

ISSN 1471-0498



DEPARTMENT OF ECONOMICS

DISCUSSION PAPER SERIES

WAGES, PRICES, AND LIVING STANDARDS IN CHINA, 1738-1925: IN COMPARISON WITH EUROPE, JAPAN, AND INDIA

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Number 316
April 2007

Manor Road Building, Oxford OX1 3UQ

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Oxford University, Department of Economics Working Paper No. 316

2007

Abstract

The paper develops data on the history of wages and prices in China from the eighteenth century to the twentieth. These data are used to compare Beijing, Canton, Suzhou and Shanghai to leading cities in Europe, India, and Japan in terms of nominal wages, the cost of living, and the standard of living. In the eighteenth century, the real income of building workers in Asia was similar to that of workers in the backward parts of Europe and far behind that of workers in the leading economies in northwestern Europe. Industrialization led to rising real wages in Europe and Japan. Real wages declined in China in the eighteenth and early nineteenth centuries and rose slowly in the late nineteenth and early twentieth. There was little cumulative change in the standard of living of workers in Beijing, Canton, and lower Yangzi cities for two hundred years. The income disparities of the early twentieth century were due to long run stagnation in China combined with economic development in Japan and Europe.

Keywords: great divergence, preindustrial real wages, England, Europe, China, Japan, India

JEL classes: N33,N35

Acknowledgements:

This paper is part of the NSF grant funded project “Global Prices and Income 1350-1950” headed by Peter Lindert, the Spinoza premium project on Global Economic History funded by NWO (The Netherlands), and the Team for Advanced Research on Globalization, Education, and Technology funded by the Social Sciences and Humanities Research Council of Canada. We wish to express our thanks to Peter Lindert for suggestions and encouragements at every stage of this paper, as well as to Kishimoto Mio and Lillian Li for pointing to us useful sources of price data, Kariin Sundsback for collecting the VOC data, and Tine De Moor for designing maps. Our paper also benefited from the lively discussion at the 43rd Cliometrics Conference held at Lake Tahoe in June 2005, and from comments by Joerg Baten and participants of the Global Economic History Network (GEHN) Conference on ‘The Rise, Organization, and Institutional Framework of Factor Markets’ at Utrecht in June 2005, in particular by R. Bin Wong, Kent Deng, Bishnupriya Gupta, Patrick O’Brien, Kenneth Pomeranz, Jean-Laurent Rosenthal, Tirthankar Roy, and Osamu Saito.

“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,¹ 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.²

One thing is clear about this debate, and that is the fragility of the evidence that has been brought to the issue. Most of the comparative studies relied on indirect comparisons based on scattered output, consumption or demographic data. The few that attempted comparisons of direct income were largely based on scraps of information about wages and prices in Asia (Pomeranz, *Great Divergence*, Lee and Wang, *One Quarter of Humanity*). Our

1. For instance Pomeranz, *Great Divergence*; Parthasarathi, “Rethinking Wages”; Wong, *China Transformed*; Lee and Wang, *One Quarter of Humanity*; Li Bozhong, *Agricultural Development*, Allen “Agricultural Productivity, Allen, “Mr. Lockyer,” Allen, “Real Wages in Europe and Asia”; Allen, Bengtsson, and Dribe (eds.), *Living Standards in the Past*.

² For instance, Broadberry and Gupta, “Early Modern Great Divergence..,” Allen, “India in the Great Divergence.”

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 assembling and constructing systematic data on wages and prices from Imperial ministry records, merchant account books and local gazetteers, is an attempt to fill that gap for China in the eighteenth and nineteenth centuries. These wage series, deflated by appropriate cost of living indices using reconstructed consumption baskets, are then compared to the Japanese, Indian, and European evidence to assess the relative levels of real income at the two ends of Eurasia. 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 tael (of 37 grams)³ was a universal medium of exchange in China in this period. The terms on which silver coins exchanged defined the market exchange rate of European and Asian moneys. Next, we compare the “money price of subsistence.” This is a more complicated problem since the subsistence foods were different in China and Europe.

We approach the problem in several ways, which turn out to imply similar relative price levels. Once they are measured, we can see how money wages and the costs of

³ We have used this average; variation for the four most important units ranged between 36.54 and 37.58 grams. See Peng Xinwei, *Monetary History of China*, p. 669, fn. 4-7

subsistence differed between Europe and China and what those differences imply for the “real recompense of labour.”

The rest of the paper is divided into five sections with a conclusion. The first two sections review a variety of Chinese wage data to establish the history of nominal wages from the eighteenth to the twentieth centuries. We concentrate on the histories of Canton, Beijing, and the nearby cities of Suzhou and Shanghai in the lower Yangzi because we have the fullest information for these cities and because they are comparable to the large cities in Europe and Japan for which we have similar information. In section 3, we compare nominal wages in China and Europe to see if Smith was correct about the “money price of labour.” Section 4 turns to the “price of subsistence” and develops consumer prices indices to compare the cost of living across Eurasia. In section 5, we compare our Smithian price indices to Fisher Ideal Indices and show that they give similar results in a comparison of London and Beijing. In section 6, we estimate real wage income in Canton, Beijing, and Suzhou/Shanghai from the mid-eighteenth century to the 1920s. We test Smith’s belief about the “real recompense of labour” by comparing real wage income in these Chinese cities to their counterpart in other countries. For Japan, we compare Chinese urban incomes to 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’s study “Japanese Unskilled Wages.” Real wages in China are compared to those in India using the results in Allen’s “India in the Great Divergence.” We broaden the perspective on Asian performance by comparing living standards there to London, Amsterdam, Leipzig and Milan as worked out by Allen in “Great Divergence in European Wages.” We conclude with a discussion of the significance of our findings for Adam Smith and the great divergence debate.

1. Wage Levels in Eighteenth- and Nineteenth-Century China

Before we can compare living standards, we must establish the level and trend of nominal wages in China. We aim for unskilled male workers in large Chinese cities since most of our European wages are for labourers in the building industry. No single source covers the whole period from the eighteenth century to the twentieth, so we must piece together the wage history of China by combining disparate information.⁴

For Beijing, we know some wages for labourers on eighteenth century government building projects, and we can find wages for similar workers from the 1860s to the 1920s. For Canton, we know wages of unskilled port labour hired by European trading companies in the eighteenth century. For Suzhou, we can estimate the daily earnings of men engaged as calenderers pressing cloth in the textile industry. This series can be linked to the wages of spinners in cotton textile mills in Shanghai in the twentieth century. Indeed, we develop a more complete picture of labour incomes in the lower Yangzi by also assessing the earnings of male farm labourers, rural women spinning and weaving cotton cloth, and peasant households as a whole. By matching eighteenth century wages for specific unskilled occupations in China with corresponding wages for the early twentieth century, we can reconstruct the long term history of Chinese wages in a way that we can compare with European wages.

We begin our wage survey with three sets of wage data for the eighteenth century that are reasonably continuous and well defined. The first set are the piece wage rates of the

⁴ For a survey of existing studies on wages and prices, see Kishimoto, *Shindai Chugoku*.

cotton calenderers inscribed on stele for crafts and commerce in Suzhou, the largest industrial and trading city in the Lower Yangzi during the 18-19th centuries. The case of cotton calenderers and their wage disputes have been the subject of numerous studies (see Quan 1975, Terada 1967, Santangelo 1993 and Xu Xinwu 1989). The calenderers' job was "to soften and polish cotton cloth after it had been pressed and rubbed." (Santangelo p. 109). The inscribed data give us the guild negotiated piece wage rates for the years of 1670, 1693, 1701, 1715, 1730, 1772 and 1795. As these are piece wages quoted in silver taels, there are no ambiguities about copper-silver exchange rates or additional food allowance. The major issue is the conversion of piece rates into daily wages, which we did using Xu Xinwu's study for the early 20th century, as explained in Appendix I.A. Overall, the daily wages thus derived come to 0.09944 and 0.1144 silver taels in 1730 and 1772 respectively.

The job of calenderers was "to soften and polish cotton cloth after it had been pressed and rubbed." In the eighteenth century, the calenderers were often migrants to Suzhou from the impoverished provinces of northern Jaingsu and Anhwei. They "had to be strong men, considering the especially tiring nature of their job: using their arms as levers on wooden supports while balancing, they had to rock a huge forked stone with a ground base onto cotton cloth wrapped around a wooden roller which rotated in a groove in the base of the stone." (Santangelo p. 109). Calenderers were only a little above building labourers in the skill distribution.

Our second source of private sector wages is the archives of the Dutch East Indies Company (VOC). Many VOC ships docked at Canton, which was the city where Europeans were allowed to trade with China in the eighteenth century. The VOC hired many Chinese workers to repair ships and move cargo. A recent book by Paul Vandyke offers a detailed description on the workings of the provisioning system in Canton. We obtain 63 wage

quotations spanning the eighteenth century were from the VOC archives.⁵ As shown later, the wages fluctuated, but they clustered between 0.08 and 0.1 taels per day with no additional food allowances.

