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The Labor Intensive Path: Wages, Incomes and the Work Year in Japan, 1610-1932

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Abstract

I use new evidence from servant contracts, 1610-1932, to estimate male farm wages and the length of the work year in Japan. I show Japanese laborers were surprisingly poor and could only sustain 2-3 adults relative to 7 adults for the English. Japanese wages were the lowest among pre-industrial societies and this was driven by Malthusian population pressures. I also estimate the work year and find peasants worked 325 days a year by 1700, predating the "industrious" revolution in Europe. The findings imply Japan had a distinct labor-intensive path to industrialization, utilizing cheap labor over a long work year.

The timing of the divergence between East Asia and Western Europe remains a matter of great controversy. In the case of Japan, three competing narratives have emerged. First, qualitative studies of living standards suggest similar incomes up to 1800 (Hanley, 1997). Hence, the only divergence between these regions was the "great divergence" due to the industrial revolution. Second, quantitative studies based on unskilled urban male day wages for the case of Japan suggests it had much lower wages by at least 1300 (Bassino & Ma, 2006; Bassino et. al., 2010). This narrative suggests long run differences between Japan and Europe that caused an early divergence by the medieval period. Third, GDP per capita estimates point to a gradual divergence since the 14th century due to slower growth in Japan (Bassino, 2019). As the literature stands, the divergence can be placed anytime between the medieval period to 1800. This status quo has survived due to potential weaknesses in the evidence.

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This paper uses a new source, 1,596 servant contracts, to estimate annual wages, incomes, and the work year in Japan, 1610-1890. The source provides many advantages over past estimates based on day wages (Bassino & Ma, 2006; Saito, 1975). First, the servant wages are representative of the rural masses and was the most common form of labor for much of the period. Second, the servant wages are highly robust to critiques of day wages based on potential in-kind payment and seasonality. Third, annual wages are more instructive about living standards than day wages where we must assume a work year. Fourth, this series is far longer and covers over 150 more years which reveals some interesting fluctuations that were missed in the past literature.

The new series puts it beyond doubt that Japanese farm wages were the lowest observed in world history. They reached an equilibrium at approximately 2 baskets between 1660-1750, a fact that was missed in the past wage series. Wages then began to increase and reached a new equilibrium at 3 baskets from the 19th century. When annual wages are converted to day wages, the wage level was less than half of that in England. It was also lower than wages from Italy, India, and China with the exception of periods of major negative shocks. This confirms the pessimistic view of past wage estimates. Combined with other sources, the wages show Japan had a steady low wage equilibrium from 1400-1900. This places Japan at the opposite extreme of England which had steady high wages and suggests a very early divergence.

The data also suggests potential explanations for the low wages. The first are clear Malthusian patterns of increasing population resulting in lower wages. This occurred over time, between 1600-1720, which resulted in desperate poverty. It can also be detected geographically, with regions experiencing negative population growth having higher wages. The second is through estimates of the work year through both direct observations and the indirect methodology used for England by Clark and Van Der Werf (1998) and Humphries and Weisdorf (2019). These are the first such estimates for an East Asian context and they unambiguously show a work year amounting to 325 days a year from 1700-1910. The Japanese worked much harder than most people in pre-industrial Europe with perhaps the exception of England as it approached 1800 (Humphries & Weisdorf, 2019). The hard work may have been driven by low wages, as

suggested by Hayami (2015), but it also likely led to a further decline in wages due to increased labor supply.

Another major contribution of this paper is to show how the evidence from the various narratives of divergence are actually consistent with an early and steady divergence. I first show that Japanese rural households were richer than implied by annual wages because they also commonly earned (implicit) land rental incomes due to an equal distribution of land (Kumon, 2019). The richest peasants would have had incomes comparable to the English wage by 1800. This is consistent with the view by Hanley (1997) that living standards in these societies were comparable. However, this does not suggest the lack of divergence because we are comparing wages to wages plus land rent. A divergence must be defined based on comparisons of wages or GDP per capita rather than living standards. I also show these wage estimates are consistent with agricultural GDP evidence by Bassino et. al. (2019) which show a society in stagnation. Their growth narrative is therefore based on manufacturing and service sector growth for which direct evidence is non-existent. Further, they suggest these sectors grew between 1600-1720 which seems incompatible with how people had little surplus beyond subsistence as seen by extremely low wages. There is no evidence for a steady growth up to the industrial revolution.

An important implication is that Japan was not a delayed version of the West but was instead following an alternative path of development. The difference between the Japanese and Northwest European experience preceding industrialization is striking. The Japanese experienced an industrious revolution long before Northwest Europe but did not experience an industrial revolution. Although many historians believe the industrious revolution was an important pre-condition for industrialization (De Vries, 2008; Humphries & Weisdorf, 2019), it failed to bring significantly higher living standards in Japan. On the other hand, labor was extremely cheap and abundant due to high population density unlike England where labor was scarce and expensive. Overall, this was a labor-intensive society which supplied large amounts of labor due to both high population density and a long work year which both led to low wages. Despite such large differences in these societies, Japan was also the first Asian country to begin industrializing in the 1890s from a low wage base. Much of the literature on the industrial revolution (Allen, 2001; Voigtländer & Voth,

2006; Allen, 2009; Pomeranz, 2009) have focused on wages as an indicator or a necessary condition to prepare for industrialization. The Japanese experience suggests an alternative labor intensive path to industrialization (Hayami, 2015; Austin & Sugihara, 2013). If we are to find a common factor that link the early industrializing countries, we must look beyond wage comparisons.

Data

The main data source are the servant (*hokonin*) contracts from rural Japan, 1600-1900. These servants were laborers on long-term contracts who lived and worked in their employer's household, much like their counterparts in early modern Europe. In exchange for their labor, servants received payment in kind for subsistence, most notably in the form of food and lodging, in addition to a wage payment. These servants were extremely common and one of the main means of transferring labor across households, most often from poor to rich households. The number of servants gradually declined as households began to rent out lands that could not be farmed by household labor. However, their numbers were still large and available evidence from some regions suggest servants resided in approximately 30% of household in the mid 17th century with a decline to 10% by 1800 (Mori, 1956; Mizoguchi, 1981). Their wages will reflect the living standards of the rural masses.

Fortunately, many contracts have survived and often contains detailed information on the labor conditions such as the year, length of service, location of employment, servant's home village, name, and wage. They also occasionally include the age of the servant, the number of days off, and the amount of clothing to be given to the servant. The extremely rich nature of this source allows me to reconstruct not only the wages but also the work year in the period 1610-1870.

The advantage of this source over earlier wage estimates based on day laborers by Saito (1975) and Bassino and Ma (2006) are summarized in table 1. The main concern is that other estimates may have measurement error. The use of urban day wages has been criticized for many Asian societies due to three broad concerns about measurement (Deng & O'Brien, 2016; Parthasarathi, 2011). First, urban day laborers

were uncommon and estimates from parts of Japan suggest they represented perhaps 4% of the population (Bassino et. al., 2005).[2] Thus, it was unclear whether the rural masses had similar wage levels. Second, there are ambiguities related to whether unrecorded in-kind payments were supplied to laborers. In particular, food during work hours is known to have been supplied in some cases. Third, the effect of seasonality have made it unclear whether these wages were typical wages. Fourth, the past series have been single series from single employer so we are unsure of their precision. Fifth, the number of work days is unknown so the literature has relied on arbitrary assumptions of work days to estimate living standards. Each of these issues can prove critical and have been sufficient to muddy the waters surrounding the interpretation of their findings.

The wage data from annual servant contracts are highly robust to the issues mentioned above. First, servants were common within villages across Japan making their wages representative of the marginal product of the peasant masses. Second, the subsistence of the servant was always the responsibility of the employer and can be accounted for. Third, there is no seasonality effect because these are annual wages. Fourth, the large sample allows me to construct confidence intervals so the precision of the estimates are well known. Fifth, these are annual wages so there is no need to assume the number of days of work. Of course, this in turn means I cannot directly observe day wages but I can estimate them once I know the length of the work year. Further, I can also estimate the work year allowing me to also construct day wages. Therefore, these estimates will more precisely capture the annual wage incomes of the rural masses.

However, the servant wages are not without their problems. First, the wage was mostly paid in advance to the household head, rather than the servant, as seen in the above contract. This was unlike typical servants in England who received their wage during or after employment. One reason for the advance pay in Japan was the asymmetries in the law which failed to protect employees if they were not paid (Ramseyer, 1995). Receiving the wage in advance was a solution to this asymmetry. Another reason was the urgent need for

[2] If labor markets were well functioning these wages will remain relevant to rural living standards but findings from other countries suggest a rural-urban gap can exist.

money. Many contracts state the need to pay the annual harvest tax as a motive for receiving the advance. For my purposes, I will account for any discount on wages due to the advance as I am interested in the typical value of labor rather than the wage of the servants themselves.

