Economic History Working Papers No: 339

Wages, Labour Market, and Living Standards in China, 1530-1840

Ziang Liu, LSE

May 2022

Economic History Department, London School of Economics and Political Science,
Houghton Street, London, WC2A 2AE, London, UK. T: +44 (0) 20 7955 7084.

Wages, Labour Markets, and Living Standards in China, 1530-1840

Ziang Liu, LSE

JEL Classification: N3, N15, J21, J31

Keywords: wage, living standard, labour market, early modern China, great divergence

Abstract

This article studies the long-term wage development in China between 1530 and 1840. In the long run, nominal wages moved in tandem with prices, but not as quickly as the increase in prices. Real wages experienced two substantial falls between the 1620s-1650s and the 1740s-1760s but remained fairly stable in the remainder of the periods examined. Rural-urban wage disparity suggests that the agricultural sector, rather than urban industries, continued to absorb surplus labour. A preliminary comparison of wages in Lower Yangzi China and England (London) suggests that the wage gap seems to open up after 1700.

1. Introduction

How did wages develop in China in the early modern period? Since the Great Divergence debate, the economy and living standards across the two ends of Eurasia have attracted a considerable intellectual interest. From the sixteenth century onwards, China began to enjoy the revival of its economy and commercial growth following a shortage in the money supply in the previous century.[1] As the system of hereditary occupations atrophied and bound labours declined in state manufacturing workshops and factories, private sectors started to rise and expand within the Chinese economy.[2] When the market network continued to grow in the Lower Yangzi delta, rural markets also increased steadily in northern China.[3] By the mid-nineteenth century, the time that

[1] Von Glahn, *Fountain of Fortune*, p.83; Liu, "Mingdai tonghuo."
[2] Xu and Wu, *Zhongguo ziben zhuyi,* pp.121-4.
[3] Xu, "chengxiang shichang," pp.199-201.

generally divides traditional and modern periods in Chinese historiography, China had experienced a palpable growth in population and the overall size of the economy.

When comparing the economies at the two ends of Eurasia, scholarly views often differ as to the point at which the trajectories of development diverged. Based on per capita food consumption, Pomeranz considers that the Lower Yangzi delta and England were similar in living standard prior to 1800.[4] Similar studies on family consumption in the Lower Yangzi also challenge the conventional wisdom that the Chinese peasantry lived at subsistence level in early modern times.[5] However, food consumption may reveal only part of the story. In terms of agricultural productivity, China was on a par with the English Midlands in the eighteenth century or the Netherlands in the early nineteenth century, but a remarkable productivity gap can be observed in manufacturing.[6] Occupational structure provides another angle from which to examine the structure of the economy. It is generally considered that agriculture as a whole employed the majority of the labour force in early modern China, but the precise size of this 'majority' is under review. A common view estimates it to be around four-fifths, but recent evidence seems to suggest a much smaller figure, possibly slightly higher than a half.[7] What appears to be more certain is a long-lasting status of occupational structure during the course of the eighteenth and nineteenth centuries. Furthermore, this status may be reflected in the level of urbanisation, where a small number of studies suggest that the Chinese urban population showed no sign of increasing over the eighteenth century, while the rural population rapidly increased.[8] Additionally, recent research on Chinese historical national accounting has found no evidence of intensive growth in early modern

[4] Pomeranz, *The Great Divergence*.
[5] Huang, *Minsheng yu jiaji*,
[6] Allen, "Agricultural productivity"; Li and van Zanden, "Before the great divergence."
[7] Guo et al., "Occupational structure;" Yang, "A new estimate".
[8] Cao, *Zhongguo renkoushi*, vol.4, pp.365-8; vol.5, pp.726-74; Xu et al., "Urbanization in China," p.346.

times.[9] These pictures imply high productivity in the agricultural sector, but an infertility of structural change in the economy over the centuries.

Wage is also an approach towards examining long-term development. In the European context, the standard wage account depicts a Malthusian world where no positive trend in wages was observed after the Black Death, and real wages continued to fall over the centuries. The slower wage decline in England and the Low Countries resulted in living standards in Northwestern Europe outperforming other European economies prior to the onset of the Industrial Revolution.[10] This narrative hypothesises a 'little divergence' within Europe between 1500 and 1750. However, given that this presumes a fixed length of the working year, the influence of wages on living standards may be notably revised under different assumptions.[11]

Nevertheless, in comparison with Europe, the wage history of China in early modern times is still being written, largely because historical wages and prices are noticeably more limited. The existing literature neither provides comprehensive wage estimates before the eighteenth century, nor does it offer a generally accepted wage narrative for the eighteenth century. Based on the work of Pomeranz (2000) and Li (2003), an early attempt by Broadberry and Gupta (2006) offered some preliminary estimates, implying a substantial wage gap between the Lower Yangzi and England in the eighteenth century.[12] In a study of long-term economic development, Liu Guanglin (2016) also provided a preliminary estimation of Chinese wages between 1004 and 1805 using a small number of wage records on soldiers, unskilled labourers in irrigation, and other construction works, as well as low-status professionals such as students and government clerks.[13] Nevertheless, given the limited data, Liu's research is more helpful in exhibiting the economic decline between Song (c.960-1279) and Ming

[9] Broadberry et al., "historical national accounting"; "A Restatement."
[10] Van Zanden, "Wages;" Allen, "The Great Divergence;" Clark, "The condition;" "The long march."
[11] Campbell, "National incomes;" Humphries and Weisdorf, "Unreal wages."
[12] Broadberry and Gupta, "The early modern great divergence"; Pomeranz, *The Great Divergence*; Li, *Jiangnan nongye*.
[13] Liu, *The Chinese Market Economy*, pp.247-9.

China (c. 1368-1644) than the wage movement over the sixteenth and nineteenth centuries. A more comprehensive assessment from Allen et al. (2011) suggests that the wage gap between Suzhou (the Lower Yangzi) and London was already significant by the early eighteenth century.[14] Yet in contrast with the picture painted by Broadberry and Gupta, unskilled wage estimates by Allen et al. were considerably higher, and continued to fall between 1738 and 1850. Given this controversy, Deng and O'Brien (2016) re-examined the sources of Allen et al. and considered their wage estimates suffered from sample selection and data processing.[15] Similar issues of data processing can be found in other scholarly Chinese works.[16] A few recent studies in Chinese literature also failed to lend evidential support to Allen's et al. results.[17] Thus far, we neither have a comprehensive study on Chinese wages before the eighteenth century, nor an acceptable narrative on Chinese wage history for the eighteenth century.

To break new ground on historical wages in China, this paper compiled a new dataset with wage quotations from the public and private sectors, and strived to build a wage index for the Lower Yangzi region between 1530 and 1840. This paper finds that in the long run, nominal wages in China moved in tandem with prices, but not as quickly as the increase in prices. Although real day wages experienced two substantial falls between the 1620s-1650s and the 1740s-1760s, they remained fairly stable – instead of collapsing as intimated by previous research – in the remainder of the periods examined. To place real wages in the context of a welfare ratio, the computations imply no living standards at the subsistence level for urban wage earners in the majority of the periods examined. Equally worth noting is the fact that a persistent wage differential was evident between agricultural/rural and urban sectors, with the latter paid 1.5 times higher on average than the former. This disparity reconciles some of the existing views that the agricultural sector, rather than urban industries, continued to

[14] Allen el al., "Wages."
[15] Deng and O'Brien, "a survey."
[16] See, for example, Gao, "*Mingwanli nianjian*" where conscription payments, market wages, and administrative costs were mixed up.
[17] Sun and Li, "Shengshi;" Jiang and Wang, "Qingdai shicang;" Peng, "Jindai Beijing jiage."

absorb surplus labour in rural areas. From a global perspective, a preliminary comparison of real wages in the Lower Yangzi and England (London) suggests that the gap in the purchasing power of wages seems to open up after 1700.

Some of these findings differ considerably from the previous work. My new estimates find no evidence of a continuous decline in nominal wages in the eighteenth and first half of the nineteenth centuries. It may be the case that previous work overestimated the level of nominal wages in the Lower Yangzi region and falls in real wages after 1700. Given that the annual incomes are inferred from day wage rates, the decline in annual wage earnings in real terms may be smaller and slower than the day rates suggested.

2. Labour market in early modern China

Before we delve into estimating the level and trend of wages in early modern China, two questions need to be addressed. The first is whether labour payments in early modern China reflected the factor prices of labour. The second is whether wage-dependent labourers in China provide any useful information on the economy and the living conditions of the labour force in general.

The first concern relates to labour payments. Conventional views in the Chinese literature consider labour relations in this period 'feudal' according to one Marxist interpretation, and bear no equivalence to the concept of 'employment' in an economic sense.[18] This raises a concern as to whether labour payments, both cash and in-kind rewards, reflect factor prices of labour. In other words, whether labour payments, if there was any form of labour market, reflect market conditions.

In fact, abundant evidence demonstrates that labour markets existed in early modern China, especially after the sixteenth century, and labour hiring involved payment bargaining. Local labour markets were typically referred to as the

[18] Xu and Wu, *Zhongguo ziben zhuyi*, vol.1, pp.18-24; Fu, *Mingqing nongcun,* pp.250-5.

'manpower market'(*ren shi*), 'job market' (*gong shi*), and 'hiring market' (*yong shi*),[19] where labour gathered at plazas, bridges, and tea houses, and other places to find and bargain with potential employers.[20] The demand and supply of labour on the market can best be demonstrated by the seasonality of payments. In the public sector, government regulations published in 1615, 1690, and 1732 reveal that a premium was paid for craftsmen, artisans, and labourers to work on palace constructions in Beijing during the harvest season.[21] Such a payment premium was also found in canal and embankment projects in Shandong and Jiangsu provinces.[22] In the private sector, the day wages of unskilled labours could double, triple, and even quadruple during harvest times.[23] In some cases, strikes played a role in wage bargaining. In eighteenth-century Suzhou, the Lower Yangzi core, labour strikes, particularly for skilled workers, were not rare and the local government had to intervene in disputes, mediating and carving out payment agreements on steles.[24]

The intra- and inter-provincial movement of labour was also no rarity, particularly after the seventeenth century. Emigrants from Zhili (nowadays Hebei) and Shandong provinces were commonly found in Beijing, and Shandong origins were a main source of labour input in Manchuria from the eighteenth century onwards.[25] More rigorous examinations of nineteenth-century Beijing and the surrounding markets provide evidence for inter-regional integration — wages (cash payments and in-kind rewards) could be sticky in the short-term, but tended to respond and adjust to commodity and currency prices on the market in the long-term, even in industries where guilds existed.[26] All the above examples demonstrate certain forms of matching process between labours and employers, and payment setting involved bargaining and negotiating.

---

[19] Wu, "Qingqianqi nongye;" Jiang, "beifang laodongli;" Fang, "Jiangnan de laodongli."
[20] Jiang, "beifang laodongli," p.86; Fang, "Jiangnan de laodongli," p.8.
[21] 1615 regulations see *Gongbu changku xuzhi*, vol.7; 1690 regulations see *Kangxi daqing huidian*, vol.132, 9b; 1732 regulations see *Yongzheng daqing huidian*, vol.198.
[22] See *Qinding hegong shijia zeli zhangcheng*, vol.1, 122a.
[23] Huang, "Qingdai nongcun changgong," p.71; Gamble, "Daily wages", p.46.
[24] *Mingqing Suzhou gongshangye beikeji*, pp.63-78.
[25] Tang, *Jindai Shandong nongcun*, p.773; Wang, *Jindai zhongguo jiage*, pp.150-1.
[26] Peng, "Jindai Beijing jiage," p.23-5.

The second concern relates to the size of wage-dependent labour in the Chinese context. In Northwestern Europe, a growing percentage of rural workers became proletariats and sold their labour in the city in return for wage payments. These wage-dependent workers may have already constituted up to half of the labour force in early modern times.[27] By comparison, there are concerns that wage labour comprised a minority of the labour force in early modern China; correspondingly, studies on wage labour, including any implications derived, may suffer from under-representativeness regarding the working population, and give no useful information on the economy and living standards in general.

Indeed, the current evidence indicates that wage labour consists of a minority of the Chinese labour force. However, misinterpretations regarding the size of this minority should be noted and clarified. In some English scholarly works, wage labour in early modern China was claimed to consist of approximately 3 per cent of the population, but a trace in the Chinese literature suggests that this estimate is based upon the agricultural sector rather than the whole economy.[28] Even in the agricultural sector, estimates often exhibit considerable variations —higher estimates indicate that 16 per cent of rural workers were wage farmers (including day and monthly-work farmhands), but this figure could be as low as from 1 to 3 per cent, figures that usually refer to workers under long-term or yearly contracts.[29] Recent inquiries even imply much higher figures than these conventional estimates.[30]

---

[27] Van Zanden, *The Long Road*, p.117.

[28] Xu and Wu (2003) claimed in *Zhongguo ziben zhuyi*, vol.1, 70, that "… in the Lower Yangzi Delta… (hired labours) they were no more than one per cent of the population" (translated from Chinese). But in the footnote, the authors referred to studies on agriculture rather than the other sector of the economy. This figure is then widely cited in the English literature and generalised as the overall size of wage-dependent labours. See, for examples, Deng and O'Brien (2016), "a survey," p.1061; van Zanden, *The Long Road*, p.117.

[29] Xu and Wu, *Zhongguo ziben zhuyi*, vol.1, p.70; Li and Jiang, *Zhongguo dizhuzhi jingjilun*, p.310; Li, Wei, and Jing, *nongye zibenzhuyi*, pp.335-6. Luo and Jing, *Qingdai Shandong*; Zhao Gang, *Zhongguo tudi*, p.224; Tang, *Jindai Shandong nongcun*, p.780.

[30] Cheng Yang (2022) suggests that agricultural labourers in North China can be around a half of all agricultural labour force between 1761 and 1890. The figure may be lower in the Lower Yangzi but could still reach about 20%. These estimates are much higher than the conventional figures. See Yang, "A new estimate."

Although wages were not a main source of earnings in rural areas, they often provided supplementary incomes. The long-term or yearly agricultural workers were unpopular in rural China, but short-term farmhands often appeared in text records. Many of the latter had landholdings of their own and were hired when they had completed their own work.[31] A sample of 197 villages in late nineteenth-century Shandong, a major agricultural province, suggests that approximately 40 per cent of all hired farmhands, including short-term and long-term, may have possessed their own land.[32] In some cases, tenant and wage farmers also possessed land. There were local practices in Shandong where poor peasants rented out their small plots of land and were hired as wage labour to cultivate the land they rented out.[33]

The public sector also provided regular working opportunities for rural labour that extended beyond working as wage farmhands. Along the Grand Canal, the governments undertook maintenance work on an annual or regular basis between October and March (in the Chinese calendar). At the local level, embankment constructions and maintenance were also carried out on a regular basis, especially along the cities and towns in the Lower Yangzi core.[34] These hydraulic projects often commenced in off-seasons, and each project hired hundreds to thousands of rural workers. A wage premium was often paid if the projects had to be undertaken or lasted into the harvest time. In the private sector, such as in the printing industry, skilled workers could switch between farming and wage activities during different seasons of the year.[35]

Notwithstanding some preliminary estimates tending to suggest a much larger proportion of full-time wage labour in urban areas than in rural areas, the

[31] Fei, *Peasant Life in China*, p.179.
[32] Jing and Luo, *Qingdai Shandong*.
[33] Tang, *Jindai Shandong nongcun*, p.731.
[34] See the 1933 version of the Gazetteer of Wujiang County, vol.20; vol.21 for hydraulic projects in Suzhou; 1936 version of the Gazetteer of Shanghai County, vol.11 for Shanghai; Wu's *Huaixi nianbiao* (1929) for Huai River.
[35] Zhang, *Zhongguo yinshuashi*, p.757.

evidence is more scattered.[36] Occupational structure may present some supplementary evidence in this regard. Conventionally, it has been argued that the agricultural sector in early modern China employed around 80 per cent of the labour force.[37] However, recent research implies a smaller figure – 58 per cent (male labour only) throughout the eighteenth and nineteenth centuries.[38] Other more scattered evidence indicates that employment in industries and services in large cities and commercial centres such as the Hua-Lou district of the Lower Yangzi may have been higher, comprising some 70 per cent of the local labour force (including the self-employed).[39]

The implications of the preceding discussion is that full-time wage earners in early modern China may have been a minority, but 1 to 3 per cent seems to capture an inaccurate picture of this cohort in both agricultural and non-agricultural sectors of the economy, let alone that workers were involved in non-full-time wage activities more often. Either as primary or supplementary sources of income, wages influenced the labour input strategy between wage and non-wage activities.

