# The Deep Roots of Inequality

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**Abstract**

This paper shows how wealth inequality was lower in East Asia than Western Europe over the very long-run, 1300-2000. A rich new dataset of village censuses in Japan, 1640-1870, and secondary evidence suggest Gini coefficients of wealth inequality in the East were 0.4-0.5 relative to 0.7-0.9 in the West preceding industrialization. Such regional patterns also precede the black death so any explanation must predate this. I propose the demographic institution of adoption as one such explanation. Adoption prevented the failure of male lines through which wealth was inherited. Adoption was practiced across Eurasia until the 5th century when the church began preaching against it. This increased household extinctions in Europe causing wealth concentration among surviving male lines. In contrast, the Japanese data suggest adoption prevented household extinctions and kept wealth in the family. Simulations show that this mechanism can explain much of the gap in regional wealth inequality.

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Estimates of wealth inequality in the year 2000 show a striking regional pattern of low inequality in East Asia and high inequality in Western Europe (Davies et al., 2010). This paper uses rich long-run panel data from village censuses in pre-industrial rural Japan, 1640-1870, to show that the divergent paths of the two regions equally apply to the distant pre-industrial past, 1300-1900. My estimates of wealth inequality in rural Japan suggest low Gini coefficients of 0.5 with 87% of households owning land. This is a much lower wealth inequality than that from available estimates from Western Europe on the eve of industrialization, most notably from Italy, the Netherlands, England and Sweden, where Gini-coefficients ranged 0.7-0.9 (Alfani, 2015; Alfani and Ryckbosch, 2016; Alfani and Ammannati, 2017; Bengtsson et al., 2018). Moreover, I use scattered evidence to suggest such differences were not confined to the period preceding industrialization but also preceded the black death in the mid 14th century. This is surprising because a popular hypothesis had been that inequality was converging to high levels everywhere (Scheidel, 2017). Instead, I show a divergence whereby Western Europe converged towards a society of landless laborers while East Asia remained dominated by peasant households. Any explanation of differences in wealth inequality across these regions must have validity over the very long-run.

I propose such an explanation through changes in the demographic institutions of adoption, resulting from the actions of the Christian church in the 5th century. Adoption had been practiced in Eurasia since ancient times as a means of passing on wealth when households lacked male biological heirs and thereby keeping wealth within the household (Goody, 1969). The detailed demographic data from Japanese village censuses show wealthy Japanese households were not going extinct due to adoptions, despite having at least a 20% chance of having no biological heir. However, Western European households effectively stopped practicing adoption from the early middle ages due to the teaching of the church that started putting greater emphasis on blood relations. The lack of adoption in Western Europe greatly increased household extinctions. For instance, the male lines of the English elite were going extinct at least 25% of the time during the 18th century meaning over 50% of national wealth would get inherited by other male lines over a century.[1] Due to the highly unequal nature of redistribution upon household extinctions, through wills or marriage to heiresses, societies in Western Europe saw increasing levels of wealth concentration and higher inequality (Clay, 1968; Habakkuk, 1994).

This mechanism is a plausible explanation of the divergence in wealth inequality between East Asia and Western Europe for a number of reasons. First, adoption was functioning similarly across Eurasia before institutional change in Western Europe. Second, the treat-

[1] The figures are for childlessness among the English peers from Gobbi and Goñi (2018). Even more households would have daughters but no male heirs. I assume on average at least 3 generations per century.