Our third set of wage data comes from two government sources. The first and most systematic and detailed source of government wage regulations 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 the prices of buildings materials and the wages paid at construction projects, and an attempt to set these prices and wages for the future. In itself it is a testimony of the high degree of sophistication of the Chinese state bureaucracy in the (second half of the) eighteenth 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 were described in a compilation of 220 chapters. The original compilation has not been preserved, but we have been able to locate the editions for 15 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 occupations such as master sawyers, carpenters, stonemasons, paint-makers and painters, tailors, plasterers, canopy makers, paperhangers, and cleaners (in Zhili). A few also contain information about additional food provisions and their monetary value, so that the total wage value can be calculated; where no food provisions are mentioned, probably no food allowance was given,

⁵ See Vandyke, *Canton Trade*, and also Jörg, *Porcelain and the Dutch China Trade* pp. 21-73 The details of the organization of the VOC in Canton. We specifically used the files in the National Archives The Hague, Archives VOC, no: 4373, 4376, 4378, 4381, 4382, 4386, 4388, 4390, 4392, 4395-4401, 4403, 4405, 4408, 4409.

as these wage regulations were supposed to cover the entire labour cost of the projects that were monitored in this way.⁶

A virtue of the *Wuliao jiazhi zeli* is its comprehensive regional coverage of Chinese wages. For each province we calculated the unweighted average of the wage norms for labourers in all districts. Table 1 presents the results of these calculations for 21 regions. Zhili is divided into a number of sub-regions because of the large wage differences within this province. The total population of these regions in 1776 was c. 214.5 million or 73% of the total population of China of about 293 million.⁷

Insert Table 1 here

The pattern that emerges from the *Wuliao jiazhi zeli* is that daily wages in parts of Manchuria (Heilongjiang and Jilin), the home territory of the ruling Manchu dynasty, 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 have been fairly uniform, with the coastal Fujian province fetching the lowest 0.030 tael for unskilled labourers. The high wages in Manchuria might have been sustained by its relative abundance in land and natural resources and Qing rulers' restriction on the migration of Han Chinese laborers in the 18th century.

⁶ According to the introductory memorial to these regulations, market prices and wages were investigated in the regions, and that the prices and wages quoted in these volumes were near to market prices at low market activity. 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). Two editions have editorial information suggesting that they are later compilations, such as the 1791 Sichuan and the 1795 Rehe edition. No special edition was ever compiled for Xinjiang, but a few Xinjiang data are mentioned in the Gansu, Sichuan, and Rehe editions. Digitalized versions of the price and wage data of the provinces Gansu, Zhili, Yunnan and Hunan can be found on the website of the project 'Staat, Handwerk und Gewerbe in Peking, 1700-1900' of the University of Tübingen (www.uni-tuebingen.de/sinologie/shp/databases.html). See also Song and Moll-Murata, "Notes on Qing Dynasty Handicraft Regulations."

⁷ Wang Yeh-chien, *Land Taxation*, p. 87.

A second government source is the so-called *Gongbu junqi zeli* (Regulations and precedents on weapons and military equipment by the Ministry of Public Works) of 1813, which contains more government wage regulations on the national scale. The *Gongbu junqi zeli* contains wages for master artisans and unskilled labour that produced armor, helmets, headgear, uniforms, saddles, arms such as swords, bows, arrows, and various types of tents. Our data base includes information for skilled and unskilled labourers.⁸ This source shows again that, with the exception of Zhili where Beijing is situated, the norm for average daily wages in most provinces in 1813 was about 0.04 tael, very close to that in the 1769 regulations. Clearly these average values were only about half of the market wages paid for Suzhou calenderers and Canton VOC labourers. This raises the large question of how well these government regulation wages approximate wages in the private sector of the economy.

To answer these questions, we place these wage series against a broader data set of 264 scattered wage quotations from many sources and for different parts of China. The problem with these disparate private sector wages is a lack of the kind of detailed information available for the Suzhou calenderers and Canton VOC laborers. Also, there is a general lack of comparability due to the multiplicity of labour contracts, payment systems, and currency units. Employment contracts could last for a day, a month, or a year, and careful attention must be given to the number of days worked in a month or a year to reduce the payment information to a consistent daily rate. There are many cases for which food allowances were given in addition to cash payments. Possibly the most difficult issue of all was the quotation of wages in different currency units (copper coins, silver tael) with exchange values that were

⁸ See You Zhanhong, “Lun junqi zeli,” p. 314. Wages of skilled craftsmen were 0.020 or 0.010 tael higher.

both highly localized and fluctuating over time. Studies not taking full cognizance of these problems can be very misleading.⁹

Our most important official source for private wages is the records of the Imperial Ministry of Justice, which summarized judicial cases dealing with wages paid. A sample of 188 manufacturing and handicraft wages was obtained from Peng Zeyi, *Zhongguo jindai shougongye shi ziliao* (Materials for early modern Chinese craft history), vol. 1, pp. 396-414, which is based on judicial records from ca 1740 to 1820. They are contained in the archival documents of the Ministry of Justice, *Qingdai xingbu chao'an* (Copies of archival materials from the Qing Ministry of Justice)¹⁰ This represents a wide-spread sample which includes scattered wages for different occupations, in different regions, using different means of payment (silver tael or copper coins), covering different time periods (per day, month or year), and spread over a long period. Ministry of Justice records also include information on agricultural wages, and we have obtained a sample of those from the work of Wei Jinyu and Wu Liangkai. We converted these wages (mostly in copper cash) to silver tael based on Vogel's exchange rates.¹¹

We, thus, have a large, if disparate, sample of wages covering many provinces, industries, and types of employers in eighteenth century China. To extract basic patterns from this information, we estimated a wage function using all of the wages we collected (including

⁹ Vogel "Chinese Central Monetary Policy" contains the most comprehensive collection of market exchange rates for various provinces in China for the seventeenth to nineteenth 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 "Copper Coins." For a case of neglecting these complicated currency problems in the study of nominal and grain wages, see Kang Chao, *Man and Land*.

¹⁰ Peng Zeyi, *Zhongguo jindai shougongye*, vol. 1, p. 397, note 2.

¹¹ We have included a few additional governmental wage data from *Suzhou zizhao ju zhi* (Treatise on the Suzhou weaving offices), 1686, which are included in Peng Zeyi, *Zhongguo jindai shougongye*, pp. 90-92. There are also a few wage data from *Da Qing huidian shili shili* chap. 952, fol. 4b-5a, pp. 16640-16641.

the VOC and government regulation wages). All wages were converted to daily wages in silver tael (using the dataset of silver/copper ratios by Vogel).¹²

We defined the following independent variables:

- Regions, based on *Wuliao jiazhi zeli*: Manchuria, Zhili, the North (Shanxi, Shaanxi, Gansu, Shandong), the Yangzi Delta (Jiangsu and Zhejiang), the ‘Middle’ and the South (see Table 1 for the other regions); Canton was also distinguished.
- Branches: agriculture, coal mining, iron industry, construction, textiles, and other industries;
- a time-trend with 1700 as the base year;
- Skill: a dummy for skilled labour was used; unskilled labourers were all agricultural workers, the unskilled labourers in construction and the ‘helpers’ in other industries;
- Regulation: data drawn from the four public documents setting wages were identified by a dummy for ‘regulation.’

The total number of observations was 327, relatively equally spread over the different regions and branches. There are only four observations for the late seventeenth century. Most observations cluster between the 1740s and the 1810s; no observations after 1820 were included.

Insert Table 2 here

Table 2 presents the results of the wage regression. All independent variables except the time trend are dummies for regions, branches etc.; the standard for comparison is the

¹² Another problem was how to convert monthly and annual wages into daily wages; a few observations of both daily and monthly or annual wages suggests conversion factors of about 15 (days/month) and 60 (days/year). The next step was to use these conversion factors and estimate dummies for monthly and annual wages in the wage regression. The dummies became close to zero when somewhat different conversion factors were used, namely

market wage of a construction labourer in the Yangzi Delta in 1700. The constant in the equation is his wage, which is estimated as 0.0456 tael. The regional pattern mirrors the results from the analysis of the *Wuliao jiazhi zeli*: wages in Manchuria and Zhili were (much) higher than in the rest of the country, whereas the differences between the Yangzi Delta and the rest of the rice region were very small. Most industry dummies were insignificant. Finally, the dummy for skill premium is significant; its level in regression is 63% of the wage of an unskilled labourer in the Yangzi Delta.

To get a perspective on our wage regression, we plot in figure 1 the wage rates of Suzhou and Canton against the predicted wages from our regression. Figure 1 shows that the baseline predicted wages, set as the constant plus the time trend in the wage regression (the rate equivalent to that of an unskilled labourer in the Lower Yangzi), is only slightly more half of the level of Suzhou and Canton wages. While VOC and calenderers' wages were rising gently, wages in China in general were declining slowly, as indicated by the wage equation. This difference in trend is not significant for our purpose. Figure 1 also plots the predicted wages of Beijing which uses the dummy coefficients for Zhili from the wage regression.