Second, the contracts are generally silent about the type of work and it is unclear whether these laborers were unskilled. However, this is implied from the rural setting of these contracts. Employers required assistance in their livelihoods which were mostly agricultural work or housework which required minimal skills. I intentionally avoid urban areas where servants were effectively apprentices who accepted lower wages in return for human capital. Therefore, the wage estimates can be interpreted as the rural unskilled wage.

Third, the contracts vary on details on in-kind payments for the servants themselves. The in-kind payment was a big benefit of servanthood. In some cases, children would become servants for free in order to benefit from the need to feed one less mouth (and known as *kuchi berashi*). However, only a minority of contracts include details for a subset of the in-kind payment related to clothing. Most households probably followed an unwritten rule. Rather than directly dealing with this issue, I follow Humphries & Weisdorf (2019) in assuming workers received one basket for the servant in addition to a wage. This is practical, since the minimal needs of the servants were meant to be supplied by the employer.[3]

In addition to direct wage payments, I also use payments from two other types of contracts. First were permanent sales of labor, or slavery (often known as *fudai genin*), which occurred in the 17th century but eventually disappeared due to a ban by the lords. Slaves were valued by the discounted value of their work. Due to the ability of slaves to run away, such assets were also discounted heavily for this risk. Second were loans where labor was taken as collateral. These contracts were common up to the early 18th century but then decreased in importance. In this case, the laborer was returned once the loan was returned. The loan often required zero interest because the wage of the laborer was implicitly equated to the interest payments.

[3] At the very least, food and shelter would be supplied. There is bound to have been some variance in the supply of other goods, yet such differences will be small compared to the costs of food and shelter.

Both sources provide valuable information in the 17th century, when wage contracts were less common. I can easily control for these differing types of contract via control variables.

The source will be representative of wages in the wider rural economy if the labor market was competitive. It would be safe to assume that such conditions existed. Employers lacked market power because they only hired limited numbers of servants as required by household production needs. Laborers could also choose from a wide variety of employers in nearby villages, mostly within a day's walk from their home village (Mizoguchi, 1981; Fukazu, 1991). Markets were not segmented by domain either, as implied from laws that could limit labor migration across domains. Instead, the evidence clearly shows that many laborers travelled large distances, at times crossing domain boundaries, to match with better employers using various networks (Asano, 1986; Drixler, 2016a). Households may have faced more significant barriers to migration but individuals commonly slipped in and out of villages. Thus, labor markets were fairly competitive and all payments likely converged on the real value of labor.

I have collected a sample of 1,596 observations of rural male servant wages which will be referred to as the servant wage dataset. A portion of these were digitized from original servant contracts that were collected at various archives (see appendix G). Many of these have survived because employers happened to accumulate large collections of paperwork which were eventually passed onto archives. In some cases, this allows me to observe variations in wage for the same employer over centuries. I supplement these wage contracts with data from papers and books that have made information from servant contracts available for use.

The data is richest from 1760-1869 where there are more than 50 observations per decade (see figure 1). The 17th century has poor coverage due to lower source survival. The observations are also low from the 1880s onward so I supplement my data-set with official wage statistics from the Imperial Statistics of Japan which list the average wage for servants from 1884-1932. Geographically, 34% of observations are from the *Kanto* region surrounding Tokyo. Another quarter are from *Harima* province by Osaka where an extremely large collection was made available by Uemura (1976). The remaining observations span much of Japan but with more limited observations. The type of contract transitions over time towards wage

contracts, as documented in the wider literature (Ramseyer, 1995). I rely heavily on loan or sales contracts up to the early 18th century as they were the typical means of employing servants at the time.

Price Baskets

I construct a basket of subsistence goods to make the wages comparable across societies and time. This follows the "welfare ratios" approach pioneered by Allen (2001) whereby the basket is allowed to vary by society while fulfilling certain criteria such as calorie content. For example, food in the barebones basket must have 2,100 kcals of energy content per person per day.[4] Using this approach, I express wages as the number of purchasable subsistence baskets for one person-year. This approach has a number of weaknesses. First, the baskets are not identical but this is an insurmountable problem for pre-industrial societies, with limited global trade and heterogeneous consumption by region. Second is the arbitrary nature of the basket. A large set of potential baskets exists given the lack of comprehensive consumption surveys that may point us towards one representative basket. One partial solution is to make multiple baskets of goods that can capture extremes and show whether the results are robust to basket manipulation.

I follow Bassino & Ma (2006) in an earlier study on Japan by constructing both a respectability basket and a bare-bones basket. The main difference between the baskets is in rice consumption which was considered a luxurious grain at the time. Rice is 45% of expenditure for the respectability basket whereas it is 14\% in the bare-bones basket. Interestingly, even if we believe peasants did not eat rice, the price of barley and wheat was 70-80% of rice while buckwheat may have been slightly cheaper at 50-60% of the price so that living expenses only decreased by 16%. Due to the arbitrary nature of the basket, one could argue that peasants exclusively ate the cheapest grains. However, available agricultural statistics suggest otherwise. In the case of Japan in 1877, rice was 57.6% of all grain produced by volume, whereas wheat and barley was 31.6% and only 10.8% were other grains such as millet (Oki and Goto, 2013). Peasants

[4] I do not use the 1,940 kcal standard originally used by Robert Allen due to recent criticisms by Humphries (2013) that this would be insufficient for actual energy needs.

would obviously eat the cheapest grains which lacked market value. However, they also had little price incentive to produce large volumes of such cheap grains. Even the lowest classes of people likely consumed a large amount of rice.

I use a similar basket to Bassino & Ma (2006) but update it in a number of ways. First, I add observed prices for barley, soy beans, edible oil, and linen to varying degrees for the period 1720-1880 from various sources detailed in appendix A. However, the price of three goods remain unavailable (beans, fish, sake, and buckwheat) for the preceding periods so I follow the pre-industrial wage literature by fixing prices relative to rice prices using shares from the Meiji period. There are obvious dangers to assuming the same was true in the 17th century so caution is required for interpretation. What is clear is that rice was also the most important crop in the 17th century, due to the nature of the rice based tax system, and its dominance as a food crop was unchanged throughout the period. I can get a sense of the validity of this assumption by looking at the prices of goods relative to rice (see figure 2). It is reassuring that there is no clear trend in relative prices before the opening of Japan to trade in the 1850s after which price structures changed radically. More detail on the sources are available in appendix A. From here on, I refer this price data as the price dataset.

Second, I make one small adjustment to the basket by changing annual linen consumption per person to 2 *tan* which amounts to 2 pieces of clothing. This is comparable to the cloth consumption in European baskets of 5 meters of linen that also amounts to 2 pieces of clothing.[5] It is also consistent with the standard practice of clothing consumption among servants at this time. Many servant contracts stated two pieces of clothing, one for summer and the other for winter, would be provided per year. This level of clothing consumption is therefore also a realistic addition to the basket.

[5] Oldland (2014) states a tunic would require 2-2.5 yards of cloth which is close to the 2.5m per person used above. The change is due to differing dimensions of linen as well as body size across countries. For example, linen in England appears to have been sold by length with a one yard (0.914m) width whereas Japanese linen was sold with roughly 0.361m width. It is therefore easier to make linen comparable based on how many people it can clothe.

One final issue is the location and currency of the prices. Ideally, I would have prices for all goods in each region but prices are only available in Osaka. Therefore, I assume rice markets were well integrated as shown by other studies (Bassino, 2007; Dobado-Gonzalez et. al., 2015) which implies locational choice is not a major factor. Indeed, rice prices in 15 cities across Japan for the period 1875-1884, when railways were still extremely limited, had a coefficient of variation averaging 0.11 which is extremely low. Moreover, available rice price series for the preceding period, including domain government prices, were at very similar levels throughout (see appendix A). I choose prices in Osaka, which was the center of the rice trade, and impute the missing years using the rice price in Hiroshima. As Osaka prices were in silver, I convert all wage payments in bronze or gold into silver using data from Murakami and Takahashi (1986).

Methodology

I use a regression approach to construct a wage estimate following (Clark, 2005). An advantage of this method is that I also estimate a confidence interval for the average wage. The specification is as below.

$$Annual\ wage_{i,t} = \exp\left(\beta_0 + \beta_d \sum_{d=1}^{1} half\ decade_d + \beta_2 loan_i + \beta_3 Z_{i,t}\right) + e_{i,t}$$

I use a poisson regression which allows for a more robust prediction of wages relative to taking logs of the dependent variable (Silva and Teneryo, 2006). Most importantly, this specification avoids bias due to Jensen's inequality. The variable of interest is β_d which estimates the average wage by the decade. Estimates are made by half-decade during normal years where nominal wages fluctuated little. Notable exceptions are during years of currency devaluations and the Meiji restoration which led to large fluctuations. For these periods, I deviate from half-decade intervals. Additionally, I use time period dummies that span longer periods due to low sample size. I create a dummy for loan type contracts which would automatically account for the implied interest rate on the loan. I additionally control for region separately before/after 1750 and the duration of contract using dummy variables.

