat	Kg	3370	88
Barley	Kg	3370	88
Millet	Kg	3370	90
Buckwheat	Kg	3370	108
Corn	Kg	3370	70
Fresh fish	Kg	1050	181
Egg	Each	79	3
Edible oil	Litre	8880	1
Spirits (18°)	Litre	620	4

Source: caloric and protein content based on Allen (2001) for beans and, for other items, on data reported in Mosk and Pak (1978), based on Japan Food Bureau (1972) and FAO and US department of Health and Welfare (1972).

1. Beans, wheat, corn, are beans flour, wheat flour, and corn flour in Beijing;
2. Whhen unavailable in data sources, fresh fish price is derived from that of dried fish assuming 3 kg fresh fish as equivalent for 1 kg of dried fish in terms of caloric and protein content.
3. Spirit is rice wine in Canton and Sichuan, similar to Japanese sake, and grain wine in Beijing; it is presumed that all these spirits have an alcohol content of 18°. The caloric and protein contents are those of Japanese sake of 18°.

Figure 1. Daily wage of unskilled workers, 1720-1870
(grams of silver per day)

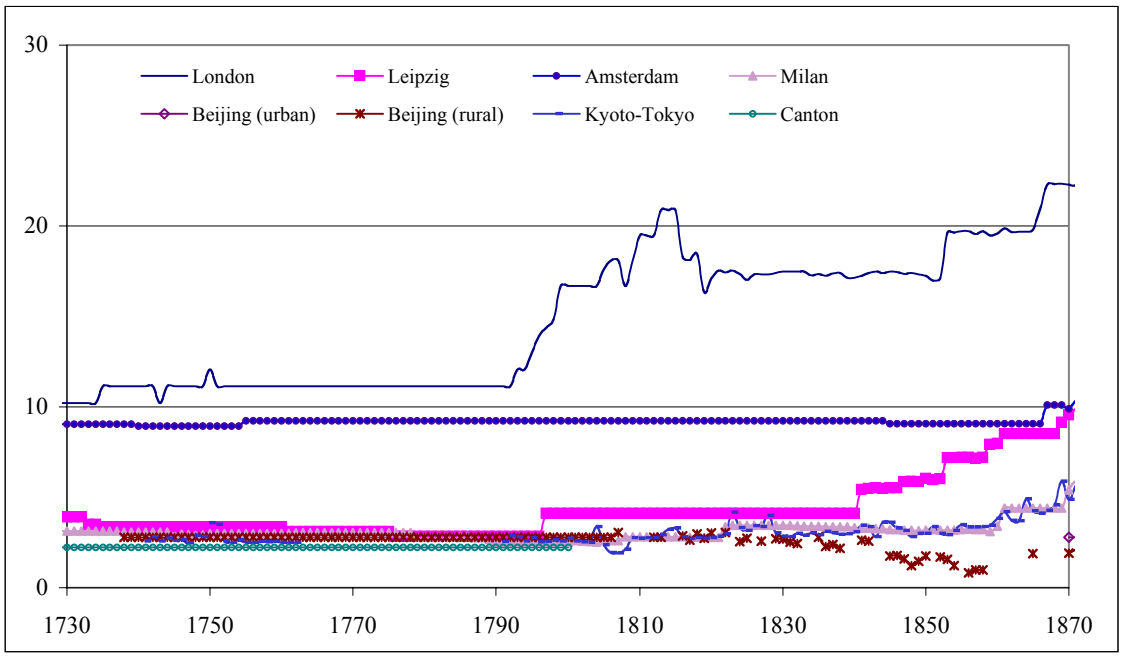

Figure 2.Daily wage of unskilled workers, 1870-1920
(grams of silver per day)

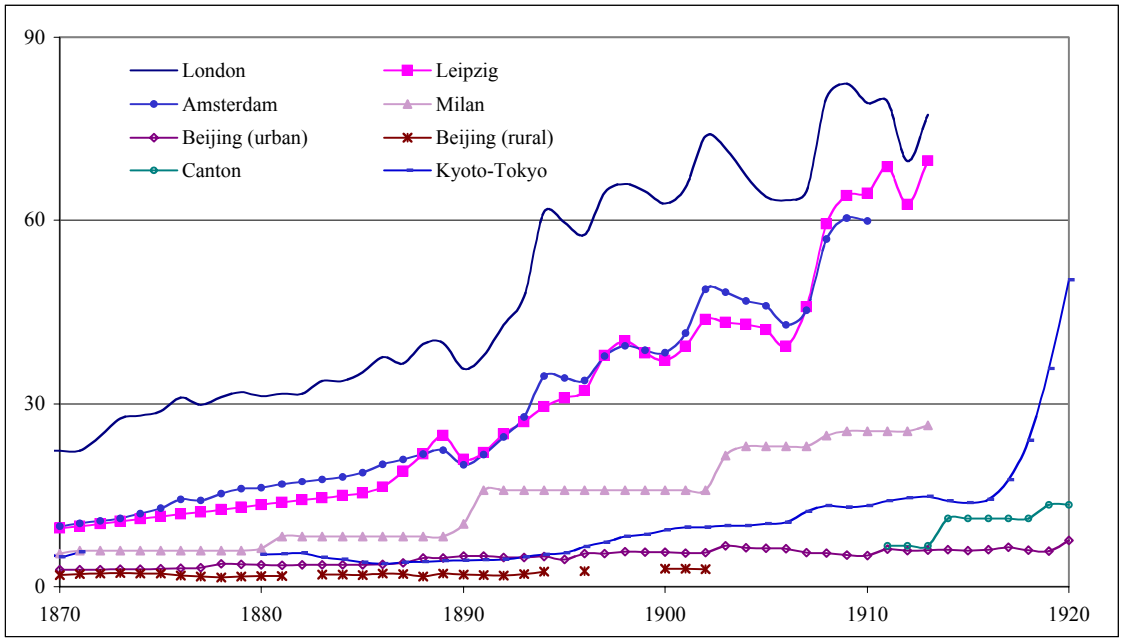

Figure 3. The Price of Subsistence in Europe and Asia

Figure 3 Costs of standard basket, 1740-1913 (in grammes silver per day)