Insert Figure 1 here

These results make sense: large cities in Europe, the counterparts of Canton, Suzhou and Beijing, had higher wages than small towns and rural districts in part because the cost of living was higher in the large cities and also because they had to recruit population from the countryside. This conjecture is in surprising agreement with Pomeranz's description of the earnings of a Yangzi farm worker employed by the year in the mid-eighteenth century.

13 and 90. We used these conversion factors in the estimation of wage levels in the wage regressions shown in table 1; therefore, the dummies for monthly and annual wages have not been included.

Pomeranz reckoned that the cash component of these earnings was 2 – 5 tael, and that the food allowance over a full year was perhaps 5 shi of rice worth 8.4 tael, so the total earnings over the year were 10.4 – 13.4 tael. Dividing by 360 implies daily earnings of 0.035 – 0.045 tael per day, very close to the baseline wage level from our regression result.¹³

As the wage regression included some wage data that might have additional food allowance, we have experimented with alternative regressions by adding 0.024 tael – roughly the cost of one kilogram of rice in Canton or millet in Beijing in the middle of the eighteenth century – to the daily earnings of those workers earning less than 6 taels per year (0.5 tael per month). The alternative regression leads to little changes of significance to the coefficients of most significance for this study.

The level of our base line wage in Figure 1 also matches the national averages in the *Wuliao jiazhi zeli* and *Gunbun junqi zeli* in the official regulation data. This leads us to believe the government wages may have been set as a wage floor for the market wages. Both these sources also reveal higher wage levels of the capital region than the national level, which we may infer as a reflection of possible governmental discrimination. For our subsequent analysis, we set the wage level for Beijing and Canton in 1700 based on the predicated values in the regression, which are 0.0897 and 0.0835 taels respectively (equal to the constant coefficients plus dummy coefficients for Zhili and Canton respectively). For

¹³ Pomeranz, *The Great Divergence*, pp. 319-320. The average of agriculture wages on daily contracts collected in our sample was 0.045 tael. Wages on daily contract were likely to be higher as usually day labourers were more likely to be employed during the planting and harvest seasons. It is unclear whether additional food was provided. A national level survey conducted in the 1930s (Chen Zhengmo, *Gusheng nonggong*) reveals the existence of both types of payment arrangements for daily wages, either with or without food payment, the latter being higher. But in cases where there was food payment, the portion amounted to about 33% of the total cash wage, much less than for the eighteenth and nineteenth century agricultural wages on annual contracts (Chen, p. 9). Bozhong Li, *Agricultural Development*, p. 94, also seems to indicate that seventeenth-century nominal wage levels may not be far apart from those of the eighteenth to nineteenth century. He discusses wage levels in agriculture (and silk production) in the Yangzi Delta, and estimates the average wage in rice cultivation at 0.06 tael per day, adding “the official standard was 0.04 tael a day which is a bit low compared to the wages in some farms in Huzhou, Zhejiang province.”

Suzhou, we use 0.09 taels for 1700, very close to the 0.0968 tael for the calenderers. We use the national trend level for all these three series in our international comparison. We believe these wages are complete payments for unskilled laborers in the three major urban centers and are, in most likelihood, the upper bound estimates in our larger dataset. It is important to bear in mind that if the average level were indeed lower than our nominal wages used here, then Chinese living standards were even lower than we find.

2. Wage Levels in Nineteenth- and Twentieth-Century China

Jumping forward in time, our best information on wages in Beijing, Canton, and Shanghai is for the early twentieth century. In addition, we have a complete wage series for Beijing in the nineteenth century.

Our Beijing investigation is anchored on the work of Sidney Gamble (1890-1968) and his associates.¹⁴ 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 1900-1924, and that index, in turn, was used in a study of real wages for the period. 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, and this is our source for unskilled wages in the capital.¹⁵

Gamble conducted another important study based on the account books of a fuel

¹⁴ Meng and Gamble, "Wages, Prices, and the Standard of Living."

¹⁵ This series is 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 Xinwei (p. 548). We use the Peng Xinwei series as we assume that it may be closer to the rates in urban Beijing. The second series is the 1900-1924 series by Meng and Gamble (p. 100).

store in the rural area of Beijing. The information runs from 1807 to 1902 and is possibly the only consistent wage series for nineteenth-century China. The nineteenth-century wage payments were recorded in copper cash and were broken around the mid-nineteenth century due to the monetary debasement in the period of the Taiping rebellion. Gamble does provide vital information on copper-silver rates in that area from which we derive a silver-based wage series for 1807-1902 as shown in Appendix 1. The level of the wage rates seems very low and is difficult to interpret in its own right as Gamble indicated that workers received unrecorded food allowances.¹⁶ We have made use of the trend (not the levels) of this silver wages to fill in the 1820-1862 gap for the light it throws on the Taiping Rebellion and its aftermath.

Our information on Cantonese wages is less comprehensive than that for Beijing. As noted previously, we have estimates of wages in the eighteenth century derived mainly from VOC records and summarized in our wage regression. For the early twentieth century, we use the simple average of six series of union regulated wage rates for unskilled labourers in the construction sector from 1912 to 1927.¹⁷ For the nineteenth century, we have various plausible wage data, but did not include them in our analysis as they were incomplete and scattered series.

Similarly, we do not have systematic wage series for Suzhou in the nineteenth century. From the middle of the nineteenth century, Shanghai was emerging as China's predominant trading and industrial city under the treaty port system imposed by Western imperialism. We have collected Shanghai cotton spinners' wages between 1910 and 1934. These are female

¹⁶ Gamble, "Daily Wages," p. 4.

¹⁷ Department of Peasantry and Labour, Kwangtung Government, *Reports of Statistics*, vol. 3, "The Wage Indexes of Labourers in Canton." Our wage series is the simple average of five types of unskilled labourers in the construction sector.

spinner wages, we have adjusted their level upward equivalent to that of male unskilled labourers based on a wage survey of the 1930s.¹⁸

3. 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.¹⁹ 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 2 and 3 graph the daily wage rates of unskilled workers in London, Amsterdam, Leipzig, Milan, Beijing, and the lower Yangzi from the eighteenth century to the twentieth. Figure 2 shows the series from 1738 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.

¹⁸ We make use of the series by Thomas Rawski, *Economic Growth*, p. 301 and The Bureau of Social Affairs, *Cost of Living*, Pp iii-iv. Female workers in 1927-28 are paid about 80% of the level of male workers according to Yang Ximeng, p. 250.

Figures 2 and 3 here

Amsterdam occupies a peculiar position in Figure 2. 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 2 as a rise in the Leipzig wage.

These developments intensified after 1870 as shown in Figure 3. British wages continued to increase. By the First World War, German wages had caught up with 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 the industrialization drive in the Meiji era, began to rise but continued to stay substantially below the rising trend of early twentieth 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 3 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

¹⁹ Zanden, "Wages and the Standard of Living," Allen, "Great Divergence in European Wages."

generalization about Chinese and European wages was more accurate at the time of the First World War than when he penned it in 1776.

4. 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." We can test this generalization by computing price indices. There are many formulae and sets of weights from which to choose. We have tried many, and the reassuring result is that our conclusions about relative real wages do not depend in any important way on the choice of price index.

The index number problem is a difficult one since diet and life style were radically different in different parts of Eurasia. How precisely can we compare the real income of an English worker who ate beef, bread, and beer to that of a Chinese labourer who ate rice and fish?

The approach we consider in this section takes Adam Smith's comment as its point of departure. His generalization about price levels is expressed in terms of the 'price of subsistence.' We operationalize that by defining consumption baskets that represent the 'bare bones' minimum for survival (See Tables 2-3). The baskets provide 1940 calories per day mainly from the cheapest available carbohydrate. In Shanghai, Canton, Japan, and Bengal that was rice, in Beijing, it was sorghum, in Milan it was polenta, and in northwestern Europe it was oats. The diet includes some beans and small quantities of meat or fish and butter or oil. Their quantities were suggested by Japanese consumption surveys of the 1920s and by the Chinese rural consumption survey in the 1930s carried out by the National

Agricultural Research Bureau (NARB).²⁰ Despite relying on the cheapest carbohydrates, these baskets provide at least the recommended daily intake of protein, although the amount varies from basket to basket. Polenta (closely followed by rice) is the least nutritious source of calories in this regard. Non fuel items include some cloth and fuel. The magnitudes of the non-food items were also suggested by the Japanese and Chinese consumption surveys of the inter war period. It would have been hard for a man to survive on less than the cost of one of these baskets.