I use the nominal wage instead of the real wage as my dependent variable because the nominal wage was far more stable during half-decade intervals. This means the nominal wage in any year should be representative of any year within the half-decade interval. I can see this by looking at the nominal wage of servants employed by one household (the *Kondo* household in Harima province) over 80 years for whom I have a large sample (see figure 3). The sample size remains very small at the annual level resulting in some fluctuations, but the average nominal wage changed slowly and steadily. The nominal wage was also rigid during famine years, shaded in grey, whereas real wages clearly fell. This was perhaps due to the establishment of local norms and nominal wage rigidity (Kaur, 2019). Statistically, this will mean the nominal wage has less variance so it can also be estimated with greater precision.

A further advantage of this approach is that once nominal wages are estimated, I can back out wages in each year by using the annual basket price. When doing this, I must also correct the nominal wage to account for the implicit interest rate paid for the wage being an advance. As I lack the data for whether this is true in all cases, I assume this is true. This may lead to a slight upward bias in my estimates. I correct for the advance using the formula below to back out the true wage rate.

$$W = \sum_{t=1}^{T} \frac{1}{(1+r)^t} w$$

Here, W is the annual wage, r is the daily interest rate, and w is the day wage. Using this, the day wage rate is as follows.

$$w = \frac{W(1-\beta)}{\beta(1-\beta^T)}$$

Here, β is the discount rate. The annual wage would be the wage received for one year of work. This would be 354 days or 384 days in leap years with the old Japanese calendar, which was based on the lunisolar calendar, but I standardize this to the 365 day year for comparability purposes. The typical annual interest rate for one-year loans that appear in contracts was 20%, with part of it accounting for a risk premium. Similar numbers also emerge from other tests using available data (see appendix C). I therefore use this

20% rate to calculate the comparable nominal day wage. The deduction could be size-able as people working one year contracts would receive 91% of what they would receive had they been paid each day.

Results

Figure 4 plots the main wage series as the number of barebones baskets purchasable with the annual wage earned by servants from 1600-1870. The new wage estimates are consistent with the pessimistic outlook of Japan in poverty. The wages were generally low and fluctuating between 2-3 barebones baskets. A male breadwinner could barely feed a family of four at the best of times. As these wages are at the annual level, there is no room for more days of work or after-hour work to be concealing higher wage incomes as argued by Bassino et. al. (2005). Moreover, the barebones basket is a basket designed for the poor. If a respectability basket of goods is used, the implied wage level is mostly below two baskets suggesting even greater poverty (see appendix D). Wages were consistently low in Japan back to 1600.

The longer time frame of this study reveals important Malthusian wage fluctuations that were missed in past studies. Population increased rapidly after 1600 due to a civil war lasting over one and a half centuries coming to an end (see right axis of figure 4). Due to the lack of population surveys for 1600, estimates for population at this time vary between 12 to 22 million. However, the population census for 1721 suggest a vast increase to 31 million (Kito, 1996; Farris, 1995). The simultaneous decline in wages is consistent with the Malthusian narrative. The fact that wages largely stabilized by the 1660s suggest population had largely stabilized by then at which point families could sustain less than two people.[6] Families would not have been sustainable on male wages alone. Narratives of the period suggest a period of poverty and attempts to control population through bans on marriages, partible inheritance, or infanticide (Drixler, 2013). This is consistent with both the wage evidence and a Malthusian concept of equilibrium. The low equilibrium wage

[6] This result has insights for the uncertain wage estimates. Since wages largely stabilized by 1670, the implication is that population was close to 30 million by the 1660s. If population grew at 1% per year, population could not have been smaller than 15 million in 1600.

level itself is interesting. Such low wages can be observed over the short-run in other societies as a result of crises but this was a long-run equilibrium lasting a century in a peaceful society. During this period, the estimates place Japan as the society with the lowest wages observed in history.

The low wage equilibrium continued up to the 1730s after which wages began a steep climb over the next 80 year. Over three generations, wages almost doubled allowing male wages to feed 1.5 more people which fits with other findings in the earlier literature (Saito, 1975). This evidence is consistent with the hypothesis by Smith (1988) that Japan experienced pre-modern rural centered growth from the 18th century. If this was a Malthusian society, why did wages subsequently increase? Two factors played a role. First, successful population control kept population stable up to 1800. Infanticide had began in many regions by the 1660s partially as a response to labor abundance but it became a major concern by the mid 18th century as wages began to increase. One estimate of infanticide from Eastern Japan suggests up to 40% of infants were being killed at birth (Drixler, 2013). This culture persisted up to the early 20th century (Drixler, 2016b). This can be considered an increase in death rates resulting in a slow shift towards higher wages. Population did eventually begin to increase in the 19th century, partially due to declining infanticide rates, and this may explain the modest decline in wages towards the mid-19th century.

Second, there was increasing agricultural production due to increased acreage and increased productivity. Agricultural acreage increased due to land improvement projects which became feasible under a peaceful and stable society (Yamasaki, 2018). Land acreage increased by 20% between 1721-1804 and a further 16% by 1872 (Bassino et. al., 2019) Although these lands were of lower quality, it certainly helped to reduce the land constraint. The productivity on these lands also improved due to new agricultural implements. For example, new tools such as the *ganzume* for weeding, the *bitchu* hoe, and *senbakoki* for threshing are known to have been invented during the mid-late Edo period (Versucher, 2016). Fertilizer also changed. Originally, farmers used local green manure collected from the commons made of vegetation, human/livestock excrement, and ash. This gradually changed to dried fish type fertilizers purchased from merchants. These estimates suggest a large share of the productivity increase occurred between 1740-1820.

These general trends were punctuated by various shocks which put dents in the wage level largely due to variation in prices. This was partly due to famines, the greatest of which occurred in the 1640s, 1730s, 1780s, and 1830s. Such times resulted in a significant temporary decline in wages and starvation among the poorest. As food markets tended to fail at such times, these real wages significantly underestimate purchasing power in the worst affected regions. The other major event were wars, such as those that marked the end of the Tokugawa period. This instability led to a decline in real wages that was comparable to a great famine, before a recovery from the 1870s. Even at the best of times, peasants never managed to escape the risk of starvation.

One concern with this narrative is potential measurement error in the estimates. To partially address this, I plot the 95% confidence interval of the time period dummies and divide this by average prices in figure 5. The confidence intervals of the main estimate are mostly small and taking any values within this range leave most of my conclusions unchanged. Wages were most certainly close to two barebones baskets by the late 17th century and remained there for a century before seeing an increase up to the early 19th century. One remaining concern is whether wages really declined in the early 17th century. However, two sources of secondary evidence corroborate this view. First, unskilled day wages from the 16th century suggest high wages. Second, slavery or hereditary servants were extremely common in the 16th- mid 17th century. The first Japanese who stepped into Europe during this period were most likely slaves who were bought in these markets (Nelson, 2004). Slavery is a system that requires labor scarcity to sustain itself as the costs of raising the next generation of slaves become prohibitively high when marginal products fall. This is exactly what happened over the 17th century as wages fell and is highly consistent with the narrative (Ramseyer, 1995).

A second concern is that farmers would have valued foods at farm-gate prices which were cheaper and the use of retail prices will significantly undervalue wages. Available statistics from the early 20th century

suggest mark ups may have been one third of farm-gate prices.[7] If I use this to discount foods other than fish and oils, which are unlikely to have been produced by most households, I find a 20% decrease in the price of the bare-bones basket. This would mean a real wage of 3 baskets becomes 3.5 baskets. While significant, this is still a very low wage that is barely sufficient to sustain a family.

I also address concerns for the specification by conducting other plausible estimates of wages and plot them against my main results seen by the thinner lines (see figure 5). The four concerns I address are as follows. First, I use of the region-time dummy that splits the period pre/post 1750. This coincides with the timing of increasing wages. I therefore place alternative splits at 1740, 1760, and 1770. Second, a small minority of servant contracts specified periods that were not round years so wage seasonality could bias my results. I therefore estimate wages using only those contracts specifying round years. Third, longer term contracts were rare during the later periods and were often given to children who cannot always be identified. To account for this, I additionally drop all contracts that were longer than 3 years. Fourth, a concern is that the dummy variable for loan or sales contracts may not be able to fully control for differences with wage contracts. Therefore, I additionally drop all loans or sales contracts. In almost all cases, the alternative estimates are similar and fall within the 95\% confidence interval of my main estimate. The estimates are unlikely to be the product of measurement error.

