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

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Abstract

Historical wages continue to provide new insights into the long-term development of the economy. In early modern Europe, the standard wage narrative hypothesises a "little divergence" in which England and the Low Countries outperformed other economies between 1500 and 1750. However, our knowledge of Chinese wage history remains considerably limited when it comes to the "great divergence" debate between China and leading economies in Europe. This article contributes to building a wage series in Lower Yangzi China from the sixteenth to the nineteenth centuries. It shows that despite the continued increase of nominal wages over this period, real day wages witnessed a sharp decline between 1620 and 1640, followed by a substantial improvement after1650, until a quick decline between 1740 and 1760. A wage gap between the Lower Yangzi and London may open up in the early eighteenth century, but this implication still awaits further examination considering the measurement limits in the current approach.

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 received a large volume of intellectual interest. From the sixteenth century onwards, China began to enjoy the revival of a money economy and commercial growth after the shortage in the money supply of the previous century.[2] As the system of hereditary occupations atrophied and bound labours

[1] I wish to express my thanks to Runzhuo Zhai, Sara Horrell, Judy Stephenson, and Kent Deng for comments and suggestions. I also thank Robert Allen for explanations on his wage data.

[2] Von Glahn, *Fountain of fortune*, p.83; Liu, "Mingdai tonghuo wenti yanjiu.".

declined in state manufacturing workshops and factories, the private sector rose and enlarged in the Chinese economy.[3] The market network continued to expand in the Lower Yangzi delta, and, in northern China, rural markets also steadily increased.[4] By the mid-nineteenth century, when traditional and modern periods in Chinese historiography are generally divided, China had a palpable growth in population and overall size of the economy.

In the effort to compare the economies at the two ends of Eurasia, scholarly opinions often debate the timing of when the trajectories of development diverged. Based on per capita food consumption, Pomeranz considered that the Lower Yangzi delta and England were similar in living standards before 1800.[5] Similar studies on family consumption in the Lower Yangzi also challenged the conventional wisdom that the Chinese peasantry had lived at a subsistence level in the early modern period.[6] Nevertheless, food consumption may reveal only a part of the story. Regarding agricultural productivity, China was on a par with the English Midlands in the eighteenth century or the Netherlands in the early nineteenth. Still, a remarkable productivity gap is observed in manufacturing.[7] The occupational structure provides another angle to cut into the economy. In Qufu, Shandong province (North China plain), the industry and service sectors may reach two-fifth of the employment in the late sixteenth and mid-nineteenth centuries.[8] In the Hua-Lou region, a part of the Lower Yangzi core, non-agricultural employment may reach 70 per cent circa the 1820s.[9] But, except for a few large cities and commercial centres, agriculture as a whole still employed the majority of the labour force in early modern China.[10] This is also reflected in the level of urbanisation: a few studies suggest that the urban population in China was declining over the eighteenth century when rural population rapidly

[3] Xu and Wu, *Zhongguo ziben zhuyi fazhanshi,* p.121-4.
[4] Xu, "Mingqing shiqi chengxiang shichang wangluo," p.199-201.
[5] Pomeranz, *The Great Divergence*.
[6] Huang, *Minsheng yu jia ji*,
[7] Allen, "Agricultural productivity"; Li and van Zanden, "Before the great divergence."
[8] Guo et al., "Occupational structure," p.148.
[9] Li and van Zanden, "Before the great divergence," p.967.
[10] Guo et al., "Occupational structure," p.153.

increased.[11] These pictures may imply high productivity in the agricultural sector but the infertility of structural change in the economy over the centuries. The research on Chinese historical national accounting also resonates this view by showing that per capita income in China was declining and diverging from the level of England after 1700.[12]

Wage is also an approach to examine long-term development. In European context, the standard wage account depicts a Malthusian world where no positive trend of wage is observed after the Black Death, and real wages continued to fall over the centuries; it was the slower wage decline in England and the Low Countries that made the living standard in north-western Europe outperform other European economies prior to the onset of the Industrial Revolution.[13] This narrative hypothesises a "little divergence" within Europe between 1500 and 1750. But since it presumes fixed family size and the length of the working year, implications from wages on living standards can be notably revised under different assumptions.[14]

In comparison with Europe, however, the wage history of China in early modern time is still being written, largely because historical wages and prices are noticeably more limited. The existing literature neither managed to provide comprehensive wage estimates before the eighteenth century, nor do we have a generally accepted wage narrative for the eighteenth century. Based on the work of Pomeranz (2000) and Li (2003), an early attempt from Broadberry and Gupta (2006) provides some preliminary estimates, implying a substantial wage gap between the Lower Yangzi and England in the eighteenth century.[15] In a study of long-term economic development in early modern China, Liu Guanglin (2016) also provides a preliminary estimation of Chinese wages between 1004 and 1805 using a few wage records on soldiers, unskilled labourers in irrigation and other

[11] Cao, *Zhongguo renkoushi*, vol.4, p.365-8; vol.5, p.726-74; Xu et al., "Urbanization in China," p.346.
[12] Broadberry et al., "Historical national accounting"; "Restatement."
[13] Van Zanden, "Wages and the standard;" Allen, "The Great Divergence;" Clark, "The condition;" "The long march."
[14] Campbell, "National incomes;" Humpries and Weisdorf, "Unreal wages."
[15] Broadberry and Gupta, "The early modern divergence"; Pomeranz, *The Great Divergence*; Li, *Agricultural Development*.

construction works, and low-status professionals such as students and government clerks.[16] But, given the data limit, Liu's research is more helpful in exhibiting the economic decline between Song (c.960-1279) and Ming China (c. 1368-1644) than the wage movement over the sixteenth and nineteenth centuries. A more comprehensive assessment from Allen et al. (2011) suggests a narrative where the wage gap between the Lower Yangzi and London was already significant by the early eighteenth century.[17] But in contrast to the picture shown by Broadberry and Gupta, unskilled wage estimates from Allen et al. are much higher and continue to fall between 1738 and 1850, and in Beijing, nominal wages collapsed by 30 to 40 per cent between 1820 and 1840. Given the controversy, Deng and O'Brien (2016) re-examined the sources of Allen et al. and consider their wage estimates suffering from sample selection and data processing.[18] In a few recent studies in Chinese literature, we do not find evidence to support the wage collapse suggested by Allen et al. 1820.[19] Similar issues of data processing are also found in some Chinese literature.[20] Therefore, we neither have a comprehensive study on Chinese wages before the eighteenth century, nor do we have 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 to include 5,620 wage quotations from public and private sectors and made the first attempt to build a wage series for the Lower Yangzi from the sixteenth to the nineteenth centuries. This paper finds that nominal wages in the Lower Yangzi experienced four sustained increases in the 1560s, 1650s, 1680s, and 1720s, along with a temporary increase between the 1790s and 1820s. Real day wages remained stable before the 1620s but experienced a sharp drop between the 1620s and 1640s due to empire-wide rebellion, inflation, and dynastic change. A

[16] Liu, *The Chinese Market Economy*, p.247-9.
[17] Allen el al., "Wages, prices and living standards in China"
[18] Deng and O'Brien, "a survey and critique."
[19] Sun and Li, "Shengshi de yanxu haishi shuailuo de kaishi;" Jiang and Wang, "Qingdai shicang;" Peng, "Jindai Beijing jiage yu gongzi de bianqian."
[20] For example, in "*Mingwanli nianjian Beijing de wujia he gongzi*", Gao Shouxian used payments on conscripted labour services to study wages in Beijing around the early seventeenth century. But he did not distinguish between conscription payments and market wages and mixed-up administrative costs with the actual payments on government labour services.

substantial improvement was then observed after 1650, and the real wage remained high until it quickly declined between the 1740s and 1760s. The trend of real wage found in this paper is consistent with estimates of per capita GDP.

These findings differ considerably from some previous works. My new estimates find no evidence of a continuous decline in nominal wages between 1736 and 1838, and show that the previous work overestimated the level of wage in the Lower Yangzi and Beijing. Given the differences in nominal wage, this paper also downscales the decline of the real wage after 1700 when the population rapidly increased in China. Considering the measurement error on annual incomes inferred from day wage rates, the decline in annual wage earnings in real terms can be smaller and slower than the day rates suggested. Thus, the implications from the wage aspect on the comparison of living standards between the Lower Yangzi China and London awaits further examination.

2. Background: Labour market in early modern China

Before we delve into estimating the level and trend of wages in early modern China, a brief discussion on the Chinese labour market would help us process historical wage data and contextualise the discussion on living standards implied by wages. One difficulty in interpreting historical wages in China comes from wage formation. Payments in kind have always accounted for a significant proportion of wages in the market, especially for unskilled labourers. Besides, cash wages were often issued in local currencies and thus require a careful read. I will discuss these below in detail.

In the private sector, labour contracts were generally divided into long-term and short-term. In addition to the length of work, means of payment also varied between these two. Records of labour disputes stored by the central and local judicial archives in the eighteenth and nineteenth centuries provide examples of

their differences.[21] Long-term unskilled labourers were mainly remunerated with payments in kind, including food and clothes, and provisions of daily meals and accommodation were common. Cash payments took only a minor portion of their wages, especially in rural areas. But for short-term contracts, cash components were generally bigger. Usually, meals and accommodation were not offered to day jobs, but monthly contracts may offer them depending on the industries. Short-term contracts also exhibited strong seasonality. Day rates were markedly higher in the harvest season, usually between May and September.[22] These contracts were referred to as "busy months' (忙月) or "busy work' (忙工).

