Did Late Imperial China Go Backwards or Forwards or Stand Still?*

Myung Soo Cha  
School of Economics and Finance,  
Yeungnam University,  
South Korea  
mscha@ynu.ac.kr  
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Using grain and farmland price data, this article estimates the interest rate and land rent in five provinces of Qing China to find that they tended to fall in the eighteenth and nineteenth centuries. Given that population growth outstripped both acreage expansion and capital accumulation, the weakening in the rental income for capital and land leads one to predict that Chinese workers also suffered shrinking real incomes, which is what available wage evidence shows. The downward trends in factor prices imply late imperial China suffering deterioration in living standards and total factor productivity, rather than achieving Smithian growth or muddling through an involutionary path. The Chinese failure contrasts with Tokugawa Japan improving total factor productivity and living standards without resorting to coal or foreign trade, which helped England achieve the first industrial revolution. Hence the causes of the growth disaster occurring in late imperial China are more likely to be found in the country’s institutions than luck.

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“China, however, though it may, perhaps, stand still, does not seem to go backwards.”


Was it defects inherent in the Chinese institutions or such misfortune as the lack of coal that stood in the way China making the first industrial revolution? The answers to this question depends on the growth performance of the Chinese economy in the eighteenth and early nineteenth centuries, in the sense that any indication of improving standard of living in China helps the country be absolved of the sin of failing to be the first to escape from the Malthusian trap. Different assessments on the growth performance of late imperial China have been proposed. Pessimists like Huang(1990) believes that the lower Yangzi suffered involution, while Li(1998) optimistically claimed that both labor and land productivity improved. Involution refers to peasants working ever longer hours to prevent declining marginal productivity from causing real incomes to fall, while rising labor and land productivity as posited by Li(1998) implies per capita output and total factor productivity growth.

The imperial government of China published information on aggregates including acreage and population, which may be used to estimate per capita output growth in pre-Republic China. It is however difficult to have a lot of faith in the assessment based on the official data, because the coverage of the information generated by the Chinese bureaucracy is likely to have changed over time, driving at least partly the estimated trends.¹ This study takes a different tack, which is to take a look at factor prices, the interest rate and land rent, in particular.

The greater part of existing research on the performance of the traditional Chinese economy is about the lower Yangzi, primarily because the region represented the most advanced part of Qing China, hence was deemed as equivalent to Britain in Europe in early modern era. This study examines five provinces of the Chinese empire in addition to Zhejiang in the lower Yangzi. They include Anhui in the mid-Yangzi, Shanxi in the north, Guangdong and

¹ For instance, see Ho(1959) and Perkins (1969) on the shifting level of reliability of official data on the Chinese population and acreage.
Taiwan in the south. Pre-colonial Korea, a vassal state of Qing China linked to the lower Yangzi by maritime exchange is also discussed. The wider geographical coverage yields a more balance appraisal of how well late imperial China did in terms of economic growth than an investigation focused on the lower Yangzi. Qing China represented an economy made up of regions integrated by flows of commodities and productive factors. Hence, it makes less sense to examine the lower Yangzi in isolation than to study either England or the Netherlands separately, taking each of the two countries out of the context of early modern Europe, given that. Had the lower Yangzi prospered by starving rest of China of resources, an assessment on the growth performance of China based solely on the lower Yangzi could be misleading and of limited relevance at best.

This article stands on two foundations. One is the monthly grain prices as reported by the imperial government, which are used to estimate the interest rate. The other is the information on farmland value as recorded in land contracts created by private individuals, which is combined with the estimated rate of interest to derive the land rent. Trends in the rental price of capital and land are then related to the high likelihood of population growth taking place more rapidly than acreage expansion and capital accumulation, which leads to draw conclusion as to the direction of change in living standards and total factor productivity in eighteenth and nineteenth century China.

The first section begins by describing the procedure and data used to estimate the interest rate and land rent in this article. The following section uses information provided by land contracts to estimate farmland value in term of silver in five provinces of China from the second quarter of the eighteenth to the fourth quarter of the nineteenth century. The third section estimates silver price of grains and the gross rate of return from inter-temporal grain trade. Combining the results of the preceding two sections, the fourth section finds that the land rent tended to fall as did the interest rate, which in the context of population growth occurring faster than acreage expansion and capital accumulation implies deteriorating per capita output and total factor productivity. Comparisons are made with England, Korea, and Japan in the fifth section to discuss the implication of the findings on the origins of the Chinese growth failure. The final section summarizes and concludes by highlighting issues warranting further research.

**Grain and Land Price Data**
Assuming away capital gains or losses, nominal price of a parcel of agricultural land ($TP_t$) equals the sum of the current value of the expected stream of rent ($S_{t+i}^e$) from the soil:

\begin{equation}
TP_t = \sum_i S_{t+i}^e \frac{P_{t+i}^e}{r_{t+i}^e}
\end{equation}

where $P_{t+i}^e$ and $r_{t+i}^e$ are expected price of agricultural product and the rate of interest in period $t+i$, respectively, $i$ being an integer index beginning from unity. Assuming the expected values of the two variables equal their present values, $P_t$ and $r_t$, equation (1) can be written as:

\begin{equation}
S_t = r_t \frac{TP_t}{P_t}.
\end{equation}

The following section estimates nominal value of farmland ($TP_t$) using data taken from land contracts, while the rate of interest ($r_t$) and agricultural price ($P_t$) will be derived in the third section from monthly grain prices as recorded by the imperial bureaucracy. The estimates are plugged into equation (2) in the fifth section to derive the land rent ($S_t$).