How do these estimates fit into the broader picture? I augment my findings using two sources. First are the unskilled day wage estimates from medieval Japan by Bassino et. al. (2010) They make estimates from 1300-1600 assuming a stable nominal wage of 10 *mon* of copper coins per day. However, I only use wages from 1400-1550 which is where the underlying data exists. These wages are in-feasibly low during some periods as they suggest wages were below subsistence for one person during a year of relatively high food prices. It seems likely these laborers additionally received food when they worked. I account for food

[7] An agricultural household survey showing the sales price for brown rice relative to retail prices was used to get to this number (Noukai, 1915; Noukai, 1916). Assuming a 5% milling fee and 90% conversion rate of brown rice to white rice in volume, farm-gate prices are 73% and 82% of retail prices in 1913 and 1914.

incomes by adding 0.7 baskets (approximately the food expenses within the basket) during days of work. To convert day wages into annual wages, I assume medieval laborers worked 325 days a year which was the standard in 1800 when wages were also low. Second, I use monthly or annual servant wages listed in the annual statistics of the Japanese empire (*nihon teikoku tokei nenkan*) from 1881-1932.

I plot the long-run wage series from 1400-1932 in figure 6. Wages from the three differing sources are plotted independently and it is reassuring that my estimates coincide with the official statistics from the 1880s. These estimates show that the low wage economy can be traced back to the medieval period. Low wages were not unique to the Tokugawa regime, 1600-1868, but was clearly a longer-run phenomenon. Wages did see some fluctuation with high wages during the long civil war between the mid-15th century to 1600. This was likely caused by Malthusian forces as the war put downward pressure on population as armies roamed the lands and are likely to have spread of disease. The wage being above 3 subsistence baskets in the 1550s is reassuring for my narrative of high wages. It was only after the industrial revolution that wages consistently remained above 4 baskets of goods and rural Japan escaped the low wage trap it had been stuck in for at least half a millenium.

Regional Variations

It is also possible to measure region-specific wages in the case of the Kanto region that was surrounding Edo (or current day Tokyo), and the provinces surrounding Osaka for which the sample size is sufficiently large.[8] The wages of these regions are of interest because they contained the three biggest cities of the time, Edo, Osaka, and Kyoto. They were also regions with high population densities and were the hubs of the East and West of Japan. How different were region-specific wages to the national level wage estimates?

Due to the more limited sample size, I estimate the results from the 1720s onward by decade and plot the results in figure 7. The estimates reveal an interesting divergence that occurred from the 1790s whereby the

[8] For the Osaka region, I use data from the following provinces: *Yamashiro, Yamato, Omi, Izumi, Settsu, Kawachi,* and *Harima*.

Edo-region began to have much higher wages than the Osaka-region. The Edo-region farm wage could afford 1.5 more baskets at its peak. This is also consistent with the regional dummy variables which indicated the Edo-region had significantly higher nominal wages relative to other regions. This does not appear to be due to price differences by region. The best prices available for Edo are the *bakufu* government rice prices which were not market prices. These prices were controlled and therefore saw lower fluctuation and must be interpreted with caution. Looking at the price ratio of rice relative to Osaka, I find that Edo prices were on average only 6% higher after the 1790s. This difference is partially driven by price controls during years of rice scarcity and if I only account for years which saw small price fluctuations, Edo prices were only 2% higher. The regional divergence cannot be explained away by differences in regional prices. It is also difficult to imagine any significant skill differences by region. What can explain these differences?

One explanation for this is the great decline in population that occurred within the Edo-region between 1721-1828. Over these hundred years, population declined in the Edo-region by 15% while the Osaka-region saw only a modest decline of 5%. The lower population led to labor scarcity and therefore higher wages. This can be attributed to at least three factors. First, high levels of infanticide down the pacific coast of Eastern Japan led to lower population as shown by Drixler (2013). It could be the case that infanticide was more intense in this region. Second, the urban graveyard effect meant big cities had negative population growth and hence tended to absorb population from its periphery. Edo was the biggest city at the time with 1.2 million people while Osaka and Kyoto combined had less than 0.8 million people. Therefore, the effect was likely larger in the region around Edo. Third, there must have been limitations to long-distance migration as a means for wage-convergence. Households found it very difficult to migrate at this time due to laws at the time and most migration was limited to individuals. Moreover, villages valued trust because villagers were held jointly responsible for paying taxation. Strangers could not hope to settle without the use of networks. Such migration frictions likely increased with distance. This problem was compounded with lower population growth in the periphery of the Edo-region, where the northeast also had depopulation. Therefore, migration mostly occurred from population dense provinces to the north and west. I observe such cases from the neighboring provinces of *Echigo* in the north or *Shinano* in the west within the dataset.

Despite the existence of such migrants, they were insufficient to restock local populations. The regional wages also show Malthusian forces were at work within Japan.

The Length of the Work Year

Annual wages of servants were low but how long were they working to earn it? Were these peasants earning low annual wages because they were lazy? A long literature has attempted to answer this question for European countries but the evidence has remained limited for pre-industrial East Asia (Clark and Van Der Werf, 1998; Voth, 2001; Humphries and Weisdorf, 2019). I can investigate this using a small subset of these wage contracts (83 observation) which include stipulations on the number of days of rest with which I can estimate the length of the work year. Most of these contracts would state the number of days of rest per month resulting in large clusters of observations between 2-4 days of rest per month. Unfortunately, it is unclear if servants additionally rested during the national holidays and these are not added in my estimates. If they additionally got these holidays, they would have perhaps rested for an additional 3 days for new year, 3 days to honor the spirit of their ancestors during the *bon* holidays, and 5 days for the *gosekku* coming to a total of 11 additional days.

As a robustness exercise, I also estimate the work year using the method pioneered by Clark and Van Der Werf (1998). They divide the annual wage by the day wage to get an estimate of the work year as below.

$$Work\ Year = \frac{Annual\ Wage}{Day\ Wage\ -\ Risk\ Premium}$$

The day wage is often considered to include a risk premium, as such laborers were not guaranteed jobs on any given day. As we do not observe this risk premium component, the standard approach is to assume it is very small or to focus on the trends rather than levels. I can partially resolve this issue in the case of Japan by using the implied day wage from servant contracts that specify the number of days of work. Such contracts often specified 15 days a month of work but there was some variation. These workers would face significantly less risk due to the longer span of the contract. Due to such factors, the wage premium was likely very small. Additionally, there will not be seasonality issues due to their working every month of the

year. To avoid issues of regional/employer bias, I use observations from the same employer in two villages located in western Japan, 1780-1820, and central Japan, 1800-1840, to get one estimate of the working year in each.[9] I also estimate the work year in the Edo-region (or the *Kanto* region) as a whole for the periods 1780-1820 and 1820-1840. I will additionally plot other estimates of the work year based on village surveys as compiled by Abe (1998) and Saito (1998) to test for robustness.

The results unambiguously show these farm workers were highly industrious with the longest known average work year recorded in pre-industrial history (see figure 9). They worked for 310-330 days a year which is significantly more than the standard in modern society where people commonly work less than 250 days. This is longer than in 18th century England according to Clark and Van Der Werf (1998) who estimate 280-300 days of work, or the 250-280 days seen between the 16th-17th centuries. However, there is some debate on the work year in England with the highest estimates suggesting 350 days of work in the 1840s (Voth, 2001; Humphries and Weisdorf, 2019). The high labor hours itself also likely contributed to lower day wage rates as it shifted the labor supply curve to the right. The low annual wage in Japan was not the result of a lazy workforce.

This seems unlikely to be due to measurement error of servant work years as alternative estimates based on dividing the annual wage by day wages suggest similarly long work years (shown as other Japanese estimates in figure 9). It is also not due to servants having exceptionally long work years. Other surveys of the work year in these villages also suggest at least 300 days of work per year. However, there was certainly some regional variation and the estimates suggest Eastern Japan had a shorter work year than Western Japan by perhaps 10 days. This is consistent with higher wages in the region surrounding Edo which may have allowed laborers to work less.

It is interesting that the Japanese saw an increase in individual labor supply at an early stage in history without seeing an industrial revolution until much later. This may be due to the hard working ethics for

[9] Specifically, these villages were in *Harima* province and *Kai* province. I only attempt one estimate because of the low sample size of day wages.

Japan being the results of desperation and poverty rather than demand for new goods as hypothesized by De Vries(2008). Hayami (2015) was an early proponent of this view arguing the population explosion in the 17th century led to the development of a new labor-intensive agriculture. This necessarily resulted in a longer work year as horses and oxen were increasingly substituted with the cheaper man-power. In one region in central Japan, oxen and horses declined by 68% between the 1670s and 1820s while the population increased by 25% showing the changing inputs in agriculture. It is not possible to see the origins of the longer work hours but the results are highly consistent with this viewpoint. The consequences would have been a society saving on capital and intensifying labor, which Hayami originally coined as an "industrious revolution" before the work by Jan De Vries. Hayami's concept stands in contrast to an industrial revolution where labor saving technologies dominate. Japan was on a labor intensive path of development where labor was abundant and cheap due to both high population pressures and long work hours.