Artisans and skilled workers from guilds were subject to regulated wage standards. These regulation wages included payments in cash (工钱), meals (饭钱), and sometimes allowances for liquor and cigarettes (烟酒钱). Compared with individual labour contracts, guilds tended to specify the money values of payments in kind, either in copper coins or silver ingots.[23]

Cash wages in the Chinese market involved a variety of local currencies. For wage quotations, the same amount of cash payments may have different meanings across the empire. Wages may be recorded in silver numeraire in bookkeeping, but they were more often issued in copper coins, especially in the private sector. Unlike European markets, the Chinese market used silver currency by its weight without a uniform shape. Silver ingots were usually seen in taxation and large transactions, and silver nuggets for small purchases. But weight and purity of silver currencies varied across central departments and local authorities.[24] 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.[25] This standard was adopted by the Ministry of Revenue in

[21] Central judicial records were stored by the Ministry of Justice. These cases usually involved death penalty and required the permission of execution by the emperor. Local judicial records, such as the archive of Baxian county in Sichuan province, contained disputes and major cases.
[22] Huang, "Qingdai nongcun changgong gongjia zonghengtan," p.71; Gamble, "Daily Wages", p.46.
[23] Peng Zeyi, *Zhongguo jindai shougongyeshi ziliao*, vol.1, p.189-90.
[24] Deng, "Miracle or Mirage," p.336.
[25] Qiu ed., *Zhongguo lidai duliangheng kao*, p.419; p.512.

taxation. But grain tributes paid in cash adopted *caoping* weight, which was slightly lighter than *kuping* weight. For transit taxes and customs, *guanping* weight was applied, and it was slightly heavier than the *kuping* standard. From the eighteenth century onwards, there was a growing tendency that European and American silver coins began to circulate in certain regions, mainly south and southeast coasts.[26] But until the collapse of the Qing state in 1911, there was no single silver currency that monopolised the market. Employers, especially guilds, tended to indicate the weight standard to avoid disputes if wages were specified in silver.[27]

For copper coins, the situation is more complex, as the shapes and weights of coins varied across mints and regions. Similar to silver currencies, official mints adopted different standards for coinage. In the late-sixteenth century, the official exchange rate between silver *tael* and standard copper coin, *zhiqian*, was around 1:800 in Beijing due to the heavier weight of copper coins issued by mints in the capital. But in the Lower Yangzi delta, the official exchange rate was usually around 1:1200. [28] Despite 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.[29] For instance, the "capital coin' (*jingqian*) was commonly circulated in North China, including Shandong province, North Zhili, and Beijing. It was traded at a ratio of 2:1 against the standard coin minted in Beijing. While in Northeast China (Manchuria), wages were commonly marked in "eastern coin' (*dongqian*) or "market coin" *(shiqian),* trading at a ratio of 6:1 against the standard coin.

In the public sector, wage payments were mainly counted in silver numeraire. The wages of standing craftsmen and artisans consisted of two parts. One was the monthly or daily allowance of food and the other was the cash component. These

[26] Peng, *Zhongguo huobishi*, p.540-8.
[27] *Qingdai qianjiadao baxian dangan xuanbian*, p.238.
[28] Wang, *Xuwenxian tongkao*, vol.18.
[29] Peng, "Jindai beijing huobi hangyong yu jiage bianhua guankui."

skilled workers are referred to as "food provision artisans" or *shiliang jiang* (食粮匠). They were mainly employed in the imperial manufacturing workshops in Beijing and imperial silk factories in the Lower Yangzi delta. In many cases, government projects were carried out by casual workers directly hired from the market, marked as "outer employment" or *waigu* (外雇). "Outer employment" became more common after the mid-seventeenth century when the imperial law in 1645 formally removed the forced hereditary status of artisans.[30] In some cases, artisans and labourers employed by the government also received "family allowances" (养家银). One example is the wage standard of the imperial shipyard in the 1580s Nanjing (the Lower Yangzi), where a monthly "wife allowance" (妻粮) of 4 *dou* of grains (equivalent to 30kg if issued in rice) was offered to sailors who worked more than three years but was terminated if the sailor or his wife passed away.[31]

A special type of government employee in the public sector is worth discussing — *ya yi* (sub-official functionaries). In early modern China, *ya yi* was the largest cohort of personnel in local government. These people were levied or hired by governments to provide labour services, taking on jobs such as doormen, runners, mail carriers, and police. Before the sixteenth century, *ya yi* mainly came from corvée labourers. But from the sixteenth century onwards, there was a growing tendency for the government to reimburse *ya yi* with cash and payments in kind. Before the 1570s, it was more common to see contractors (*shoutou*) working on behalf of the government for the collection of corvée taxes and the issue of service payments.[32] Local governments provided asking prices of exemption fees for each conscription, but extra charges were common in practice.[33] In an attempt to

[30] See Fan Jinmin, "Qingdai feichu jiangji de lishi yiyi" for the development of forced hereditary artisans in Ming period; Also see Wei, "Shishuo mingqing shidai" for the legal status of employees in the private market.
[31] *Chuanzheng xinshu* 船政新书, vol.3, collected in *Zhongguo dayunhe lishi wenxian jicheng*, vol. 69, p.289.
[32] Payments collected and issued from this process are called *da tao* 打讨.
[33] Liu, *Zai guojia yu shehui zhijian*, p.162-70.

standardise *ya yi* payments, remunerations were required to be paid directly by the government after the 1570s.[34]

In short, the Chinese labour market in the early modern period can be categorised as: First, a general division between long-term and short-term contracts, where payments in kind usually had a larger weight in the long-term work. Second, cash wages in the private sector were usually issued in copper coins, but they involved a variety of local currencies, and each had different exchange rates against the standard coins. Third, wage components in the public sector were similar to those in private contracts, but they were more often recorded in silver numeraire.

3. Data source and processing

Compared with European wage data, wage records in early modern China, especially before the eighteenth century, are noticeably limited. I have to rely on a combination of wages in the public and private sectors to build nominal wage series in the Lower Yangzi delta between 1530 and 1840. Wage quotations in public sectors include payments on doormen and runners (*ya yi*) in prefectural and county governments, the Grand Canal and riverbank construction labourers, and Beijing's skilled and unskilled workers in handicraft and service industries. Private sector wages include woodblock engravers in the Lower Yangzi and a variety of scattered wage quotations across China.

The first data set contains 1,017 quotations of remunerations on *ya yi* between 1530 and 1640. No consistent records can be collected after 1640 due to social disruption. They are collected from local gazetteers (*difang zhi*) published in the sixteenth and seventeenth centuries, and time and regional distributions are reported in Table 1. As explained in the previous section, *ya yi* were conscripted to provide labour services in governments. Their remunerations are expected to

[34] Payments issued via the government are called *guan gei* 官给. The Single-Whip Reform of the 1570s required that corvee taxes shall not be collected by tax farmers, but in reality, many local governments still relied on tax farmers.

capture the long-term trend of wage payment in kind in urban areas. This data set covers nine provinces out of fifteenth, including North Zhili, South Zhili (including nowadays Jiangsu, the Lower Yangzi core, and Anhui province), Shandong, Shanxi, Henan, Jiangxi, Huguang (including nowadays Hunan and Hubei provinces), Zhejiang (the Lower Yangzi core), Fujian, and Guangdong provinces. South Zhili province is further divided into Anhui and Jiangsu, as the wage difference was too large. These cover China's territory cores in the sixteenth century.

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

Period	*Freq.*	*Percent*	*Cum.*	*Region*	*Freq.*	*Percent*	*Cum.*
1530-1539	96	9.44	9.44	Beijing	16	1.57	1.57
1540-1549	138	13.57	23.01	North Zhili	74	7.28	8.85
1550-1559	123	12.09	35.1	Anhui	123	12.09	20.94
1560-1569	85	8.36	43.46	Shandong	118	11.6	32.55
1570-1579	138	13.57	57.03	Guangdong	83	8.16	40.71
1580-1589	95	9.34	66.37	Hangzhou	28	2.75	43.46
1590-1599	94	9.24	75.61	Jiangsu	98	9.64	53.1
1600-1609	116	11.41	87.02	Jiangxi	82	8.06	61.16
1610-1619	52	5.11	92.13	Henan	34	3.34	64.5
1620-1629	20	1.97	94.1	Zhejiang	140	13.77	78.27
1630-1640	60	5.9	100	Huguang	89	8.75	87.02
				Fujian	132	12.98	100
Total	*1,017*	*100*		*Total*	*1,017*	*100*	

Source: See text

Given the nature of these civil servants, I expect that remunerations for government labour services should represent the living cost necessary for survival rather than the market wage rate. Not all *ya yi* satisfy this assumption. I took records only on doormen (*menzi*), runners (*zaoli*), and state school doormen (*ruxue menzi*) for the following reasons. Firstly, these jobs can be found in each local government across the empire. Second, payments on these services did not contain stipends on tools or office supplies.[35] Third, remunerations for these three jobs can be safely converted to day rates. In most cases, records in local gazetteers are marked either in payments per job per person or per person per year. No exact

[35] A contrary example is the payment of prison guards, which included the spending instruments of torture.

length of the working year is provided. Scrutiny of government practices in bookkeeping and the day rates on labour services from other official documents show that in most cases, "yearly" payments in local gazetteers are day rates multiplied by a theoretical length of 360 days working. Such practice is typical for government budgeting in early modern China. In practice, a year- long labour service was usually divided into three or four terms, and each term can be 10 days or a season long (90 days). Based on these bookkeeping practices, I managed to convert "yearly" payments on doormen and runners into day rates.

To test whether *ya yi* payments could stand for a minimum level of payments in kind, I put together sample data that includes *ya yi* payments and other market rates paid in the public sector in Dongchang, Yanzhou, Xuzhou, Yangzhou, and Beijing between 1571 and 1615. These cities are connected by the Grand Canal, and both market and non-market rates on canal construction labourers can be found. If there is a pay difference between *ya yi* and non-*ya yi* labourers in the public sector, then:

$$\text{Market Premium} = \text{Market Wage} - \text{Non-Market Wage}$$

Estimated results show that, on average, payments on other unskilled public workers are 35 per cent higher than conscripted labour. The full regression results are reported in Appendix 1. The possible explanation for this is that *ya yi* payments may have only been the cash value of living expenses, and the estimated premium is likely to be the cash component of wage in the market (*gongyin* or *gongqian*). Scattered records also show that unskilled wages were mainly composed of payments in kind. In the agricultural sector, cash payments were around 20 per cent of total wages in the Lower Yangzi in the early seventeenth century, with the rest on food and other payments in kind.[36] The cash component

[36] In *Manyan zhaicao* (曼衍斋草), for instance, a long-term contract for workers on the mulberry field in early-seventeenth-century lower Yangzi delta was specified with cash payment of 2.2 *taels* of silver per annum and food payments of 7.2 *shi* of rice (or 8 *taels* equivalent) per annum. In total, it gives 10.2 *taels* of silver per annum (calculated in "four seasons" in the original literature), or 0.028 *taels* per day. Another wage quotation from *Shengshi nongshu* (沈氏农书) shows that a long-term contract included 5 *taels* of cash payment, 5.5 *shi* of rice payment, 1 tael of travelling expenses,

of unskilled wages in urban areas was higher, ranging between 20 to 40 per cent.[37] Therefore, I use payments on doormen and runners as a proxy for payments in kind in urban areas.