3. Data sources and processing

Compared with European cases, wage and price records in early modern China are noticeably limited (especially before the eighteenth century). To address this, I pooled wages in the public and private sectors to construct a wage index in China between 1530 and 1840, and then derived a wage series for the Lower Yangzi delta. In total, 6,006 quotations of wages were collected. Wages in the public sector include payments to doormen and runners (*yi* or *ya yi*) in prefectural and county governments, to the Grand Canal and riverbank construction labourers, and to Beijing's skilled and unskilled workers in the

[36] Fang (2004) suggests that in Zhouzhuang, Suzhou, wage labours might count about 20 per cent of local population in the mid-19th century. See Fang, *Jiangnan de laodongli*, p.6.
[37] Guo et al., "occupational structure".
[38] Yang, "A new estimate".
[39] Li and van Zanden, "Before the great divergence," p.967.

construction, handicraft, and service industries. Wages in the private sector include woodblock engravers in the Lower Yangzi and a variety of scattered quotations across China. To construct consumer price indices, three price series were available which I discuss in detail below.

3.1 Wage data

The first wage data set contains 1,017 quotations of remunerations to *yi*/*ya yi* (sub-official functionaries) between 1530 and 1640. No records were included after 1640 (see the further discussion below). The data were collected from China's local gazetteers (*difang zhi*) published in the sixteenth and seventeenth centuries. This data set covers nine provinces out of fifteen in sixteenth-century China, and its time and regional distributions are reported in Table 1.

Table 1. Number of Ya Yi Payment Records by Period and Region, 1530-1640

Period	*Freq.*	*Percent*	*Cum.*	*Region*	*Freq.*	*Percent*	*Cum.*
1530-1540	113	11.11	11.11	Beijing	16	1.57	1.57
1541-1550	136	13.37	24.48	North Zhili	74	7.28	8.85
1551-1560	116	11.41	35.89	Anhui	123	12.09	20.94
1561-1570	90	8.85	44.74	Shandong	118	11.6	32.55
1571-1580	134	13.18	57.92	Guangdong	83	8.16	40.71
1581-1590	86	8.46	66.37	Jiangsu	98	9.64	50.35
1591-1600	118	11.6	77.97	Jiangxi	82	8.06	58.41
1601-1610	92	9.05	87.02	Henan	34	16.52	74.93
1611-1620	60	5.9	92.92	Zhejiang	168	3.34	78.27
1621-1630	12	1.18	94.1	Huguang	89	8.75	87.02
1631-1640	60	5.9	100	Fujian	132	12.98	100
Total	*1,017*	*100*		*Total*	*1,017*	*100*	

Source: see text

Yi comprised the largest cohort of personnel in local governments. These workers were levied or hired to provide labour services such as doormen, runners, mail carriers, and police. Because *yi* were developed from corvée labour, their remunerations were expected to capture the living cost necessary or comprise the bare minimum for survival rather than the market rate. Not all *yi* records in local gazetteers satisfy this assumption. I selected only doormen (*menzi*), runners/lictors (*zaoli*), and doormen of state school (*ruxue menzi*) for the following reasons. First, they were standing *yi* and could be found in all local governments. Second, payment budgets on these services did not contain stipends on tools or office supplies.[40] It is important to note that these three works should not be confused with a type of stipends in the government's bookkeeping — in the literature, the latter was also classified as "*yi*" (service) but in fact a form of stipends to government officials. The most common titles of those stipends were the so-called *chaixin zaoli* ("log and runner/lictor"), *mafu* ("groom"), *ruxue shanfu*, and *ruxue zhaifu* ("servants of state schools").[41] Third, remunerations for these three works can be converted to day rates. In most cases, *yi*'s remunerations in local gazetteers were marked either in payments per job per person or per person per year. No exact length of the working year is given. A closer examination of government bookkeeping practices alongside the day rates of labour services from other official documents reveals that the 'yearly' payments of these *yi*'s are calculated by day rates multiplied by a theoretical length of 360 days of work, even though in practice a year-long labour service was usually divided into three or four terms, and each term could be 10 days or a season long (90 days).

Given the widespread practice of non-statutory tax surcharges among local governments, one potential concern over this data source is that the setting of *yi* payments could be arbitrary and provides no meaningful information on labour costs. A cross-check on the raw data indicates that budget records in local

[40] From the 16th century onwards, costs on office supplies were gradually removed from *zaoli*'s remunerations and became a separate category in local budgets. A contrary example is the payment on prison guards, which included the spending on instruments of torture.
[41] See also Hu, *Mingdai guanfeng* on this.

gazetteers published before the mid-seventeenth century contained certain information on labour costs; nonetheless, they no longer serve their intended purpose after the mid-seventeenth century due to the changing practices of fiscal and accounting institutions. Most noticeably, the raw data before 1644 reveals clear payment differences among jobs and regions (both within and between provinces). However, payment budgets on standing *yi*, except for the doormen of state schools, were all unified into 6 *taels* of silver per annum, regardless of work type and region, and remained unchanged after 1652. These differences help explain why systematic collections of non-statutory surtax incomes became more prominent after the mid-seventeenth century. Therefore, I exclude all *yi* data in local gazetteers published in Qing period (1644-1911). Figure A4 in Appendix 2 compares *yi* data before and after the mid-seventeenth century.

A further concern is to what extent *yi* data before 1644 reflect labour costs. To test the mechanism of payment setting for conscripted labour, a sample data was compiled to include both *yi* remunerations and market rates paid in the public sector between 1571 and 1615. I selected the following cities for this test: Dongchang, Yanzhou, Xuzhou, Yangzhou, and Beijing. These cities were connected by the Grand Canal where both market and non-market rates for canal construction labourers could be found. As the majority of market wage records come from Beijing between the 1590s and 1610s, other cities are used only as control groups. Estimated results indicate that, on average, market rates were 35 per cent higher than remunerations for conscripts. The full test results are reported in Appendix 2. One interpretation of this difference is that conscript payments equated to the cash value of living expenses, and the estimated market premium was likely to be the cash component of wages on the market (*gongyin* or *gongqian*). In early seventeenth-century Lower Yangzi, cash components were around 20 per cent of a hired farmhand's wage, with the remainder being foods and other payments in-kind.[42] Cash wages for unskilled urban workers were

[42] *Manyan zhaicao* (曼衍斋草) recorded that a long-term contract for the mulberry field workers was paid with 2.2 *taels* of silver per annum in cash and food payments of 7.2 *shi* of rice (or 8 *taels* equivalent) per annum in early-seventeenth-century Lower Yangzi. In total, it gives 10.2 *taels* of

higher, usually ranging between 20 and 40 per cent.[43] The market premium found in the test falls into the range of the cash component of unskilled wages.

The second data set contains 689 wage records in the public sector (other than *ya yi*) between 1571 and 1840. It was collected from various sources and includes artisans, craftsmen, and labourers employed by the governments in Beijing and Rehe, as well as hydraulic labourers (canals and riverbanks), mainly in Yanzhou, Dongchang (North China), Xuzhou, and Yangzhou (the Lower Yangzi). The wages collected are either in day rates or rates per working day (*gong*), and include both payments in-kind and cash. Industrial and locational distributions are reported in Table 2.

Table 2. *Number of Public Sector Wage by Industry and Location, 1571-1840*

Industry	*Freq.*	*Percent*	*Cum.*	*Location*	*Freq.*	*Percent*	*Cum.*
Printing	12	1.74	1.74	Beijing	225	32.66	32.61
Construction	385	55.88	57.62	Rehe	371	53.83	86.50
Handicraft	264	38.32	95.94	Other North	38	5.52	92.92
Service	28	4.06	100	Lower Yangzi	55	7.89	100
Total	*689*	*100*		*Total*	*689*	*100*	

Source: see text

Wages in Beijing were collected from four sources: Miscellaneous Notes of Wanping County Government (*Wanshu zaji*), Factory Instructions of the Ministry of Work (*Gongbu changku xuzhi*), Collected Statutes of the Great Qing (*Daqing huidian*), and the printed primary source on the payroll records of the Ministry of Imperial Household (*Neiwufu zaobanchu qianliang kupiao*), as well as accounting records on yearly maintenance projects in Rehe (*Nianbu suixiu hushi yongguo yinliang qingce*). Miscellaneous Notes is a private publication by Shen Bang, the magistrate of Wanping county between 1590 and 1593

silver per annum, or 0.028 *taels* per day. Another quotation from *Shengshi nongshu* (沈氏农书) shows that a long-term farmhand was paid 5 *taels* of silver in cash, 5.5 *shi* of rice, 1 *tael* of travelling expenses, 0.3 *taels* of farm tools, and 1.2 *taels* of firewood and liquor. This gives in total 13 *taels* of wage payment. The duration of this contract is unknown, possibly calculated for 360 days, and the day rate could be 0.036 *taels*.

[43] Deng and O'Brien, "a survey," p.1063.

(subordinated to Beijing, then called Shuntian prefecture). It contains wage quotations on various artisans and labourers hired by the local government in Wanping and central government in the city of Beijing between 1588 and 1593. Factory Instructions is an official publication around 1615 and contains records on wages and materials for construction and crafting projects, including payments on standing craftsmen (*shiliang jiang*) and casual workers. The Collected Statutes are official publications on the administrative regulations, laws, and cases between the mid-seventeenth and late-nineteenth century, while payroll records of the Ministry of Imperial Household and accounting records in Rehe construction/maintenance projects are printed archive materials. All recorded scattered wages, budgetary and issued, for artisans, craftsmen, and building labourers employed by the central government in Beijing between 1659 and 1840. Whether it was in Beijing city or Rehe (a place where the emperors constantly stayed during the summer), the court applied the same payment standards. In fact, records on Rehe projects suggest that many artisans who worked in Rehe were hired from Beijing. Therefore, in the dataset, wage records in Rehe and Beijing are grouped into one. Furthermore, it is important to note that construction wages in Rehe's bookkeeping remained unrevised after 1790 when the government began to substantially raise construction wages (mainly for those working on canal and embankment projects in Zhili, Shandong, and the Lower Yangzi delta). These revised payment standards comprised an 'allowance' (*jintie*) in addition to the 'exemplary wages' (*lijia*). Unfortunately, however, I found no sufficient evidence to revise the exemplary wages in Rehe. There would have been a risk of underestimating construction wages after 1790 if the 'exemplary wages' were included. Hence, wage data in Rehe after 1790 were omitted from the data set.

Wages on hydraulic projects were collected from diverse sources, including local gazetteers, Veritable Records of the Ming (*Ming shilu*), Collected Literature of the Ming (*Huangming jingshi wenbian*), Overview of River Administration (*Hefang yilan*), the Collected Statutes of the Great Qing (*Daqing huidian*), and The Complete Book of Hydraulic Projects in the Lower Yangzi Delta (*Chongjun*

Jiangnan shuili quanshu). Except for local gazetteers, other materials are selected publications of the memorials of officials and contain a mix of budgetary and issued wage payments. Veritable Records are the official compilation of government diaries, ministerial papers, and officials' memorials released on a daily basis. Collected Literature, the Overview, and the Complete Book are all compilations of selected memorials and official reports in the sixteen, early seventeenth, and early nineteenth centuries.

The third data set contains 3,773 records of cash wages for woodblock engravers employed by Buddhist temples in Suzhou, Hangzhou, Jiaxing, Changshu, Zhenjiang, and Songjiang between 1601 and 1686, the core cities in the Lower Yangzi delta. These cash wages were collected from the printing costs of Buddhist scriptures, Jiaxing Tripitaka (*Jiaxing zang*, also referred to as *Lengyan zang*, *Wanli zang*, or *Jingshan zang*). As the project was under the supervision of the same group of people, these skilled workers were employed by the same employer, worked for the same project, and paid according to the same standard. Except for the year 1620, wage records between 1601 and 1644 are consecutive. Following the dynastic change in 1644, no records are available for 1647, 1649, 1658, 1659, and 1678-85. Locational distributions of these wages are reported in Table 3.

Table 3. *Number of Woodblock Printing Costs by Location, 1601-1686*

Location	*Freq.*	*Percent*	*Cum.*
Jiaxing	524	13.89	13.89
Hangzhou	1,916	50.78	64.67
Suzhou	258	6.84	71.51
Changshu	231	6.12	77.63
Zhenjiang	795	21.07	98.7
Songjiang	39	1.03	99.73
Other	10	0.27	100
Total	*3,773*		

Source: See text. "Other" includes Guangji and unknown locations.

Payment records in Jiaxing Tripitaka should adequately represent the market rate during this period.[44] The project was mostly funded by public donations and a large number of scriptures recorded the names of donors, the dates of payment, and the costs of engraving, calligraphing, and woodblock (pearwood). In some cases, scriptures also recorded the names of volume editors, engravers, and calligraphers. Engravers' wages are expressed in piece rates (silver *tael* per 100 words) which can be converted into day rates, presuming that an average engraver carved 125 words a day (in *Song* font).[45] A considerable proportion of cash wage records in the original texts are the total payments, rather than separate entries, for both calligraphers and engravers (*xie gong* and *ke gong*). I extracted the engravers' piece rates by presuming that the pay ratio between them remained the same throughout this project.

The fourth data set contains 527 scattered wage records collected from secondary literature, as well as printed primary sources on labour disputes stored in Qing empire's central and local judicial archives. They cover the period from 1724 to 1840, and except for Xinjiang and Mongolia, encompass nearly all eighteenth- and nineteenth-century Qing territory. The distribution of these wage records is reported in Table 4. I discuss the processing of this dataset along with the others below.

[44] When Jiaxing Tripitaka was initiated in Mount Wutai in the 1570s, the cash wage standard to woodblock engravers was 0.04 *taels* of silver per 100 words, which was claimed to be the common piece rate in North China. In Beijing, this was also the piece rate paid on the market (see Liu, *Zhuozhong zhi*, 14). When the workshop moved to the Lower Yangzi in the 1590s, the piece rate was set as 0.035 *taels* of silver, which was close to the standard paid by *Jigu ge* (0.03 *taels*), one of the most famous printing workshops in the mid-seventeenth century (see Ye, *Shulin qinghua*, p.154). Mao Jing, the owner of *Jigu ge*, was also one of the major donors to Jiaxing Tripitaka. Many engravers worked for *Jigu ge* also appeared in Jiaxing Tripitaka.

[45] A woodblock engraver was able to carve at least 100 to 110 words in *Song* font per day. Workers with more experience were able to carve 130 to 160 words per day. On average, I presume that 125 words was the usual workload. See Zhang, *Zhongguo yinshuashi*, p.747; *Qingneifu keshu dangan shiliao huibian*, vol.2, p.454; *Lidai keshu gaikuang*, pp.558-9.