Tables 3-4

Having specified the consumption ‘baskets’ in Tables 3-4, 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. For Europe, we use the prices described in Allen, ‘Great Divergence’.²¹ New data bases were compiled for the Chinese cities we study. For Beijing, we use Gamble’s retail prices for 1900-1924 and extend them back to 1738. Food prices were extended using wholesale agricultural prices for Zhili province compiled by Lillian Li (2000). The implicit assumption in these extrapolations was that the ratio of retail to wholesale prices remained constant. The details and the procedures for cloth and fuel are explained in Appendix II. For Shanghai and Canton, twentieth century retail prices were extracted from official sources²². For the eighteenth century, Yeh-Chien Wang’s Yangzi rice price series was used for Shuzhou and Cun-sheng Chen’s series for Guangdong. These are

²⁰ Department of Crop Reporting, “Crop Reports” Vol. VI, no. 10, pp. 115-117. Rôdô Undô Shiryô Iinkai, 1959, p. 568.

²¹ The data are available on-line at www.nuffield.ox.ac.uk.

²² The Canton data is based on *The Reports of Statistics* compiled by the Department of Peasantry and Labour, Kwangtung Government in 1928; it covers the period of 1911 to 1927. The Shanghai price is from Bureau of Social Affairs, The City Government of Greater Shanghai: *The cost of living index numbers of labourers, greater Shanghai* January 1926 - December 1931., 1932.

probably wholesale rather than retail prices. No allowance was made for retail mark-ups—a procedure which is again biased against our conclusions, for if rice prices were higher than living standards would have been even lower. The prices of other foods and fuel were taken from the costs incurred by European trading companies in provisioning their ships in Canton. These prices have been compared to the estimated prices for Beijing, and the agreement is close. For most of the eighteenth century, competition was intense in supplying these ships (see Van Dyke, *Canton Trade*).

The cost of the basket is Adam Smith's "money price of subsistence" and its history is plotted in Figure 4 for leading cities in China and Europe in the eighteenth and nineteenth centuries. The findings would have surprised Smith, for it contradicts his claim that China had cheaper subsistence than Europe. The silver cost of a bare bones basket in Beijing or Canton was in the middle of the European range. A corollary is that the price of grains, which dominate the cost of these indices, were similar across Eurasia. Another casualty of Figure 4 is Smith's generalization that "rice in China is much cheaper than wheat is anywhere in Europe."²³

Another feature of Figure 4 is worth highlighting. The figure shows the consumer price index for both Beijing and Suzhou/Shanghai. There was very little difference between the two for the 18th century. These two cities represent the two agrarian halves of China – the northern small grain region and the southern rice region. However, from beginning of the 18th century, rice prices began a secular rise over that of the sorghum, which led to a somewhat more expensive basket for the unskilled labourers in the South than in the North. While the implication of this finding needs further research, this difference matters little for

²³ Smith, *Wealth of Nations*, p. 189.

our purpose of international comparison. Overall, as seen in Figure 4, price gap between Europe and China really opened up from roughly the mid-19th century.

Figure 4 here

5. A Look at Other Index Numbers

Before we consider the implications of the cost of the baskets for comparative living standards, we briefly summarize the results of indexing prices in other ways.

In modern theory, the index number 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 consumer welfare has risen or fallen.

If we compare this theory to the realities of the eighteenth century, we see problems in relating the theory to the world. There are no insuperable difficulties 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 Asian 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 flexible enough to voluntarily shift their consumption between the European and the Asian patterns in response to the difference in prices. In that case, how can we compare living standards? This is the reason why we approached the problem in terms of Adam Smith's 'cost of subsistence.' By building on the results of these calculations, we can, however, approximate the results of a more orthodox approach. As we proceed, however, the data problems associated with it come sharply into focus. We concentrate on a comparison of Beijing and London because the Beijing diet was based on small grains that were more comparable than rice to English grain.

We first approach the question from the point of view of a Beijing resident and ask how much it would have cost to live the 'bare bones' Beijing lifestyle in London. This is the pertinent question, for, as we shall shortly see, the typical labourer could not afford to buy anything more. The difficulty is that we cannot cost out the Beijing basket in London, for sorghum was not sold in London. However, oats was the counterpart of sorghum in Britain—it was the least cost, most inferior grain—and if we take oats and sorghum to be equivalent, we realize that we have already answered the question by comparing the cost of the bare bones baskets.

We can also ask how much the London lifestyle would have cost in Beijing. That lifestyle is specified by "respectable" consumption basket in Table 5, which summarizes the spending in north western Europe.²⁴ The diet is late medieval in inspiration in that it does not

²⁴ Allen, "Great Divergence in European Wages."

contain new commodities like sugar and potatoes introduced into Europe after the voyages of discovery.

Insert Table 5 here

The basket in Table 5 contains important items for which we lack prices in China. Bread is the most important, and we estimated what bread would have sold for, had it been produced commercially, from the ‘bread equation’ estimated by Allen (2001, p. 418). This is a statistical relationship between bread prices, wheat prices, and wage rates prevailing in many cities in Europe. Since we have time series of wages and wheat prices for Zhili province, which includes Beijing, we can calculate the price at which bread would have been supplied had it been produced in the European manner. Likewise, we do not know the price of beer. For it, we substitute the quantity of rice wine (sake) that contained the same quantity of alcohol²⁵. We estimated the price of rice wine using the Japanese relationship between the retail price of sake and the wholesale price of rice. In this way we proxied the missing prices needed to cost out a European basket in Beijing.

The European and Beijing baskets define Paasche and Laspeyres price indices. The final step in comparing the cost of living in London and Beijing is to compute the geometric average of the two, which is a Fisher Ideal Price index. This is a ‘superlative’ price index, which corresponds to a generalized Leontief expenditure function²⁶. That representation of consumer preferences has the property that indifference curves are tangent to prices at both consumption patterns. In other words, the representative consumer whose behaviour is summarized by the price index would shift from an English to a Chinese spending pattern as prices shifted from the London to the Chinese configuration. Using this index number

²⁵ 182 litres of beer at 4.5% alcohol contains as much as alcohol as 41 litres of sake at 20%.

imposes the assumptions of modern theory on the reality of eighteenth century behavior—certainly a debatable procedure.

How does the Fisher Ideal Price index compare to the bare bones indices? In fact, they are very similar. The relative cost of the European basket in London and Beijing was always close to the relative cost of the bare bones baskets which are equal to ratios of 1.12 and 1.17 respectively in Table 5. Hence, their geometric average is also similar. Consequently, a superlative index number, in this case, gives the same result as a comparison of Smith's 'cost of subsistence.' Since the latter has so many intuitive interpretations, we use it as the axis of our discussion with the confidence that it is not misleading us when the index number problem is considered from other perspectives.

6. 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 represented the least cost way to survive. (Tables 3 and 4, however, do not include housing costs, so we increase them now by 5%, which is a minimal allowance for rent.) The budget was an annual budget for an adult male. If the man supported a family, the expenditures would have been higher, and we multiply the cost of the budget (augmented 5% for rent) 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

²⁶ W.E. Diewert, "Exact and Superlative Index Numbers," *Journal of Econometrics*, Vol. 4, No. 2, 1976,

children. On the income side, our income measure is the annual earnings that a worker could have gained if he worked full time for a year. We assume that one year's work consisted of 250 days – roughly full time work allowing for holidays, illness, and slack periods. 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 the economic strategies of families. The ratio of estimated full time earnings to the annual cost of the family budget is a real wage index.

Our real wage index has a particular interpretation since it answers a specific question, namely, whether a man working full time could support a family at the 'bare bones' level of consumption. Real wage indices of this sort are called 'welfare ratios.' When the welfare ratio equalled one, an unskilled labourer working full time could earn just enough to support his family at subsistence income. Higher values indicate some surplus, while values below one mean either that the family size had to be reduced or work effort had to be increased since there was little scope for reducing expenditure.

Figure 5 shows welfare ratios for unskilled male workers from 1738 to 1923 in the European cities we have been discussing and in Beijing and the lower Yangzi cities. Several features stand out:

Figure 5 here

1) The Yangzi Delta is reputed to have the most advanced economy of any Chinese province, but the real wage there was not noticeably higher than the real wage in Beijing or Canton, as we will see.

2) The Chinese cities were in a tie for last place with the Italian cities. They had the lowest standard of living in Europe, so an optimistic assessment of China's performance is difficult.

Figure 5 is not peculiar in pointing to a low Chinese standard of living, for it is also a feature of the data cited by Pomeranz and Li when they argue the reverse case, namely, that labouring people in the lower Yangzi had a high standard of living. Pomeranz, for instance, estimates that a male agricultural labourer employed full time over the course of a year would have realized about 12 Taels, as we noted previously. Using average prices for 1745-54, the 'bare bones' cost of maintaining a family was 22.59 Taels, so the labourer was only earning 53% of subsistence; in other words, the welfare ratio was .53. He could barely support himself, let alone a wife and children. A woman spinning and weaving cotton for 200 days per year, which Li and Pomeranz both reckon was about the maximum possible, could earn 14.61 Taels, a bit more than a man.²⁷ Again, however, this was less than the cost of maintaining a family. The man and the woman together, however, would have earned 26.61 Taels, which was 1.18 times the cost of maintaining a family. A family could survive on that, so long as nothing went wrong, but the standard of living was far behind that in London or Amsterdam where the labourers earned four times the cost of a bare bones standard of living in the middle of the eighteenth century.