Given that harvest failures and ensuing famines frequently led to peasant riots and destabilized the political system, rulers of Qing China paid particular attention to grain price fluctuations to intervene in grain markets and reduce price volatility (Will and Wong (1991)). As the Qianlong emperor ascended the throne in 1736, prefectural government began to report regularly to higher authorities local prices of different types of grains, a system which was maintained until Qing dynasty was overthrown by the Republican Revolution in 1911. The reports, known as *liangjia qingdan*, were split into the possessions of the First Historical Archives of China at Beijing and the Taipei National Palace Museum, which were merged, made machine-readable, and then published online by Yeh-chien Wang (http://140.109.152.38/DBIntro.asp).²

In the database are included price observations for more than forty different kinds of grains, including barley, bean, corn, rice, sorghum, wheat, of distinct quality, which were made in

² Li(2000) used *liangjia qingdan* grain price data to investigate market integration in Qing China. Shiue(2002)’s study on grain storage and trade in eighteenth-century China is based on the Beijing portion of the dataset.
different prefectures (fu, 府) of twenty one provinces (sheng, 省). High and low prices were reported monthly in terms of the candareen (fen, 分) – one hundredth of a tael, a silver unit of account -- per shi, a volume measure for grain, equivalent roughly to 80 kilogram (Rawki and Li(1992, xiii)). Further details of Wang’s grain price database are available from Yeh-chien Wang’s website and from Li, Bernhofen, Eberhardt and Morgan(2013: 7), a study using the liangjia qingdan database to explore grain market integration.

Buying and selling farmland has a long history in China. One very early example of land contract is a deed inscribed on a piece of stone in the ninth century BCE (Zhang(1995)). Activities in the land market thrived in the Qing period (Huang(1990: 106); Pomeranz(2008), as is confirmed by the existence of a large number of land contracts surviving major upheavals such as the Taiping Rebellion and the Republican and communist revolutions.

A typical land contract created in Qing China specified the month and year of transaction, names of seller and buyer, the area, location, and type and of the property involved and prices paid. The unit used to measure the area was usually mu, which was roughly equal to 0.1642 acre or 0.0666 hectare with regional variations (Rawski(1989: xv)). A variety of types of property, including not only farm land, but also reservoirs, mountains, graveyards, houses, building sites, fruit and vegetable gardens, were traded, and not infrequently transactions involved bundles made up of distinct kinds of property. Buyers typically paid with the silver tael -- known also as the liang (兩) -- and in a minority of cases with copper cash (wen). The incidence of payment with copper cash rising significantly in the second half of the nineteenth century, when the use of foreign silver coins -- the Mexican dollar most importantly -- and the Chinese silver dollar (yuan) also became more commonplace. As far as the Chinese land contracts used in this study are concerned, property was never purchased with bank credit, and paper money very rarely used as a means of payment. While linked observations exist, it is rarely possible to put up price history for a particular plot of farmland even over a short period.

**Trends in Farmland Value**

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3 Information on whether the two parties of land deals were related and what motivated disposition of farmland is also frequently found in land contracts.
This section estimates farmland value in five provinces of China – Anhui, Guangdong, Shanxi, Taiwan, and Zhejiang – by the quarter century. The period covered varies from one province to another depending upon data availability. The estimation began by converting purchase price recorded in term of either the yuan or wen into liang prices. The liang or tael did not represent silver coins, and according to Lee(1926: 13-17), there “existed a wide variety of tael, which represented different amount of silver of distinct fineness circulated in different regions, and used for different kinds of trade.” As Young (1971: 164) observed, however, the definition of the tael did not differ enormously between different places and trades, with the tael’s weight varying “in the approximate range of 500 to 600 grains”, i.e. 32 to 39 grams.4

The yuan, the Chinese silver dollar coin, was first introduced as late as in 1889 in Guangdong as a part of modernization program, which was subsequently adopted by other provincial governments. While the yuan coins originating from different parts of China also was different in terms of design and quality, “Despite the differences and the slight underweight of some coins, the dollars were generally interchangeable at par”, and “It was in the order of 50 per cent heavier than the silver dollar” (Young 1971: 164). Hence prices in silver dollar was divided with 1.5 to obtain prices in the tael. Neither silver ingots or coins nor copper coins was supplied monopolistically by the Beijing government, which implied that exchange rates between silver and copper currencies did not remain fixed, but fluctuated all the time. Up to 1857, prices in the wen, copper cash, were changed into price in the liang using exchange rates between the two currencies in different provinces as provided by Vogel(1987). From 1858 on, the exchange rates in Beijing as given in Allen, et al (2011) were applied for all regions.

To estimate farmland value by the quarter century, the total purchase price in the tael thus obtained was divided by area to derive price per mu, which was then log-transformed and regressed on a set of dummy variables. They typically include dummies representing

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4 According to Rawski and Li (1989: xiii), one tael is equivalent to one sixteenth of one jin (斤) equaling 1.3 pounds, hence 36.9 grams, which is the conversion rate used in the following. On the regional variations in the way how the tael was defined, see Miyashita(1952) and Kuroda(1994).
different periods starting from the first quarter of the eighteenth to the first quarter of the twentieth century, as well as those indicating distinct 1) modes of transaction, 2) kinds of silver currency used as a means of payment, 3) forms of document, and finally 4) kinds of land.