Table 4. Number of Private Wage Records by Period and Region, 1724-1840

Period	*Freq.*	*Percent*	*Cum.*	*Region*	*Freq.*	*Percent*	*Cum.*
1724-1730	15	2.85	2.85	Northeast	52	9.87	9.87
1731-1740	34	6.46	9.30	Beijing	26	4.93	14.8
1741-1750	33	6.26	15.56	Central	67	12.71	27.51
1751-1760	39	7.40	22.96	North	127	24.10	51.61
1761-1770	18	3.42	26.38	South	55	10.44	62.05
1771-1780	8	1.52	27.89	Lower Yangzi	41	7.78	69.83
1781-1790	11	2.09	39.98	Northwest	54	10.25	80.08
1791-1800	44	8.35	38.33	Southwest	105	19.92	100
1801-1810	134	25.43	63.76				
1811-1820	94	17.84	81.59				
1821-1830	53	10.06	91.56				
1831-1840	44	8.35	100				
Total	*527*	*100*		*Total*	*527*	*100*	

Source: See text

To pull these wage records together for regression analysis, two additional steps of processing are needed: payments in kind and currency conversions. First, with respect to payments in kind, one difficulty of interpreting historical wages in China comes from wage formation. In early modern times, payments in kind accounted for a significant proportion of wages in China, especially for unskilled labours. In the private sector, long-term contracts were mainly, even mostly in many cases, remunerated with payments in kind, particularly in rural areas. In-kind rewards normally included daily meals and accommodation, and additional grain and clothes were also common, and usually paid by the end of the year or contract. For short-term contracts, cash components were generally larger, and day and monthly works did not always offer meals and accommodation; this

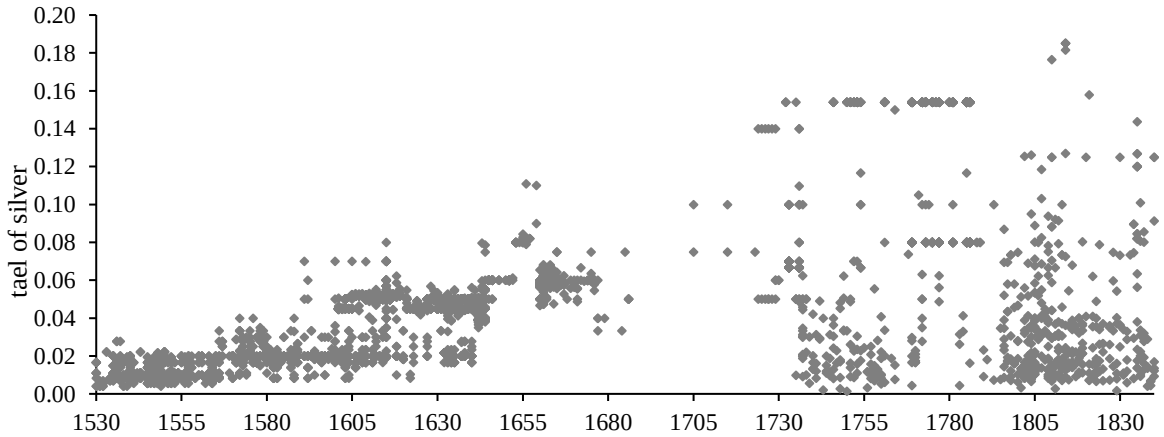
depended on industries and cases. Ideally, payments in kind should have been valued on a case-by-case basis, but the original text often provided no indication of this. An alternative strategy, therefore, was to take a reference of those records that are more certain regarding the inclusion of both cash payments and in-kind rewards. If a wage record was too low against a common level of total wage, it was assumed to be cash payments only (payments in kind were often unrecorded in the private sector). In public sectors, similarly, skilled (and highly-skilled) workers were paid in two different ways. Wage quotations on standing artisans and craftsmen often recorded only their daily or monthly allowance of food and other in-kind rewards. Additional payments on workdays were recorded separately as in many cases they were issued by a different government body. These workers were referred to as food provision craftsmen and were mainly found in the court's manufacturing workshops and silk factories. In comparison, wage quotations for casual labourers and workers were usually total wages with cash and in-kind payments included. These casual workers were referred to as *waigu* (external employment), and appeared more frequently in government records after the mid-seventeenth century when the imperial law in 1645 formally removed the forced hereditary status of artisans and craftsmen.[46] To avoid underestimation, workers in public sectors are distinguished between those additional food allowance and those without.

Second, with respect to currency conversions, cash wages were often issued in local currencies, and thus required careful read. In the public sector, wages were mostly expressed in silver numeraire, but the weight and purity standards of silver currencies varied between and within the central departments and local authorities.[47] The most common standard was the so-called *kuping* weight, where one *tael* of silver equalled 36.9 grams in the sixteenth century or 37.3 grams after the mid-seventeenth century.[48] In the private sector, payments involved both silver and copper currencies. Employers, especially guilds, tended

[46] Fan, "Qingdai feichu jiangji;" Wei, "Shishuo mingqing shidai."
[47] Deng, "Miracle or mirage," p.336.
[48] Qiu ed., *Zhongguo lidai dulianghеng kao*, p.419; p.512.

to specify the numeraires of payment to avoid disputes.[49] In the late-sixteenth century, the official exchange rate between silver *tael* and standard copper coin (*zhiqian*) was approximately 1:800 in Beijing, principally due to the heavier weight of copper coins issued by mints in the capital. In the Lower Yangzi delta, the official exchange rate was usually around 1:1200.[50] Notwithstanding the increasing coinage after the mid-seventeenth century, standard coins (*zhiqian*) served more like a numeraire for bookkeeping rather than a transaction intermediary. In fact, a variety of local coins were more popular in the market.[51] For instance, there was the 'capital coin' (*jingqian*) which circulated in North China, including Shandong province, North Zhili, and Beijing. This was traded at a ratio of 2:1 against the standard coin (*zhiqian*). Conversely, in Northeast China (Manchuria), wages were commonly marked in 'eastern coin' (*dongqian*) or 'market coin' *(shiqian)* which traded at a ratio of 6:1 against the standard coin. Unless wages were explicitly marked in the standard coin, wage records from North and Northeast China were treated as being in local currencies. Figure 1 plots all raw data converted into silver *tael*.

Figure 1. Raw Data Converted into Silver Tael, 1530-1840 (N=6,006)



Source: See text

[49] *Qingdai qianjiadao baxian dangan xuanbian*, p.238.
[50] Wang, *Xuwenxian tongkao*, vol.18.
[51] Peng, "Jindai beijing huobi."

3.2 Price data

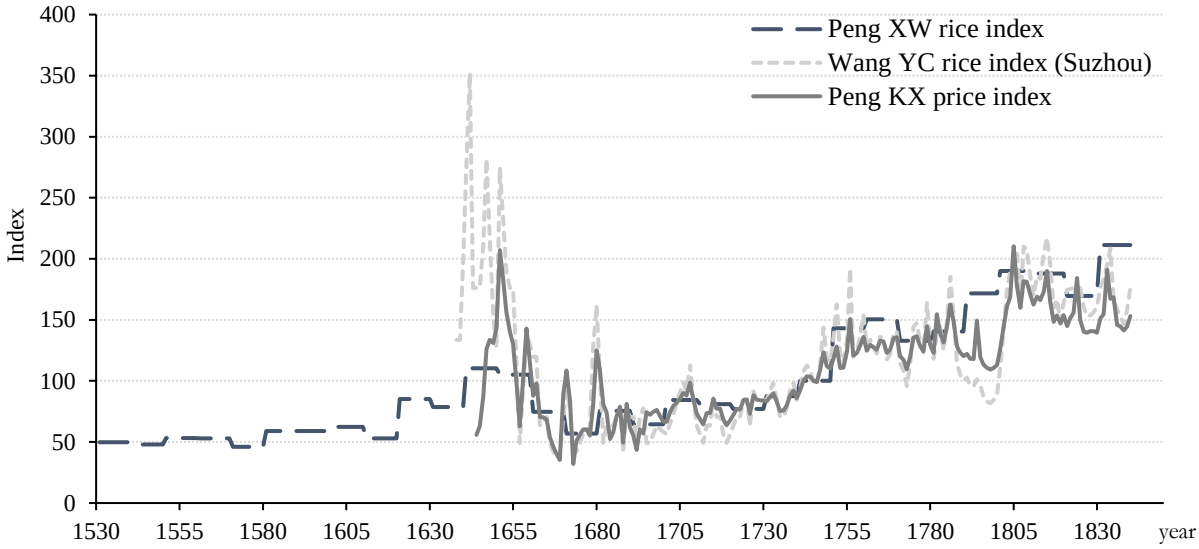
To estimate the living standards of wage labour in early modern China, the standard practice deflates nominal wages with the cost of a basket of consumer goods. However, once again, price data is noticeably limited for the Chinese case. A common approach for resolving this is to take rice and grain prices as a benchmark of the consumer price index. Another approach is to extrapolate the consumer price index by applying the movement of rice prices to the cost of a consumption basket at a specific point in time, or to interpolate a time series of consumer prices with scattered data.

Empirical studies have indicated that rice prices were highly correlated with other commodities in early modern and modern China.[52] To a certain extent, rice was used as a currency in kind in fifteenth- and sixteenth-century China when commodities were often valued against the weight of rice.[53] Rice price was also a benchmark for converting taxes paid in kind into money payments. Although it may not capture short-term fluctuations, the price of rice provides a reference for the movement of prices on other commodities in the long term.

Rice and grain prices for the period examined in this paper are available from three sources. First, Peng Xinwei's decadal price index of rice (1530-1840) captures the average and national level of rice prices.[54] Second, Wang Yeh-Chien's yearly price index of Suzhou rice in 1638-1840 is more representative of the top-grade rice.[55] Wang also produced a more general and larger database of grain prices at the Academia Sinica, but unfortunately these price series are not available before 1736. Third, Peng Kaixiang's yearly consumer price index is addressed (1644-1840).[56] It is mainly computed based on grain prices, and is consistent with Wang's index.

[52] Peng, *Qingdai yilai de liangjia*, pp.33-40; Wang, *Jindai zhongguo wujia*, pp.20-3.
[53] Li, "Cong Mingdai de qiyue."
[54] Peng, *Zhongguo huobishi*, p.497.
[55] The Qing Dynasty Grain Prices Database of Academia Sinica provides the prices of top-grade rice which match Wang's Suzhou rice series.
[56] Peng, *Qingdai yilai de liangjia*, pp.168-76.

Figure 2. Price indices, 1530-1840 (1745=100)



Notes and Source: Peng Xinwei's decadal rice prices see Peng, *Zhongguo huobishi*, p.497; Wang Yeh-chien's yearly Suzhou rice prices see Secular Wang, 'Trends of Rice Prices in the Yangzi Delta, 1638—1935', in Chinese History in Economic Perspective, pp.40-5; Peng Kaixiang's consumer price index see Peng, *Qingdai yilai de liangjia*, pp.168-76, Appendix 5.

These price indices are often used to extrapolate consumer prices. For instance, Allen et al. (2011) provided the costs of two consumption baskets for Beijing and Suzhou, respectively in 1750.[57] For Suzhou, the authors extended Shanghai's twentieth-century retail prices with Wang Yeh-Chien's Suzhou series and built a bare-bones basket that supplies 1,940 calories per day from the cheapest available carbohydrates, and non-food items including cloth, candles, lamp oil, and fuel.

Allen's Suzhou basket provides a starting point for estimating living standards in early modern China, but appears to underestimate the weight of food consumption and overestimate the weight of energy consumption for poor people in the Lower Yangzi region. Although no price details are indicated for each item in Allen's Suzhou basket, Table 5 compares Allen's Beijing baskets with Huang Jingbin's Lower Yangzi basket for household consumption. Allen's basket represents a bare-bones level of consumption, while Huang's basket represents the average level of household consumption in a peasant family in the Lower

[57] Allen et al., "Wages," p.21.

Yangzi and includes vegetables, meat, fish, eggs, and several flavourings. In Table 5, the major differences between Allen and Huang's baskets are the weights of food, light (candles and lamp oil), and fuel consumption. In Allen's bare-bones basket, foods comprise 65.82 per cent of the expenditure on basic needs – which I define as every item in Allen's basket, including food, flavouring/coking oil, clothing, fuel, and candles/lamp oil. Conversely, in Huang's structure of family consumption, food consumption contains 75.25 per cent of basic needs. On the other hand, light and fuel consumption constitute 22.98 per cent of total spending in Allen's basket compared to 9.85 per cent in Huang's.

Table 5. Annual Family Consumption of a Chinese Family Around 1745 (grams of silver)

Allen's Beijing basket, barebone			Huang's Lower Yangzi basket, average		
Basic needs	*Cost/person*	*Weight*	*Basic needs*	*Cost/5 ppl*	*Weight*
sorghum	85.92	46.80%	rice	779.57	52.78%
beans	16.8	9.15%	vegetables	220.07	14.90%
meat/fish	6.12	3.33%	meat&fish		
cooking oil	12	6.54%	flavouring&oil	111.9	7.58%
(food consumption - 65.82%)			(food consumption - 75.26%)		
soap	2.145	1.17%	soap	n/a	n/a
linen/cotton	18.42	10.03%	cloth	220.07	14.90%
candles	4.29	2.34%	candles	22.38	1.52%
lamp oil	4.29	2.34%	lamp oil		
fuel	33.6	18.30%	fuel	123.09	8.33%
total	183.585	100.00%	total	1477.08	100.00%

Source: Allen's basket sees Allen et al., "Wage, prices, and living standards,' 25; Huang's basket see Huang, *Minsheng yu jiaji*, 307-8.

Two aspects of Allen's basket need to be modified: first, the structure of household consumption in the Lower Yangzi region; and second, the selection of a 'cheap' source of calories for a subsistence level of food intake. Huang's consumption structure is more representative of mid-eighteenth century Lower Yangzi for the following reasons: 1.Huang estimated these expenses according to direct evidence and records of the eighteenth century; 2. The weight of a 'subsistence' level of food intake in Allen's basket was expected to be higher than Huang's more respectable calculations, but we observed the opposite; 3.Allen

assumes the same level of energy consumption in Europe and China (3 BTU for subsistence and 5 BTU for respectable levels), but the weight of energy consumption can vary significantly in the two regions, as evidenced by the differences in Allen and Huang's baskets. Fuel consumption in the Lower Yangzi was expected to be lower than that in Beijing, given a warmer climate in the former region. Given that Chinese employers usually supplied meals and living places for long-term contracts (and sometimes short-term contracts too), an unskilled labourer's spending on light and energy could be even lower. For these reasons, we need to modify China's consumption baskets used by Allen.

Based on Huang's basket, I reconstructed a bare-bones level of consumption in Table 6 for the Lower Yangzi around 1745, while retaining the key assumptions from Allen. Following Allen's approach, food consumption in the new basket provides 1,940 calories per day from the cheapest available carbohydrate. Instead of top-grade rice, I averaged per unit costs for inferior rice along with barley as the cheapest available carbohydrate in the Lower Yangzi region, setting the consumption per person per year as 171 kilograms. In eastern parts of the Lower Yangzi, such as Jiading and Songjiang (the area of cotton planting), barley (and sometimes wheat) were popular substitutes for rice in certain seasons, especially for poor people.[58] Prices of rice (inferior), barley, and beans come from the prices database of Academia Sinica and are a twelve-month average for Jiangsu province.[59] Consumption of beans, meat/fish, and cooking oil were set to be the same as in Allen's basket (20 kg, 3 kg, and 3 kg per person per year, respectively). To be consistent with Huang's basket, this food expenditure was set to be 75.26 per cent of the total spending. The weight of clothing expenditure followed Allen's basket. The weights of light and energy spending were replaced by Huang's suggestion.

[58] Li, *Jiangnan de zaoqi gongyehua*, p.98; Huang, *Minsheng yu jiaji*, pp.56-7.
[59] https://mhdb.mh.sinica.edu.tw/foodprice/about.php

Table 6. Revised Costs of a Subsistence Basket in the Lower Yangzi in 1745

Consumption	*Quantity per person per year*	*Cost / unit (grams of silver)*	*Total cost (grams of silver)*
rice(inferior)/barley[1]	171kg	0.46	78.66
beans[1]	20kg	0.50	10.05
meat/fish[1]	3kg	2.04	6.12
cooking oil[2]	3kg		11.29
soap[2]			1.97
linen/cotton[2]			16.86
candles/lamp oil[3]			15.16
fuel[3]			
Total			140.11

Notes and source:
1. Per unit costs for rice(inferior) and barley are averaged to simulate food consumption for poor people in the Lower Yangzi. Prices are taken from https://mhdb.mh.sinica.edu.tw/foodprice/about.php
2. Expenditures on cooking oil, soap, and cloth are calculated using their weights in Allen's basket.
3. Expenditures on candle/lamp oil and fuel are calculated using their weights in Huang's basket.