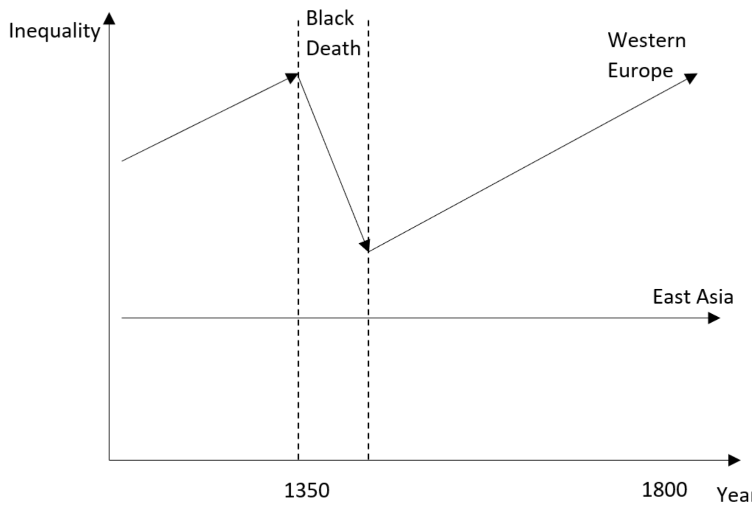



**Figure 1: A Conjecture of Long-run Wealth Inequality**

ment that changed institution in Western Europe was motivated by factors which can be considered exogenous to inequality. The religious authorities were motivated by the desire to increase church wealth, through the higher likelihood of donations upon household extinction. Therefore, it is difficult to theoretically argue for an endogenous development towards an institutional change. Third, adoption was not limited to Japan. Although the evidence is less detailed, there are observations of widespread adoption across East Asia making this a plausible mechanism in explaining regional differences in inequality (Feng and Lee, 1998; Goody, 2000; Kim and Park, 2010). Fourth, I show that this mechanism had plausibly large effects on inequality through a simulation model, calibrated by the data. I find that adoption is likely to have resulted in a 0.1-0.2 point decrease in Gini coefficient. This can explain a large share of differences in wealth inequality outcomes.

A major contribution of this paper is to show a very long-run regional divergence in inequality that changes our understanding of inequality in the pre-industrial world (see figure 1). The past literature had mostly focused on the 18th century onward in the case of Asia. Milanovic (2018) found cross-country evidence of pre-industrial *income* inequality being lower in Asian societies after the 18th century which is consistent with my findings using wealth inequality.[2] Scheidel (2017) also attempted to look at a longer time scale with more fragmentary data and contemporary narratives of inequality but he concluded that all societies were converging towards high inequality. I am the first to compute long-run wealth

[2]Income inequality is measured using social tables, which exploits estimated differences in inequality between typical social classes. Due to it being based on little data, there is less confidence on the accuracy of the measure compared to wealth inequality. Milanovic (2018) finds income inequality is positively correlated with population density. The regions with high population density were predominantly Asian, where rice production allowed for more people to subsist per area.

inequality in East Asia and I find no evidence for such claims. Japan seems not to have been an idiosyncratic, but to be representative other societies in the region. This newly documented dimension of divergence adds to the well known case of wage divergence across East Asia and Western Europe.

Another important contribution is the proposal of a new mechanism that can explain differing inequality outcomes across countries. There has been a recent focus on the "Great Gatsby Curve" which shows the existence of an empirical negative relationship between social mobility and inequality (Corak, 2013). This has led to growing numbers of studies that look at transmissions of wealth or social status as a key factor in explaining inequality (Clark and Cummins, 2014; Chetty et al., 2014; Adermon et al., 2018). I complement this literature by showing a model of how differential fertility outcomes also have large effects on inequality. Unlike most datasets, this historical micro-data gives me the unique opportunity to simultaneously study household demography and wealth. Detailed examination shows big differences in household wealth transmissions in Japan relative to the typical Western European household which resulted in divergent inequality outcomes.

An interesting implication of this paper is that religious institutions impacted inequality through demographic institutions. Christianity and the church have often been considered a distinguishing feature of Europe. However, their role in economic history has been debated since the seminal book by Weber (1930), as it contended with others factors such as geography or political fragmentation (Diamond, 1998; Becker and Woessmann, 2009; Bosker et al., 2013; Cox, 2017; Cantoni et al., 2018). I show that the church did in fact play a key role in creating a divergence in inequality. This divergence in inequality may play a key role in explaining the great divergence in living standards. A companion paper shows that the divergence in inequality also created a divergence in living standards, whereby East Asia became poor and Western Europe became rich (Kumon, 2018). Therefore, the church may have been a major unintentional actor contributing to the unique path of economic development in Western Europe.

# Data

I primarily use data on landownership within pre-industrial economies. Looking at inequality in landownership is a good way of understanding wealth inequality for three reasons. First, land was the most important form of wealth in agricultural economies, with for instance approximately one third of GDP being tied up in landownership in 18th century Japan. Therefore, land inequality is a good measure of wealth inequality. Second, real estates (mainly in the form of land) is the only systematically observable measure of individual

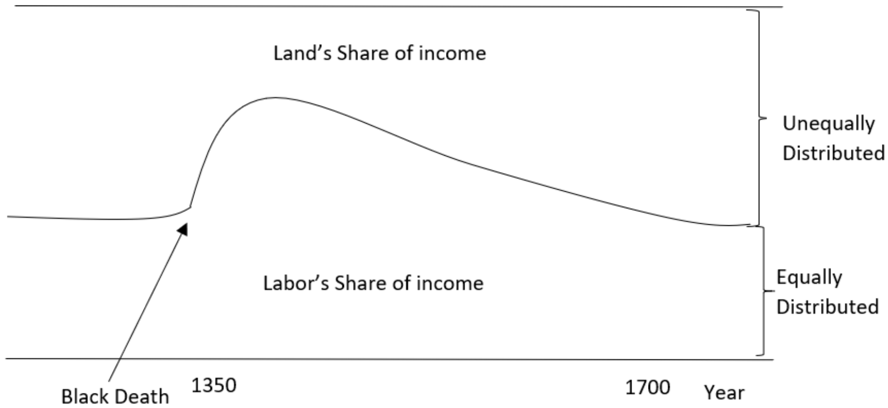



**Figure 2: A representation of pre-industrial Inequality**

incomes within these pre-modern societies.[3] Third, land ownership inequality is also a very good measure of income inequality in an era where labor incomes were relatively evenly distributed due to the rarity of skilled workers.[4]