3) We have no information about wages in the lower Yangzi for most of the nineteenth century. We do have information about Beijing wages in this period, however, and it indicates that the real wage continued to slide until the Taiping Rebellion when it

²⁷ Li, *Agricultural Development*, pp. 149, 152. Pomeranz, *Great Divergence*, pp. 318-9, offers two calculations pointing to slightly lower earnings. Li's calculation assumes the woman received .19 shi per bolt of cloth; Pomeranz's slightly more. They do not use precisely the same prices. We use average values for 1745-54.

reached a life-threateningly low level. After authority was restored, living standards improved slowly into the early twentieth century.

4) The most striking feature of Figure 5 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 or the lower Yangzi. After the middle of the nineteenth century, London living standards began an upward trajectory and increased the lead over China. 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.²⁸ 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 and Suzhou. The standard of living in China remained low and on a par with the regions of Europe untouched by the industrial revolution.

6) The workers in northwestern Europe with welfare ratios of four or more did not eat four times as much oatmeal as their 'bare bones' diet presupposes. Instead, they ate higher quality food—beef, beer, and bread—that was a more expensive source of calories. In addition, they bought a wide range of non-food items. In the eighteenth century, these included the Asian imports and novel manufactures that comprised the 'consumer revolution' of that era. By the same token, the workers in northwestern Europe could afford the basket of goods shown in Table 5, while workers in Asia could not and had to subsist on the 'bare bones' baskets. After all, in regions of settled agriculture, the least expensive way to get

²⁸ Van Zanden and Van Riel, *The strictures*, 121ff, 188ff.

calories is to boil the cheapest grain into a gruel or porridge. In northern Britain, the poorest people ate oat porridge; in the Yangzi Delta, they ate wheat gruel²⁹.

Figures 6 here

Figure 6 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, India, and Canton was very similar to Beijing's or Suzhou's. Özmucur and Pamuk have found that real wages in Istanbul were at a level as low as China's, so it may have characterized much of the non-industrializing world in the eighteenth century.³⁰ There is evidence of rising living standards across Asia 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.

One might worry that the wages we analyse here are not representative of labour incomes in China in general. While the question deserves more research, we believe that our conclusions are robust. First, we know that wage labour – particularly short-term labour – was common in early modern China and Japan, although the precise proportion remains elusive. Moreover, if the labour market in eighteenth century China was as flexible as claimed by the revisionists,³¹ there is all the more reason to believe that the wage rates we measure

²⁹ Bozhong Li, *Agricultural Development*, p. 207, fn. 25.

³⁰ Özmucur and Pamuk, "Real Wages and Standards of Living."

³¹ See Pomeranz, "Great Divergence," chapter 2 for an argument on the flexibility of product and factor markets and labour migration in early modern China.

are representative of labour earnings across the economy. In this regard, the wage rate not only reveals the average earnings of a particular social-economic group but also serves as an indicator of the marginal productivity of labour in the economy as a whole.

Second, we have focussed our comparison on the wage income of unskilled labourers. However, the wage regression and the twentieth century wages summarized by Gamble for Beijing all indicate that the ratio of skilled to unskilled wages was about the same in China as in northwestern Europe. While future research is needed, this evidence suggests that our conclusions about comparative living standards would hold true if the comparison was broadened to include all kinds of wage earners.³²

7. Conclusion

Our investigation of Asian and European wages and prices shows that the situation differed somewhat from Adam Smith's impressions. Money wages were in accord with his view: In China, they were certainly lower than wages in the advanced parts of western Europe in the eighteenth century. Chinese wages were similar to those in the lagging parts of Europe. By the twentieth century, however, wages in all parts of Europe were higher than in China. Contrary to Smith, the cost of living was similar in China and in Europe.

The upshot of the wage and price comparisons is that living standards were low in China. In the eighteenth century, advanced cities like London and Amsterdam had a higher standard of living than Suzhou, 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, India, and Japan. By the twentieth century, enough progress had occurred in even the backward parts

³² Van Zanden, "The Skill Premium and the Great Divergence."

of Europe that their standards of living were beginning to creep above those in China. Wages seemed to be slipping in China in the eighteenth century. There is, consequently, the chance that the seventeenth century was a ‘golden age,’ and that possibility warrants investigation. Leaving the possibility aside, 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 is our finding that unskilled labourers in major cities of China and Japan – poor as they were – had roughly the same standard of living as their counterparts in central and southern Europe for the larger part of the eighteenth century. This calls into question the fundamental tenet of the large “Rise of the West” literature that sees Western Europe – as a whole – surpassing the Rest of the World in the early modern era. Our paper shows that it was only England and the Low Countries that pulled ahead of the Rest. The Rest, in this context, includes not only Asia but also the much 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 were on a par with England on the eve of the Industrial Revolution, for we find real wages in the lower Yangzi to have been no higher than those in Beijing or Canton. Clearly, our database 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.

Appendix I: Sources Notes for Chinese Wages, 1686–1902

A. Cotton Calenderers' wages

In the 17-19th centuries, the calenderers in Suzhou usually consisted of migrant workers from impoverished regions in Northern Jiangsu or Anhwei. They usually worked under a contract system renting capital and working place from cotton cloth merchants. Although not allowed to form their own guilds by the government, they often went on strike for higher wages, hence the documentation of these negotiated wage rates in the Steles records.

To convert the piece rates into daily wages, we use the daily productivity information in Xu Xinwu's study. According to Xu on p. 378, a calenderer can do one bolt of cloth in about 40 minutes. For a day with about 11-hour working hours, they can press about 12 bolts of cloths. For conversion, we use 11 bolts of cloth pressed per day to adjust it roughly to a ten hour working day. However, the calenderers would have to hand in 20% as payment for rental and other expenses. So deducting the 20% from the final wage, I convert the piece wage of 0.0113 taels (in 1730) and 0.013 taels (in 1772 and 1795) per bolt of cloth into 0.0994 and 0.1144 silver per day respectively. Although the daily productivity data in Xu's study is based on suburban Shanghai in the early 20th century, Xu explicated stated that both technology and organization changed little from the early modern period (p.375).

B. The Nineteenth Century Wage Series by Gamble

The wage series in Gamble, "Daily Wages" which spans almost the entire nineteenth century, was 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 September and January through December 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 (January through December) 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, he 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-1860s 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 tael 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 nineteenth 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 1,000 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 Zhongping et al.³³ Yan and his associates derived the exchange rate series (1807-1850) from the account books of a merchant store located in Daliu zhen of Ningjin County in Hebei province, about three hundred kilometres from Beijing. In a footnote to their exchange rate table (Table 31 on p. 38), the authors pointed out that value of two copper cash was counted as one. We also compared the copper-silver exchange series of the Yan 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 1,000 cash. Our copper-silver exchange rate series in the second column is

³³ Yan Zhongping et al., *Zhongguo jindai jingjishi*.

similarly derived with the standard of one *tiao* equal to 1,000 cash. Thus, the silver wages in tael 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 stated on p. 41 that workers were also given food, we adhere 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 tael, 1807-1902

	Copper wages	Copper/silver conversion	Silver wages in tael		Copper wages	Copper/silver conversion	Silver wages in tael
1807	81	979	0.083	1860	255		
1808	83	1,020	0.081	1865	265	5,180	0.051
1812	81	1,078	0.075	1870	287	5,576	0.051
1813	80	1,067	0.075	1871	333	5,892	0.057
1816	87	1,129	0.077	1872	355	6,170	0.058
1817	80	1,123	0.071	1873	382	6,383	0.06
1818	89	1,106	0.081	1874	388	6,611	0.059
1819	87	1,183	0.074	1875	389	6,681	0.058
1820	95	1,159	0.082	1876	370	7,446	0.050
1822	99	1,203	0.082	1877	368	8,325	0.044
1824	83	1,208	0.069	1878	348	8,314	0.042
1825	88	1,192	0.074	1879	375	8,342	0.045
1827	88	1,265	0.070	1880	410	8,510	0.048
1829	95	1,294	0.073	1881	401	8,341	0.048
1830	96	1,329	0.072	1883	387	7,154	0.054
1831	92	1,346	0.068	1884	356	6,722	0.053
1832	89	1,347	0.066	1885	395	7,573	0.052
1835	94	1,251	0.075	1886	402	6,950	0.058
1836	85	1,378	0.062	1887	395	7,024	0.056
1837	96	1,488	0.065	1888	361	7,883	0.046
1838	91	1,553	0.059	1889	421	7,314	0.058
1841	98	1,382	0.071	1890	393	7,254	0.054
1842	100	1,439	0.070	1891	390	7,627	0.051
1845	86	1,823	0.047	1892	372	7,651	0.049
1846	96	2,010	0.048	1893	410	7,212	0.057
1847	87	2,013	0.043	1894	443	6,722	0.066
1848	68	2,049	0.033	1896	448	6,501	0.070
1849	80	2,046	0.039	1900	422	5,312	0.079
1850	94	1,997	0.047	1901	462	5,758	0.080
1852	93	2,018	0.046	1902	470	6,079	0.077
1853	93	2,205	0.042				
1854	90	2,723	0.033				
1856	110	4,970	0.022				
1857	105	3,935	0.027				
1858	130	4,970	0.026				