It is important to note that the weight of food consumption in the new bare-bones basket was computed based on Huang's consumption structure for an average family of five (including one couple and three seniors/juniors). This structure may still underestimate the weight of food consumption for poor people, especially at the 'subsistence' level. Therefore, this new basket represents only a theoretical situation that follows Allen's assumptions on calorific intake.

4. Wage index, 1530-1840

To be consistent with the existing literature, the day wage of an unskilled construction labourer in the Lower Yangzi was selected as the basis of estimation. The following OLS model was defined for the wage quotations reported in Table 1-4:

$$ln(wage_i) = a + \sum_{t=1}^{31} \beta_t \cdot period_{t,i} + \sum_{j=1}^{8} \eta_j \cdot region_{j,i} + \sum_{k=1}^{6} \gamma_k \cdot industry_{k,i}$$
$$+ \sum_{j=0}^{3} \sum_{p=0}^{2} \cdot \delta_{j,p} \cdot skill_{j,i} \cdot food_{p,i} + \sum_{m=0}^{2} \theta_m \cdot payment_{m,i} + \sum_{l=0}^{4} \rho_l \cdot miscellaneous_{l,i} + \sum_{o=0}^{4} \varphi_o \cdot woodblock_{o,i}$$

where $wage_i$ is the log of the daily wage of labour$_i$; a is the constant term; and $period_{t,i}$ is the period of observation grouped into 31 sequential periods from 1530

to 1840. Except for 1641-1650, which is further divided into 1641-1644 and 1645-1650 to capture the dynastic change of 1644, all other periods are decennial. Regarding the remainder of the model, $region_{j,i}$ is a dummy for eight regions in China, including Northeast, Beijing, North, Northwest, the Lower Yangzi, Middle, South, and Southwest; $industry_{k,i}$ is a dummy for occupations, and contains seven categories, including, *ya yi*, agriculture, construction, printing, handicraft, service, mining; $skill_{k,i}$ and $food_{p,i}$ are an intersection that captures whether $labour_i$ is unskilled, skilled, or highly skilled, and whether an observed wage record contains cash payment, payment in kind, or both; $payment_{m,i}$ is a dummy specified for the *ya yi* data source reported in Table 1. It indicates whether the payment was issued from the government or the conscription agent.[60] Finally, $miscellaneous_{l,i}$ and $woodblock_{l,i}$ are two dummies specified for the data source of printing workers reported in Table 3, and capture whether the printing cost contains additional spending on woodblocks and other miscellaneous. Full results are reported in Appendix 1.

4.1 Nominal wage

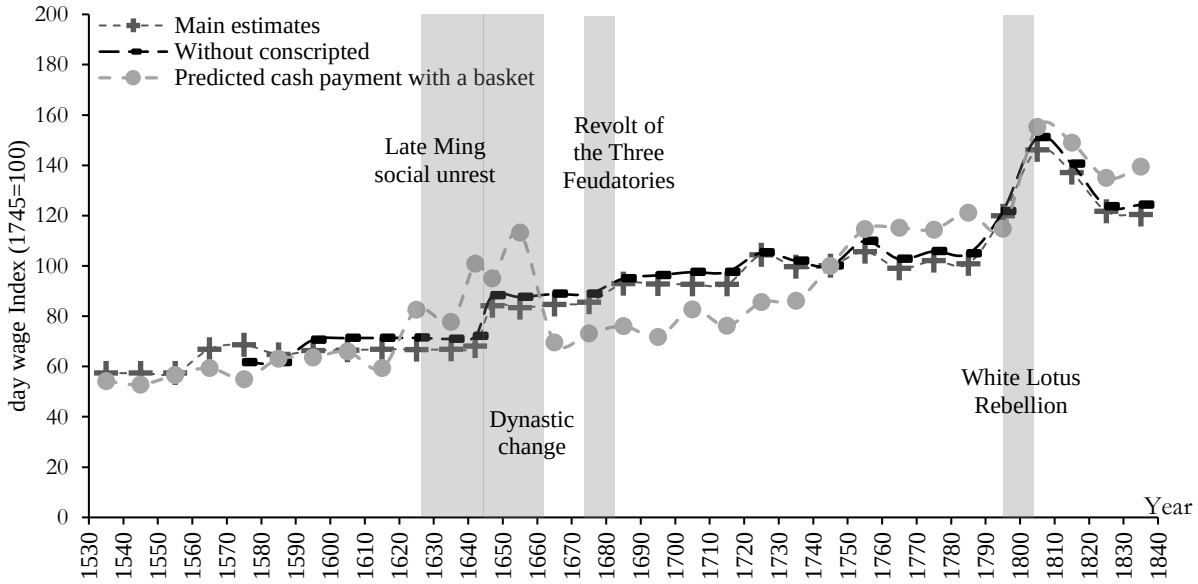
Figure 3 presents the wage indices generated by three estimation strategies, clustered to region and weighted by regional population as well as occupational structure.[61] Wage predictions for 1690-1700 are interpolated with the average of 1680-1690 and 1700-1710. The main estimates present a wage index predicted with data reported in Table 1-4. To address the concern that *ya yi* data may

[60] In the government's bookkeeping, there were two ways of paying these conscripted labourers. One was called *guangei* (官给), which means the payment was issued by the government. The other was *datao* (打讨), where the government issued tax receipt (*youtie* 由帖) to the conscription agents and specified the amount of fees to be collected from people subject to conscription. Payments issued from *datao* approach were usually collected from multiple taxpayers and divided between, and this made the payment figure under *datao* lower than under *guangei*. There was in essence no payment difference between two approaches.

[61] Occupational structure follows Yang's (2022) estimates. The adjustment was made by the weight of agricultural labour force. No adjustment was made for each urban industries as there is no statistically significant wage disparity among them. Population weights are calculated by the share of population in each region suggested by Cao, *Zhongguo renkoushi*, vol.4; vol.5. I adopted different shares of population for each province, based on Cao's estimates, in the following sub-periods: 1530-1630, 1631-1680, and 1681-1840. Between 1631 and 1680, China experienced wide-spread famines, rebellions, and the dynastic change. In particular, population was declining, at different rates, between 1631 and 1644, and the civil war eventually ended by the end of the Revolt of the Three Feudatories in 1681.

generate estimation bias, the series 'without conscripted' removed *ya yi* and re-estimated the trend. To address the concern that payments in kind may not be correctly identified in the main estimates, I extracted the cash components from the main regression and added a theoretical basket of consumption, given the available price data, in the Lower Yangzi (respectable level).[62] This is denoted by 'predicted cash payment with a basket'.

Figure 3. Indices of unskilled day wages in China, 1530-1840 (1745=100)



Notes: "Late Ming social unrest" shown in the figure started from 1628 when peasant rebellions enlarged in Shaanxi province; the dynastic change is marked between1644 and 1661.

The overall tendency shown by the three specifications is consistent, whereas no sign of continuous decline is found, and nominal day wages in China continued to increase over 1530 and 1840 in general. Trends derived from the 'main estimates' and 'without conscripted' are nearly identical. The index constructed by the predicted cash payment with a theoretical basket of consumption was more volatile in the 1620s-1660s and the 1740s-1760s. This is probably caused by the presumption that payments in kind always increased and reduced

[62] Based on the ratio indicated in Allen (2001) and Allen et al. (2011), I multiplied the costs of a barebone basket in Table 6 by 2.65 to simulate a respectable basket, divided it by 365 days to simulate daily consumptions, and extrapolated by a combination of Peng Xinwei and Peng Kaixiang's price indices (Figure 2) to generate a basket series for the entire period.

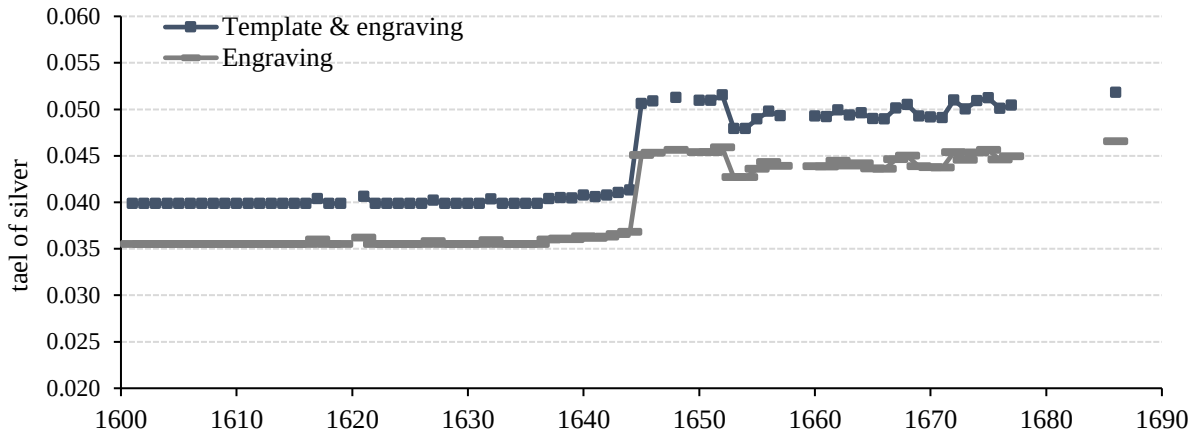
synchronously with market prices. However, this presumption is less likely to hold during a time of hyperinflation or rapid growth in prices when it is probable that employers will switch to a cheaper bundle of in-kind rewards. Moreover, such synchronisation would make prices alone the determinant of wage movements, which is indifferent to the demand and supply of labour, as payments in kind usually comprise 60 to 80 per cent of unskilled wages in the Chinese market. For these reasons, I stick to use the wage index constructed from the main estimates.

In the main estimates, five major increases are observed in the 1560s, 1640s/50s, 1680s, 1720s, and 1790s. A preliminary observation is that wage setting in the Chinese market responded to the price movement presented in Figure 2 in the long run. In the first half of the sixteenth century, nominal wages remained fairly stable until the 1560s, which coincided with a further fiscal monetisation from that period onwards. The second major upward trend began in the 1640s and reached a peak in the 1650s. The northern territory, where rebellions first began, may have experienced an earlier wage increase than the main estimates suggest. This substantial rise in wages may have resulted from the widespread plague (particularly in the northern territory), rebellions, and hyperinflation during the Ming-Qing transition. In the Qing period, the nominal wage exhibited three major rises in the 1680s, the 1720s, and the 1790s along with a temporary surge in the early decades of the nineteenth century.

The wage indices in Figure 3 are derived from a pooled data sample across the whole of China. Figure 4 and Table 7 display two more series with a concentration on the printing and construction industries in the Lower Yangzi and Beijing, respectively. Figure 4 plots the estimated yearly cash wages paid for handwriting templates and woodblock engraving in Jiaxing Tripitaka project. These two jobs received cash wages in piece rates, and food allowance was likely to have been issued in a day rate, but unrecorded. In some cases, a bonus in cash was given. Between 1601 and 1636, payment standards on template and engraving were 0.004 *taels* of silver and 0.035 *taels* per 100 words, respectively.

Cash wages began to increase from 1637, and then surged between 1645 and 1652 when the new regime occupied the Lower Yangzi and drove out the Ming residuals in the region. Notwithstanding a sizeable drop in prices in the second half of the century, cash wages did not fall at the same time. Compared with the first half of the century, cash payments increased by a quarter, and reached 0.005 *tael* and 0.045 *tael* for templates and engraving, respectively in the second half of the century.

Figure 4. Cash wages in piece rate in Lower Yangzi's printing industry, 1601-1686



Source: See the previous text.

Table 7. *Regulated Construction Wages in Beijing City and Nearby Locations (day/workday rates, silver tael)*

Location	Job type	1610s	1650s	1660s	1720s	1730s	1740s	1750s	1760s	1770s	1780s	1790s
Beijing	Inner palace, carpenter/stonemason/ bricklayer master (harvest season)	0.08	0.24	0.22	0.18	0.154	0.154	0.154	0.154	0.154	0.154	0.154
	Inner palace, carpenter/stonemason/ bricklayer master (off-season)	0.07	0.19	0.14	0.14	0.154	0.154	0.154	0.154	0.154	0.154	0.154
	Exterior, carpenter/stonemason/ bricklayer master (harvest season)	0.07	0.22									
	Exterior, carpenter/stonemason/ bricklayer master (off-season)	0.06	0.17	0.14								
	Inner palace, labourer (harvest season)	0.05		0.08	0.08	0.08						
	Inner palace, labourer (off-season)	0.045		0.07	0.07	0.08						
	Exterior, labourer (harvest season)	0.05										
	Exterior, labourer (off-season)	0.04		0.07	0.07							
Rehe	Carpenter/stonemason/ bricklayer master (palace construction)					0.154	0.154	0.154	0.154	0.154	0.154	0.154
	Carpenter/stonemason (embankment construction)											0.12
	Labourer (palace construction)					0.08	0.08	0.08	0.08	0.08	0.08	0.08
	Labourer (embankment construction)											0.075
Yongding River	Carpenter/stonemason (embankment construction)					0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Labourer (embankment construction)					0.07	0.07	0.07	0.07	0.07	0.07	0.07

Notes and source: Beijing's regulated construction wages in 1610s come Gongbu changku xuzhi, vol.7. Wages paid at Shanling gongsuo are selected because the job categories matched the samples in the 1650s collected from Guangxu qinding daqing huidian shili, vol.952, 4b-5b. 1730s-1790s are collected from Neiwufu zaobanchu qianliang kupiao. Rehe wages come from bookkeeping records reprinted in Rehe dangan. Yongding River wages were found to be the same in two sources published in 1743 (Zhili wudao chenggui) and 1815 (Jiaqing Yongdinghe Zhi). I assume they remained unrevised, as regulated wages in Beijing and Rehe neither received revision during this period.

Table 7 presents the regulated construction wages in Beijing between the 1610s and 1790s. Regulation wages in two other locations, Rehe and Yongding River, are also reported in Table 7. Rehe was the royal mountain resort where emperors stayed during the summer, and Yongding River was a waterway near the city of Beijing. These construction wages were counted in silver numeraire, but in some cases were paid in copper coins or a mix of silver and copper currencies.[63] Unskilled wages are in day rates and skilled/highly-skilled wages are usually in workday rates (*gong*).

Regulated construction wages in Beijing increased more dramatically than the printing wages in the Lower Yangzi during the dynastic change, but remained unchanged (or unrevised) throughout the second half of the eighteenth century. Regulated wages in Beijing were generally classified into six categories: interior work (*neigong/hongmen neigong*), exterior work (*waigong/hongmen waigong*), harvest season (*changgong*), off-season (*duangong*), craftsmen (*jiang*), and labourers (*fu*). From 1736 onwards, payments in harvest and off seasons were standardised into one.[64] Wages for palace construction and maintenance in Rehe also shared the same payment standards as those in Beijing. By contrast, wages for embankment projects in Rehe and Yongding River were considerably lower – in the 1730s, for instance, carpenters, stonemasons, and bricklayer masters, as well as labourers were paid 22 per cent and 12 per cent lower, respectively. Many of the craftsmen who worked on the Rehe and Yongding River projects were hired from Beijing, so sources of labour input should not be a major reason for wage differences.[65] A more sensible reason is that palace projects were more likely to seek the best craftsmen, and therefore set a wage premium. Furthermore, this premium is evident among labourers employed for *neigong* and *waigong* in Beijing.

[63] See *Guangxu daqing huidian shili*, vol.214, 14a-15b; vol.220, 1a-7b.
[64] *Guangxu daqing huidian shili*, vol.952, 5b.
[65] For example, a memorial in 1801 shows that stonemasons hired on Yongding River maintenance project this year were hired from Beijing. See document no. *Gugong*091972 reprinted in *Gongzhongdang Jiaqingchao zouzhe*, volume 10, p.345.