Reconciling the Many Divergences

How do these new findings fit into the ongoing debate of the divergence between Japan and Europe? There are currently at least three distinct views. First, Hanley (1997) uses qualitative evidence on living standards to suggest living standards were similar between Japan and Northwest Europe. This view places a divergence during the industrial revolution in Northwest Europe. Second, the GDP per capita estimates by Bassino et. al. (2019) show a slow divergence between Japan and England. They believe both societies experienced growth. They argue the divergence was caused by consistent but slower growth in Japan relative to Northwest Europe. Such a narrative is decidedly non-Malthusian. Third, is the view that divergence occurred much earlier. This is based on the urban day wage estimates by Bassino and Ma (2005) and Bassino et. al. (2010) although some of the authors adhere to the first view that there was a slow divergence.

I first look at how the Japanese wages compare with other contemporary societies. I compare Japanese wages with that from Beijing, Bengal, England, and Milan from other papers (Allen, 2001; Clark, 2007;

Allen et. al. 2011; Zwart and Lucassen, 2020). These countries were chosen as they represent distinct regions and the data was available. The wages from England are rural wages making them more comparable with the Japanese farm wages. The wages from Bengal, Beijing and Milan are city wages which may result in a slight over-estimate due to higher rents in cities although there is no sign of this in the case of Bengal. I will compare day wages as the work year clearly differed across countries. In order to make Japanese annual wages into day wages, I assume 325 days of work.

To make the wages comparable, I use bare-bone basket which may be more representative for the poor masses. Unfortunately, the literature has large variation in baskets making them incomparable. I therefore update these baskets so that they fulfill a number of common conditions while hewing as closely as possible to the original baskets in the respective papers. The food must contain 2,100 kcals, at least 50g of proteins, and 5 kgs of meat or fish. Additionally, the main consumed grain must be a cheap secondary grain but it must also include at least 300 kcals of primary grain per day. This is to prevent the basket becoming an unrealistically spartan diet. Other than food, the basket contains 2.6kg of candles/lamp oil, 5m of linen, and a 5% cost increase to account for rent. The details of each basket are given in appendix E.

I plot the resulting long-run wage series using 20 year averages in figure 10. The new series is consistent with the earlier wage evidence suggesting a very early divergence. Japan and England represent the opposite ends of the wage distribution. The English were consistently richer since the medieval period, earning 5 baskets before the black death and a subsequent new equilibrium at 7 baskets. Therefore, English peasants were earning more than double the Japanese wage at all times. The day wages show a very early divergence between these two countries. Although not compared here due to the use of a different basket, rural French wages from a recent paper by Ridolfi (2019) were close to English wages and must have also been significantly higher than Japanese wages. Despite such extreme differences, it is interesting that both England and Japan industrialized at a relatively early stage. Japan began industrializing by 1900, only a one hundred year lag and 40 or so years after opening trade to the world. This shows wages alone do not play a decisive role in industrialization.

Next I turn to Milan which is often considered as a central region of the little divergence. The wages here the were comparable to English wages in the 17th century before beginning a decline in the 18th century as argued by (Malanima, 2013). Wages were as low as two baskets in some periods such as 1793-1818 and 1847-1860. However, this was driven by political events such as the Napoleonic wars and the wars for independence. During the peaceful periods, households could afford 4 bare-bone baskets suggesting a higher equilibrium wage. Furthermore, the silver wages of a comparable laborer in nearby Florence were more than double in 1860 which brings some doubt to Milan being representative of Northern Italian wages. In any case, wages in Milan still appear slightly higher than in Japan with the exception of years of instability.

Beijing, and Bengal (Northeast India) also have middling wages. Beijing wages appear very high in the early 18th century, even comparable to rural England. This is different from the findings in Allen (2011) because I am using English farm wages rather than London wages which were inflated due to rents and contractor margins unaccounted for in the wage series (Stephenson, 2018). Wages then saw a steady decline up to the 1850s before seeing a recovery. Chinese wages were comparable or lower than Japanese wages from the 1840s-50s. However, this coincides with the opium wars, 1839-42 and 1856-60, and the Taiping rebellion, 1850-64, which suggests this was a temporary shock and long-run wages appear higher than in Japan. Bengal wages generally seem to average 4 baskets of goods. However, there were also some fluctuations, most notably in the 1770s due to a famine and in 1840s which may be due to measurement error as the standard error is larger in that decade. Data from other Indian cities suggests wages were also similar.

These findings show an early and stable divergence which seems fundamentally at odds with the other views. However, a careful analysis reveals the actual evidence is highly consistent with my finding. First, I look at the argument that Japanese living standards were comparable to those in England. The premise by Hanley (1997) (and Pomeranz (2009) in the case of China) is that equal living standards imply the lack of divergence but this is methodologically flawed. Suppose two societies with decreasing return to labor as in figure 11. One has high wages and low population (society 1) while the other has low wages and high

population (society 2). These societies have clearly diverged in wages and GDP per capita. Despite this divergence, if society 1 is highly unequal with typical households earn only wages while society 2 is highly equal with typical households earning GDP per capita, living standards will be very similar.

Society 2 is actually similar to Japan as land was relatively equally distributed meaning total incomes also included a supplemental (implicit) land rental income. In a companion paper, Kumon (2019) shows that land was relatively equally distributed in Japan with up to 87% of households owning land unlike England where most peasants were landless. Moreover, land rental incomes were large despite heavy taxes. They also increased over time due to the lords finding it risky to increase land taxes, due to potential rebellion, so that land taxation remained fixed while yields increased (Brown, 1987). Thus, increased yields were pocketed by the peasants as land rents and higher wages. A rough estimate of the distribution of incomes in Japan given such land rents is possible by splitting households into the lower (the bottom 40%), middle (middle 40%) and upper class (the top 20%) (see appendix F for details).

Table 3 shows the estimated annual incomes of these peasants. Only a small share of these land rental incomes went to the lower classes, who on average owned only 20% of the land they farmed, so their incomes were only modestly higher than wages. The living standards of the bottom 40% of peasants would have still been the lowest in the world. However, the middle class could afford 0.6-1.5 more basket of goods which would place them at or above Italian or Northeast Indian levels of standards of living. Finally, the upper class owned triple the amount of land they cultivated and earned more than double the income implied by wages by 1721. These estimates place the upper class peasants at living standards above the landless laborer of England by the 19th century. If Hanley (1997) was looking at these peasants, she was right to point out their similar living standards.

However, the typical peasant remained poorer than the typical Northwest European. This evidence is corroborated by evidence of the shorter pre-industrial heights of the Japanese (155cm) relative to the English (165cm), Dutch (164cm) or French (164 cm) (Steckel, 2001). Lower nutrition likely led to lower heights through lower nutrition during childhood. The lower heights in turn would have been beneficial for survival because the Japanese would have required 250-300 fewer calories (FAO/WHO/UN, 2004). The

long-run nature of low living standards may have also led to selection and transmission of low heights within the population through hereditary factors such as genes which are a key determinant of heights (Jelenkovic et. al., 2016) or lower levels of growth hormone receptors which may have persistence across generations (Nemoto and Kakinuma, 2020).

The second alternative narrative was by Bassino et. al. (2019) which was based on GDP per capita estimates shown in figure 12. They place the beginnings of divergence in the medieval period. Japan was growing since this time but at a slower pace than England. Comparing GDP per capita is methodologically valid as a means of identifying a divergence. However, a critical problem is the vast amount of data required for estimating something as data intensive as GDP per capita. Their estimates of GDP per capita are plausible estimates given the evidence but the underlying sources remain extremely limited and measurement error is a big concern. The data for sectors beyond agriculture do not exist before the 1870s and therefore much rests on speculative assumptions. This contrasts with wages that are observable and less prone to error. What do the more reliable agricultural GDP estimates suggest? I also plot these in figure 12 after applying a recent correction for agricultural production in the 8th century by Midorikawa (2016). Agricultural production per person was highly stable with little improvement from ancient times to 1874. The agricultural production itself suggests no growth and is highly consistent with the findings of a stable wage.

The key to their findings of divergence therefore rest on non-agricultural production. There are two problems. The first is methodological. These estimates are based on the assumption that population densities and urbanization rates will be correlated with the share of the secondary and tertiary sectors. They use the relationship between these variables in 1874, 1890, and 1909, to backwardly project this to the distant past (for details see Saito and Takashima (2016)). Unsurprisingly, most of the non-agricultural growth comes from the population growth of 1600-1720. The sectoral share of non-agricultural production jumps from 26% to 37% at which it remains relatively stable. Yet, the assumptions are highly precarious given 1600-1720 was a period of huge transformation with an almost doubling of population. The second issue is that the timing of non-agricultural growth coincides with the lowest wages. If demand for non-food

good rests on the amount of income available beyond subsistence, then it is unlikely that these sectors saw much growth at this time. If we are to discard the non-agricultural estimates, what remains is a Malthusian society. There was no gradual growth before industrialization.