Appendix II. Sources Notes for Chinese Prices

Beijing

Our series of prices for Beijing begin with Meng and Gamble's study of wages and prices in Beijing between 1900 and 1924. For that period they collected the retail prices of most elements of our basket detailed in Table 4. We abstracted the following series (Meng and Gamble, "Wages, Prices, and the Standard of Living," pp. 28, 38-9, 51, 59): wheat flour, lao mi (blackened rice), bean flour, millet, corn flour, pork, sweet oil, peanut oil, foreign cloth and 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 soybeans for 1900-1908, 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 Lillian Li, "Grain Prices," as will be explained. For 1909 onwards (when the Li series ends), we extrapolated the 1908 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 do 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 Lillian Li's study of grain 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 of little consequence for our study.³⁴ With these series we extrapolated the retail prices of wheat flour, millet, corn flour, bean flour, and soybeans back to 1738. Our extrapolated series are linked using the average of 1901-04 as our base period. 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:

Meat, edible oil, lamp oil, candles – using the price of wheat flour based on the benchmark period of 1901-04 for meat (the average price of pork and mutton), and 1902 for the rest.

corn flour – using the price of sorghum based on 1901-04 benchmark;

rice (lao mi) – using the price of rice in the Yangzi Delta (Wang, "Secular Trends", pp. 40-47), based on 1901-04 benchmark.

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 Albert Feuerwerker's series of the price of cotton cloth imported into China.³⁵ 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.

³⁴ Professor Li kindly supplied us with some of the underlying series, which we used in preference to the graphed data.

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, who discussed cloth prices and weaving incomes at length estimated the price in his low price scenario at 0.5 tael per bolt.³⁶ On these assumptions 300 square feet of cloth were worth 4.59 tael, and we interpret this as the eighteenth-century counterpart to Meng and Gamble's price for a 100 foot length of a piece of cloth three feet wide. Pomeranz claimed that cloth prices remained constant over the eighteenth century, and we have assumed the same.³⁷

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 to 1824, 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 traded across Asia, so we would not expect extreme differences in its price. Starting in the 1830s, 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 combined from diverse sources. For 1739-1769, we used the price implied by charcoal prices in Zhili province in the 1769 *Wuliao jiazhi zeli*. For 1816, we used the price implied by the price of coal in Beijing given in Timkovski, *Voyage à Péking*, p. 200. From

³⁵ Feuerwerker, *Handicraft and Manufactured Cotton*, p. 344.

³⁶ Pomeranz in *Great Divergence*, p. 319 decided that a cloth of 16 chi length cost 0.4 tael. According to Bozhong Li, *Agricultural Development*, p. xvii, a bolt of 20 chi had 3.63 square yards. Hence, the price of cloth was 0.5 tael per bolt.

³⁷ Pomeranz, *Great Divergence*, p. 323.

1900 onwards, we based our energy price on the price of coal balls. One of the striking features of this scattered information is that they should give a fairly constant price of energy. In view of that constancy, we interpolated values for missing years.

We do not have price of alcohol for China. We used the Japanese data which shows that 1 litre of sake equal to 1.31 kg of rice (based on Mitsui Bunko). This ratio is applied to Beijing and Canton with the assumption that processing technology of rice wine was similar in China and Japan.

Appendix Table II. Caloric and protein contents

	Unit (metric)	Calories per unit	Grams of protein per unit
Bread	Kg	2450	100
Beans/peas (Europe)	Litre	1125	71
Beans (Asia)	Kg	3383	213
Meat	Kg	2500	200
Butter	Kg	7268	7
Cheese	Kg	3750	214
Eggs	Kg	79	6,25
Beer	Litre	426	3
Soy beans	Kg	4160	365
Rice	Kg	3620	75
Wheat flour	Kg	3390	137
Barley	Kg	3450	105
Millet	Kg	3780	110
Buckwheat	Kg	3430	133
Corn flour	Kg	3610	69
Fresh fish	Kg	1301	192
Edible oil	Litre	8840	1
Alcohol (20°)	Litre	1340	5

Sources: The caloric and protein content are based on Allen (2001) for bread, beans/peas consumed in Europe (fresh with pods, measured in litre), meat, butter, cheese, eggs, and beer. For other items, we relied on US Department of Agriculture (USDA: National Nutrient Database for Standard Reference, http://www.nal.usda.gov/fnic/foodcomp/cgi-bin/list_nut_edit.pl)

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Table 1. Nominal wages of workers in public construction, 1769-1795,
and in arms manufacture, 1813 (in tael per day)

	Construction unskilled	Constructio n skilled	<u>N</u> =	Arms manufactur e (unskilled)	Population (millions in 1787)
Manchuria and the Northwestern frontier					
Heilongjiang	0.100	0.191	2/6		
Jilin	0.095	0.160	6		1.0***
Shengjing	0.057	0.100	13		
Xinjiang	0.097	0.110	3		.5?
North					
Rehe*	0.066	0.120	7		
Beijing*	0.077	0.141	24		
Tianjin/Baoding*	0.071	0.112	34		23.0****
Residual Zhili*	0.054	0.081	82	Zhili 0.060	
Gansu	0.044	0.054	48		15.2
Shanxi	0.054	0.073	85	0.040	13.2
Shaanxi	0.044	0.050	74	0.040	8.4
Shandong	0.045	0.061	50	0.040	22.6
Middle					
Henan	0.037	0.039	106	0.040	21.0
Jiangsu**	0.040	0.051	63	0.040	31.4
Zhejiang**	0.040	0.060	63	0.040	21.7
Hunan	0.039	0.050	10	0.040	16.2
Hubei				0.040	
Jiangxi				0.030	
Guizhou				0.040	
Sichuan	0.048	0.062	47	0.040	8.6
Yunnan	0.048	0.068	84	0.030	3.5
South					
Fujian (including Taiwan)	0.030	0.050	9	0.040	12.0
Guangdong	0.040	0.050	89	0.040	16.0
Guangxi				0.040	
Average (unweighted)	0.053	0.081			
Average (weighted by <u>N</u>)	0.047	0.065	901/905		
Average (weighted by population)	0.044	0.060			214.5

* part of the province of Zhili (there are separate regulations for Rehe)

** Yangzi Delta

*** Manchuria as a whole

**** Zhili as a whole

N number of districts for which data are available

Sources for wages: see the text; for population data, Wang Yeh-chien, *Land Taxation*, p. 87.

Table 2. Wage regressions for eighteenth-century China, standardized on the daily wage of an unskilled construction labourer in the Yangzi Delta in 1769 (in tael)

	Coefficient	T-value
Constant	0.0456	4.00
Trend	-0.0000351	-0.348
Manchuria	0.0902	6.73
Zhili(incl.Beijing)	0.0441	4.36
North	0.0132	1.397
Middle	-0.0022	-0.026
South	-0.000593	-0.056
Canton	0.0379	3.55
Skilled	0.0295	4.79
Regulated	-0.0171	-2.21
Iron Industry	0.0092	1.12
Coal mining	-0.0093	-0.83
Agriculture	-0.0072	-0.744
Textiles	0.0403	3.22
Other	-0.0147	-1.93
R^2	0.408	
$F(14,312)$	15.34**	
N	327	

** Significant at 1 percent.

Table 3. Subsistence Lifestyle: Baskets of Goods in China

	<u>Suzhou/Canton</u>			<u>Beijing</u>		
	quantity per person per year (kgs)	nutrients/day		quantity per person per year	nutrients/day	
		Calories	Grams of protein		Calories	Grams of protein
Rice	171	1677	47			
sorghum				179 kg	1667	55
polenta						
beans/peas	20	187	14	20	187	14
meat/fish	3	8	2	3	21	2
butter						
oil	3	67	0	3	67	0
soap	1.3			1.3		
cotton	3 m			3 m		
candles	1.3			1.3		
Lamp oil	1.3			1.3		
fuel	3 M BTU			3 M BTU		
Total		1939	63		1942	71

Notes: For conversion of calories and proteins, see Appendix Table II.