Worth noting that the level and trend of wages estimated in this paper differ substantially from the previous predictions of Allen et al. (2011). Table 8 compares my estimates for unskilled wages in the Lower Yangzi (derived from the main estimates) with earlier predictions from Broadberry and Gupta (2006), and Allen et al. (2011).[66] Allen et al.'s predictions of unskilled wages in Suzhou are in fact closer to the skilled wages. This paper downscaled the wage level considerably and indicated that nominal wages continued to grow, rather than decline, over the periods examined. Furthermore, Deng and O'Brien (2016) indicated that Allen's unskilled wage is close to the level of skilled weaving workers in Suzhou.[67] Construction wages in Beijing also seem to be overestimated in the previous work. Based on regulated wages, Allen et al. (2011) stated that the day rate of an unskilled labourer in Beijing's construction industry was around 0.09 *taels* of silver per in the 1760s. However, in this paper, I downscaled it to 0.0775 *taels* (derived from the main estimates), the same day rate quoted by Allen et al. (2011) from the 1769 edition of Regulations and Precedents on the Prices of Materials (*Wuliao jiazhi zeli*). (0.077 *taels*).[68] A further discussion on this is attached in Appendix 3.

Table 8. Comparisons on Estimated Day Wage of Unskilled Labourers in the Lower Yangzi (silver taels)

	Broadberry and Gupta (farming)[1]	Allen et al. (Suzhou, construction)[2]	This paper (urban/construction)[3]
1500-1549			0.038
1550-1599	0.04		0.043
1600-1649	0.04		0.046
1650-1699		0.090	0.057
1700-1749		0.088	0.064
1750-1799	0.045	0.086	0.069
1800-1840	0.045	0.085	0.086

***Notes and Source*:**
[1] Broadberry and Gupta., *The early modern great divergence*, p.18.
[2] Allen et al., 'Wages'.
[3] 1500-49 is the average of 1530-49.

[66] Broadberry and Gupta, "The early modern great divergence"; Allen et al., "Wages".
[67] Deng and O'Brien, "a survey," p.1076.
[68] Allen et al., "Wages," p.12, Table 1.

4.2 Regional differences

Table 9 presents the estimated results for regional differences. Macro-regions are classified as follows: the Lower Yangzi includes Jiangsu and Zhejiang provinces; North China includes North Zhili, Henan, Shandong, and Shanxi provinces; Central China includes Anhui, Jiangxi, Hunan, and Hubei; and South China includes Fujian and Guangdong. Beijing is reported separately, as nominal wages there were the highest among all the regions. The Lower Yangzi lies on the second tier, followed by the southern coastal provinces. Nominal wages in northern and central regions were among the lowest.

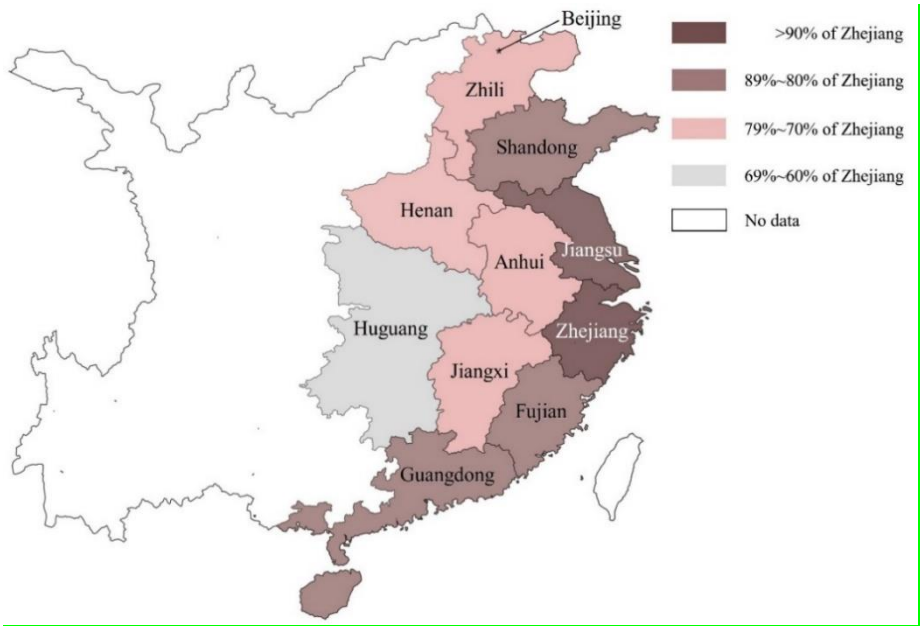
Table 9. Regional Wage Levels as Percentages of the Lower Yangzi

Region	*1530-1640**	*1530-1840*
Lower Yangzi	100%	100%
Beijing	113%	117%
North	78%	83%
Central	75%	71%
South	83%	90%

***Note and source*:** For 1530-1640*, results are estimated from *ya yi* remunerations, averaged based on provincial levels in each macro-region.

One possible cause of these regional variations is labour productivity, but price differences between regions also played a role. To further test this, given the lack of comprehensive regional price data, Table 9 reports the remunerations for conscripted government workers between 1530 and 1640 separately, where the baseline is set as a prefectural doorkeeper in Zhejiang province and no market rates are included. Figure 5 categorises the result into provincial levels.

Figure 5. Living wages in China proper, standardised on the payment of a doorkeeper in a county government in Zhejiang province, 1530-1640



***Notes and Source*:** Inner China territory map is obtained from the China Historical Geographical Information System (https://chgis.fairbank.fas.harvard.edu/). Beijing (marked in star) is the city of Beijing rather than Shuntian prefecture. The latter contained several subordinate counties, and payments on *ya yi* varied greatly within Shuntian prefecture. South Zhili is further divided into Anhui and Jiangsu, as the wage difference was too large between the two.

Remunerations on conscripts are consistent with the overall regional pattern. Because conscripted labourers were developed from corvée duties, Figure 5 is more likely to reflect regional costs of living instead of labour productivity. Again, the remuneration was the highest in Beijing, reflecting the elevated living costs in this mega city. By comparison, payments in prefectures and counties surrounding the city of Beijing were significantly lower, and North Zhili as a whole was only 65 per cent of Beijing's level. Among all provinces where data are available, two provinces of the Lower Yangzi, Jiangsu and Zhejiang offered the highest payment for conscripted labour. Following the Lower Yangzi, the southern part of the North China Plain, Shandong province, and southern coast, Guangdong, and Fujian provinces ranked in the second tier. Hinterland provinces such as Huguang were among the lowest. City size also affected remunerations for conscripts, as payments were generally higher in large cities (prefecture) and lower in small cities and towns (county).

4.3 Skill premium and sectoral wage differential

On average, a skill premium (1.4:1) is evident between skilled and unskilled workers during the period tested. With the construction industry as a baseline, no statistically significant wage differential among the urban industries classified (construction, handicraft, and service) was found after controlling for the regional effect. One interpretation of these results is that there was a certain degree of integration of labour markets in urban areas, and a substantial wage differentiation between industries was yet to form during the periods examined.

More important in the test results is the rural-urban wage gap. A statistically significant disparity is observed between agricultural and non-agricultural wages where the latter is on average 1.5 times higher than the former. This result is confined to China as a whole in the eighteenth and first half of the nineteenth centuries rather than any specific region, as the result came from a pooled data set which does not include agricultural wages before the eighteenth century. Although regions with a higher degree of commercialisation and integration may exhibit less disparity, this rural-urban differential in general suggests that the wage gap already existed before the nineteenth and twentieth centuries when China's industrialisation slowly began.[69] The price difference between rural and urban areas played a role but cannot adequately explain the wage gap.[70] It is also likely that the agricultural sector, instead of urban industries, continued to absorb a substantial amount of the labour force and depressed agricultural/rural wages. We may find support for this interpretation from China's occupational structure and urbanisation rate during these two centuries where no structural changes were found to have occurred.[71]

Theoretically, the wage gap between industries or sectors generates incentives for the labour movement, and eventually causes wage convergence. In practice, however, this convergence may not happen if the growth of the labour force

[69] Sun and Li, "Shengshi", pp.45-8; Wang, *Jindai zhongguo jiage*, p.168.
[70] Wang's *Jindai zhongguo jiage*, p.100, provides an example of wheat's retail prices in Shanghai and rural prices in Wujin, Jiangsu between 1912 and 1936.
[71] Yang, "A new estimate"; Xu et al, "Urbanization in China".

outpaces the industry's demand for labour and negatively impacts the man to land ratio. It is difficult to measure precisely the growth of the Chinese rural labour force over the periods examined, but population estimates suggest that population growth accelerated in the eighteenth century, possibly reaching 200 to 300 million by the mid-eighteenth century, and eventually 400 million by the mid-nineteenth century.[72] Studies on agricultural development also tend to imply that the consequent pressure on the land strengthened labour intensification throughout the century.[73]

Given the abundant textual evidence on intra- and inter-regional labour movement, this rural-urban wage gap should not be interpreted as an absence of labour mobility, but limited employment opportunities in China's urban industries as a whole. The equilibrating movement of labour between the rural and urban sectors may not be subject entirely to the wage differential but more to the employment capacity in the urban sector. In addition, reliance on the family as a social safety net in China was likely to affect the outflow of migrants from rural areas. The rural-urban wage gap may affect the labour input strategy of individuals, but when it concerns family strategy, the wage differential alone does not suffice as an explanation. In rural communities, the relief mechanism provided by families and clans gave rural labourers the means to survive even when they were unemployed. Moreover, the prevalence of landownership and family farms also helped to absorb family workers who could not find any external work opportunities. Such a social safety net in rural communities made family labour input quite flexible and able to absorb surplus labour under the diminishing marginal return from the land.[74] Thus, a more appropriate interpretation of the rural-urban wage differential is that urban industries in China as a whole could not effectively absorb labour in rural areas and this caused the wage gap to persist.

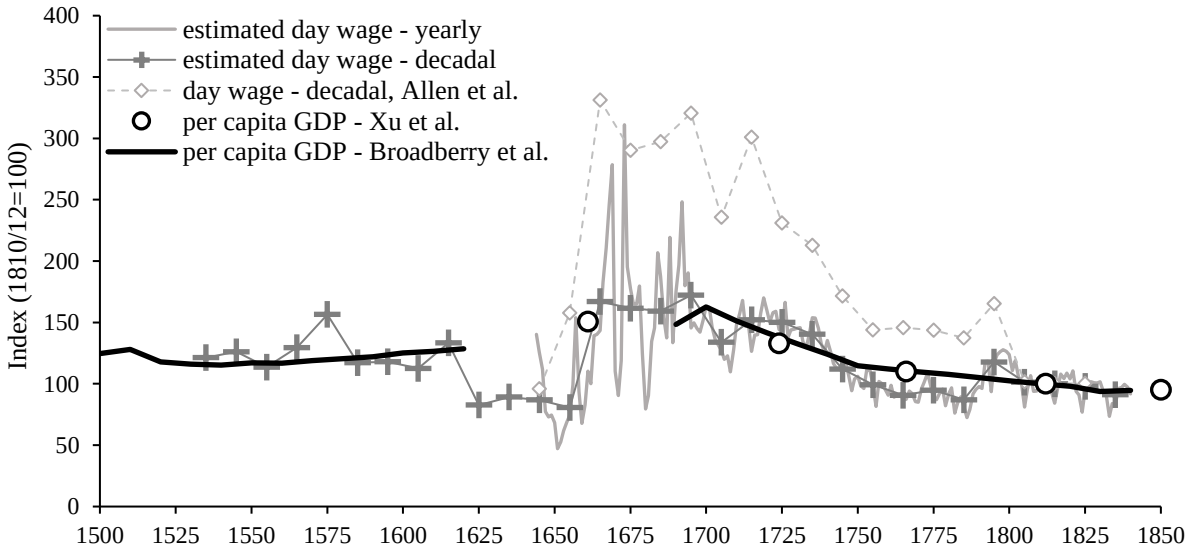
---

[72] Cao, *renkoushi*, vol.5, 831-2; Chao, *Man and Land*, p.41; Lee and Wang, *One Quarter of Humanity*, p.28.
[73] Zhao and Chen, *Zhongguo tudi zhidushi*, 219; Huang, *The Peasant Economy; The Peasant Family*.
[74] Zhao and Chen, *Zhongguo tudi zhidushi*, p.320; Huang, *The Peasant Family,* p.71.

4.4 Real wage and living standard

To illustrate the long-term movement of real wages, Figure 6 presents the indexed real day wages in the Lower Yangzi along with estimates from the previous work as well as indices for per capita GDP. In the long run, two major falls in real wages coincided either with widespread social unrest (mid-seventeenth century) or rapid population growth (mid-eighteenth century). Real wages remained stable until a substantial fall occurred after the 1620s. From the mid-seventeenth century onwards, a substantial improvement can be observed. This was partly caused by a surge in nominal wages after 1644 and partly by a fall in prices, especially after 1660. Thereafter, real wages remained high until another major fall occurred between the 1740s and 1760s, but this then stabilised (rather than collapsed as previous research suggests). Even though nominal wages and prices tended to move in tandem over the long run, the wage increase was not as fast as the price increase, implying that the labour supply on the market affected wage setting in addition to prices.

Figure 6. Real day wage and per capita GDP indices for the Lower Yangzi, 1500-1850



Notes and Source: Allen's et al. wage series see "Wages"; Per capita GDP from Broadberry et al., "A Restatement," pp.970-2, and Xu et al., "Chinese National Income," p.385.

To cross-check the real wage trend estimated in this paper, per capita GDP estimates from Xu et al. (2017) and Broadberry et al. (2021) are plotted in Figure

6.[75] Their GDP estimates were inferred from an output approach which summed the output values from the agricultural, industry, and service sectors. Overall, my real wage estimates exhibit a pattern consistent to that of per capita GDP where a substantial improvement was observed in the second half of the eighteenth century, but diminished over the eighteenth century. Again, real wages estimated in this paper are substantially different from the predictions of Allen et al. (2011). This is evidenced by the magnitude of wage improvement after 1644 and subsequent fall after 1700 in Figure 6. The decline in real day wage is considerably milder after 1700 than is suggested by the previous work, and no precipitous fall is observed after 1800. Nevertheless, estimates on real wages and per capita GDP tend to imply an absence of intensive growth in the Chinese economy over the centuries.

To set the development of real wages into the context of living standards, I took the case of the Lower Yangzi and measured the purchasing power of unskilled wages in terms of welfare ratio. Allen (2001) and Allen et al. (2011) developed the 'welfare ratio' approach to compare real wages across countries.[76] This ratio measures 'whether a man working full time could support a family at the "bare-bones" level of consumption'.[77] The higher the welfare ratio is above one, which is a theoretical level of subsistence, the better the living standard. A few key assumptions underlie this approach. First, the day wage is multiplied by a fixed length of working year, 250 days, to estimate annual incomes from wage earnings. Second, an adult's cost of living is multiplied by 3.15 to simulate the annual consumption for a family of four (two adults and two children, counted as one adult), including 5 per cent of rent spending.

Despite possible marginal errors, the computation implies that no living standard at the subsistence level existed for urban wage earners in the majority of the periods examined. In prosperous times such as the 1660s-1730s, a

[75] Broadberry el al., "A Restatement," pp.970-2, and Xu et al., "Chinese national income," p.385.
[76] Allen, "The great divergence"; Allen et al., "Wages."
[77] Allen et al., "Wages", p.26.