Land contracts of Qing China usually refer to farmland either as just land (di) or dry field (tian), and only exceptionally is a paddy field specified as such (shuitian).\(^5\) Land dummy measures the price gap between properties defined using the three distinct notations. The dummy for document types distinguishes two different types of contract documents, known as red and white documents or hongqi and baiqi, respectively. Red documents refer to publicly authenticated deals carrying the seal of endorsement issued by the Chinese government, while a larger number of contracts, known as baiqi, were created by private individuals, including seller, buyer and, sometimes, witnesses.

While in a large majority of land contract land prices are recorded simply in terms of the liang, there exist a significant number of documents specifying the kind of liang used for payment in terms of design and silver color (銀色), i.e. fineness. Dummies representing distinct silver monies were included to control the effect of different tael’s used on property price.

Conventionally, land deals were considered as unfinalized (huomai) in Qing China, in the sense that sellers retained the right to buy back at the original price, unless specified as finalized (juemai or dumai) on contracts. No infrequently, sellers took deals, which had been agreed upon as juemai, to courts to dispute irrevocability (Wang and Rosenthal(2011)). The price of redemption right was reflected in the discount huomai price suffered vis-à-vis juemai price. The practice of unfinalized sale probably emerged in China to help peasants recover property that they were forced to dispose of to tide over climatic shocks or such unexpected and unfortunate events as disease and death.\(^6\) However, they often gave up the hope of recovery shortly after huomai and asked sellers to pay additional amount, known as zhaotie, to convert the unfinalized deals into juemai. Although separate deeds were created to record

\(^5\) Price information on other types of agricultural land, including vegetable gardens and ponds, are excluded from the analysis of this study.

\(^6\) Levicitus 25 suggests that unfinalized sale by no means was a practice unique to China.
the supplementary deals, a large number of disputes occurred over the amount of *zhao tie* to be paid (Kishimoto(2011)).

Figure 1 Silver Price of Farmland (tael/mu)

Source: see the appendix on data sources.

Note: farmland value for finalized sale in Zhejiang, but unfinalized sale in other provinces.

A substantial part of land contracts created in in Anhui, Guandong, Shanxi is silent on whether they refer to finalized or unfinalized deals, and in the documents originating from these provinces, records of *zhao tie* payment are only rarely found. As the result of estimating the specification explained above for the three provinces shows, the dummy variable separating finalized sales from unspecified transactions was statistically insignificant, while coefficient estimates for other dummies mostly turned out as significantly different from zero. It appears that the reversibility of land deals had little effect on land prices in the three provinces. Figure 1 presents farmland prices in the three provinces as calculated using estimated coefficients associated with period dummies.

Irrevocability of land sale and *zhao tie* appeared to remain an issue largely confined to the lower Yangzi, as Ho(2011) observed. This claim is borne out by land contracts created in Shicang village of Zhejiang from the early eighteenth to twentieth centuries, a substantial part of which is represented by some one hundred and fifty *huomai* records matched by an equal
number of separate documents describing associated *zhaotie* deals.\(^7\) Log-transformed prices per *mu* calculated from both *huomai* and *zhaotie* deeds found in *Shicang* were pooled to be regressed on the product of the period dummies and the dummy distinguishing *zhaotie* from *huomai* prices in addition to the four dummy variables as introduced above.

Figure 2 Amount of *zhaotie* payment as a share of *huomai* price

![Figure 2](image)

Source: *Shicang qiyue*

Figure 2 shows the amount of *zhaotie* payment as a share of *huomai* price as indicated by the coefficients of the product of the period and *zhaotie* dummies, which were highly significant. In the second quarter of the eighteenth century, the ratio was roughly 45%, which fell consistently to about 10% in the third quarter of the nineteenth century and then rebounded to approach 30% in the early twentieth century.\(^8\)

\(^7\) *Shicang* documents are in the course of being made available to the public from 2011 on by installment. This article analyzed the first segment published as Cao, Pan and Que(2011). The data included in the second and third portions published by the same authors in 2012 and 2014 are being digitized at the time of writing this manuscript. See also Cao, Li and Gong(2010).

\(^8\) As Ho(2011: 25) observed, *huomai* price amounted to 60-70\% of *juemai* value of farmland, which implies *zhaotie* payment (=*juemai* - *huomai* price) was equivalent to 67-43\% of *huomai* price.
The specification used for Shicang was estimated after pooling the Shicang dataset and observations made in other places in Zhejiang, which yielded results broadly similar to those based on Shicang data only. The solid line in Figure 2 shows juemai value of farmland in Zhejiang, which was derived by first calculating huomai value of farmland by quarter century and then multiplying it with one plus the ratios shown in Figure 1.

The Taiwanese land contract dataset used in this study is also special in that it includes information on juemai deals only, which were retrieved from the searchable land contract database provided by the Taiwan Historical Digital Library (http://thdl.ntu.edu.tw/THDL/RetrieveDocs.php). Hence, Taiwanese farmland value per mu presented in Figure 1 may be obtained by estimating a simplified specification, excluding transaction type dummy, which is presented in Figure 1. The silver value of farmland in the five provinces of China presented as Figure 1 tended to rise in the eighteenth and early nineteenth centuries, fall in the late nineteenth century, and then revived in the early twentieth century.