Conclusion

This article has been the first to construct annual wage estimates for Japan, 1610-1870. The results shows landless laborers in Japan were the poorest people recorded in history. There were some fluctuations in their wages but wages never rose far above 3 bare-bones baskets. The causes were partially Malthusian because wages were negatively correlated with population. I also showed the Japanese were incredibly hard working, putting in over 325 days a year. This may have been partially caused by low wages and desperation. However, it may have in turn contributed to even lower day wages due to an increased labor supply. People survived in such conditions due to supplemental land rental incomes from widespread land ownership. Despite such supplemental incomes, the median peasant's living standards would still have been lower than the English level. The implications of these wage series is an early divergence between Japan and England that remained steady up to 1800. Explanations for divergence that rely on factors such as the black death cannot fully explain the divergence (Voigtländer & Voth, 2006). Instead, we must seek answers in factors that long precede the black death.

One potential explanation is the equality in land distributions. A companion paper shows that equality generates poverty through a Malthusian mechanism. In the short run, equality is highly beneficial for people because they earn extra incomes from land ownership. However, the extra incomes mean people have more children over the long-run leading to an economy of labor abundance and low wages. This mechanism may not only be limited to Japan as there is evidence that China also had a relatively equal distribution of land. Moreover, the differences in land distribution were due to differences in the demographic institution of adoption (Kumon, 2019). Adoption was used to keep land within the family when a household lacked a son. This did not occur in Europe due to the Christian church preaching against adoption from the 5th century

that led to greater inequality. This precedes the black death and can be a potential explanation of an early divergence. This mechanism may partially explain why Japan, and perhaps other East Asian societies, were placed on a different labor-intensive path of development.

Table 1 Comparison of this paper to Other Wage Studies

	Bassino and Ma (2006)	Saito (1975)	This Paper
Sample	Kyoto day laborers (One Employer)	Rural day laborers (One Employer)	Rural Servants (Many Employers)
Years	1741-62, 1791-1874, 1882-1890	1727- 1830	1610-1932
In-kind payment	Unknown	Yes	Yes
Seasonality	Unknown	Yes	No
Confidence Intervals	No	No	Yes
Work Year Estimate	No	No	Yes

Table 2The Consumption Basket per Person per Year, 1750-1759

	Quantity		Price	Share of Expenditure (%)	
Goods	Respectability	Barebones	(monme)	Respectability	Barebones
Beans (l)	4	4	.19	1.00	1.2
Soybeans (kg)	40	23	0.30	20.6	12.3
Rice (kg)	152	33	0.30	45.2	14.2
Barley (kg)	11	77	0.20	2.6	22.1
Fish (kg)	26	5	0.59	2.7	
Buckwheat (kg)	18	82	0.18	3.8	21.4
Sake (liters)		49	0.42	1340	5
Edible oil (l)	3	3	1.96	2.6	3.1
Linen (*tan*)	2	2	5.58	14.7	17.6
Lamp oil (l)	5.2	2.6	1.96	6.7	8.1
Total cost of Basket				75.78	63.30
Total Calories				2,500kcals	2,100 kcals

Note: Most of the above follows (Bassino and Ma, 2006). I assume 180 litres/koku, 150kg/koku for rice, and 129 kg/koku for soybeans. I assume prices relative to rice as fol-lows: Beans 0.63, buckwheat and other grain 0.6, and 1.46 for fish. A full rice wage basket costs 60.62 monme for this decade. Source: The price dataset

Table 3Annual Incomes in Bare-bone Baskets for Various Classes in Japan

Year	Wage	Land Rent if Full Owner	Incomes		
			Lower Class	Middle Class	Upper Class
1600	3.2	0.6	3.3	3.7	5.1
1721	1.9	0.8	2.1	2.6	4.4
1804	3.4	1.7	3.7	4.8	8.4
1846	3.1	1.7	3.4	4.5	8.2
1872	3.0	1.8	3.4	4.5	8.3
% of Population			40%	40%	20%
% of Farm owned			20%	82.5%	295%

Sources: Kumon (2019) and estimates of land incomes detailed in appendix F.

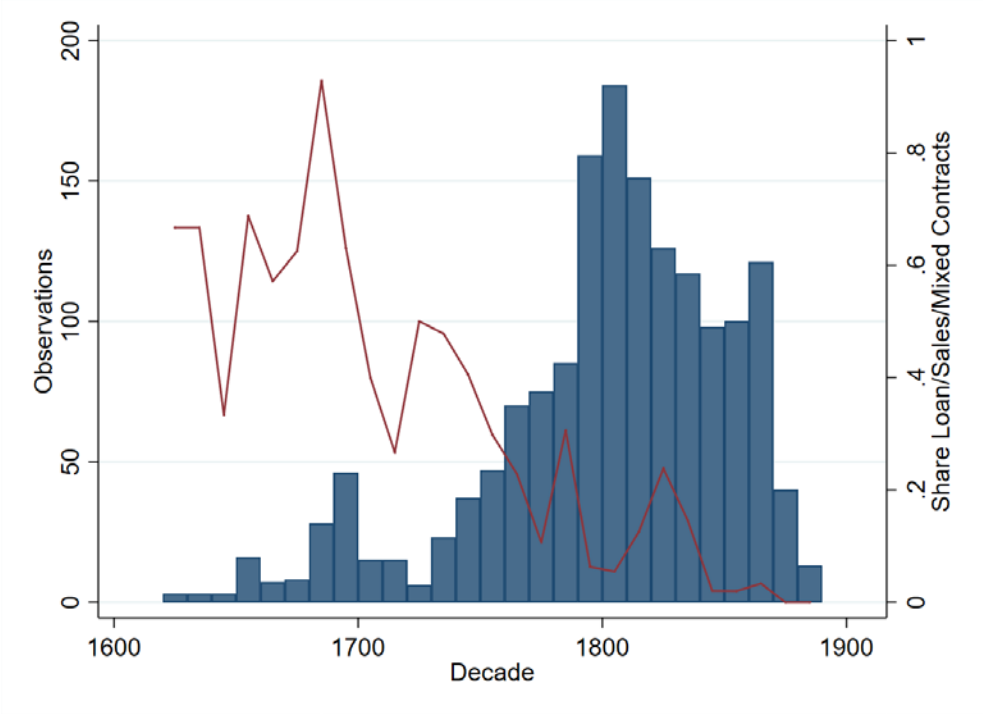

Figure 1 The Number and Type of Observations per Deacade

Note: Bars represent numbers of observations (left axis) and lines indicate contract type (right axis). Source: Servant wage dataset

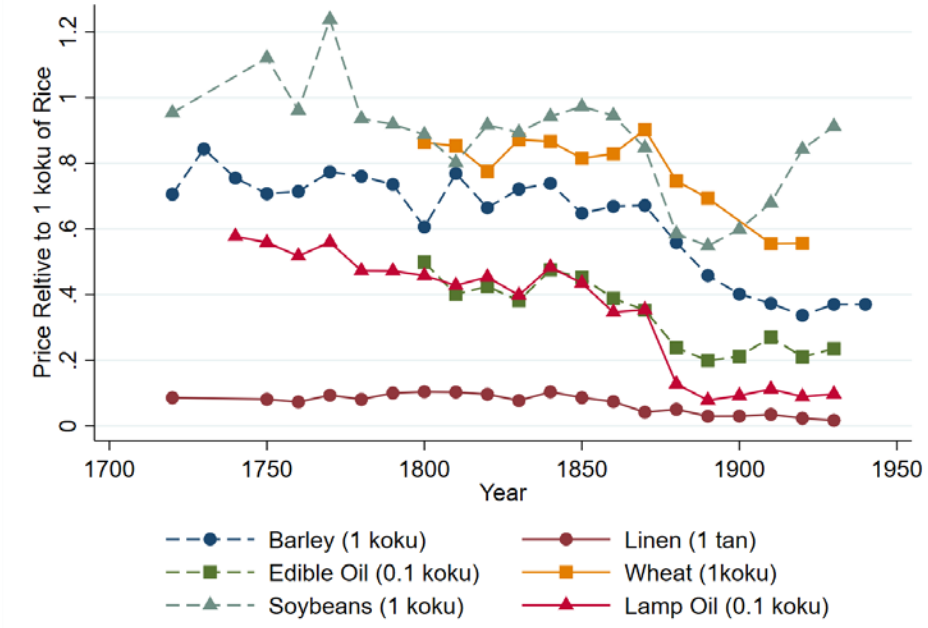

Figure 2 Price of Individual Goods Relative to Rice by Decade

Source: The price dataset

(a) Nominal Wages (b) Real Wages

Figure 3Wages of Servants Employed in a Village near Kobe

Note: The shaded areas are periods of Famine. The smoothed line is generated using a local polynomial estimation of degree 3. Source: Servant wage dataset

Figure 4 Male Annual Farm Wages

Note: The annual wage is plotted with a 11 year moving average. The regional dummies are weighted by population in 1798. Shaded areas indicate major episodes of famine or warfare.Source: Servant wage dataset and price dataset.