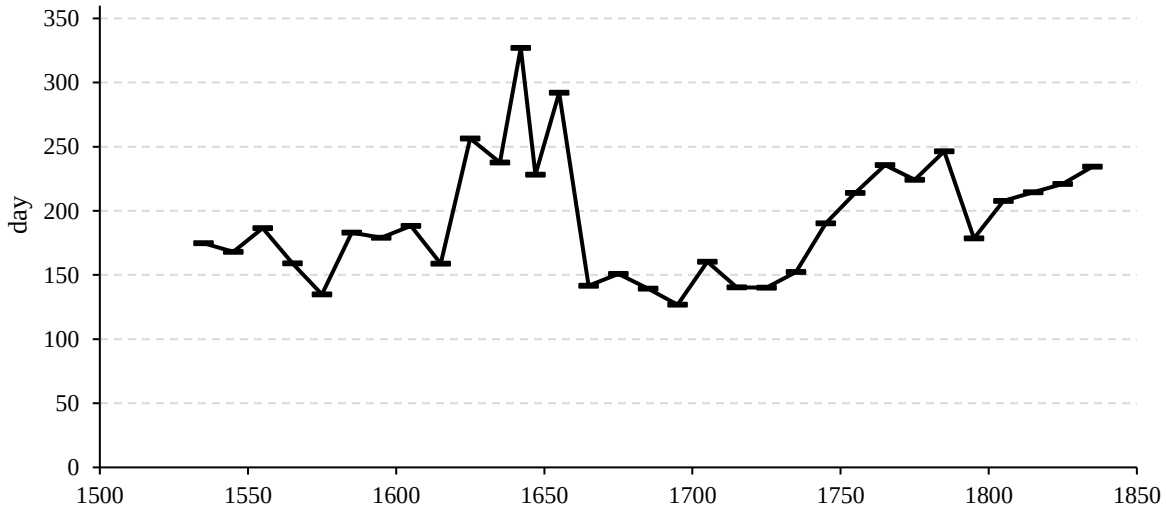
theoretical annual income from 250 days of work would enable an unskilled male labourer to support 1.68-1.98 times annual family consumption at a bare-bones level. In the remainder of the periods, welfare ratios were lower but still ranged between 1.2 to 1.5. The theoretical level of subsistent living, marked as 1, can be observed in times of dynastic change and the 1830s (right before the Taiping Rebellion in the 1850s). Interpretations of living standards in rural areas require more caution. Even though wages were lower, the majority of rural workers did not live solely on wage earnings. More often, wage activities were a supplementary source of income in addition to the yields from farming. Moreover, rural/agricultural wage earners would benefit from lower prices in the countryside and received in-kind rewards such as daily meals, accommodation, and clothes. Thus, lower wages in rural areas did not necessarily translate into worse living standards.

Two further considerations may further stabilise the living standard in the long run. First, the welfare ratio approach infers living standards from individual rather than family incomes. Taking the example of a peasant family in the Lower Yangzi, sericulture or textile weaving often provided additional incomes to supplement either farming or wage earnings. These activities usually involved the participation of the female labour force in the household.

Second, annual incomes inferred from day wages rely entirely on a theoretical (and fixed) length of working year, but falls in day wages may possibly be compensated by the increasing number of days of work. We were unable to estimate the actual length of the working year due to the lack of annual wages in the dataset. As an alternative, I present in Figure 7 an estimated minimum working year to purchase a family consumption basket at a bare-bones level in the Lower Yangzi. Based on day wage earnings, Figure 7 shows how many days an unskilled male labourer had to work to maintain the bare-bones level of consumption defined in Table 6 (multiplied by a theoretical family size of 3.15). The results indicate that the minimum length of the working year generally increased from the eighteenth century onwards, but it is by no means certain

that Chinese labourers increased their working year simply to maintain a minimum level of consumption. Taking the first half of the nineteenth century as an example, the estimated minimum working year ranged between 200 to 230 days in the Lower Yangzi, while other studies have suggested that the actual working year may have reached 300 to 330 days.[78] This difference implies that on the one hand, living standards in the Lower Yangzi may still remain stable even if real day wages declined, while on the other hand, the living standard derived from day wages may differ from the picture inferred from annual wage earnings.

Figure 7. Estimated Minimum Working Year to Purchase a Barebone Level of Family Consumptions in the Lower Yangzi



Notes: The minimum working year = a barebone level of family consumption basket / unskilled day wage. The cost of a barebone level of consumption basket in 1745 is defined in Table 6, and costs in other years are derived from price indices reported in Figure 2. Unskilled day wages in the Lower Yangzi are derived from regression results.

5. Discussion: wage divergence

What implications could the new wage series have for the comparative living standards between China and leading economies in Europe? This matter reverts to the Great Divergence debate, where Pomeranz argues that living standards in the Lower Yangzi delta were comparable to those in England as late as 1800. At

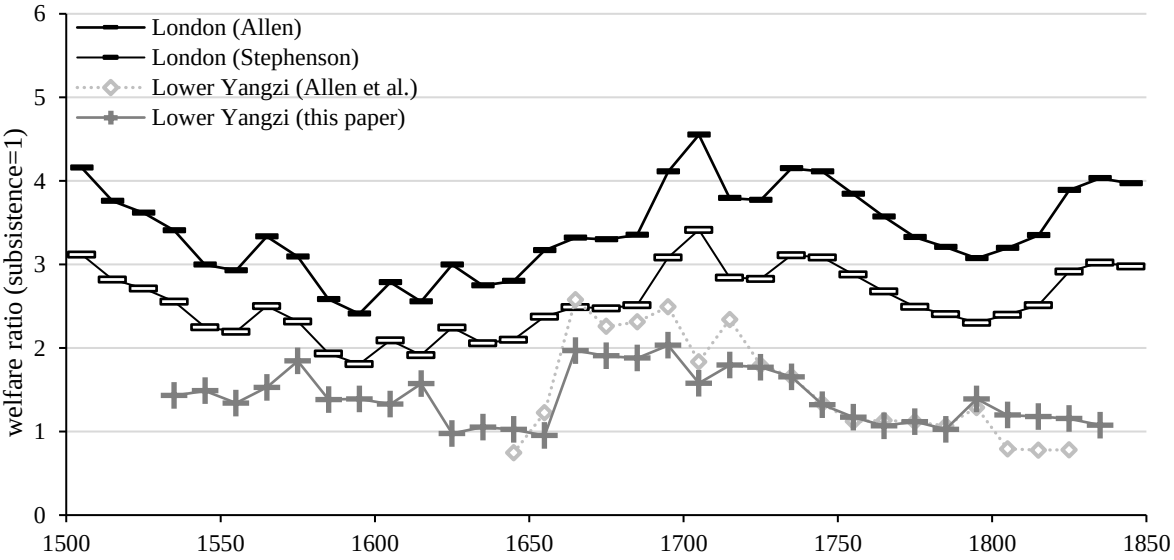
[78] Li, "Zhongsui qindong"; Jiang and Wang, "Qingdai shicang".

the core of Pomeranz's (2000) argument is the claim that per capita food consumption was as high in the Yangzi delta region of China as in the most developed parts of Europe.[79] However, Broadberry and Gupta (2006) contend that the high grain wage in the Lower Yangzi did not translate into a high silver wage, which suggests lower productivity in the tradable sector in early modern China.[80] To be consistent with previous studies, I followed the welfare ratio approach as a starting point for comparison. The subsequent observations in this paper lend support to the view that wage earners in Lower Yangzi China secured food security, but the diverging trend in the purchasing power of wages between Lower Yangzi China and England may have begun circa 1700.

Figure 8 presents the living standards (welfare ratios) inferred from day rates in the context of previous work. I focus particularly on the Lower Yangzi and England (London). The decadal 'welfare ratio' measures the number of consumption baskets for a family of 3.15 that an unskilled male labourer could afford. Again, the subsistence level of living is indicated by a ratio of 1. The higher the 'welfare ratio', the higher the living standard.

[79] Pomeranz, *The Great Divergence*.
[80] Broadberry and Gupta, "The early modern great divergence."

Figure 8. Estimated living standards inferred from day rates, 1500-1850



***Notes and Source*:** Welfare ratios are estimated from the barebone level of consumption baskets. Wage and price data for Chinese cities see the previous text; European data come from Allen, "The great divergence".

A comparison of living standards through the welfare ratio approach requires careful interpretation. The 'London (Stephenson)' series in Figure 8 is worth noting in particular. Stephenson (2018) contends that the London building wages constructed by Allen are the charge out rates for contractors, and are 20 to 30 per cent higher than the average level.[81] This difference has a considerable impact on real wages and living standards comparisons.

I start with the conclusion from Allen et al. (2011). Allen et al. (2011), shown by 'Lower Yangzi (Allen et al.)' and 'London (Allen)', suggest that the divergence in real wages between the most advanced part of China and England may have occurred before 1800, the timing favoured by the California School. Nevertheless, as discussed previously, this scenario suffers from two issues. First, the authors overestimated nominal wages in the Lower Yangzi. Second, they overestimated the costs of living in the Lower Yangzi (especially for a bare-bones basket). The second scenario, illustrated by the comparison between 'Lower Yangzi (this

[81] Stephenson, "'Real' wages," pp.115-6; See also Stephenson, "the average craftsman;" in Hatcher and Stephenson eds., *Seven Centuries of Unreal Wages*, pp.119-23.

paper)' and 'London (Allen)', implies an enduring gap in living standards, and wage divergence may never happen.

In the final scenario I utilise the new series of money wages and costs of living in the Lower Yangzi constructed in this paper, and compare them with the building wages suggested by Stephenson (2018). This is shown by 'Lower Yangzi (this paper)' and 'London (Stephenson)'. The key implication is that if we deflate Allen's charge out rate by 25 per cent to simulate the average wage level of building labourers in London, real wages in the Lower Yangzi and England (London) were moving towards par before 1700. Yet the gap seems to open up in the early decades of the eighteenth century and may have widened further after 1740 when the living standard inferred from day rates in the Lower Yangzi declined.

This last scenario suggests that the diverging trend in real wages between the Lower Yangzi and England may have occurred during the early decades of the eighteenth century. However, this conclusion is subject to two key assumptions. First, there was a fixed length of the working year (250 days) for all countries. This assumption provides convenience when making a comparison of annual incomes, but implies a constant decline in living standards across the two ends of Eurasia (except for England and the Low Countries). Recent studies have demonstrated that an alternative picture using the actual length of the working year could differ substantially from this narrative.[82] In the case of England, Humphries and Weisdorf (2019) show that the assumption of constant working days may significantly overestimate real wages before 1600.[83] A similar issue may also emerge in the case of the Lower Yangzi, and the decline in wages inferred from living standards after 1700 may be slower, or even compensated, if we allow for an increasing length of the working year in China. Moreover, the Chinese living standards discussed in this paper are largely confined to urban wage earners. In the case of England, wage differentials between urban and

[82] Campbell, "National incomes;" Humphries and Weisdorf, "Unreal wages."
[83] Humphries and Weisdorf, "Unreal wages."

rural areas are eliminated once the costs of living are considered, and this suggests that wage incomes should fairly represent living standards in each sector of the English economy.[84] However, from the data collected in this paper, it is difficult to draw a precise conclusion regarding the extent to which the living standards of rural and urban labourers represent each other in China, especially when we go beyond food security and consider non-food consumption.

Given the discussions above, this paper comes only to a preliminary conclusion that the diverging trend in wages may have begun circa 1700.

6. Conclusion

To summarise, in this article I aimed to answer the question: what were the level and trend of real wages in China in the early modern time? This question matters not only to Chinese, but also global economic history, as wages remain an important source of information to support our understanding of the long-term economy and living standards. Using a new collection of wage data, I compiled new evidence for a chronology of wage development in the Lower Yangzi delta. Contrary to some previous estimates, no evidence of a continuous decline on nominal wages was found. Moreover, I downscaled not only wage levels, but also the decline of real wages in the Lower Yangzi delta,

Between 1530 and 1840, nominal wages moved in tandem with prices, but not as quickly as the increase in prices. No persistent improvement in real wages was observed. Real day wages remained relatively stable before 1620, but then witnessed a sharp decline during the 1620s and 1640s due to empire-wide unrest, rebellion, dynastic change, and inflation. A substantial improvement occurred after the 1650s and remained high when the core areas in China began to recover from the destruction caused by the dynastic change. Another major fall occurred between the 1740s and 1760s. While taking into account the possible increase in the length of working year, the decline in real wage earnings

[84] Clark, "The long march."

might be even slower than the annual income inferred from day wage rates. A persistent wage differential was identified between agricultural/rural and urban sectors with the latter on average paid 1.5 times higher than the former. This disparity reconciles the existing view that the agricultural sector, rather than urban industries, continued to absorb surplus labour in rural areas. These wage developments in early modern China lend no evidence for cumulative changes in the economy over the centuries.

From a global perspective, a preliminary comparison of wages in China (the Lower Yangzi) and England (London) implies that the gap in the purchasing power of wages seems to open up after 1700. Nevertheless, our understanding of living standards inferred from wages in these two regions continues to be conditional. The current picture when comparing living standards remains subject to the assumption of a fixed length of working year. Changes in working days may lead to a substantial revision in both the trend and level of real wages.

Appendix 1. Test results and wage indices

Table A1. Estimated Wage Indices (1745=100) and Basket Costs in the Lower Yangzi

Period	Nominal	Real	Basket cost (grams of silver)	welfare ratio
1530-1540	57.36	108.30	76.879	1.4308
1541-1550	57.36	112.64	73.920	1.4881
1551-1560	57.36	101.40	82.113	1.3396
1561-1570	66.90	115.65	81.571	1.5278
1571-1580	68.62	139.67	70.960	1.8451
1581-1590	64.77	104.68	90.884	1.3830
1591-1600	66.32	105.26	91.028	1.3906
1601-1610	66.48	100.47	96.009	1.3273
1611-1620	66.84	119.04	81.463	1.5727
1621-1630	66.78	73.85	131.272	0.9756
1631-1640	66.46	79.66	121.166	1.0524
1641-1644	67.79	74.59	147.068	0.9854
1645-1650	83.69	89.03	159.648	1.1762
1651-1660	82.95	72.00	187.933	0.9511
1661-1670	84.23	149.04	92.448	1.9690
1671-1680	85.08	144.26	99.580	1.9058
1681-1690	92.99	142.17	100.523	1.8782
1691-1700	92.83	153.74	91.244	2.0311
1701-1710	92.67	119.48	115.179	1.5785
1711-1720	92.67	135.81	100.895	1.7942
1721-1730	104.34	133.99	113.349	1.7702
1731-1740	99.62	125.29	117.710	1.6552
1741-1750	100.00	100.00	147.546	1.3211
1751-1760	105.62	88.62	175.254	1.1708
1761-1770	99.02	80.93	180.968	1.0691
1771-1780	102.04	84.64	177.436	1.1182
1781-1790	100.85	77.64	192.744	1.0258
1791-1800	119.87	105.19	165.895	1.3897
1801-1810	146.15	90.52	235.445	1.1958
1811-1820	137.14	89.25	228.190	1.1791
1821-1830	121.65	87.38	208.316	1.1544
1831-1840	120.38	81.45	218.834	1.0760

Table A2. Regression Results on Nominal Daily Unskilled Wage, Standardised on the Log of Payment of an Unskilled Building Labourer in Zhejiang Province in the 1530s

	Coefficient
Region	
Lower Yangzi	/
Northeast	0.2700326***
	(0.071)
North	-0.1631444***
	(0.015)
Northwest	-0.417572***
	(0.078)
Beijing	0.179825***
	(0.052)
Central	-0.2893547***
	(0.013)
South	-0.1021191***
	(0.001)
Southwest	-0.4276022***
	(0.069)
Industry	
agriculture	-0.5291359***
	(0.084)
printing	-0.05552
	(0.075)
ya yi	-0.5622518***
	(0.050)
handicraft	-0.05136
	(0.045)
service	-0.10247
	(0.059)
mining	-0.10989
	(0.077)
Skil level # in-kind payment	
*unskilled*yes*	-1.092061***
	(0.042)
*unskilled*ya yi*	-0.09025
	(0.043)
*skilled*no*	0.4070766***
	(0.066)
*skilled*yes*	-0.08145
	(0.076)
*hi-skilled*no*	0.686809***
	(0.029)
*hi-skilled*no*	0.2772646***

	(0.050)
Miscellaneous	
standard 1	0.099473***
	(0.003)
standard 2	0.1104217***
	(0.003)
standard 3	0.1334162***
	(0.006)
Woodblock	
price 1	0.1731902***
	(0.030)
price 2	0.2261425***
	(0.034)
price 3	0.1852809***
	(0.054)
R2	0.93611
N	6,006

Notes: ** significant at 5%; *** significant at 1% level. Standard errors in brackets.