**Grain Prices and the Rate of Interest**

Out of the wealth of grain price information found in Wang’s lianjia qingdan database, monthly price observations for medium quality rice and wheat made in Anhui, Guandong, Shanxi, and Taiwan, and Zhejiang were selected wherever possible. Otherwise, items were selected on the basis of abundance and regularity of information. The monthly information including high and low prices, the average of the boundary observations was taken to derive monthly price series. The monthly averages were then log-transformed to be regressed on dummies indicating different months to isolate the patterns of seasonal price fluctuations. The regressions were run separately for each province and for each quarter century.

Figure 3 Grain Prices in Eighteenth and Nineteenth Century China
Figure 3 shows grain prices in different provinces of Qing China from the second quarter of the eighteenth to the fourth quarter of the nineteenth century, which equal the exponential of estimated constant terms. Grain refers to wheat for Shanxi (found at the bottom) and rice in other provinces (clustered at the top). Grain prices tended to rise from the second quarter of the eighteenth to the first quarter of the nineteenth century and then stabilized, a pattern, which is not too different from that found in farmland value (Figure 2). In the eighteenth century, rice prices observed outside Shanxi remained close to each other, indicating the presence of a well-integrated rice market. Interregional rice price gap widened in the following century, with rice prices following different trends in different provinces.\(^9\)

Figure 4 Gross Rate of Return on Stored Grain

\(^9\) This is consistent with the finding by Li, Bernhofen, Eberhardt and Morgan(2013) that regional markets of China fell apart from each other after 1800.
The coefficient estimates of month dummies indicated that in the eighteenth and early nineteenth centuries both rice and wheat prices typically reached a peak in summer months preceding autumn harvest to fall to a trough in the following winter, although the two crops were grown during different months of the year.\textsuperscript{10} Figure 2 shows gross rate of return (including storage cost) on stored rice in six provinces, which was derived applying the following formula, which is based on McCloskey and Nash (1984):

\begin{equation}
R = ((P_P/P_T)^{(1/n)} -1) \times 12,
\end{equation}

where $P_T$ and $P_P$ are grain prices at trough and subsequent peak calculated using coefficient estimates of month dummies, and $n$ equals one plus the number of intervening months between the months when $P_T$ and $P_P$ were observed. Over the eighteenth century, the rate of return including storage cost ($R$) tended to fall in the six provinces, which is in line with the conjecture made by Homer and Sylla (1996: 614) based on a limited number of observations on nominal rates in interest. Homer and Sylla (1996: 614) also presents evidence of the

\textsuperscript{10} Millet and sorghum prices followed seasonal patterns distinct from that found in wheat. See Li (1989: 85, Figure 2.5).
decline continuing in the nineteenth century. Although the falling interest rate appears as plausible, specifically given that an increasing amount of foreign capital flowed into China over the century, it is difficult to tell from monthly grain fluctuations whether the gross rate of return from inter-seasonal trade in grain trended upwards or downwards in the nineteenth century for two reasons. First, in a number of cases the coefficient estimates of month dummies for the nineteenth century not only fail to reveal a distinct seasonality, but also lose statistical significance, which make it impossible to calculate the rate of return in the first place. The other issue is increase in instability, with the rate of return rising and falling widely from one to another quarter of the nineteenth century. The volatility is likely to have little to do with marginal productivity of capital, given that evidence hardly exists of either major technological breakthrough or massive destruction of capital goods occurring in Qing China in as short a span as a quarter of a century. Both the disappearance of seasonal pattern and heightened unpredictability in seasonal volatility after 1800 are probably consequences of political disturbances, which shook the imperial regime in a profound way, raised the risk of grain storage substantially, and debilitated the working of grain markets. In particular, the White Lotus Rebellion (1796-1804) and the Taiping Rebellion (1851-64) are likely to explain why the rate of return shot up in Shanxi in the first quarter of the nineteenth century and in Anhui in the second quarter, respectively. Hence, a temporary surge in the rate of return in a quarter was replaced by the average of the rate of return in the preceding and following quarters. The nineteenth century valued shown in Figure 4, representing the outcome of the smoothing operation, conveys the impression of stagnating gross rate of return in the nineteenth century. Given that the Qing regime was being weakened, and that as a consequence the risk associated with storing grain probably rose as a matter of trend over the nineteenth century, the risk-free rate of interest may well have been on the decline in the nineteenth century.

The Land Rent

\[11\] [Specify where and when]
The farmland values \( (TP_t) \) and grain prices \( (P_t) \) in terms of silver and the rate of return \( (r_t) \) as estimated in the preceding sections may be plugged into equation (2) to derive land rent in terms of either rice or wheat \( (S_t) \). Note that the rate of return includes storage costs, which would cause the level of land rents to be overestimated.

Figure 5 Estimated Land Rents

A. Yangzi

B. Rest of China
Figure 5 presents land rents derived using equation (2) in five provinces of Qing China from the second quarter of the eighteenth to the fourth quarter of the nineteenth century. Land rent remained substantially higher in Anhui and Zhejiang, representing the mid- and lower Yangzi, respectively, than either in Guangdong and Taiwan, located on and off the southern coast, respectively, or in or Shanxi, a landlocked province in the north of China. The higher rents along the Yangzi confirm the conventional picture of the lower Yangzi being ahead of the rest of traditional China. Land rents in Shanxi being in terms of wheat, which was almost half as expensive as rice, the province was at a disadvantage vis-à-vis Guangdong, hence the worst off of the four provinces.