Table 4. Subsistence Incomes: Baskets of Goods in Europe

	<u>Northern Europe</u>			<u>Milan</u>		
	quantity per person per year (kgs)	nutrients/day		quantity per person per year	nutrients/day	
		Calories	Grams of protein		Calories	Grams of protein
Rice	155	1657	72			
sorghum				165	1655	43
polenta						
beans/peas	20	187	14	20	187	14
meat	5	34	3	5	34	3
butter	3	60	0	3	60	0
oil						
soap	1.3			1.3		
Linen/cotton	3 m			3 m		
candles	1.3			1.3		
Lamp oil	1.3			1.3		
fuel	3 M BTU			3 M BTU		
Total		1938	89		1936	60

Table 5. Comparison of Different Basket Costs around 1750

	Barebone basket		Respectable Basket		London Prices (in grams of Silver)	Beijing Prices (in grams of Silver)
	Europe	North China	Europe	North China		
Oats/Sorghum	155 kg	179 kg			0.76	0.48
Bread			182 kg	182 kg	1.28	0.95
Beans			40 kg	40 kg	0.5	0.84
Meat/Fish	5 kg	3 kg	26 kg	31 kg	3.19	2.04
Cheese			5.2 kg		2.07	
Eggs			52 pc	52 pc	0.37	0.074
Butter	3 kg		5.2 kg		6.45	
Beer/Rice			182 l	49 l	0.39	1.98
Wine						
Soap	1.3 kg	1.3 kg	2.6 kg	2.6 kg	6.36	1.65
Linen/Cotton	3 m	3 m	5 m	5 m	4.87	6.14
Candles	1.3 kg	1.3 kg	2.6 kg	2.6 kg	5.4	3.3
Lamp Oil	1.3 kg	1.3 kg	2.6 kg	2.6 kg	2.8	3.3
Fuel (M BTU)	3	3	5	5	5.59	11.2
Total Basket Cost (Grams of Silver)	213	182.6	558.6	499.3		
Europe/Beijing Ratio	Barebone Basket		Respectable basket		Geometric Average	
	1.17		1.12		1.14	

Figure 1. Nominal Wages in Beijing, Suzhou and Canton (in Silver Taels)