Table A3. Regression Results on Regional Differences of Ya Yi Payment, standardised on the log daily payment of a county doorman in Zhejiang province in the 1530s

	Coefficient
Region	
North	
Beijing	*0.1252502****
	(0.047)
North Zhili	*-0.2441817****
	(0.035)
Shandong	*-0.1845861****
	(0.034)
Henan	*-0.2955893****
	(0.047)
Central	
Hangzhou	*0.04577*
	(0.048)
Zhejiang (excluding Hangzhou)	*/*
Jiangsu	*-0.0718928***
	(0.037)
Anhui	*-0.2411696****
	(0.032)
Jiangxi	*-0.2394188****
	(0.034)
Huguang	*-0.3829652****
	(0.028)
South	
Guangdong	*-0.1847542****
	(0.028)
Fujian	*-0.1845193****
	(0.033)
Administrative level	
County	*/*
Prefecture	*0.0597225****
	(0.019)
Job	
Doorman	*/*
School doorman	*0.0564064****
	(0.019)
Runner/lictor	*0.1172462****
	(0.020)
Payment method	
agent issued	*/*
gvt. paid	*0.6249869****
	(0.026)

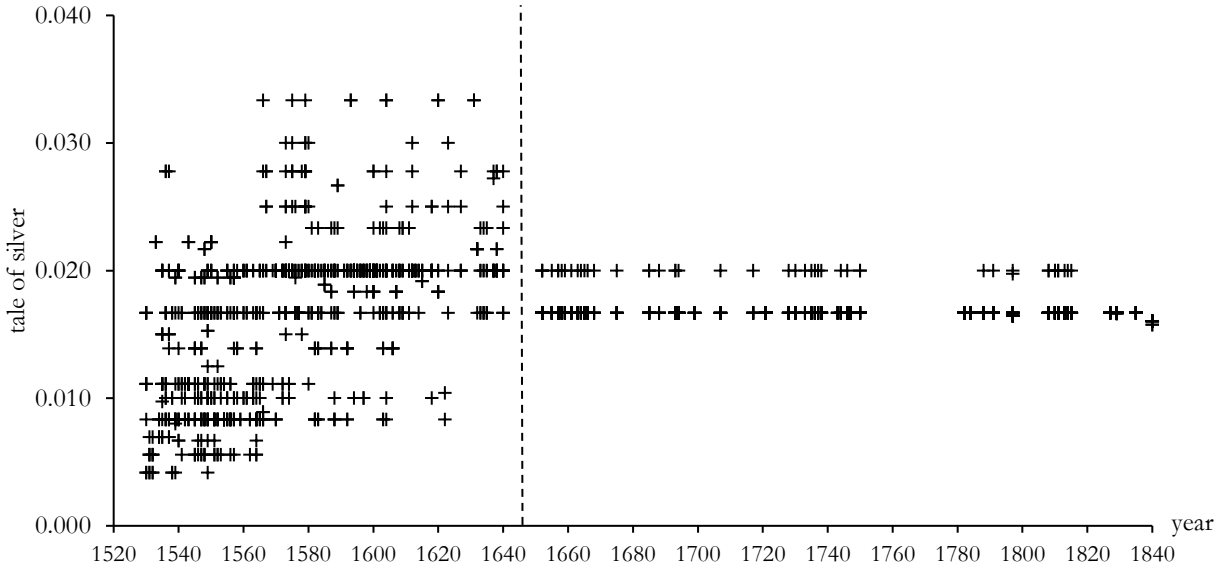
constant	*-4.5953*
R2	0.823

Notes: ** significant at 5%; *** significant at 1% level. Standard errors in brackets.

Appendix 2. Discussion on ya yi data

Figure A presents the daily payments of *ya yi* recorded in local gazetteers and *fuyi quanshu* (The Complete Book of Taxation and Corvée) before and after the dynastic change in 1644. All data are originally expressed in "yearly" rates with a theoretical working length of 360 days. 1,017 data points are collected before 1644 and contain three types of *ya yi*: doormen, runners/lictors, and state school doormen. 1,365 data points are collected after 1644, 1652 in particular, and contain 16 types of services, including doormen (*menzi*), runners/lictors (*zaoli*), state school doormen (*ruxue menzi*), foot messengers (*bukuai*), polices (*bukuai*), horsemen (*makuai*), patrol archers (*xunjian gongbing*), prison guards (*jinzu*/*jinzi*), coroners (*wuzuo*), grain measurers (*douji*), granary janitors (*cangfu*), treasury janitors (*kufu*/*kuzi*), lantern carriers (*dengfu*), night watchmen (*gengfu*), sedan-chair bearers (*jiaofu*), and parasol and fan bearers (*sanshan fu*).

Figure A1. Payments of Ya Yi Before and After 1644, Converted into Day Rates (n=2,382)



Before the dynastic change in 1644, *ya yi* records in local gazetteers displayed payment variations between not only jobs but within and between provinces. Usually, large prefectures (large cities) paid higher than small prefectures (small cities), and counties attached to or as the provincial seat also paid higher than small prefectures. In many cases, payments also varied between counties subordinate to a prefecture. Given these features, *ya yi* records before 1644 would contain at least certain information on regional labour costs.

Despite a wider range of jobs included, *ya yi* records in local gazetteers published after 1652 exhibit no meaningful information on labour costs. Except for state school doormen which received a budget 7.2 *taels* of silver per annum, all other 15 type of services uniformly received a budget of 6 *taels* of silver per annum. As

shown in Figure A, these two standards remained completely unchanged between 1652 and 1840. In many regions, this 6 *taels* standard was lower than the one set in the mid-sixteenth century.

Besides, *ya yi* payments after 1652 exhibit no variations between large and small cities (prefectures) as well as provinces. Regardless of local costs of living, all *ya yi* subjected to a unified payment standard. One major reason for this is that local gazetteers and *fuyi quanshu* recorded only the budgets issued from the land-poll taxes. In the gazetteers of Yongzhou Prefecture, Yuezhou Prefecture, and Jingde County where details budget adjustments were recorded, a universal cut-off on funding and *ya yi* quotas was found between 1652 and 1657. Thereafter, payments standards remained completely unchanged throughout the eighteenth and nineteenth centuries. In fact, *ya yi* after 1652 had stipends or additional payments from tax surcharges, either statutory or non-statutory. But these are not recorded in local gazetteers. In salt gazetteers (*yanfa zhi*), *yi* who served in local salt fields and offices received much higher "yearly" payments, but their payments were covered by salt tax surcharges, which were legalised after 1723, instead of land-poll taxes. For example, in Shuangen salt field, Guangdong province, a storehouse janitors(*cangfu*) received a monthly payment (*gongshi yin*) of 1 *taels* of silver from the legalised salt surtaxes in the 1730s. This in turn gives 12 *taels* per annum or 0.0333 *taels* per day. Either way, this was double the payment standard we can find in local gazetteers. See 1762 version of the Salt Gazetteer of Liangguang District (*Liangguang yanfa zhi*), vol.19, 13a. Given all reasons discussed above, this paper utilised *ya yi* records before 1644 with the expectation of extracting a minimum level of maintenance wages with regional pattern. *Ya yi* records after 1644 are completely excluded.

A few government invoices also show that payments on government doormen and runners were supposed to cover daily necessities. In December 1578, for instance, an invoice from Jinan prefectural government, the provincial seat of Shandong, recorded that 1.34 *taels* of silver of "firewood and rice money" (*chaimi yin*) were issued to the assistant prefect's doormen this month, which matches the budget standard found in local gazetteers.[85] On the budget account, the assistant prefect of Jinan prefecture was assigned two doormen. So a monthly spending of 1.34 *taels* of silver in total converts into 0.67 *taels* for each per month, or 0.0223 *taels* per day. In Yanzhou, another major prefecture in Shandong, the payment standard of a prefectural doorman recorded in local gazetteer was 8 *taels* of silver per annum in around 1573, or 0.0222 *taels* per day if divided by 360 days of work (a common practice in government accounting).

[85] See *Zhongguo mingchao dangan huizong*, vol.99, p.248. On the budget account, the assistant prefect of Jinan prefecture was assigned two doormen. So a monthly spending of 1.34 *taels* of silver in total converts into 0.67 *taels* for each per month, or 0.0223 *taels* per day. In Yanzhou, another major prefecture in Shandong, the payment standard of a prefectural doorman recorded in local gazetteer was 8 *taels* of silver per annum in around 1573, or 0.0222 *taels* per day if divided by 360 days of work (a common practice in government accounting). County doormen were paid lower with 6 *taels* per annum or 0.0167 *taels* per day. See the 1573 version of the Gazetteer of Yanzhou Prefecture collected in *Tianyige cang Mingdai fangzhi xuankan xubian*, vol.55, *Wanli Yanzhou fuzhi,* vol.26, *minyi*, 9b.

County doormen were paid lower with 6 *taels* per annum or 0.0167 *taels* per day. See the 1573 version of the Gazetteer of Yanzhou Prefecture collected in *Tianyige cang Mingdai fangzhi xuankan xubian*, vol.55, *Wanli Yanzhou fuzhi,* vol.26, *minyi*, 9b.

Similarly, the same amount of "firewood and rice money" was found in another invoice of January 1579 issued to doormen of a *fenshou dao* in Shandong (Commissioner in Charge of a General Administration Circuit), a senior official in the provincial government.[86] For the military office, an invoice from a garrison in Liaodong district, North-eastern China, shows that the doormen of battalion captains were also given the money for clothing.[87]

Despite that *yi*'s payment budgets before 1644 contained certain information on labour costs, they are not supposed to be market rates. The following test is set to examine whether there was a premium paid in the market over *yi*'s payments. If there is a pay difference, then:

Market Premium = Market Wage – Non-Market Wage

I specify and run the following regression:

$$\ln(\text{wage}_i) = \alpha + \beta_t \cdot \text{period}_{t,i} + \sum_{h=1}^{2} \theta_h \cdot \text{market}_{h,i} + \sum_{k=1}^{3} \varphi_k \cdot \text{industry}_{k,i} + \sum_{j=1}^{5} \phi_j \cdot \text{region}_{j,i} + \sum_{m=1}^{2} \Pi_j \cdot \text{skill}_j$$

where $wage_i$ is the log of the daily wage of labour i; α is the constant term; $period_{t,i}$ is the time of observation; $market_{h,i}$ indicates whether the observation is a *ya yi*; $industry_{k,i}$ is a dummy for occupations, including building, craft, and service industries; $region_{j,i}$ is the location of the observation; $skill_{j,i}$ indicates whether the observation is skilled or unskilled labour. The base is set as the regulated wage of an unskilled construction labourer in Beijing in the 1570s. The dummy variable $market_{h,I}$ is expected to be statistically significant if there is a difference between the payments issued by the government to *ya yi* and non-*ya yi* worker in the public sector. Estimate results in Table A show that the dummy variable $market_{h,I}$ is statistically significant.

[86] *Zhongguo mingchao dangan huizong*, vol.99, p.251.
[87] *Ibid*, p.214.

Table A4. Wage regressions standardised on the log of daily wage of a ya yi in Beijing between the 1590s and 1610s.

	Coefficient
Constant	-3.474558
Period	-0.0104432**
	(0.005)
Market	**0.3465805*** **
	(0.040)
Skilled	0.3227291***
	(0.065)
Industry	
Ya yi (basis)	
Handicraft	0.0317536
	(0.060)
Service	-0.1038261***
	(0.037)
Region	
Beijing (basis)	
Dongchang	-0.3181195***
	(0.055)
Yanzhou	-0.3103743***
	(0.054)
Xuzhou	-0.3226499***
	(0.041)
Yangzhou	-0.30425***
	(0.042)
R^2	0.933
N	172

Notes: *** significant at 1% level, ** significant at 1% level; standard errors in bracket.

Appendix 3. Discussions on the 1769 edition of regulations and precedents on the prices of materials (wuliao jiazhi zeli)

Allen et al.'s (2011) sources of Chinese building wages mainly come from the 1769 edition of Regulations and Precedents on the Prices of Materials (*Wuliao jiazhi zeli*). This is a collection of official reports on the prices of building materials and the wages paid in construction projects. Yet in the original texts there is little information other than the location and wage for each job quoted, and jobs are vaguely defined, as the majority were either marked as 'labourer' (*fu*) or 'craftsman' (*jiang*). No information is given as to the types of projects for which wages were quoted. Thus, there is a potential risk of assuming that all 'craftsman' in the Regulations and Precedents had the same level of skill, and that high wages in certain regions were due to locality rather than skill.

One example in Shandong province illustrates this concern. In the 1769 edition of Regulations and Precedents, the day rate of a skilled building craftsman in Shandong province was quoted as 0.061 *taels* of silver.[88] However, another wage quotation for building craftsmen from the Archive of Confucius Family Mansion (*Kongfu dangan*) suggests that the day rates of a building craftsman and a nanmu carpenter in Qufu, Shandong, were 0.14 *taels* and 0.154 *taels* of silver, respectively, in the Temple of Confucius in the 1720s-1730s. The former is the same payment standard of a building craftsman that Allen et al. quoted from the Regulations and Precedents for Beijing (0.141 *taels*),[89] and the wage of a nanmu carpenter is also consistent with Beijing's regulated construction wage presented in Table 8 (0.154 *taels*). The fact that the project was sponsored by the emperor means that instead of local rates in Qufu, the same payment standards were likely to have been applied to these building craftsmen as those hired for Beijing's palace projects.

[88] Allen et al., "Wages," p.12, Table 1.
[89] Allen et al., "Wages," p.12, Table 1.

References

Allen, Robert C. "Agricultural productivity and rural incomes in England and the Yangtze Delta, c. 1620–c. 1820 1." *The Economic History Review* 62.3 (2009): 525-550.

———. "The great divergence in European wages and prices from the Middle Ages to the First World War." *Explorations in Economic History* 38.4 (2001): 411-447.

Allen, Robert. C., Bassino, Jean-Pascal., Ma, Debin., Moll-Murata, Christine., and Zanden, Jan Luiten van. "Wages, prices, and living standards in China, 1738–1925 in comparison with Europe, Japan, and India." *The Economic History Review* 64 (2011): 8-38.

Broadberry, Stephen, and Bishnupriya Gupta. "The early modern great divergence: Wages, prices and economic development in Europe and Asia, 1500–1800 1." *The Economic History Review* 59.1 (2006): 2-31.

Broadberry, Stephen, Guan, Hanhui, and Li, Daokui. "China, Europe, and the Great Divergence: A study in historical national accounting, 980–1850." *The Journal of Economic History* 78, no.4 (2018): 955-1000.

———. "China, Europe, and the Great Divergence: A Restatement." *The Journal of Economic History* 81.3 (2021): 958-974.

Buck, John Lossing. *Land utilization in China: A Study of 16,786 Farms in 168 Localities, and 38,256 Farm Families in Twenty-two Provinces in China, 1929-1933*. Chicago: University of Chicago Press, 1937.

Campbell, Bruce. "National incomes and economic growth in pre-industrial Europe: insights from recent research." *Quaestiones Medii Aevi Novae* 18 (2013): 167-196.

Cao, Shuji. *Zhongguo renkou shi* (Demographic History of China). Shanghai: Fudan University Press, 2000.

Chao, Kang. *Man and Land in Chinese History: An Economic Analysis*. Stanford University Press, 1986.

Chao, Kang, and Chen, Zhongyi. *Zhongguo tudi zhidushi* (History of Land Institutions in China). Beijing: Xinxing chubanshe, 2006.