As Allen(2009: 537, 545) believed, rice output per mu was 2.3 shi in the lower Yangzi in the early nineteenth century, and Perkins(1969: 313) presented evidence of rent payment being equivalent to half of the principal summer-fall crop, including rice, which implies rent being equal to 1.15 shi per mu – a level reasonably close to 1.06, which is the land rent in Zhejiang in the first quarter of the nineteenth century as presented in Figure 5.

Land rents trended downward in the Anhui, Guandong, and Shanxi from the second quarter of the eighteenth to the last quarter of the nineteenth century. Over the same period, it is difficult to identify either upward or downward trend in the lane rent estimates for Taiwan.
and Zhejiang. In Zhejiang, rents roughly doubled from the second to the fourth quarter of the eighteenth century and then more than halved over the nineteenth century. The Taiwanese trend is nearly opposite, falling in the eighteenth and recovering in the nineteenth century. The eighteenth century improvement in Zhejiang and nineteenth century recovery in Taiwan appeared to be explicable in terms of inflow of workers from the rest of China. As Perkins (1969: 207, Table A.4) shows, the population of Zhejiang in 1819 was about two and half times as large as that in 1749, demographic expansion far outstripping that took place in either Anhui or Shanxi. The Taiwanese population increased by 60% from 1811-87, after remaining stagnant in the eighteenth century (Ho (1978: 8, Table 2.1)). Although official figures given in the same source indicate the Guangdong population more than tripled from 1749-1819, Perkins (1969: 206) believed that the figures substantially overstates the actual population growth in Guangdong, over which “the central government maintained rather ineffective control until after 1949.”

Downward drifts in the land rent in Anhui, Guandong, and Shanxi together with stagnation in Zhejiang and Taiwan implies that the overall trend, calculated as a weighted average of the five regional trends, should be downward. The estimated land rents in Figure 5 are based on observations on farmland value, which represents a set of convenience samples obtained on the basis of availability. Hence, one needs to address the issue whether the observed trends were driven at least partly by self-selection. In particular it is important to ask if there are reasons to believe that plots of poorer quality increasingly self-selected into the sample over the eighteenth and nineteenth centuries.

Table 1 Distribution of Contracts by in Anhui

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Sources: see text.

Panel A of Table 1 shows the distribution of land contracts in terms of month of transaction, which indicates almost half of land deals occurring in winter months, including December, January, and February, and a significantly part of land contracts being signed in early spring. As is revealed by the distribution in terms of area in Panel B, more than four fifths of land trade involved small plots not larger than three mus, which is equivalent to less than half an acre. Although the distributions shown as Table 1 refer to Anhui, the province, which stands out by having the largest number of observations, similar patterns are found in other provinces.

A plausible interpretation of the concentration of land trade in winter and early spring and the predominance of small plots would be that land sales in Qing China were motivated primarily
by the need for small peasants to tide over food scarcity caused by climatic shocks, rather than by the desire to improve farming efficiency. As rice storage ran out in the months following autumn harvest and preceding spring harvest, an increasing number of peasants were forced to sell small parcels to ensure survival.  

Panel A of Table 1 shows that over the eighteenth and nineteenth centuries the share of transactions occurring in January and February rose, while the likelihood of land sale in the following months fell, indicating the amount of buffer stock held by Anhui peasants shrank over the eighteenth and nineteenth centuries. While small parcels continued to account for the lion’s share of land deals in Anhui, the average size of plots traded in Anhui land market was on the rise over time. As seen in panel B of Table 1, small plots not larger than one mu accounted for more than 60% of transactions in the first half of the eighteenth century, a share, which fell sharply to 15% on the second half of the nineteenth century. The change was mirrored by the rise in the share of farmland larger than two mus and not exceeding three mus from 24% to 53%. The falling importance of very small plots suggests that the extent of emergency financing required to tide over adverse climatic shocks was on the rise, which is consistent with the shrinking buffer stock held by peasants. Land contracts created in Guangdong, Shanxi and Zhejiang display similar trends.  

The increasing likelihood of land sale to occur in winter than in spring and a decreasing role played by very small plots suggest that the conditions of peasants in Anhui, Guangdong, Shanxi, and Zhejiang became increasingly precarious over the eighteenth and nineteenth centuries. It thus appears likely that the share represented by distress sales in the convenience samples used in this study was on the rise over time. Land quality, i.e. soil fertility, represents an element of capital stock built by investment over time. Hence, distress sale is likely to begin with parcels of lower quality and to bring in better quality land as the required amount of distress sale expands. Therefore, the average quality of land in the

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12 Highlighting that land transactions in medieval England predominantly involved small plots, Bekar and Reed(2003) claimed that the open field system, characterized by strips scattered in different parts of villages, emerged to make it easier for peasants to tide over subsistence crises by reducing property holdings.

13 The evidence for the three provinces are available upon request. Guangdong differed from other provinces in that larger plots accounted for a substantial parts of land trade.
samples is likely to have improved over time, which implies that the land rent would have fallen as a matter of trend at rates faster than are suggested by Figure 5.