The second data set contains 387 wage records in the public sector (other than *ya yi*) between 1571 and 1840. It is collected from various sources and includes artisans, craftsmen, and unskilled labourers employed by local and imperial governments in Beijing, as well as hydraulic labourers (canals and riverbanks) in Yanzhou, Dongchang (North China plain), Xuzhou, and Yangzhou (the Lower Yangzi). These wages are either in day rates or rates per working day (*gong*) and have already included both payments in kind and cash. Industrial and locational distributions of these wage records 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	22	5.68	5.68	Dongchang	10	2.58	2.58
Building	104	26.87	32.56	Yanzhou	26	6.72	9.3
Handicraft	204	52.71	85.27	Beijing	283	73.13	82.43
Service	57	14.73	100	Xuzhou	50	12.92	95.35
				Yangzhou	18	4.65	100
Total	387	100		Total	387	100	

Source: see text

Wages in Beijing are collected from four sources: Miscellaneous Notes of Wanping County Government (*Wanshu zaji*), Factory Instructions of the Ministry of Work (*Gongbu changku xuzhi*), the Collected Statutes of the Great Qing (*Daqing huidian*), and the printed primary source on payroll records of the Ministry of Imperial Household (*Neiwufu zaobanchu qianliang kupiao* 內務府造辦處錢糧庫票). Miscellaneous Notes is a private publication by Shen Bang, the magistrate of Wanping county (outside Beijing city) between 1590 and 1593. The Notes contain wage quotations on various artisans and labourers hired by local and imperial

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*.

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

governments in Beijing between 1588 and 1593. The Factory Instructions is an official publication around 1615 and contains wage quotations and material costs for construction and crafting projects. These sources record a variety of skilled and unskilled wages in service, handicraft, and building industries and are usually in day or monthly rates. Finally, the Collected Statutes are the official publications on the administrative regulations, laws, and cases between the mid-seventeenth and late-nineteenth century, and payroll records of the Ministry of Imperial Household are printed archive materials. They both record scattered wages for artisans, craftsmen, and building labourers employed by the imperial state in Beijing between 1659 and 1840.

Wages of hydraulic labourers are 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*), and the Collected Statutes of the Great Qing (*Daqing huidian*). Except for local gazetteers, other materials are selected publications of the memorials of imperial officials. They all record unskilled wages, budgetary or issued, but they have selection differences. Veritable Records are the official compilation of government diaries, ministerial papers, and officials' memorials on a daily basis. Collected Literature and the Overview are private publications. The former compiled the memorials written by a few influential officials. The latter is mostly the writings by the author Pan Jixun himself, an imperial official and hydraulic expert in sixteenth-century China.

The third data set contains 3,710 cash wage records on 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 wage data are extracted from the costs of woodblock printing of Buddhist scriptures — Jiaxing Tripitaka (*Jiaxing zang*, also referred to as *Lengyan zang*, *Wanli zang*, or *Jingshan zang*). These skilled workers were employed by the same employer, worked for the same project, and were paid by the same standard, as the project was under the supervision of the same group of

people. Except for 1620, wage records are consecutive from 1601 to 1644. After the dynastic change in 1644, no records are available in 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	461	12.43	12.43
Changshu	231	6.23	18.65
Guangji	5	0.13	18.79
Unknown	5	0.13	18.92
Hangzhou	1,916	51.64	70.57
Songjiang	39	1.05	71.62
Suzhou	258	6.95	78.57
Zhenjiang	795	21.43	100
Total	*3,710*	*100*	

Source: See text

When Jiaxing Tripitaka was initiated in the 1570s, the printing workshop was set in Mount Wutai, Shanxi province (Northwest China).[38] From the 1590s onwards, the workshop moved to the Lower Yangzi.[39] Because the project was mostly funded by public donations, many scriptures recorded the names of donors, the date 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. Because a considerable part of wage records in the original texts is the total sum of payments on engravers and calligraphers, I presume that the pay ratio between them remained the same throughout this project. Besides, these cash wages are in piece rates (silver *tael* per 100 words). I converted them into day rates, presuming that an average engraver could carve 125 words a day (in *Song* font).[40]

[38] Yang and Xing, "Jiaxingzang zhengliji," p.203.
[39] *Ibid*, p.204.
[40] Between the sixteenth and nineteenth century, a woodblock engraver was able to carve at least 100 to 110 words in *Songti* font every day. A highly skilled engraver was able to carve 130 to 160 words in *Songti* font a day. On average, I assume 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*, p.558-9.

The fourth data set contains 547 scattered wage records from secondary literature and printed primary sources on labour disputes stored in the Qing empire's central and local judicial archives. They range from 1724 to 1840, and except for Xinjiang and Mongolia, they cover nearly all eighteenth- and nineteen-century Qing territory. The distribution of these wage records is reported in Table 4.

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

Period	*Freq.*	*Percent*	*Cum.*	*Region*	*Freq.*	*Percent*	*Cum.*
1724-1730	15	2.74	2.74	Northeast	52	9.51	9.51
1731-1740	33	6.03	8.78	Beijing	29	5.3	14.81
1741-1750	34	6.22	14.99	Central	72	13.16	27.97
1751-1760	39	7.13	22.12	North	100	18.28	46.25
1761-1770	18	3.29	25.41	South	58	10.6	56.86
1771-1780	21	3.84	29.25	Jiangnan	50	9.14	66
1781-1790	12	2.19	31.44	Northwest	81	14.81	80.8
1791-1800	53	9.69	41.13	Southwest	105	19.2	100
1801-1810	131	23.95	65.08				
1811-1820	94	17.18	82.27				
1821-1830	53	9.69	91.96				
1831-1840	44	8.04	100				
Total	*547*	*100*		*Total*	*547*	*100*	

Source: See text

One issue with these data is that the original text does not indicate whether wages already include payments in kind.[41] To solve this problem, I classified and coded them based on the common range of wage levels recorded in other official and private publications of this time. Another issue is that wages in copper coins recorded in judicial files are calculated in local currencies in many cases. This is common in North (Shandong, Zhili, and Beijing) and Northeast China (Manchuria). In North China, local currencies, usually referred to as "small coins" (*xiaoqian*) or "capital coins" (*jingqian*), are traded at a ratio of 2:1 against the standard copper coin. In Northeast China, local currencies, "east coins" (*dongqian*) or "market coins" (*shiqian*), are traded at a ratio of 6:1 against the standard copper

[41] Deng and O'Brien, "a survey and critique."

coin. Therefore, unless wages are explicitly marked in the standard coin, wage records from North and Northeast China are treated as in local currencies.

Table 5. Nominal Units of Wage Accounting and Conversion in Table 1-4

Dataset	*Wage numeraire*	*Currency*	*Payment rate*	*Conversion*
ya yi	silver tael	standard	yearly rate	silver, day rate
other public	silver tael	standard	day/monthly rate	silver, day rate
woodblock engravers	silver tael	standard	piece rate	silver, day rate
other private	silver&copper coins	standard/local	day/monthly rate	silver, day rate

Note: Silver-copper coin exchange ratios (tael of silver per standard copper coin) see Lin, Yinxian, 76-77, Table 2.6. Noticing that Lin's exchange rates are more representative of northern and Beijing markets, but exchange rates in the north and south tended to move in tandem in the long term.

Table 5 summarises the nominal units of accounting in which wage data are collected and converted. To be consistent with existing literatures, the nominal day wage of an unskilled building labourer in the Lower Yangzi is selected as the basis of estimation. The following OLS model (3) is defined for wage records reported in Table 1-4:

$$\ln(\text{wage}_i) = \alpha + \sum_{t=1}^{31} \beta_t \cdot \text{period}_{t,i} + \sum_{j=1}^{8} \eta_j \cdot \text{region}_{j,i} + \sum_{k=1}^{6} \gamma_k \cdot \text{industry}_{k,i} + \sum_{j=0}^{3} \sum_{p=0}^{2} \cdot \delta_{j,p} \cdot \text{skill}_{j,i} \cdot \text{food}_{p,i} + \sum_{m=0}^{2} \theta_m \cdot \text{payment}_{m,i} + \sum_{l=0}^{4} \rho_l \cdot \text{miscellaneous}_{l,i} + \sum_{o=0}^{4} \varphi_o \cdot \text{woodblock}_{o,i} + \varepsilon_i \quad (1)$$

where $wage_i$ is the log of the daily wage of labour$_i$. α is the constant term; $period_{t,i}$ 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 in 1644, all other periods are decennial. $region_{j,i}$ is a dummy for eight macro-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 *ya yi*, agriculture, printing, handicraft, serve, and mining industries. $skill_{k,i}$ and $food_{p,i}$ are the intersection that captures whether labour$_i$ is an unskilled, skilled, or highly skilled worker, and whether

wage quotations contain only cash payment, payment in kind, or both. $payment_{m,i}$ is a dummy specified for *ya yi* data source reported in Table 1. It indicates whether the payment was issued from the government or the conscription agent. [42] $miscellaneous_{l,i}$ and $woodblock_{l,i}$ are two dummies specified for the data source reported in Table 3, and they capture whether the printing cost contains additional spending on the miscellaneous and woodblock.

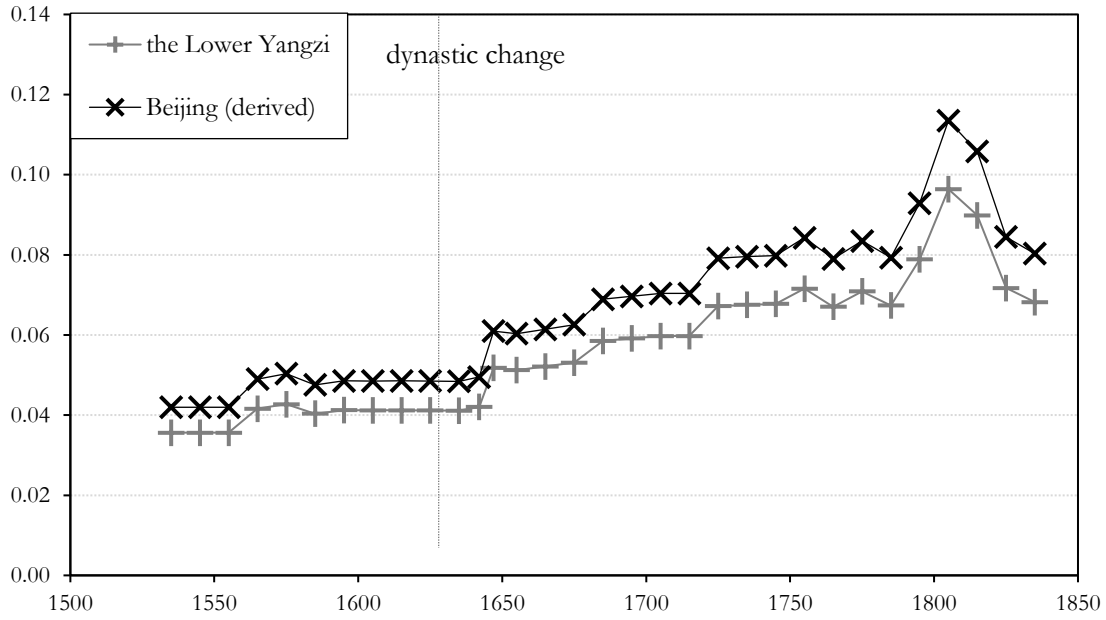
4. Nominal wage

What were the level and trend of nominal wages in China in the early modern period? Figure 1 presents the estimates of unskilled day wage in the Lower Yangzi delta, where the wage of a building labourer in the 1530s is set as the baseline. I also derived Beijing's wage level from the wage function for comparison. Except for the 1540s and 1550s, the period dummies in wage function are all statistically significant. Taking an unskilled building labourer in the Lower Yangzi as the baseline, regression results show that except for agricultural employment and conscripted government labours, wage differentials between all other industries are statistically insignificant. What contributed to wage differentials are regions and skills. Full regression results are reported in Appendix 2[43].