Clark, Gregory. "The condition of the working class in England, 1209–2004." *Journal of Political Economy* 113.6 (2005): 1307-1340.

Clark, Gregory. "The long march of history: Farm wages, population, and economic growth, England 1209–1869." *The Economic History Review* 60.1 (2007): 97-135.

Deng, Kent, and Patrick O'Brien. "Establishing statistical foundations of a chronology for the great divergence: a survey and critique of the primary sources for the construction of relative wage levels for Ming–Qing China." *The Economic History Review* 69.4 (2016): 1057-1082.

Deng, Kent. "Miracle or mirage? Foreign silver, China's economy and globalization from the sixteenth to the nineteenth centuries." *Pacific Economic Review* 13.3 (2008): 320-357.

Fan, Jinmin. "Qingdai feichu jiangji de lishi yiyi" (The historical significance of the abolition of artisanship registration in the Qing period). *Social Science Quarterly* 1(1995): 105-115.

Fang, Xing. “Qingdai qianqi Jiangnan de laodongli shichang (Labour markets in Jiangnan region in the early Qing period).” *Zhongguo jingjishi yanjiu* 2 (2004): 3-12.
Fei, Hsiao-Tung. *Peasant life in China : a field study of country life in the Yangtze Valley*. London : Routledge and Kegan Paul, 1980.
Fu, Yiling. *Mingqing nongcun shehui jingji: Mingqing shehui jingji bianqianlun (Rural Community and Economy during the Ming-Qing Period: Social and Economic Development during the Ming-Qing Period)*. Beijing: Zhonghua shuju, 2007.
Gamble, Sidney “Daily Wages of Unskilled Chinese Laborers 1807-1902.” *The Journal of Asian Studies* 3.1 (1943): 41-73.
Gao, Shouxian. “Mingwanli nianjian Beijing de wujia he gongzi” (Price and Wage in Beijing under Wanli Emperor of the Ming). *Journal of Tsinghua University* 28, no.3 (2008): 45-62.
Guo, Yongqin, Zhang, Zipeng, van Leeuwen, Bas, and Xu, Yi. “A View of the Occupational Structure in Imperial and Republican China (1640–1952).” *Australian Economic History Review* 59.2 (2019): 134-158.
Hatcher, John, and Stephenson, Judy Z. ed. *Seven Centuries of Unreal Wages : The Unreliable Data, Sources and Methods That Have Been Used for Measuring Standards of Living in the Past*. London : Palgrave Macmillan, 2018.
Huang, Miantang. “Qingdai ‘gugongren’ wenti kaoshi (A study on the history of *gugongren* in the Qing period).” *Shehui kexue zhanxian* 1 (1988):136-143.
———. “Qingdai nongcun changgong gongjia zonghengtan” (Enquiry on rural wage of long-term contract in Qing period). *Researches in Chinese Economic History* 3 (1992): 71-78.
Hu, Tieqiu. “Mingdai guanfeng goucheng biandong yu junyaofa de qidong (The changing composition of officials’ salaries and Junyaofa reform during the Ming).” *Shixue yuekan* 11 (2012): 22-42.
Huang, Minsheng. *Minsheng yu jiaji: Qingchu zhi minguo shiqi jiangnan jumin de xiaofei* (Livelihood and Household Economy: Consumption in the Lower Yangzi from Early Qing Dynasty to the Republic Period). Shanghai: Fudan University Press, 2009.
Huang, Philip C. *The peasant family and rural development in the Yangzi Delta, 1350-1988*. Stanford University Press, 1990.
———. *The Peasant Economy and Social Change in North China*. Stanford University Press, 1985.
Humphries, Jane, and Weisdorf, Jacob. “Unreal wages? Real income and economic growth in England, 1260–1850.” *The Economic Journal* 129.623 (2019): 2867-2887.
Jiang, Qin and Wang, Zekun. “Qingdai shicang de gugong yu gongzi (1836-1870) ” (Labour and wage in Shicang of Qing Period, 1836-1870). *Researches in Chinese Economic History* 5(2020):103-116.
Jiang, Shoupeng. “Mingqing shiqi de beifang laodongli shichang (Labour markets in northern China during the Ming-Qing period).” *Dongbei shida xuebao: Zhexue shehui kexueban 4* (1995):85-90
Jing, Junjian. “Guanyu Mingqing shiqi fadian zhong ‘gugongren’ lvli de yixie wenti (shang) — da luolun xiansheng deng (The legal status of *gugongren* in

Ming and Qing codes – A response to Mr. Luolun and others)." *Zhongguo jingjishi yanjiu* 4 (2007): 3-12.
Jing, Su, and Luo, Lun. *Qingdai Shandong dizhu jingying de shehui xingzhi* (The Social Status of the Landlord Economy in Shandong Province in the Qing period). Jinan: Shandong renmin chubanshe, 1959.
Lee, James., and Wang, Feng. *One Quarter of Humanity: Malthusian Mythology and Chinese Realities, 1700–2000*. Harvard University Press, 2001.
Li Bozhong. "Zhongsui qindong: kuazhang haishi xianshi? 19 shijichu songjiang diqu gehangye congye renyuan niangongzuorishu zhi kaocha" ("Always Working": Exaggeration or Reality? The Length of Working Year in Songjiang Early Nineteenth Century). *Academic Monthly* 4 (2008): 139-139.
———. *Jiangnan de zaoqi gongyehua, 1550-1850* (Proto-Industrialisation in the Lower Yangzi, 1550-1850). Beijing: Social Sciences Academic Press, 2000.
———. *Jiangnan nongye de fazhan, 1620-1850* (Agricultural development in Jiangnan, 1620-1850) Shanghai: Shanghai Classics Publishing House, 2000.
Li, Bozhong, and Zanden, Jan Luiten van, "Before the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the Beginning of the Nineteenth Century." *The Journal of Economic History* 72.4 (2012): 956-989.
Li, Ruoyu. "Cong Mingdai de qiyue kan Mingdai de bizhi" (A Study on Monetary System in the Ming Period: Evidence from Private Contracts). *Researches in Chinese Economic History* 4 (1988): 39-43.
Li, Wenzhi, and Jiang, Taixin. *Zhongguo dizhuzhi jingjilun* (The Landlord Economy in China). Beijing: China Social Science Press, 2005.
Li, Wenzhi, Wei, Jinyu, and Jing, Junjian eds. *Mingqing shidai de nongye zibenzhuyi mengya wenti* (Sprouting of Capitalism in Agriculture Sector in Ming and Qing Period). Beijing: China Social Science Press, 2007.
Lin, Manhong. *Yinxian* (Silver String). Nanjing: Jiangsu People's Publishing House, 2011.
Liu, Guanglin. *The Chinese Market Economy, 1000 1500*. Albany: Suny Press, 2015.
———. "Mingdai tonghuo wenti yanjiu — dui Mingdai huobi jingji guimo he jiegou de yanjiu" (Currency in the Ming Period — A Study on the Size and Structure of Money Economy). *Researches in Chinese Economic History*, 1 (2011): 72-83.
Liu, Ruoyu. *Zhuozhong zhi*. Reprinted in Beijing: Beiji guji chubanshe, 1994.
Liu, Zhiwei. *Zai guojia yu shehui zhijian* (Between State and Society: A Study on Corvée and Tax Institution in Ming-Qing Guangdong). Sun Yat-sen University Press, 1997.
Peng, Kaixiang. "Jindai beijing huobi xingyong yu jiage bianhua guankui" (Money Market and Price Change in Modern Beijing). *Researches in Chinese Economic History* 3 (2010): 91-100.
———. "Jindai Beijing jiage yu gongzi de bianqian: 19shiji chu zhi 20shiji chu" (Prices and Wages in Modern Beijing from Early Nineteenth to the Early Twentieth Centuries). *Journal of Hebei University* 2 (2013): 20-29.
———. *Qingdai yilai de liangjia* (Grain Prices since the Qing Period). Shanghai: Shiji chuban jituan, 2006.

Peng, Xinwei. *Zhongguo huobishi* (History of Money in China). Shanghai: Fudan University Press, 2000.
Peng, Zeyi. *Zhongguo jindai shougongyeshi ziliao* (History of Modern Chinese Handicrafts). Beijing: Joint Publishing Company, 1957.
Pomeranz, Kenneth. *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. Princeton: Princeton University Press, 2000.
Qiu, Guangming ed. *Zhongguo lidai duliangheng kao* (A Study on Chinese Metrology). Beijing: Science Press, 1992.
Rawski, Thomas G., and Lillian M. Li, eds. *Chinese history in economic perspective*. University of California Press, 2018.
Shanghai xinsijun lishi yanjiuhui yinshua yinchai fenhui. *Lidai keshu gaikuang* (An Overview of Publishing Industry). Beijing: Printing Industry Publishing Company, 1991.
Shi, Zhihong. "Cong huoluxian shengce kan qingdai qianqi de tudi jizhong he tanding rendi gaige" (Land Concentration and Poll Tax Reform in the Early Qing Period, Evidence from Registration Books of Huolu County). *Journal of Hebei University* 1 (1984): 138-147.
Stephenson, Judy. "'Real' wages? Contractors, workers, and pay in London building trades, 1650–1800." *The Economic History Review* 71.1 (2018): 106-132.
Sun, Rui, and Li, Muzi "Shengshi de yanxu haishi shuailuo de kaishi—Jiaqing shiqi mingyi gongzi tezheng yiji jineng yijia wenti" (Continuation of the Golden Age or Beginning of the Decline? Nominal Wages and Skill Premium under the Reign of Jiaqing Emperor). *Qing History Journal* 6 (2020): 37-51.
Tang, Zhiqing. *Jindai Shandong nogncun shehui jingji yanjiu* (A Study on Modern Rural Community and Economy in Shandong). Beijing: renmin chubanshe, 2004.
Van Zanden, Jan Luiten. "Wages and the standard of living in Europe, 1500–1800." *European Review of Economic History* 3.2 (1999): 175-197.
———. *The Long Road to the Industrial Revolution: The European Economy in A Global Perspective, 1000-1800*. Leiden: Brill, 2009.
Von Glahn, Richard. *Fountain of fortune*. Berkeley: University of California Press, 1996.
Wang, Qingyuan. "Qingchu huizhou de juntu yulince yanjiu" (A Study on Fish-Scale Book in Huizhou in Early Qing Period). *The Qing History Journal* 5.2 (2009): 48-63.
Wang, Yuru. *Jindai zhongguo jiage jiegou yanjiu* (The Price Structure in Late Modern China). Xi'an: Shanxi renmin chubanshe, 1997
———. *Jindai zhongguo wujia, gongzi he shenghuo shuiping yanjiu* (Prices, wages, and Living Standards in Late Modern China). Shanghai: Shanghai caijing daxue chubanshe, 2007.
Wei, Jinyu. "Shishuo mingqing shidai guyong laodongzhe yu gugongren dengji zhijian de guanxi" (Enquiry on the Legal Status Between Employer and Labour in Qing Period). *Researches in Chinese Economic History* 4 (1986): 93-105.

Wu, Liangkai. “Qingqianqi nongye gugong de gongjia (Wages of agricultural workers in the early Qing period).” *Zhongguo shehui jingjishi yanjiu* 2 (1983):17-30.
Xu, Dixin, and Wu, Chengming. *Zhongguo ziben zhuyi fazhanshi* (The History of Capitalism in China). Beijing: Renmin chubanshe, 2003.
Xu, Tan. “Mingqing shiqi chengxiang shichang wangluo tixi de xingcheng ji yiyi” (Development of Urban and Rural Market Network during the Ming-Qing Period). *Social Sciences in China* 3 (2000): 191-202.
Xu, Yi, Bas van Leeuwen, and Jan Luiten van Zanden. "Urbanization in China, ca. 1100–1900." *Frontiers of Economics in China*, 13.3 (2018): 322–368.
Xu, Yi, Shi, Zhihong, Leeuwen, Bas van, Ni, Yuping, Zhang, Zipeng, and Ma, Ye. "Chinese national income, ca. 1661–1933." *Australian Economic History Review* 57.3 (2017): 368-393.
Yang, Yuliang, and Xing, Shunling. "Jiaxingzang zhengliji" (Collation of Jiaxing Tripitaka). *Wenxian* 1(1984): 200-216.
Yang, Cheng. "A new estimate of Chinese male occupational structure during 1734–1898 by sector, sub-sector pattern, and region." *The Economic History Review* (2022).
Ye, Dehui. *Shulin qinghua* (Chatting on the Forest of Books). Reprined by Beijing: Beijing yanshan chubanshe, 1999.
Zhang, Xiuming. *Zhongguo yinshuashi* (The History of Printing in China). Shanghai: Shanghai People’s Publishing House, 1989.

Historical sources

Dai Jing ed. *Guangdong tongzhi chugao* (First Draft of Provincial Gazetteer of Guangdong). Beijing: Bibliography and Literature Publishing House, 1996.
Gongbu changku xuzhi (Factory and Workshop Instructions of the Ministry of Work).
Guangxu daqing huidian shili (Collected Statutes and Precedents of the Great Qing, Guangxu Reign’s version).
Gongzhongdang Jiaqingchao zouzhe (Palace Archive of the Memorials to the Throne in Jiaqing Emperor’s Reign). Taipei: Guoli gugong bowuyuan.
Jiaqing Yongdinghe zhi (Gazetteer of Yongding River of Jiaqing’s Reign). Reprinted in *Zhongguo dayunhe lishi wenxian jicheng*, vol.24 (Collection of Historical Literature on the Grand Canal). Beijing: Guojia tushuguan, 2014.
Mingqing Suzhou gongshangye beikeji (Stele of Suzhou during the Ming-Qing Period). Nanjing: Jiangsu renmin chubanshe, 1981.
Mingshenzong shilu (Veritable Records of Shenzong Emperor of the Ming). Taipei: Academia Sinica Institute of History and Philology, 1962.
Mingxianzong shilu (Veritable Records of Xianzong Emperor of the Ming). Taipei: Academia Sinica Institute of History and Philology, 1962.
Mingxiaozong shilu (Veritable Records of Xiaozong Emperor of the Ming). Taipei: Academia Sinica Institute of History and Philology, 1962.
Mingyingzong shilu (Veritable Records of Yingzong Emperor of the Ming). Taipei: Academia Sinica Institute of History and Philology, 1962.

Qingdai qianjiadao baxian dangan xuanbian (Selected Archives of Baxian County under Qianlong, Jiaqing, and Daoguang Emperors of the Qing). Chengdu: Sichuan University Press, 1989.
Qinggaozong shilu (Veritable Records of Gaozong Emperor of the Qing). Beijing: Zhonghua Publishing Company, 2008.
Qinggong neiwufu zaobanchu dangan zonghui (Archive Collection of Manufacturing Bureau of the Ministry of Imperial Household of the Qing). Beijing: People's Publishing House, 2005.
Qinggong rehe dangan (Archive Materials of Rehe). Beijing: Zhongguo dangan chubanshe, 2003.
Sun, Mingan ed. *Suzhou zhizaoju zhi* (The Gazetter of Suzhou Imperial Silk Manufacturing).
Wang, Qi. *Xuwenxian tongkao* (Replenished Comprehensive Examination of the Literature). Japan, Waseda University library.
Wen, Lianxi ed. *Qingneifu keshu dangan shiliao huibian* (Archive Collections of the Ministry of Imperial Household of the Qing). Yangzhou: Guangling Publishing Company, 2007.
Zhili wudao chenggui (Regulations of Five Administration Circuit of Zhili Province). Beijing, National Library of China.
Zhongguo dayunhe lishi wenxian jicheng (Collection of Historical Literature on the Grand Canal). Beijing: National Library of China Publishing House, 2014.
Zhongguo mingchao dangan huizong (Collection of Archives of Ming Dynasty). Gulin: Guangxi Normal University Press, 2001.
Yi, Sang'a ed. *Daqing huidian*. originally published in Beijing: Neifu kanben, 1690.
Yun, Lu ed. *Daqing huidian*. originally published in 1732.