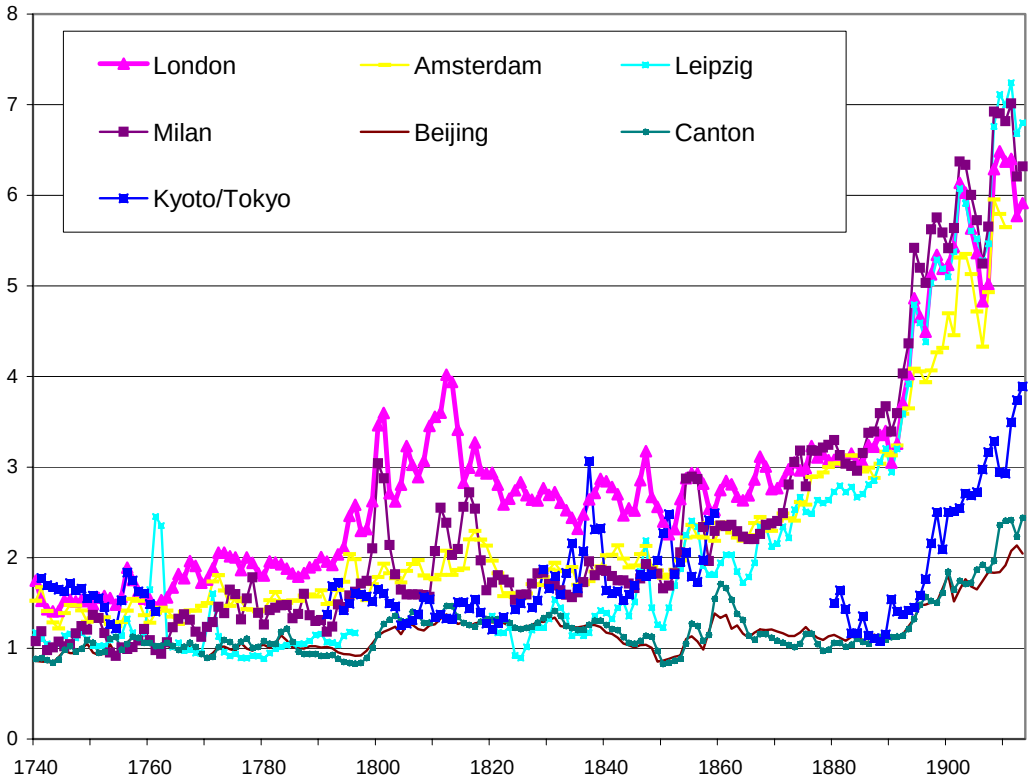

Figure 4. Welfare Ratios in Europe and Beijing

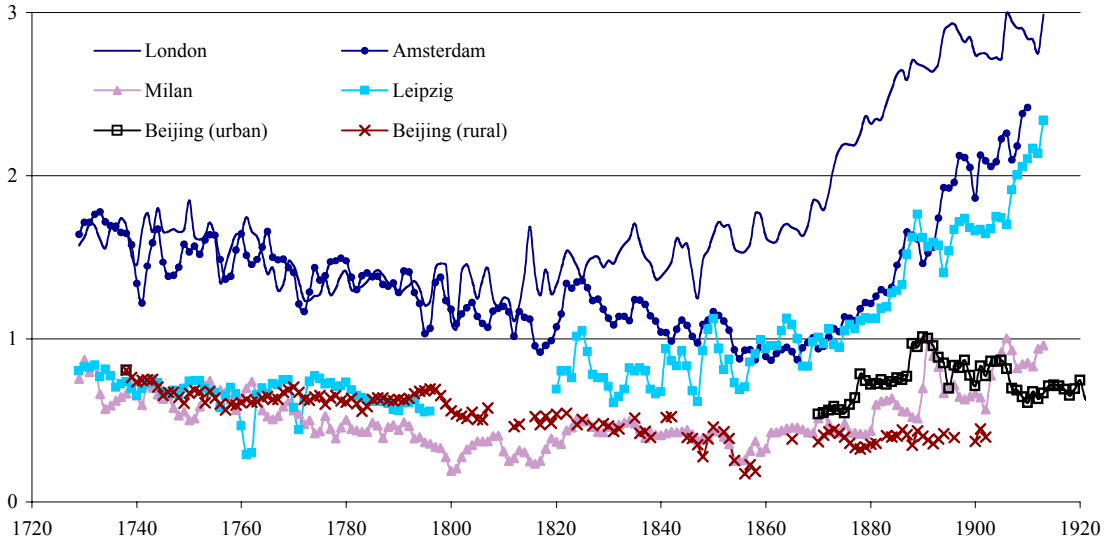

Figure 5. Welfare Ratios in London and Asia