[42] In the government's account, there were two ways of paying these conscripted labourers. One is called *guangei* (官给), literally means the payment was issued by the government. The other is called *datao* (打讨), where the government issued tax receipt (*youtie* 由帖) to the conscription agents with the amount of fees to be collected from people who subject to conscription. Wages paid by *datao* were significantly lower than by *guangui*, not because there was a wage gap between the two methods of payment, but because payments from *datao* approach were usually collected from multiple taxpayers and equally divided between. A single tax receipt was only a part of the total sum, and there is no wage difference between two payment methods. I added a dummy variable here to control the impact of *datao*.

[43] Appendix 2 will be released with the final version of this paper.

Figure 1. Nominal daily unskilled wages in the Lower Yangzi and Beijing, 1530-1840 (silver taels)



Source: Data see previous text.

The overall picture shown in Figure 1 is that the nominal wage continued to increase in the Lower Yangzi between1530 and 1840. Four sustained rises are observed in the 1560s, 1650s, 1680s, and 1720s, along with a temporary increase between the 1790s and 1820s. In the first half of the sixteenth century, nominal wages in the Lower Yangzi remained stable until the 1560s, when a substantial rise occurred. This wage increase coincided with the further fiscal monetisation from the 1560s. In 1561, reforms were initiated in Zhejiang province, the core of the Lower Yangzi Delta, and in 1567 the imperial state opened Yuegang port of Zhangzhou prefecture, Fujian province, in south coast China to overseas trade. Despite the controversies surrounding its regional adaptability, the reforms were formally promulgated as an empire-wide policy under the Single-Whip Law of 1581. After that, nominal wages in the Lower Yangzi stagnated until 1635, when the Ming empire was on the verge of collapse, and surged after the dynastic change of 1644. This drastic change in wage levels may be the result of widespread plague (particularly in the northern territory), rebellion, social turmoil, and hyperinflation during the Ming-Qing transition.

Entering the Qing period, two substantial rises in wages were observed in the 1680s and the 1720s, and they coincided with the Revolt of Three Feudatories (1673-1681) and the fiscal reform of the 1720s. The Revolt was led by three lords of the fiefdoms in the south and southwest China, and the regime occupied six provinces at its peak. The tax reform, referred to as *tanding rumu* (摊丁入亩) and *huohao guigong* (火耗归功), is an empire-wide reform that abolished poll tax in essence and legalised local tax surcharges. Wages remained stable over the rest of the eighteenth century until a temporary rise occurred after the 1790s, which coincided with a temporary price rise on the market. From the 1790s onwards, the official reports on hydraulic projects frequently mentioned budget deficits caused by the increasing costs of construction materials and labourers in Shandong (north plain) and Jiangsu provinces (the Lower Yangzi core).[44]

It is worth noting that Figure 1 presents the trend of silver wages. In the early modern Chinese market, copper coins were a more popular medium of daily transaction. As the purchasing power of silver generally declined over the sixteenth and nineteenth centuries, we need to test whether nominal wages still increased if they were measured in copper coins.[45] As there were many local currencies circulating in the Chinese market over these centuries and no comprehensive record of silver-copper coins exchange rates are available for each, we take the Lower Yangzi as an example of wage development in copper coins.

[44] See examples from *Guangxu Daqing hudian shili*, vol.909, p.11a.
[45] Peng, *Zhongguo huobishi*, p.500; p.610-2.

Figure 2. Index of day wage in standard copper coin in the Lower Yangzi, 1638-1840 (1638=100)

Notes and Source: Wage data are converted from silver wages estimated in this paper. Silver-copper coin exchange ratios (*tael* of silver per standard copper coin) see Lin, *Yinxian*, 76-77, Table 2.6.

Figure 2 shows the wages index in the standard copper coin in the Lower Yangzi between 1638 and 1840. They are converted from silver wages shown in Figure 1. Wages in copper coins display more volatility and continue to rise over the centuries at a greater scale. Since the late eighteenth century, there was constant depreciation of copper coins against silver, usually referred to as "cheap copper coins and expensive silvers" in Chinese literature (*qianjian yingui*). By the middle of the nineteenth century, wages in copper coins were three times the level of 1638. In either silver or copper coin numeraire, nominal wages in the Lower Yangzi increased over the sixteenth and first half of the nineteenth centuries.

Given the situation in the Lower Yangzi, we wonder whether wages in other regions differed from the Lower Yangzi. Table 6 presents estimated results of regional wage patterns between 1530 and 1840. Macro-regions in Table 6 are classified as follows: the Lower Yangzi includes Jiangsu and Zhejiang provinces; North China includes North Zhili, Henan, and Shandong provinces; Central China includes Anhui, Jiangxi, and Huguang provinces; and South China includes

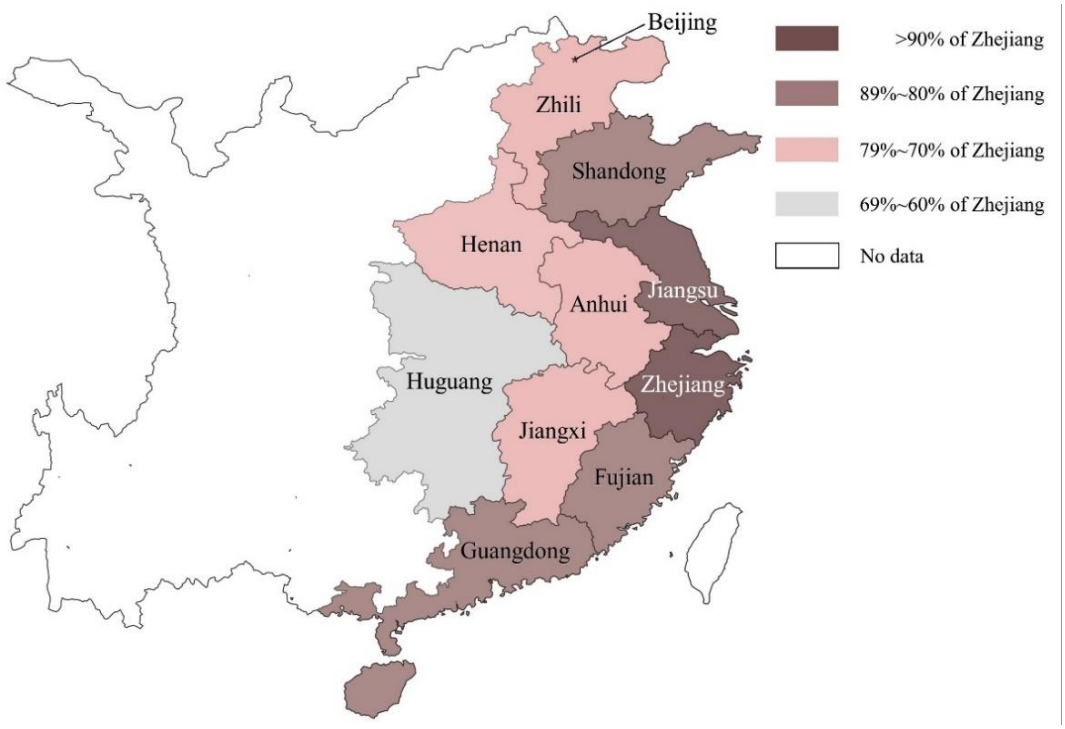
Fujian and Guangdong provinces. Table 6 also reports separately a regional pattern of payments on conscripted government labours (*ya yi*) between 1530 and 1640. The baseline is set as a prefectural doorman in Zhejiang province, the Lower Yangzi, and no market rates are included. Graph 1 further breaks this pattern into provincial levels. This is to test whether conscription payments tell us a different story about labour costs.

Table 6. Regional Wage Levels as Percentages of the Lower Yangzi

Region	*1530-1640**	*1530-1840*
Lower Yangzi	100%	100%
Beijing	113%	116%
North	78%	83%
Central	75%	71%
South	83%	90%

Note and source: Percentages of the Lower Yangzi are derived from separate regressions. For 1530-1640*, results are estimated from *ya yi* remunerations, averaged based on provincial levels in each macro-region; for 1530-1840, results come from the entire wage dataset.

Graph 1. Living Wages in China proper, Standardised on the Payment of a Doorman in a County Government in Zhejiang Province, 1530-1640



Notes and Source: *Ya yi* data are used here, see Appendix 3; Inner China territory map is obtained from the China Historical Geographical Information System (http://www.people.fas.harvard.edu/~chgis/). On the map, 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.

Overall, the Lower Yangzi led other regions in nominal wages except for Beijing. After excluding the market rate, the payment of unskilled labours from conscription still exhibits the same regional pattern. Again, the remuneration for conscription was the highest in Beijing, reflecting higher living costs due to the large population and troops in the city.[46] In comparison, payments in prefectures and counties surrounding Beijing city are significantly lower: North Zhili as a whole was only 65 per cent of Beijing's level. City size also affected payments, as they were relatively higher in large cities (prefecture) than in small cities and towns (county). Among all provinces where data are available, the lower Yangzi, Jiangsu and Zhejiang provinces, offered the highest level of payment for

[46] Cao Shuji estimates that the civilian population in Beijing city may have surpassed one million in the late Jiajing era (c.mid-sixteenth century). See Cao, *Zhongguo renkou shi*, vol.4, p.218.

conscription. Following the Lower Yangzi, the southern part of North China Plain, Shandong province, and southern coast, Guangdong and Fujian provinces, ranked in the second tier. Hinterland provinces were among the lowest.