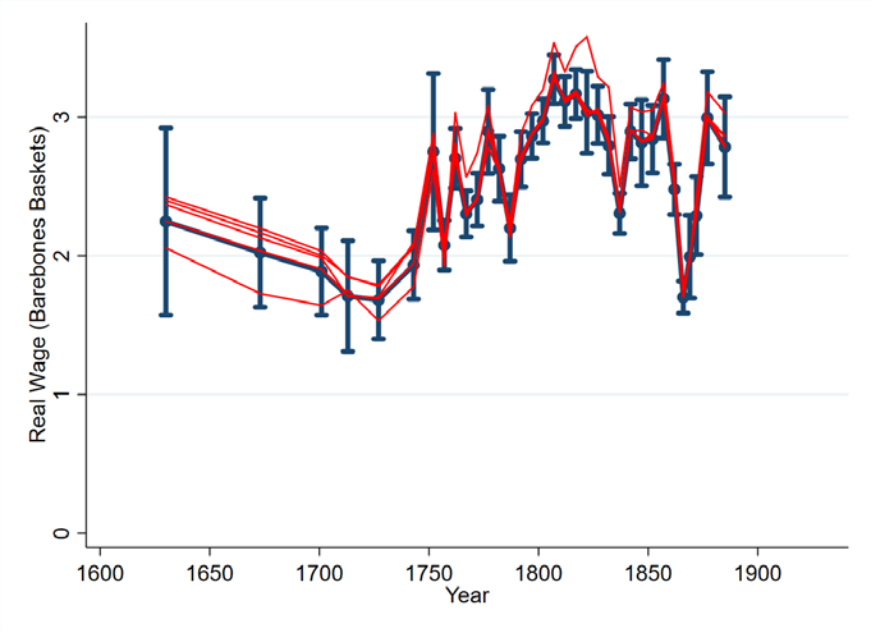

Figure 5 Alternative Specifications Relative to Main Estimate

Note: The main estimates are in thick lines and alternative estimates in thin lines. 95% Confidence Intervals are plotted for my main estimate. Sources: Servant wage dataset and price dataset

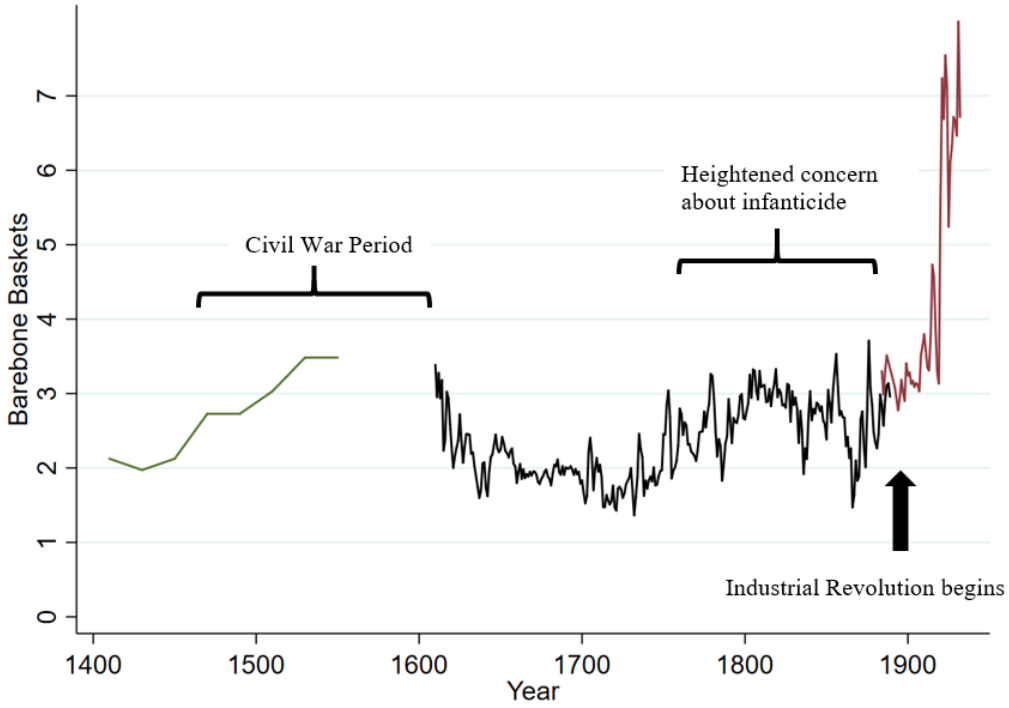

Figure 6 Unskilled Wages over the Very Long Run

Sources: Servant wage dataset, price dataset, and Bassino et al. (2010)

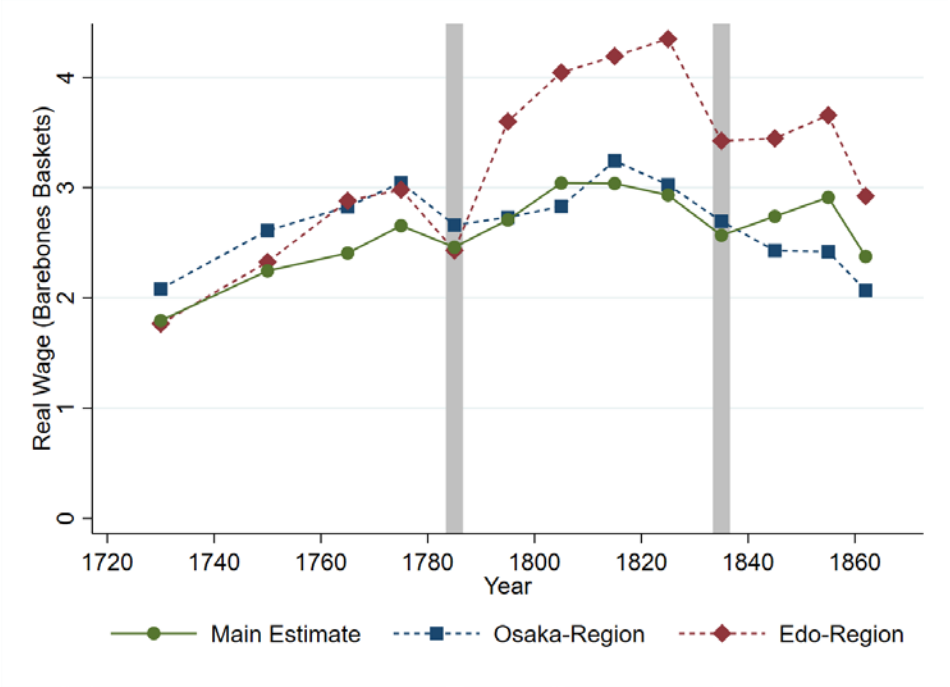

Figure 7 Farm Wages by Region

Note: The shaded region indicates decades with major famines. Sources: Servant wage dataset and price dataset.

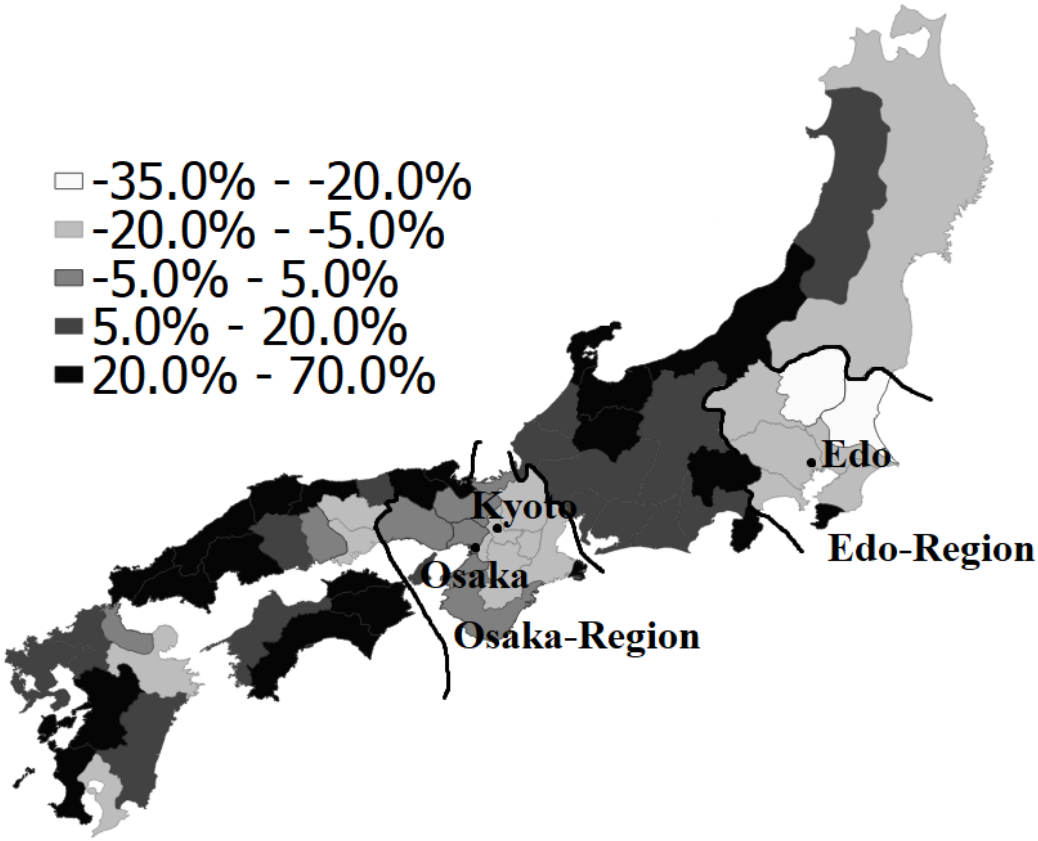

Figure 8 Population Growth in Japan, 1721-1828

Source: (Kito, 1996)