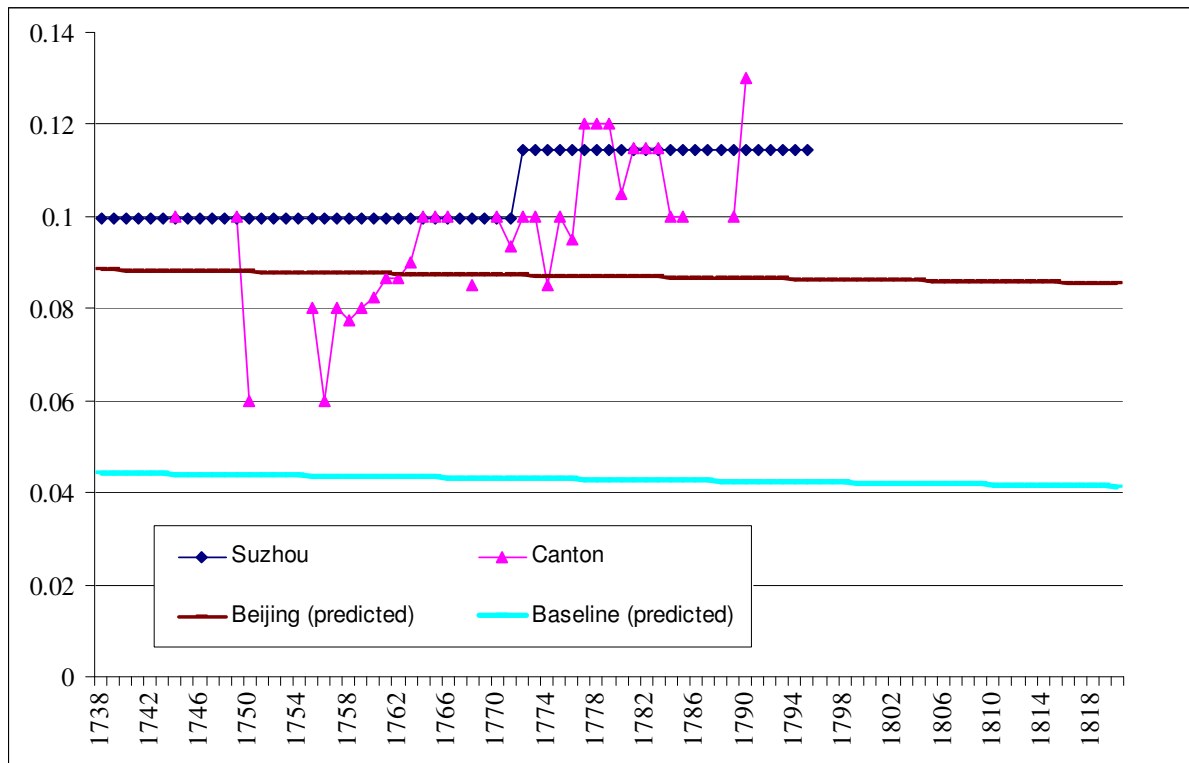


Figure 2
Daily Wages in Grams of Silver, 1738-1870

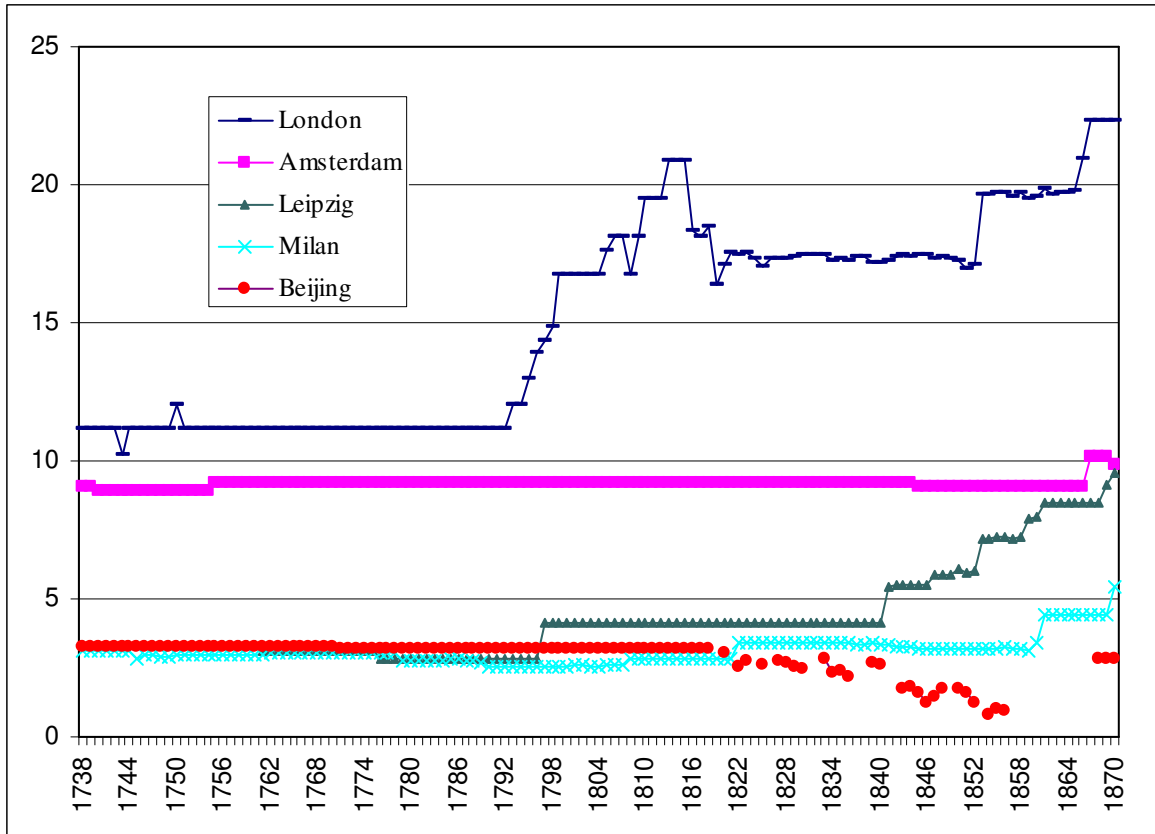


Figure 3
Daily Wage in Grams of Silver, 1870-1914

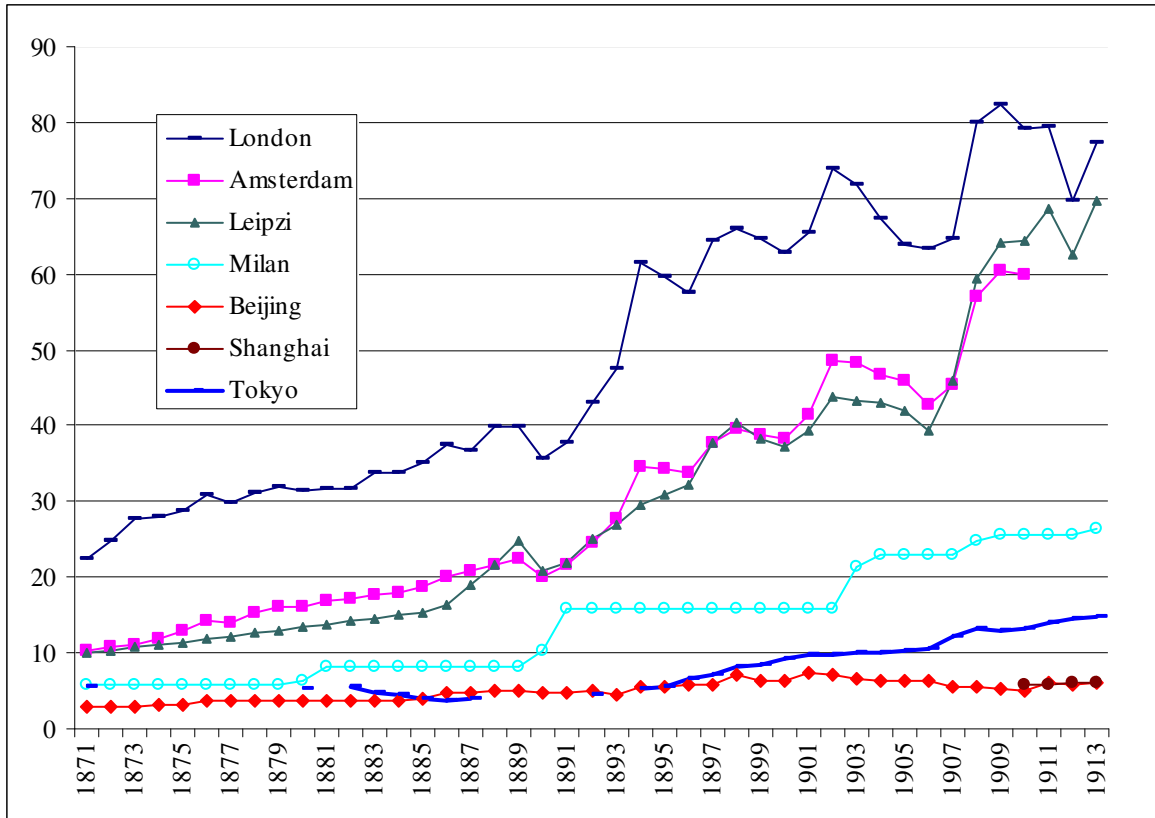


Figure 4
Costs of the Baskets in Grams of Silver per man per year

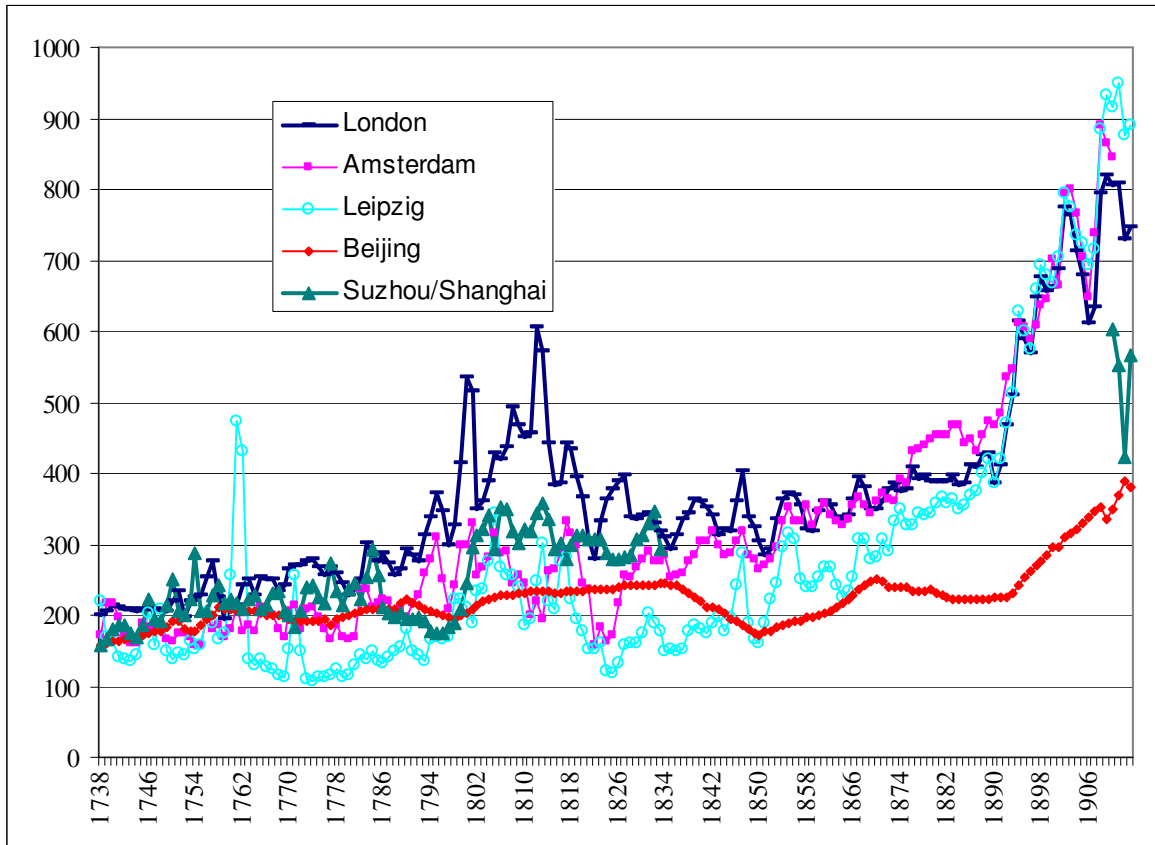


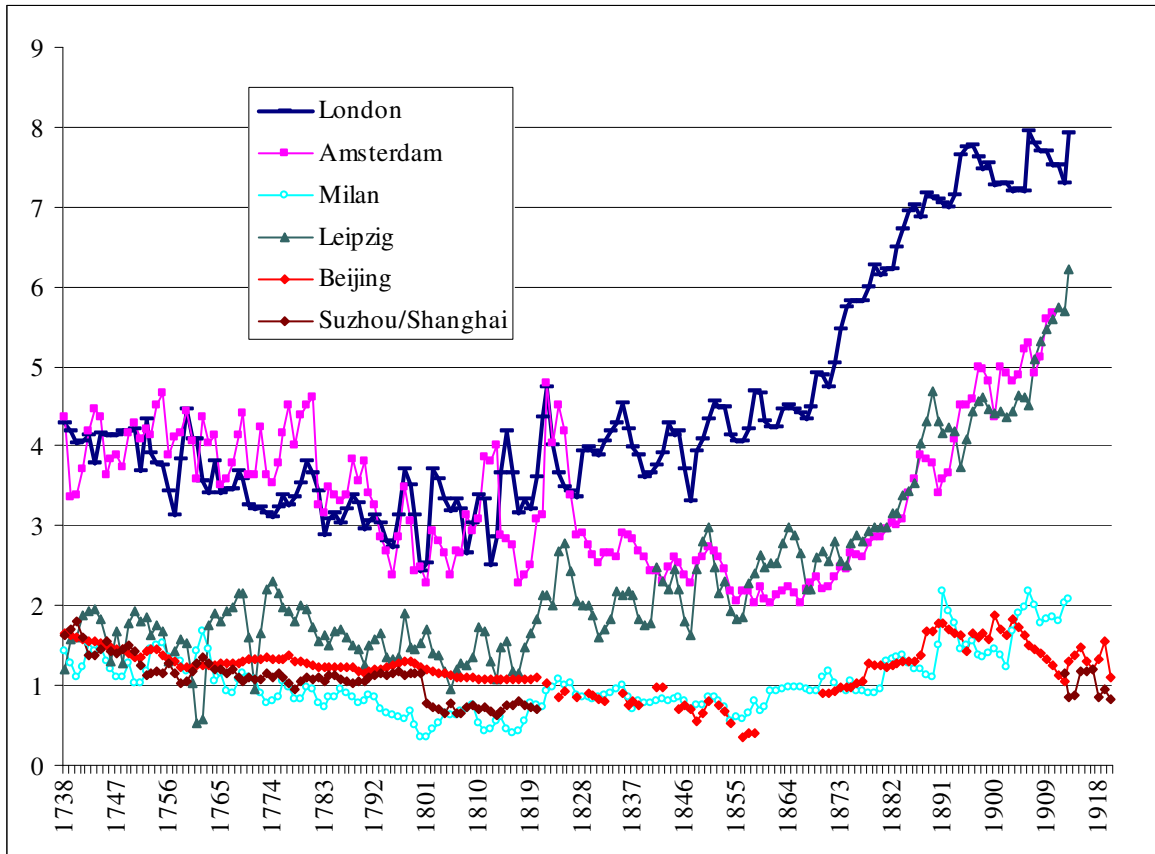
Figure 5
Welfare Ratios

Figure 6
Welfare Ratios in Asia