One possibility of this regional variation is labour productivity. But since our selection of government labour services was developed from corvée obligations and had no skill requirement, this variation is more likely to reflect regional costs of living. A few government invoices show that the payments for doormen and runners covered daily necessities, or the so-called "firewood, rice, oil, and salt" in Chinese idiom. For instance, in December 1578, Chinese calendar, an invoice from Jinan prefectural government, the provincial seat of Shandong, recorded that 1.34 *taels* of silver of "firewood and rice money" (柴米银) were issued this month to the doormen of the assistant prefect, and this was consistent with the payment standard found in government budget account.[47] Similarly, the same amount of "firewood and rice money" was issued in January 1579 to the doormen of a *fenshou dao* (分守道) in Shandong, a senior official in the provincial government.[48] 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.[49]

Given its essence, conscription payments were expected to be the living wage. Some evidence indicates that the cash value of these payments was converted from payments in kind, and rice was one of the most frequently used bases of calculation. Sometimes, the total payment was settled by the cash value of rice allowance but issued in other payments in kind equivalent in value. Table 7 shows the rice allowance for a construction labourer by conscription, where one *sheng* of rice per day (750 grams) remained a basic standard throughout the second half of the fifteenth and eighteenth centuries. In addition to rice, food allowance was often

[47] See *Zhongguo mingchao dangan huizong*, vol.99, p.248. On the budget account, assistant prefect of Jinan prefecture was assigned two doormen. So a total monthly spending of 1.34 *taels* of silver converts into 0.67 *taels* for each, or 0.0223 *taels* per day. This was exactly the payment standard of a prefectural doorman in large prefecture found in local gazetteers.
[48] *Zhongguo mingchao dangan huizong*, vol.99, p.251.
[49] *Ibid*, p.214.

accompanied by salted vegetables, though they were sometimes issued in cash. The standard of food allowance for conscription labourers can be uniform across places, but its cash value was different on the budget account. This may explain why the majority of government labour services in a district received the same cash value of the payment. Sometimes, local officials would investigate the actual living costs and assess whether payments were reasonable.[50]

Table 7. Rice Allowance for A Construction Labourer by Conscription, 1451-1791

Year	*Region*	*Place*	*Construction work*	*Daily rice allowance*	*Other payments*	*Source*
1451	North	Jinan	riverbank	1 *sheng*	unknown	MYZSL, vol.290, 4502
1472	Lower Yangzi	Yangzhou	riverbank	1 *sheng*	yes	MHZSL, vol.100, 1939
1485	Lower Yangzi	Yangzhou	riverbank	1 *sheng*	unknown	MHZSL, vol.261, 4429
1485	North	Tongzhou	riverbank	1 *sheng*	unknown	MXZSL, vol.28, 631
1586	Northwest	Xuanfu	fortification	1 *sheng*	yes	MSZSL, vol.172, 3150
1725	North	Qingyuan	riverbank	1 *sheng*	yes	GG021555
1739	Southwest	Guizhou	fortification	1 *sheng*	yes	QGZSL, vol.101, 522
1757	North	Shandong	riverbank	1 *sheng*	yes	QGZSL, vol.547, 971
1772	North	Yongding river	riverbank	1 *sheng*	yes	QGZSL, vol.916, 271
1791	North	Zhili	riverbank/ cash for work	1 *sheng*	yes	QGZSL, vol.1373, 427

Notes: Abbreviations for primary sources: 明英宗實錄(MYZSL), 明憲宗實錄(MHZSL), 明孝宗實錄(MXZSL),明神宗實錄(MSZSL), 清代宮中檔奏摺及軍機處檔摺件(GG), 清高宗實錄(QGZSL).

Payments for agricultural employment are, on average, lower than non-agricultural employment, and this is consistent with some existing studies.[51] But

[50] One example comes from Hai Rui, one of the most famous statesmen of the late Ming empire. His personal memorials show that during his term of office as the magistrate of Xingguo county, he investigated and updated payment standards on conscription. Another example comes from Dai Jing, a senior imperial minister. As a part of local reform, he investigated local living costs and reset the payment standards for labour service in governments during his term as the provincial governor of Guangdong. See *Guangdong tongzhi chugao*, vol.19; vol.21.

[51] Between 1837-1870 in Shicang, Hunan Province, the average day wage was about 75.19 *wen* (food payments already included). The average daily wage of agricultural workers was about 73.06

the wage differential between non-agricultural employments is statistically insignificant.

It is worth discussing the building industry as it is a common benchmark for cross-country wage comparison. Compared with previous work, this paper downscaled the level of unskilled building wages in eighteenth-century Lower Yangzi and Beijing. One possibility for this result may come from the issues on sample selection and data processing in the previous work. In Allen et al. (2011), Chinese building wages mainly come from the 1769 edition of Regulations and Precedents on the Prices of Materials (*Wuliao jiazhi zeli*). It is a collection of official reports on the prices of building materials and the wages paid at construction projects. But in the original texts, there is hardly any information other than the location and wage for each job quoted. The types of job are also vaguely defined as the majority were either quoted as "labourer" (*fu*) or "artisan" (*jiang*). No information is given to the types of projects for quoted wages. There is a potential risk of presuming all "artisans" in the reports had the same skill level, and consequently, certain regions had exceptionally high wages.

This is particularly an issue for building wages in Beijing. The official building projects in Beijing were mainly palace constructions. Wage quotations on building craftsmen and artisans employed in the inner palace are more likely to represent "highly skilled" rather than "skilled" workers. But in other regions, official constructions were usually hydraulic projects such as canals and riverbanks and building wages are more likely to be "skilled" wages.

One example in Shandong province clearly illustrates this. In the 1769 edition of Regulations and Precedents quoted by Allen et al. (2011), the day rate of a skilled building craftsman in Shandong province was 0.061 *taels* of silver.[52] However, another wage quotation on building artisans from the Archive of Confucius Family

wen and non-agricultural workers 83.42 *wen*. Real wages in rice prices present no significant upward trend between 1835 and 1850. See Jiang and Wang, "Qingdai shicang", p.112-3. See also Sun and Li, "Shengshi de yanxu haishi shuailuo de kaishi," p.41-7.

[52] Allen et al., "Wages, prices, and living standards in China," p.12, Table 1.

Mansion (*Kongfu dangan*) shows that in the 1720s, the day rate of a building craftsman in Qufu, Shandong province, was quoted at 0.14 *taels* of silver for the project on the Temple of Confucius. This is exactly the wage level of a building craftsman in Beijing that Allen et al. quoted from the Regulations and Precedents (0.141 *taels*).[53] The possible reason for Confucius Family Mansion to pay such an exceptional rate is that the project was sponsored by the emperor and employed the payment standard for those highly skilled workers in the inner palace in Beijing. This example suggests that wage quotations in the 1769 edition of Regulations and Precedents included skilled and highly skilled workers. It also explains why my estimate of the day rate of an unskilled building labourer in 1760s Beijing (0.0789 taels) is very close to the average day rate quoted in the 1769 edition of Regulations and Precedents (0.077 taels), despite the huge difference on "skilled" wage.

It is also worth noting that the level and trend of wages estimated in this paper differ substantially from the previous predictions of Allen et al. (2011). My estimates downscaled the wage level in the Lower Yangzi (and Beijing) and showed that wages continue to increase over this entire period. Table 8 compares my estimates with earlier results from Broadberry and Gupta (2006) and Allen et al. (2011). For the eighteenth century, Allen's et al. estimates for Beijing and the Lower Yangzi are eighteen and thirty per cent higher than mine, respectively. Besides, their predictions continue to decline over the seventeenth to the first half of the nineteenth centuries, especially between 1820 and 1838 when nominal wage in Beijing dropped by nearly fifty per cent. In fact, Allen's et al. predictions of unskilled wages in the Lower Yangzi are closer to the level of skilled wages. For instance, my estimates on the daily wage of a woodblock engraver ranged between 0.082 and 0.086 *taels* of silver between 1645 and 1677. While Allen's unskilled building wage already reaches 0.09 *taels* during this time. When comparing with the textile industry, Deng and O'Brien (2016) also point out that Allen's unskilled wage is closer to the level of skilled weaving workers in the Lower Yangzi.[54]

[53] *Ibid*.
[54] Deng and O'Brien, "a survey and critique," p.1076.

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

	Broadberry et al. (farming)[a]	Allen et al. (building)[b]	Liu (building)[c]
1500-49			0.036
1550-99	0.040		0.040
1600-49	0.040		0.043
1650-99		0.090	0.055
1700-49		0.088	0.064
1750-99	0.045	0.086	0.071
1800-49	0.045	0.085	0.082

***Notes and Source*:**

[a] Broadberry et al., *The early modern great divergence*, p.18.

[b] Allen et al., *Wage, prices, and living standards in China*.

[c] 1500-49 is the average of 1530-49; 1800-49 is the average of 1800-40.

5. Real wage

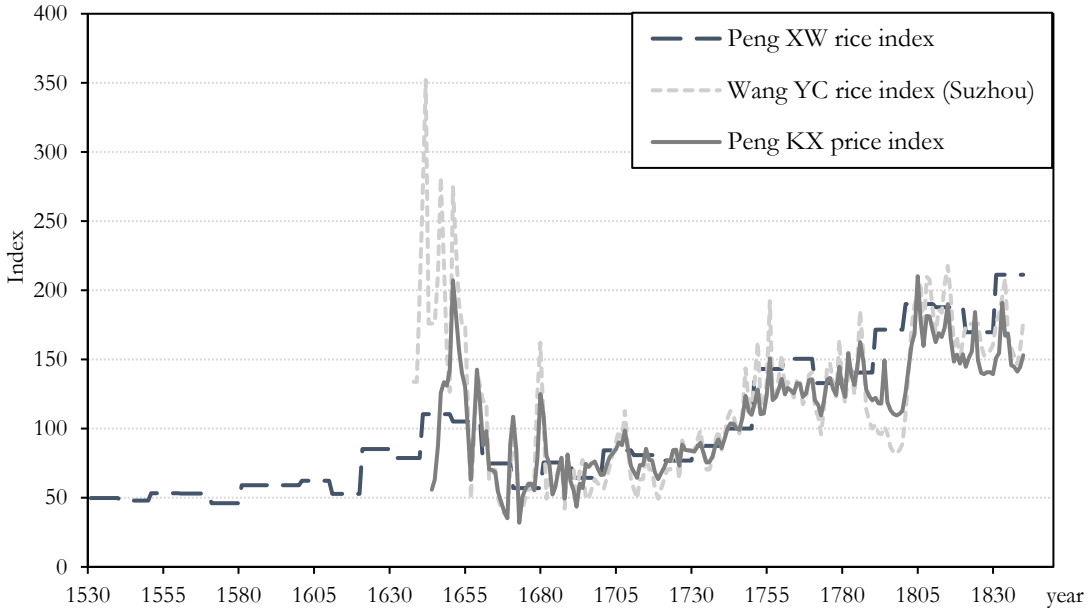
What implications can we draw from wage earnings about living standards? To estimate the living standard from the wage perspective, the standard practice deflates nominal wages with the cost of a basket of consumer goods. In comparison with Europe, however, price records are very limited in early modern China. A common approach to deal with this constraint is to take rice and grain prices as a benchmark of a 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 alternatively, to interpolate a time series of consumer prices with scattered data. 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.[55] Rice price was also a benchmark for converting taxes paid in kind into money payments. Despite that

[55] In Huizhou, Anhui province, for example, the unstable value of paper notes and the ban on metallic currencies made rice and other grains a common mean of payments for land transactions in the market before 1450. See Li, "Cong Mingdai de qiyue kan Mingdai de bizhi". It was not rare to see rice as a unit of price conversion even in the first half of the 17th century. Ye Mengzhu, the author of *Yueshi pian* 阅世篇, recorded the prices of soybeans, salt, and firewood between 1620 and 1644 in the bucket of rice.