**International Comparisons**

This section compares the Chinese land rent as presented in the preceding section with those observed in England, Japan, and Korea for two purposes. First, the international comparison serves as a plausibility check on the rent estimates for Qing China, which were not based on direct observation, but derived by multiplying real value of farmland with the rate of return inclusive of grain storage costs. In particular, the estimates for China are put side by side with direct observations on rent generated by paddy fields in dynastic Korea, a country, which could be reached by sailing to the east across the Yellow Sea some three hundred miles from the coast of the lower Yangzi. Pre-colonial Korea, a vassal state in the Qing empire until Japan forced China to abandon suzerainty over the country in 1895, closely resembled China in many respects, including agricultural technology and institutions like the land market and sharecropping tenancy.14 Second, the international comparison also throws lights on the origins of the Great Divergence. Given that England and Japan differed from China in different ways in terms of geography and institutions, identifying patterns in the international rent gap offers fresh insights on why eighteenth century China and England represented growth failure and success, respectively.

Figure 6 Land Rents in Zhejiang, England, Japan, and Korea

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14 To specify the year of transaction, Korean land contracts used the year of the Chinese emperors’ reign.
Sources: Zhejiang – see text; Korea – Rhee(2012); Japan – Kusano(1996); England – Norton, Trist and Gilbert(1962)

Figure 6 shows that the land rent in Zhejiang and Korea did not differ significantly in terms of either the level or trend. A similar level of land rent was observed in Japan at the beginning of the eighteenth century, which however tended to rise, rather than fall as in the Chinese empire, until the country was forced open by the U.S. to foreign trade in 1854. As a result, Japan achieved a significant rent advantage vis-à-vis the Chinese empire in the second quarter of the nineteenth century. For instance, the land rent in Japan (1.39 shi per mu) was about twice as high as that in Korea (0.74 shi per mu), which is precisely what different Japanese visiting Korea in the late nineteenth century reported.¹⁵ The English land rent shown at the bottom of the figure was about two hundredth of that in Zhejiang at the end of

¹⁵[reference to be added] While the Japanese rent shown in Figure 6 is derived by taking one half of yield per mu observed in a village in Hyogo prefecture, the level of land productivity in the particular place in 1850 is roughly on a par with the national average estimated by Nakamura(1966) and Shinbo and Saito(1989: 19).
the eighteenth century. The huge gap was reduced to about one sixtieth in the mid-nineteenth century, because the land rent rose in England, but fell in China.\footnote{The gap far outweighs Allen(2009)’s assessment of China’s land productivity being about nine times as high as that in England. One reason to explain the disparity can be found in the different relative prices between rice and wheat. While Allen(2009: 535) set wheat price equal to 70% of rice price, the liangjia qingdan data shows that wheat prices in Shanxi remained below 60% of rice price in Anhui or Zhejiang in the eighteenth and nineteenth centuries. Another cause would be the higher land share in the Chinese production function as seen in Table 2 shown below. [More reasons to be added]}

To account for the international gaps in the level and growth of the rental price of farmland, suppose Cobb-Douglas technology is used to combine labor (N), capital (K), and land (T). Differentiate the production function with respect to each of the three inputs and then equate the expressions for marginal productivities to wage (w), the interest rate (r), and land rent (s) to obtain the following relations:

\begin{align}
(4) \quad w &= \alpha A N^{\alpha-1} K^\beta T^\gamma \\
(5) \quad r &= \beta A N^\alpha K^{\beta-1} T^\gamma \\
(6) \quad s &= \gamma A N^\alpha K^\beta T^{\gamma-1},
\end{align}

where w, r, and s are expressed in terms of the welfare ratio, per cent, and shi of rice per mu, respectively. On the right hand side of equations (4), (5), and (6), A is total factor productivity and \( \alpha, \beta, \) and \( \gamma \) are, respectively, labor, capital, and land shares. Dividing equation (4) with (5) and then arranging in terms of K gives:

\begin{equation}
(7) \quad K = \frac{w}{r} \cdot \frac{\beta}{\alpha} \cdot N,
\end{equation}

which may be plugged into (6) to arrive at:
Equation (8) indicates that land rent gap observed in different regions can be attributed to differences in total factor productivity (A), capital intensity as reflected in the relative price of labor to capital \((w/r)\), and labor/land ratio \((N/T)\), as well as distinct factor shares.

Table 2 Accounting for the Lower Yangzi’s Advantage in the Land Rent in the Early Eighteenth Century

<table>
<thead>
<tr>
<th></th>
<th>wage</th>
<th>interest rate</th>
<th>land rent</th>
<th>labor share</th>
<th>capital share</th>
<th>land share</th>
<th>population</th>
<th>agricultural land</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>3.2</td>
<td>3.2%</td>
<td>0.006</td>
<td>0.5</td>
<td>0.35</td>
<td>0.15</td>
<td>9</td>
<td>204.0</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>1.2</td>
<td>9.3%</td>
<td>1.237</td>
<td>0.4</td>
<td>0.2</td>
<td>0.4</td>
<td>31</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Notes: wages in welfare ratio; interest rates refer to gross rate of return including storage costs; English interest rate is the average of 1.4% for the seventeenth and 5.0% for the nineteenth century; land rent in shi of rice per mu; population in million persons; agricultural land in million mu.

Sources: welfare ratio – Allen, et al. (2011); Chinese interest rate and land rent – see text; English interest rate and land rent from Poynder (undated: 11) and Norton, Trist, and Gilbert (1962); English factor shares – Crafts (1985: 81); Chinese factor shares – see text; population – Mitchell (1988) and Li (1998: 19); agricultural land – Allen (1994) and Li (1998: 27).