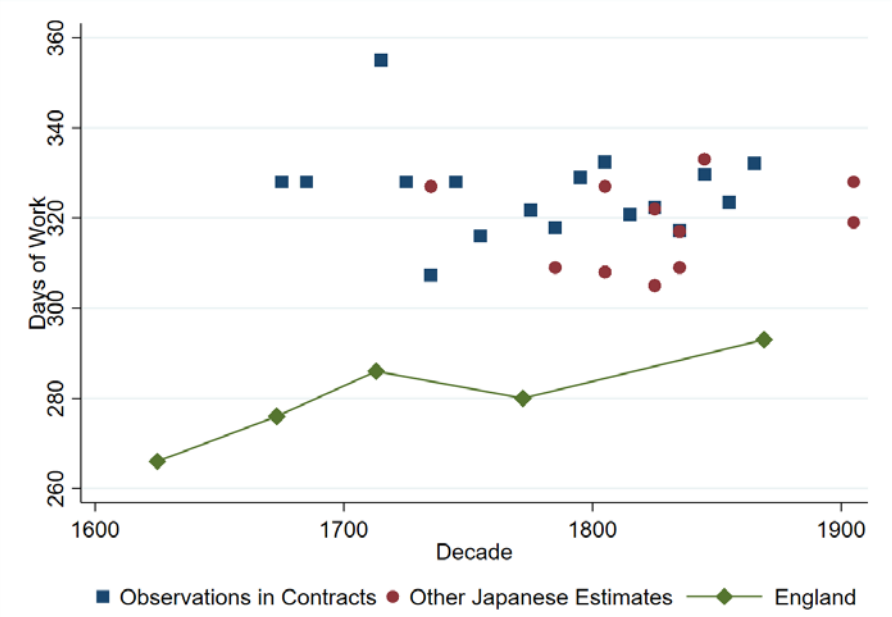

Figure 9 Estimates of the Work Year in Japan

Note: I take the average of the work year from observations in each decade Observations from contracts and the annual wage/day wage method almost overlap in the 1820s and 1830s so are difficult to see. Sources: Servant wage dataset, Clark and Van Der Werf (1998),Abe (1998) Saito (1998)

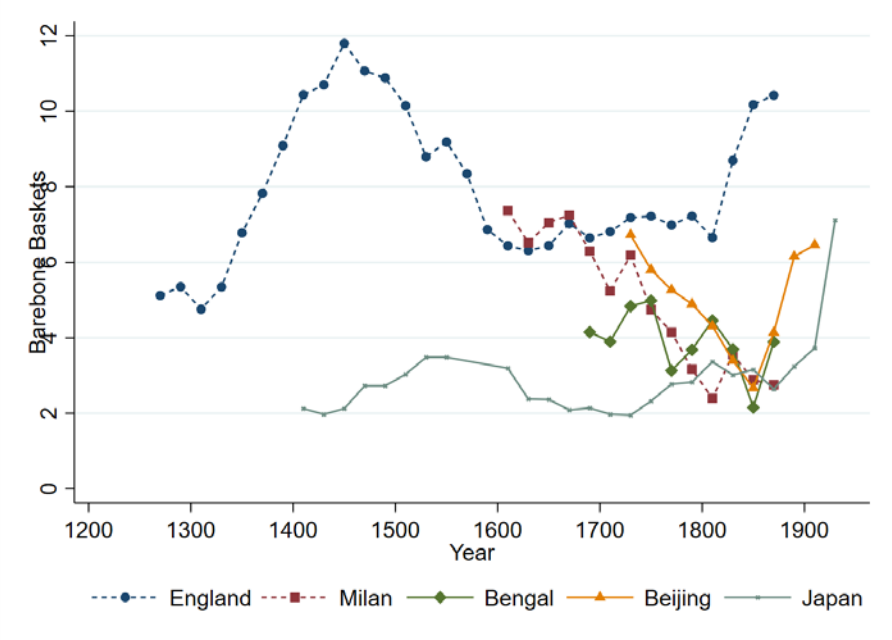

Figure 10 International Comparisons of Wage

Note: All units are in number of one person's worth of basket purchasable. I use the barebones basket for Japan to make it comparable to the estimates for China. Sources: GPIH website wages as originally used by originally used by Clark (2007), Allen et al. (2011), Allen et al.(2011), Zwart and Lucassen (2020)

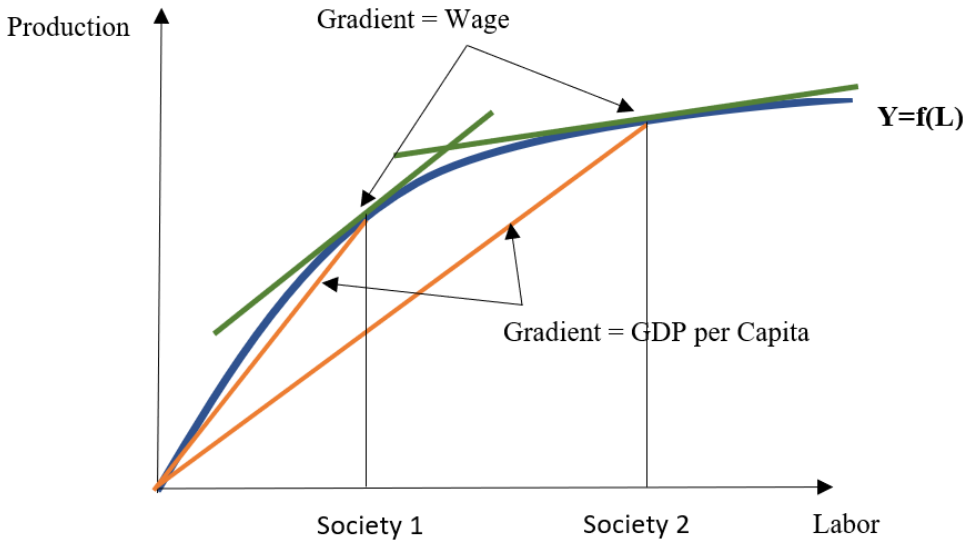

Figure 11 Wages and GDP per Capita in Two Societies that have Diverged

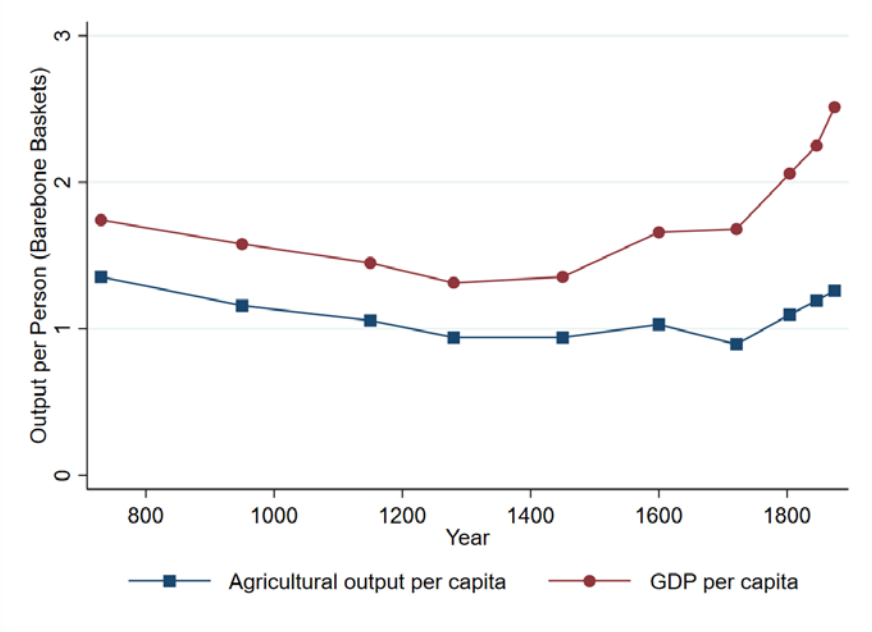

Figure 12 Estimates of GDP per Capita and Agricultural Output per Person

The number of baskets before 1700 are all converted by assuming 1.48 koku of rice could buy a barebone baskets. These are highly approximate conversions. Source: Bassino et al. (2019), Midorikawa (2016)

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