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.

Figure 3 presents three price indices. First, the decadal price index of rice between 1530 and 1840 comes from Peng Xinwei, and it captures the average level of rice prices.[56] Second, the yearly price index of rice in 1638-1840 Suzhou comes from Wang Yeh-chien, which is more representative of the top-grade rice.[57] Lastly, the annual consumer price index between 1644-1840 comes from Peng Kaixiang.[58] It is mainly computed based on grain prices and is consistent with Wang's index for the Lower Yangzi region.

Figure 3. Price indices in the Lower Yangzi, 1530-1840 (1745=100)



***Notes and Source*:** Peng Xinwei's decadal rice prices see Peng, *Zhongguo huobishi*, 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, p.40-5; Peng Kaixiang's consumer price index see Peng, *Qingdai yilai de liangjia*, p.168-76, Appendix 5.

[56] Peng, *Zhongguo huobishi*, p.497.
[57] The Qing Dynasty Grain Prices Database of Academia Sinica provides rice prices at different grades and quality. Among them, the price of top-grade rice is consistent with Wang Yeh-chien's Suzhou rice series. See Qing Dynasty Grain Prices Database from https://mhdb.mh.sinica.edu.tw/foodPrice/.
[58] Peng, *Qingdai yilai de liangjia*, p.168-76, Appendix 5.

Overall, the three indices present a coherent pattern over the long run. Prices remained stable before 1620 but began to rise rapidly afterwards and reached a peak in the mid-seventeenth century. This is the time of widespread famines, rebellions, hyperinflation, and dynastic change. In the second half of the seventeenth century, prices fell back to the level of the late-sixteenth century. Beginning in the eighteenth century, commodity prices in China saw a steady rise which was then accelerated after 1740. By the end of the century, fluctuations in the silver-copper coin exchange rate caused prices to drop substantially and surged in the first two decades of the nineteenth century.

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 (the Lower Yangzi), respectively, around 1750.[59] For Suzhou, the authors extended Shanghai's twentieth-century retail prices with Wang Yeh-chien's Suzhou rice series shown in Figure 3 and built a barebones basket that provides 1,940 calories per day from the cheapest available carbohydrate and non-food items include cloth, candles, lamp oil, and fuel.

Allen's Suzhou basket provides us with a starting point to estimate living standards in early modern China, but it seems to underestimate the weight of food consumption and overestimate the weight of energy consumption for poor people in the Lower Yangzi region. Since no price detail is provided for each item in Allen's Suzhou basket, Table 9 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, and Huang's basket represents the average level of household consumption in a peasant family in the Lower Yangzi and includes vegetables, meat, fish, eggs, and several flavourings. In Table 9, 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 take up 65.82 per cent of the expenditures on basic needs - I define basic needs as every item in Allen's basket, including food, flavouring/cooking oil, clothing, fuel,

[59] Allen et al., "Wages, prices, and living standards in China," p.21.

and candles/lamp oil. While in Huang's structure of family consumption, food consumption takes up 75.25 per cent of basic needs. On the other hand, light and fuel consumptions take up 22.98 per cent of total spending in Allen's basket while 9.85 per cent in Huang's.

Table 9. Annual Family Consumption of a Chinese Family Around 1745 (grams of silver)

Allen's Beijing basket, barebones			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.

We need to modify Allen's basket in two aspects: first, the structure of household consumption in the Lower Yangzi region; second, the selection of "cheap' sources of calories for subsistence level of food intake. Huang's consumption structure is more representative of mid-eighteenth-century Lower Yangzi for the following considerations:

1. Huang estimated these expenses based on direct evidence and records of the eighteenth century.
2. Allen's basket is supposed to represent a bare bone level of consumption. The weight of the "subsistence' level of food intake is expected to be higher than Huang's more respectable calculations. But we observe 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 be very different in the two regions, as shown by the differences in Allen and Huang's baskets.

Considering that Chinese employers usually provided meals and living places for long term contracts (and sometimes short-term contracts), an unskilled labourer's spending on light and energy can be further lower. In addition, fuel consumption in the Lower Yangzi is expected to be lower than that in Beijing, given a warmer climate in the former region. 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 10 for the Lower Yangzi around 1745 while keeping 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 the eastern part of the Lower Yangzi, such as Jiading and Songjiang (the area of cotton planting), barley, sometimes wheat, was a popular substitute for rice in certain seasons, especially for poor people.[60] Prices of rice (inferior), barley, and beans come from the prices database of Academia Sinica and are a 12-month average of Jiangsu province.[61] Consumptions of beans, meat/fish, and cooking oil are set to be the same as in Allen's basket (20kg, 3kg, and 3kg per person per year, respectively). To be consistent with Huang's basket, these food expenditures are set to be 75.26 per cent of the total spending. The weight of clothing expenditure follows Allen's basket. The weights of light and energy spending are replaced by Huang's suggestion.

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

Table 10. Revised costs of subsistence baskets in the Lower Yangzi c. 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:

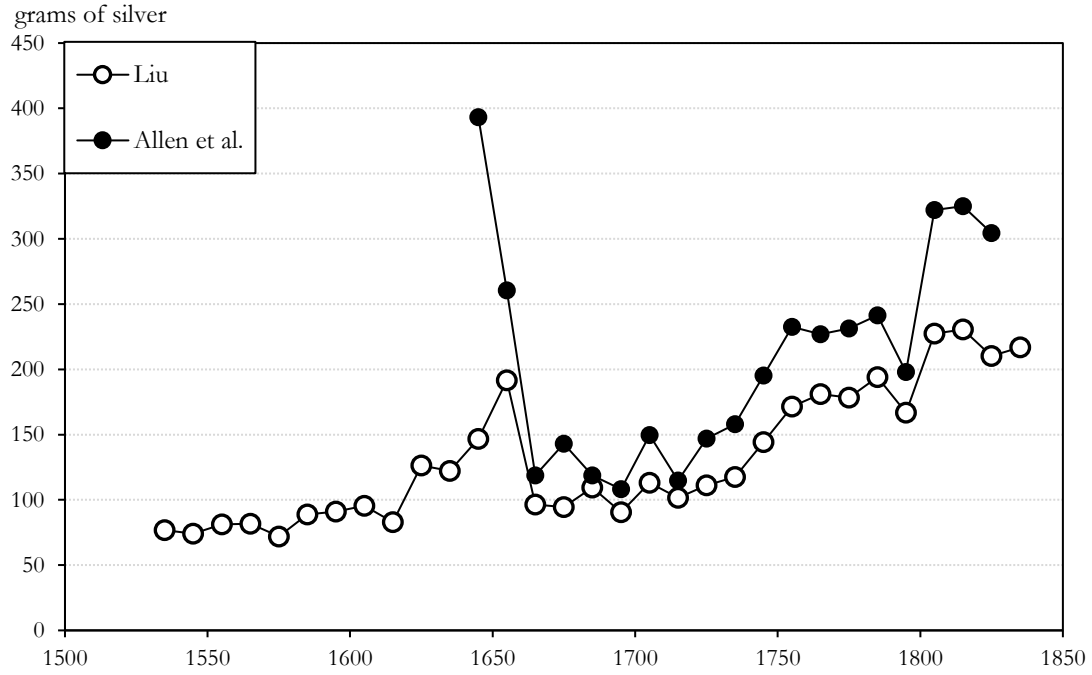
1. Per unit costs for rice(inferior) and barley are averaged to simulate food consumption for poor people in the Lower Yangzi. Prices are taken from https://mhdb.mh.sinica.edu.tw/foodprice/about.php
2. Expenditures on cooking oil, soap, and cloth are calculated using their weights in Allen's basket.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

It is worth noting that the weight of food consumption in my new barebones basket is 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 an idealised situation of a consumption basket that follows Allen's assumptions of calorie intakes.

Figure 4 compares Allen's bare bones basket cost and my modification. The new series of living costs is extrapolated from the basket of 1745 shown in Table 10 and the rice and grain prices trend. Figure 5 shows the indexed real day wages along with estimates from the previous work as well as indices for per capita GDP in the Lower Yangzi. In the long run, my real wage series displays an opposite trend to that of price. It remained stable before 1620, but a substantial drop occurred between 1620 and 1640, mainly due to the sharp increase in prices (see Figure 3). After the mid-seventeenth century, a substantial improvement was observed. This is partly caused by a surge in nominal wage after the dynastic change in 1644 and

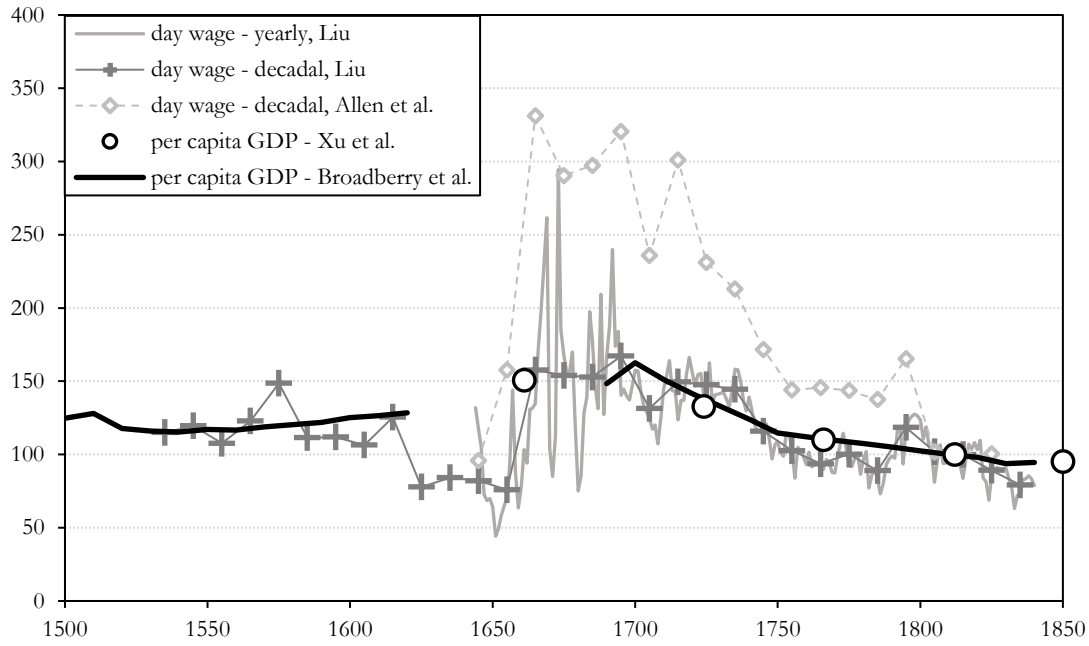
partly a fall in prices, especially after 1660. Thereafter, the real wage remained high until it quickly fell between the 1740s 1760s and remained at that level for the rest of the period.