Information on the parameters and variables in equation (8) are available from the sources as given at the bottom of Table 2, except the Chinese factor shares, which are based on the factor shares for dynastic Korea as estimated by Cha (2010).\(^{17}\) Plugging these numbers into

\(^{17}\) The factor share estimates for pre-colonial Korea -- 0.4 for labor, 0.1 for capital, and 0.5 -- are educated guesses based on factor shares in colonial Korea. Given evidence of dynastic Korea suffering capital scarcity vis-à-vis imperial China, the Chinese capital share was
equation (8) yields total factor productivity levels in England and the lower Yangzi, which were 0.12 and 0.67, respectively, at the beginning of the eighteenth century. Although the Chinese TFP superiority accounted for a large part of the land rent gap between the two places, an even larger part of the rent gap was due to higher labor/land ratio in China, which was 6.92 as compared with 0.04 persons per mu in England: 71% of the log value of Zhejiang/England land rent ratio was attributable to the gap in labor/land ratio, which compares to 31% explained by the TFP gap. The higher land share in China explains about 18% of the log value, while lower wage/interest rate in Zhejiang, while the English advantage in capital intensity served to narrow the land rent gap substantially.

The land rent fell in China, as population increased consistently in the eighteenth and nineteenth centuries. McEvedy and Jones(1978: 167)’s estimates indicate the Chinese population grew 0.73% in the eighteenth and 0.36% per year in the nineteenth century. The population expansion led to significant expansion of acreage, which however was considerably slower, 0.31% from 1685-1766, 0.21% from 1766-1893 (Perkins(1969: 240, Table B.17)). There is little evidence of proto-industrialization and urbanization at a sufficiently rapid pace in Qing China to reduce labor force in rural areas despite demographic growth (Skinner). Nor is it plausible that rural handicraft industry grew so rapidly that rural labor input (reference to be added). Given the likelihood of labor/land ratio rising in rural China, the weakening of the land rent was driven by either worsening productivity or shrinking capital use per mu or both. Either way, the prediction follows that the population growth would have depressed real incomes earned by Chinese workers over the eighteenth and nineteenth centuries, which is precisely what the welfare ratio as estimated by Allen, et al.(2011) and real wage indices presented in Bassino, Ma, and Saito(2005) show.\footnote{Chao’s wage data as well.}

Not only real wages and land rents, but also the real interest was probably on the decline in eighteenth and nineteenth century China as discussed above (Figure 4). The weakening of incomes earned by workers, landlords, and capitalists imply declining per capita output, which is consistent with the conclusions reached by Allen(2009) and Broadberry, Guan and Li(2012). Plugging negative growth rates for the three factor price into dual formula, which obtained by adjusting the Korean capital share by 0.1, which was offset by lowering the land share.
gives total factor productivity growth as a weighted average of factor price growth using factor shares as weight-share indices, should yield a negative number as the rate of the Chinese total factor productivity growth (Hsieh(2002)).

What drove China’s total factor productivity failure? Eighteenth century observers, including Adam Smith and Robert Malthus, believed that China had huge advantage in land productivity, which they attributed to soil fertility allowing multiple cropping. The conjecture was confirmed as valid by such modern studies as Elvin(1973), Bray(1986: 15), and Allen(2009). In the eighteenth and nineteenth centuries, the Chinese lead was being eroded, as woodland shrank, causing seasonal flooding to occur more frequently and depleting soil. As in Qing China, factor incomes declined Chosŏn Korea, which also suffered severe deforestation.

In the eighteenth century, real wages stagnated, but the interest rate and land rent drifted upwards in England, which indicate both per capita output and total factor productivity rose. The decline in the Chinese living standards due to de-forestation in the eighteenth

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19 As Smith stated, “In rice countries, which generally yield two, sometimes three crops in the year, each of them more plentiful than any common crop of corn, the abundance of food must be much greater than in any corn country of equal extent. Such countries are accordingly much more populous.” Part III. Of the Variations in the Proportion Between the Respective Values of That Sort of Produce Which Always Affords Rent, and of That Which Sometimes Does, and Sometimes Does Not, Afford Rent. According to Malthus, “we are assured China is the most fertile country in the world, that almost all the land is in tillage, and that a great part of it bears two crops every year,” Chapter 4


22 The interest rate in this sentence refers to the ex post real interest as derived from long term interest rate and retail price index, which are available for download from eh.net. The English real wage as measured by the welfare ratio stagnated in the eighteenth and early nineteenth centuries, when they started to rise (Allen, et al. (2011)). The rising trend in rental income from an acre of English farmland was presented in Figure 6. Calculation using the
century and the per capita output growth in England however does not necessarily lead to the conclusion that the English success was attributable to the relief from population pressure provided by coal and the trade with America. For eighteenth century Japan achieved income and productivity growth comparable to England without resorting either to substitution of coal or foreign trade. Japanese workers’ real incomes did not improve, but neither did they suffer shrinking real incomes (Bassino and Ma(2006)). Seasonal fluctuations in rice prices neither stabilized nor became more volatile in the first half of the nineteenth century, which suggests the interest rate also stagnated. (Miyamoto(1988: 303, Figure 5-6)). As seen above, the Japanese land rent (Figure 6) drifted upwards over the eighteenth and early nineteenth century. Finally, as Saito(2008: 129) estimated, the Japanese per capita output grew 0.15% in the eighteenth century.