Figure 4. Estimated costs of a barebone consumption basket in the Lower Yangzi, 1530-1840



Source: Liu's series see the previous text; Allen's series see Allen et al., "Wages, prices, and living standards in China."

Figure 5. Real day wage and per capita GDP indices for the Lower Yangzi, 1500-1850 (1810/12 = 100)



***Notes and Source*:** Allen's et al. wage series see "Wage, prices, and living standards in China"; Per capita GDP from Broadberry et al., "A Restatement," p.970-2, and Xu et al., "Chinese National Income," p.385.

Despite real day wage declining over the long run, the previous estimate from Allen et al. (2011) exhibits a substantial difference from mine. This is shown by the magnitude of wage improvement after 1644 and the drop after 1700. My new estimate shows that the real day wage increased 1.5 times after the mid-seventeenth century against three times suggested by the previous estimate. The decline in real day wage is much milder after 1700 than is suggested by the previous work, and no precipitous fall is observed after 1800. To check against my estimated trend of the real day wage, Per capita GDP estimates from Xu et al. (2017) and Broadberry et al. (2021) are also plotted in Figure 5.[62] Their GDP estimates are derived from the output approach, which summed up output values from the agriculture, industry, and service sectors. Overall, my estimate of real wage presents a consistent pattern with that of per capita GDP. A substantial improvement is observed in the second half of the eighteenth century. But, similarly to real day wage, per capita GDP began to decline after

[62] Broadberry el al., "A Restatement," p.970-2, and Xu et al., "Chinese National Income," p.385.

1700, which possibly suggests no intensive growth in the Chinese economy over these centuries.

6. Discussion: The great divergence

Can these new series of nominal and real wages offer any implication for the comparative living standards between China and the leading economies in Europe? This matter of interest goes back to the Great Divergence debate, where Pomeranz argues that living standards in the Lower Yangzi delta were comparable to that in England as late as 1800 (or 1750 by his later view).[63] But the following enquiries on this question often bifurcate around the timing of divergence. At the core of Pomeranz's (2000) argument, per capita, food consumption was found as high in the Yangzi delta region of China as in the most developed parts of Europe.[64] But Broadberry and Gupta (2006) consider that the high grain wage in the Lower Yangzi did not translate into a high silver wage, suggesting lower productivity in the tradable sector in early modern China.[65] A further enquiry on productivity by Li and van Zanden (2012) presents a similar position to Broadberry and Gupta's by presenting a remarkable productivity gap in the manufacturing sector between the Lower Yangzi and the Netherlands, despite their similar levels of agricultural productivity in the 1820s.[66] To capture productivity difference and structural change in the economy, Broadberry et al. (2018, 2021) develops the approach of historical national accounting and compares per capita GDP between China and leading economies in Europe from 980 to 1840.[67] Their findings show that per capital GDP was comparable between the Lower Yangzi and England before 1700 but began to diverge after 1720.

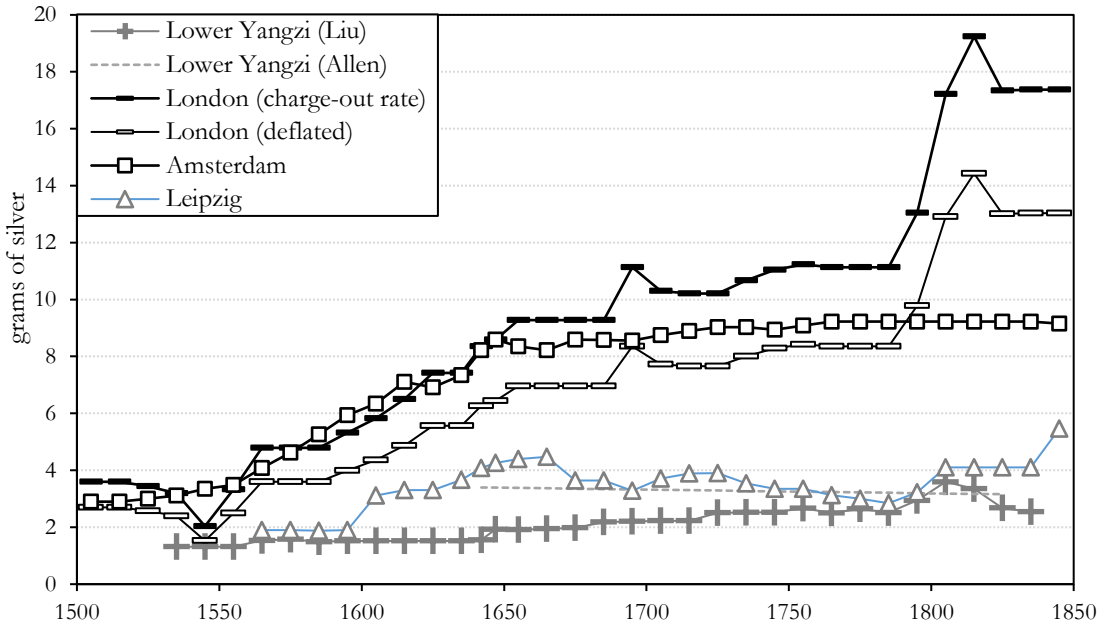
[63] 1800 as the timing of the divergence comes from Pomeranz's book *The Great Divergence*. His recent view can be seen from Pomeranz, "Ten years after," p.24.
[64] Pomeranz, *The Great Divergence*.
[65] Broadberry and Gupta, "The early modern great divergence."
[66] Li and van Zanden, "Before the great divergence".
[67] Broadberry et al., "A study in historical national accounting." Broadberry et al., "Restatement."

From the wage perspective, Allen (2001) and Allen et al. (2011) develop the approach of 'welfare ratio' to compare real wages across countries.[68] This welfare ratio measures "whether a man working full time could support a family at the "bare bones' level of consumption".[69] 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. To be consistent with existing literatures, we follow Allen's welfare ratio as a starting point.

In the following part, I'll firstly compare nominal day wages in China and Europe between the sixteenth and nineteenth centuries. Then, I'll examine the possible timings of the great divergence inferred from real wages given different estimates on nominal wages and costs of living. Finally, I'll address some issues regarding the welfare ratio approach in the case of early modern China. Given the constraint of current wage approach, this paper limits the implication from real wage comparison that the diverging wage trend may begin circa 1700

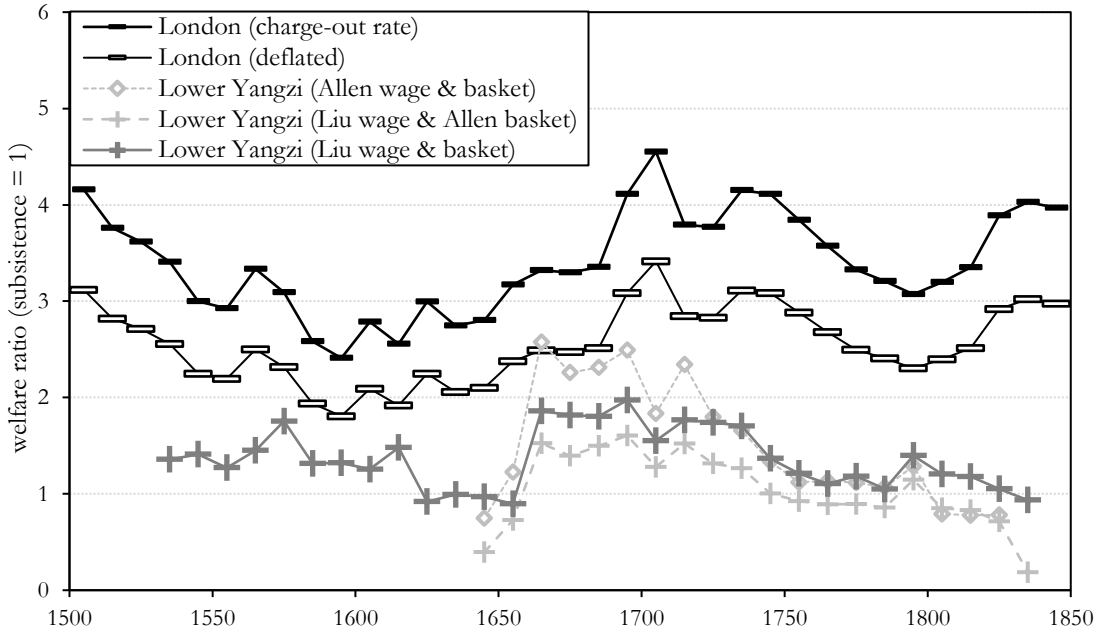
[68] Allen, "The great divergence"; Allen et al., "Wages, prices, and living standards in China."
[69] Allen et al., "Wages, prices, and living standards in China", p.26.

Figure 6. Estimated day wages, 1500-1850



Notes and Source: Money wage in the Lower Yangzi see previous text; European data come from Allen, "The great divergence." "London (deflated)" from Stephenson, "Real wages," p.115-6.

Figure 7. 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.

Figure 6 shows the daily wages of unskilled building labourers in London, Amsterdam, Leipzig and the Lower Yangzi from the sixteenth to the nineteenth centuries. For comparison, Allen's wage series for the Lower Yangzi is also plotted on the graph. Based on Allen's predictions, the money wage of an unskilled labourer in the advanced part of China was lower against Northwestern Europe but similar to the level of Central Europe. However, my new wage series suggests that the Lower Yangzi was the lowest against both Northwestern and Central Europe. It is also worth noting the series of "London (deflated)" on Figure 6. Judy Stephenson (2018) points out that London building wages shown by Allen are the charge out rates for contractors and are 20 to 30 per cent higher than the average level of wage.[70] If we compare the average day rate in London against its counterpart in the Lower Yangzi, the difference in money wage is smaller than previous literatures suggest.

Implications from real wages on living standards comparison is more complicated. Figure 7 compares real annual incomes inferred from day wage in the context of previous work. It shows my new series for the Lower Yangzi along with earlier estimates. We focus particularly on the Lower Yangzi and London, as these two cases are most frequently compared in the great divergence debate. The decadal "welfare ratio" measures the number of consumption basket (specified in Table 10) for a family of 3.15 that an unskilled male labourer could afford. Subsistence level of living is presented as 1. The higher the "welfare ratio", the higher the living standard.

A comparison on living standards through welfare ratio approach requires careful interpretation. Figure 7 exhibits two scenarios. We start with the implication from Allen et al. (2011). By comparing "Lower Yangzi (Allen wage & basket)" and "London (charge-out rate)", the divergence on real wages between China and England may occur before 1750, the timing favoured by the California School. But this scenario suffers from three issues. First, Allen et al. overestimated nominal

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

wage in the Lower Yangzi. Second, they overestimated the costs of living in the Lower Yangzi (especially for a bare bones basket). Lastly, unskilled building wages in London also seem too high. To illustrate how these overestimations can cause misleading implications, Figure 7 also shows "Lower Yangzi (Liu wage & Allen basket)". After deflating my nominal wage series with Allen's costs of living for the Lower Yangzi, the living standard in the advanced part of China long stay below the level of subsistence. In this sense, the great divergence might never exist.

In the second scenario we utilise the new series of money wages and costs of living in the Lower Yangzi provided in this paper and in the meanwhile revise downward Allen's charge out rate for London building labourers. This is shown by "London (deflated)" and "Lower Yangzi (Liu wage & basket)". The key finding is that if we deflate Allen's charge out rate by 25 per cent to generate an average wage level for London building labourers, real wages in the Lower Yangzi and London are moving on par before 1700. The gap seems to open up in the early decades of the eighteenth century when real wages began to increase in London. The gap may further widen after 1740 when real wage, inferred from day rate in the Lower Yangzi, declined.

This scenario suggests that the diverging trend on real wage may have occurred during the first half of the eighteenth century. But we should also note that this conclusion is subject to two key assumptions. First, the welfare ratio approach assumes a fixed length of the working year (250 days) for all countries. This assumption provides convenience for a comparison on annual incomes, but the wage narrative derived from it implies a constant decline in living standards across two ends of Eurasia (except for England and the Low Countries). Recent studies have shown that the actual growing length of the working year exhibits a different picture to the standard account.[71] In the case of England, Humphries and Weisdorf (2019) show that the assumption of constant working days may significantly overestimate the real wage before 1600.[72] In the case of the Lower

[71] Campbell, "National incomes;" Humpries and Weisdorf, "Unreal wages."
[72] Humphries and Weisdorf, "Unreal wages."

Yangzi, Li (2008) suggests that average working days may have considerably increased in the first half of the nineteenth century.[73] Therefore, the difference on the actual length of the working year, and the timing to which working days began to increase, can revise the trends and levels of real wages in each economy. Also, the decline in Chinese real wages after 1700 may be slower if we allow an increasing length of the working year in China.

Another issue with the wage approach is about the size of wage-dependent labourers in early modern China. In the European context, especially north western Europe, a growing percentage of rural labourers became proletarians and sold their labour for wages in the city. In the North Sea area, wage-dependent labourers may account for up to a half of the labour force.[74] In early modern China, however, waged workers took a decisively smaller portion, particularly in rural areas where the majority of labour was employed.[75] Xu Di and Wu Chengming (2003) suggest that in late-sixteenth-century Lower Yangzi, waged workers in rural areas should be no more than one per cent of the population.[76] Li Wenzhi and Jiang Taixin (2005) suggest that the figure might have increased in the eighteenth century but should be less than 10 per cent in general.[77] Full-time wage earners were still small even if we consider all types of employment. In mid-nineteenth-century Gui'an county, Zhejiang province (the Lower Yangzi), and Mi county, Henan province (North China), waged labourers account for only 6 per cent and 3.26 per cent of the local population respectively.[78] In large cities and commercial centres such as Hua-Lou district (the Lower Yangzi core), employments in industries and services can be significantly higher.[79] But considering non-agricultural employments in cities also include self-employment such as peddler and family businesses, wage earners were a small cohort rather than the dominant form.

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[73] Li, "Zhongsui qindong: kuazhang haishi xianshi".
[74] Van Zanden, *The Long Road to the Industrial Revolution*, p.117.
[75] Xu et al. suggest that urbanisation rate in early modern China declined from 11% in the early seventeenth century to 7% in the late eighteenth century. See Xu et al., "Urbaniszation in China."
[76] Xu and Wu, *Zhongguo ziben zhuyi fazhanshi*, vol.1, p.70.
[77] Li and Jiang, *Zhongguo dizhuzhi jingjilun*, p.310.
[78] Li, Wei, and Jing, *Mingqing shidai de nongye zibenzhuyi mengya wenti*, p.335-6.
[79] Li and van Zanden, "Before the great divergence," p.967.

A further issue is that the livelihood of a waged worker may not represent that of the majority, especially when we consider the living standard inferred from family, rather than individual, income. Some estimates suggest that the annual wage earnings from a single waged worker can be substantially lower than the family income of a peasant household, especially in the Lower Yangzi area. Table 11 compares annual incomes between peasant and waged workers in the Lower Yangzi in the mid-eighteenth century. The annual income of a peasant household can be twice or even three times higher than the wage earning of a skilled worker (presuming 250 working days). In the Lower Yangzi, peasant families could also have incomes from sericulture or textile weaving in addition to farming income, and sericulture and weaving usually involved the participation of female labour force in the household. Besides, the standard approach of real wage comparisons presumes that a waged male labourer needs to support a family of 3, including two adults and two children (counted as one adult). But in my wage data where marriage status is recorded, many wage labourers in rural and urban areas were single men. I cannot estimate a representative size of family for full-time wage labourers given that records on marriage status are too scattered, but waged labours in China may have a different family structure compared with tenant and freehold peasants.[80] Therefore, there is potential risk that the annual wage earning from a single worker is likely to underestimate the livelihood of the majority in early modern China.

[80] Land ownerships in Huolu county (Zhili province, north China) and Xiuning county (Anhui province, Middle China) suggest that freehold peasants took up 40% to 50% of the farmland in the late seventeenth and early eighteenth century. See Shi, "Cong huoluxian shengce;" Wang, "Qingchu huizhou de juntu yulince yanjiu." For the early twentieth century see Buck, *Land Utilization in China*, vol.1, 194–7.

Table 11. Estimated Annual Incomes in the Lower Yangzi in the Mid-Eighteenth Century

Peasant household	*g. silver*
Fang (1996)[a] - farming & sericulture	1753.54
Fang (1996)[a] - farming & weaving	1523.81
Li (2007)[b]	2960.00
Huang (2009)[c]	2377.88
Single wage-dependent worker	(*250 days*)
unskilled[d]	631.89
skilled[d]	897.89

Notes and source:
Silver-copper coin exchange rate in 1745 Lower Yangzi was 1:850. See Lin, *Yinxian*, 76-77, Table 2.6.

[a] Fang, "Qingdai nongmin jingji zaishengchan de xingshi".

[b] Li, *Jiangnan nongye de fazhan*, 153. An annual income of 44 *shi* of rice is equivalent to 79.2 *taels* of silver (1.8 *taels* per *shi* as an averaged price between 1740 and 1760 in the Lower Yangzi).

[c] Huang, *Minsheng yu jiaji*, 318.

[d] Annual incomes for waged workers are inferred from day wage rates provided in this paper.

7. Conclusion

To summarise, this article intends to answer the question: what were the levels and trend of wage in China in the early modern time? This question matters not only to Chinese economic history but also the Great Divergence debate. Using a new collection of wage records, this paper contributes new evidence on a chronology of wage development in the Lower Yangzi delta. From the sixteenth to the first half of the nineteenth centuries, nominal wage experienced four sustained rises in the 1560s, 1650s, 1680s, and 1720s, and a temporary rise between the 1790s and 1820s. In contrary to some previous estimates, this paper finds no evidence of continuous decline on nominal wages and suggests that the previous work overestimated the wage level in the Lower Yangzi and Beijing. Wages exhibited stickiness but they responded to price movements in the long-term. Among all provinces in China proper, money wage in the Lower Yangzi was the highest and lowest in the hinterland. This may reflect regional costs of living. The wage difference between skilled and unskilled workers also suggests a high skill premium.

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 is observed after the 1650s when the core areas in China began to recover from the destruction caused by the dynastic change. For the first hundred years of the Qing empire, real wage exceeded the level of the late Ming empire and remained high. But it quickly declined between the 1740s and 1760s when the Chinese population rapidly increased. While considering the possible increase on the length of the working year, the decline in real wage earnings might be further slower than the annual income inferred from day wage rates.

From the global perspective, the interpretation of the standard of living in early modern China is more complex. Despite the gap on real wage between the Lower Yangzi and London seemingly opening up circa 1700, our understanding on wage inferred living standards in the early modern time is conditional. First, the standard account compares living standards based on annual incomes inferred from a fixed length of working year over the sixteenth and nineteenth centuries. Recent studies have shown that real wages derived from this assumption differ considerably from those that allow changes in working days. Second, wage-dependent workers were a small cohort in early modern China, possibly less than 10 per cent, or even less, of the labour force. Their size could undermine our impression on Chinese living standards inferred from the livelihood of waged workers. In early modern China, a typical labour input in the household economy was the so-called "man farming and woman weaving" (broadly defined). Increasing prices on agricultural products in the market did not naturally mean an income loss to the majority of Chinese households. Some evidence suggests that family incomes of average peasantry in the Lower Yangzi were substantially higher than the wage earning of a single worker. Still, wages remain an important source of information on living standards, and wage development in early modern China still implies no evidence on cumulative change in the economy over these centuries, even if we allow the measurement errors.

Appendix 1

To test if there is a premium paid in the market over *ya yi* payments, we add market wage data for Beijing, Yanzhou, Dongchang, Xuzhou, and Yangzhou with their regulated wages. As the majority of market wage records comes from Beijing between the 1590s and 1610s, other cities are used only as the control groups. I specify and run the following regression:

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

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 A1 show that the dummy variable $market_{h,I}$ is statistically significant.

Table A1. *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	
Handicraft	0.0317536
	(0.060)
Service	-0.1038261***
	(0.037)
Region	
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 2 will be available in the final version of this paper

Appendix 3

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

	Coefficient	*N*
Region		
North		
Beijing	*0.1252502***	*16*
	(0.047)	
North Zhili	*-0.2441817***	*74*
	(0.035)	
Shandong	*-0.1845861***	*118*
	(0.034)	
Henan	*-0.2955893***	*34*
	(0.047)	
Central		
Hangzhou	*0.0457689*	*28*
	(0.048)	
Zhejiang (excluding Hangzhou)	*/*	*139*
Jiangsu	*-0.0718928***	*98*
	(0.037)	
Anhui	*-0.2411696***	*120*
	(0.032)	
Jiangxi	*-0.2394188***	*80*
	(0.034)	
Huguang	*-0.3829652***	*89*
	(0.028)	
South		
Guangdong	*-0.1847542***	*80*
	(0.028)	
Fujian	*-0.1845193***	*130*
	(0.033)	
Administrative level		
County	*/*	
Prefecture	*0.0597225*	
	(0.019)	
Job		
Doorman	*/*	
School doorman	*0.0564064*	
	(0.019)	
Office runner	*0.1172462*	
	(0.020)	
Payment method		
gov. paid	*/*	
agent collected	*0.6249869*	
	(0.026)	
constant	*-4.595299*	
R2	0.823	

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

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