The Japanese population grew in the seventeenth century, which caused forest land to shrink. Remaining outside the Chinese empire, however, Tokugawa Japan managed to remain a “green archipelago” by both establishing public control of illegal lumbering and developing an institution known as iriai, which promoted and enforced mutual restraint in the use of common pool resources (Totman(1989)). Hence, the cause of the Chinese growth failure is institutional, rather than incidental, and it is important to ask why the Qing government was unable to monitor and curb overexploitation of common pool resources and why Chinese were unable to develop institutions encouraging cooperation.

Conclusions

While the historical origins of the rapid economic growth taking place in contemporary China is an important issue, assessing the performance of the pre-Republican Chinese economy has been a difficult task primarily due to paucity of quantitative information. This article used monthly grain prices recorded by the imperial government and from farmland value data generated by private individuals to estimate rental incomes from capital and land in five

English factor price growth rates by Antràs and Voth(2003: 63, Table 3) indicated total factor productivity grew 0.27% per year from 1770-1800.

provinces of Qing China. The interest rate and land rent trended downwards in the regions, which in the context of population growth implies late imperial China suffering decline in living standards and total factor productivity. Hence the revisionist optimism, highlighting Smithian growth as a prominent aspect of the Chinese economic development in the eighteenth century, cannot be accepted. Neither does the traditional pessimism, known as involutionist view, appear as sufficiently pessimistic. While in this understanding, downward pressure on living standards comes from nowhere but population growth, factor price evidence indicated matters were made substantially worse by worsening efficiency. As a result, as Allen, et al (2011)’s estimate shows, real wages roughly halved in both Beijing and Suzhou/Shanghai in the century following 1738, a drop, which was probably too large for workers to counter by working longer hours. Although Adam Smith was reluctant to believe in 1776, late imperial China did not stand still, but went backwards. The calculation based on evidence of factor endowment and price indicated China had a huge advantage in total factor productivity vis-à-vis England in the eighteenth century. The gap probably reflected difference in soil fertility, which as the logic of Malthusian model suggests would have raised population density in China far above that in England (Ashraf and Galor(2011)). Consequence of the higher labor/land ratio in China included lower wages and higher rents, which raised income inequality to a level higher than in England. As Milanovic, Lindert, nd Williamson(2007) reported, Gini coefficient calculated for China in 1880s was only about half as high as that in England in 1688, but income share of top 1% was more than twice as high in China than in England.24 The greater degree of polarization of income

24 Li and van Zanden(2012)’s calculation indicated per capita output in the lower Yangzi was comparable to that in the Netherlands. Given Allen, et al.(2011)’s finding that real wages were significantly lower in the lower Yangzi, the conclusion of higher income inequality prevailing in China follows. Higher income inequality in China was noted as early as in 1776 by Adam Smith, observing that “The retinue of a grandee in China or Indostan accordingly is, by all accounts, much more numerous and splendid than that of the richest subjects in Europe. The same superabundance of food, of which they have the disposal, enables them to give a greater quantity of it for all those singular and rare productions which nature furnishes…”
distribution in Qing China may help explain three important aspects of late imperial China, including higher fertility, scarcity of human and physical capital, and the state-run famine relief. State granaries and stabilizing intervention in grain markets were needed to check inequality from destabilizing the rule by landed elites. As De la Croix and Doepke (2003) found, higher inequality is associated with higher fertility, because the time cost of child rearing is lower for poorer families. Given the tradeoff between child quantity and quality, higher fertility would have deterred investment in human capital, an effect, which would have been made worse by capital market imperfections (Aghion and Williamson(1998)). The three facts may have been causally related. Specifically, as Cha(2012) argued, the state famine relief discouraged precautionary savings, raising the interest rate, hence discouraging investment in both human and physical capital in the Chinese empire. Investigating plausibility of these theoretical possibilities remain the task of future research on the Chinese economic growth.

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25 Highlighted by Malthus, higher fertility in China was confirmed by studies by modern demographers, including ???. [Evidence to be included on human an physical capital scarcity].
Appendix: Data Sources

All five provinces
中国历代契约会编考释
中国土地契約文書集(金一清)

Anhui
明清徽州社会经济资料丛编，第一集
安徽师范大学馆藏徽州文书
徽州千年契約文书
田藏契約文書梓编

Guangdong
广东土地契約文書 (海南包含)
乾泰隆文书-一-潮汕地区土地契約文书

Taiwan
Taiwan Historical Digital Library: http://thdl.ntu.edu.tw/THDL/RetrieveDocs.php

Zhejiang
清代浙东契約文书
清代宁波契約文书辑校
石仓契約

Appendix: Measures and Weights
One Chinese $mu$ (畒) = one Korean turak (斗落) = 614.3133 square meters (Chao?)
One Japanese $han$ (反) = 1000 square meters

26 Rawski and Li (200?: xiii) => one mu equals 666 square meters. Two distinct views exist on the area represented by one Korean turak, saying that the unit is equivalent to 495 and 660 square meters. Hence, Chinese mu = turak…
One Taiwanese jia (甲) = 10,000 square meters
One Chinese shi (石) = 80 kilograms
One Japanese koku (石) = 144 kilograms
One Korean sŏm (石) = 20 tu (斗) = 72 kilograms
One British quarter = 12.7 kilograms
References
-------. 2012. "State Famine Relief as a Cause of the Great Divergence" paper presented at Great Divergence after Ten Years of Debate, conference held at Tsinghua University, Beijing.