Land ownership inequality can therefore capture most economic inequality in society with two caveats (see figure 2). The first were changes in the share of labor's share of total income through relative changes in wages and land rental rates. This could be affected by huge shocks such as the black death (which did not hit Japan) after which wages are known to have risen. In Japan wages appear to have stayed low meaning this was a fairly static channel. The second channel was through changing purchasing powers across different income classes. For instance, a decrease in the price of luxuries will only increase the consumption by the rich and thereby increase inequality (Hoffman et al., 2002).

I use data sources from three countries to measure dynamics and levels of inequality at the village level. I use village level estimates due to the limitations of my main data source, Japanese village population censuses (*Shumon Ninbetsu Aratame Cho*) from 591 villages with sporadic observations in between 1634-1872. These lists the yield of plots by ownership within these villages. This source only allows for the construction of within-village inequality. As a source of comparison for levels and trends, I use wealth data from Italy, 1307-1809, where inequality measures have already been published in the literature (Alfani, 2015; Alfani and Ammannati, 2017). I also use data on land distributions from English parliamentary enclosures, 1720-1850, as another source of comparison for inequality at the village level. This is also compiled from secondary data available from various papers but

[3]All measures of income inequality in the literature are based on assumed representative individuals by class. They measure inequality across classes.

[4]In these agricultural economies skill premiums were small with typical skilled workers in rural Japan earning perhaps 2.6 times more in wages (Saito, 2005).

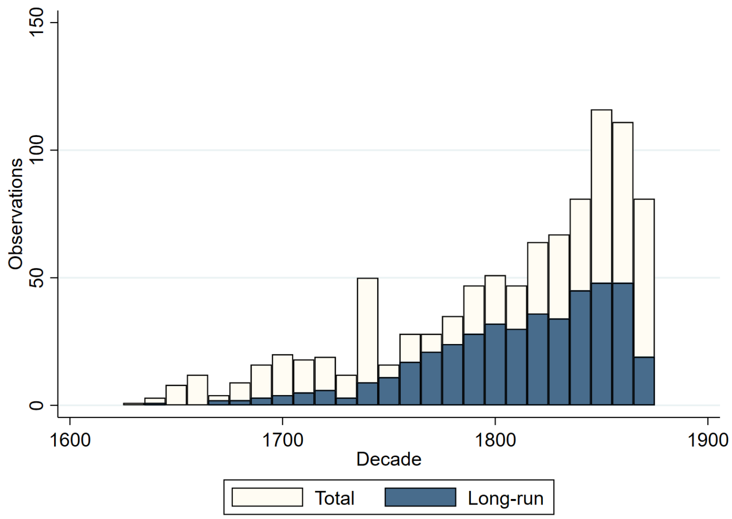



**Figure 3: Total Observations by Decade**

inequality measures have not been constructed in the past.

## Japan: Village Population Censuses

The population censuses were annually compiled by all villages in Japan by order of the lords to enforce a ban on Christians by the Tokugawa shogunate. The censuses included the names, ages, household compositions, and a declaration of religion as a means of weeding out Christians. Despite Christianity being an extreme minority in Japan by the 18th century, the surveys continued until 1870 by taking on new administrative roles. Many of these censuses began listing information on household landholdings which was the main source of wealth at these times.[5]

I have collected population censuses from three sources. The first is data published in local histories which I have digitized.[6] The second is the large dataset collected by the Reitaku University "Population and Family History Project". Third, I use an online dataset collected by Hiroshi Kawaguchi called DANJURO. I drop all observations from post stations, where transportation and other services for travellers were located, and coastal villages where fishermen resided. This is because other important forms of wealth, in the form of shops or boats, are unrecorded making landholding inequality unrepresentative of wealth inequality.

[5]Matsuura (2009) finds shogunate lands more often had landholdings data. Also, documents titled *shumon-ninbetsu aratame cho* were more likely to include this information.

[6]This data includes other village level administrative sources such as the "goningumi mochidaka cho" that list all households by the five household group who were jointly held responsible for certain problems caused by other group members. This source occasionally includes information on landholdings by households.

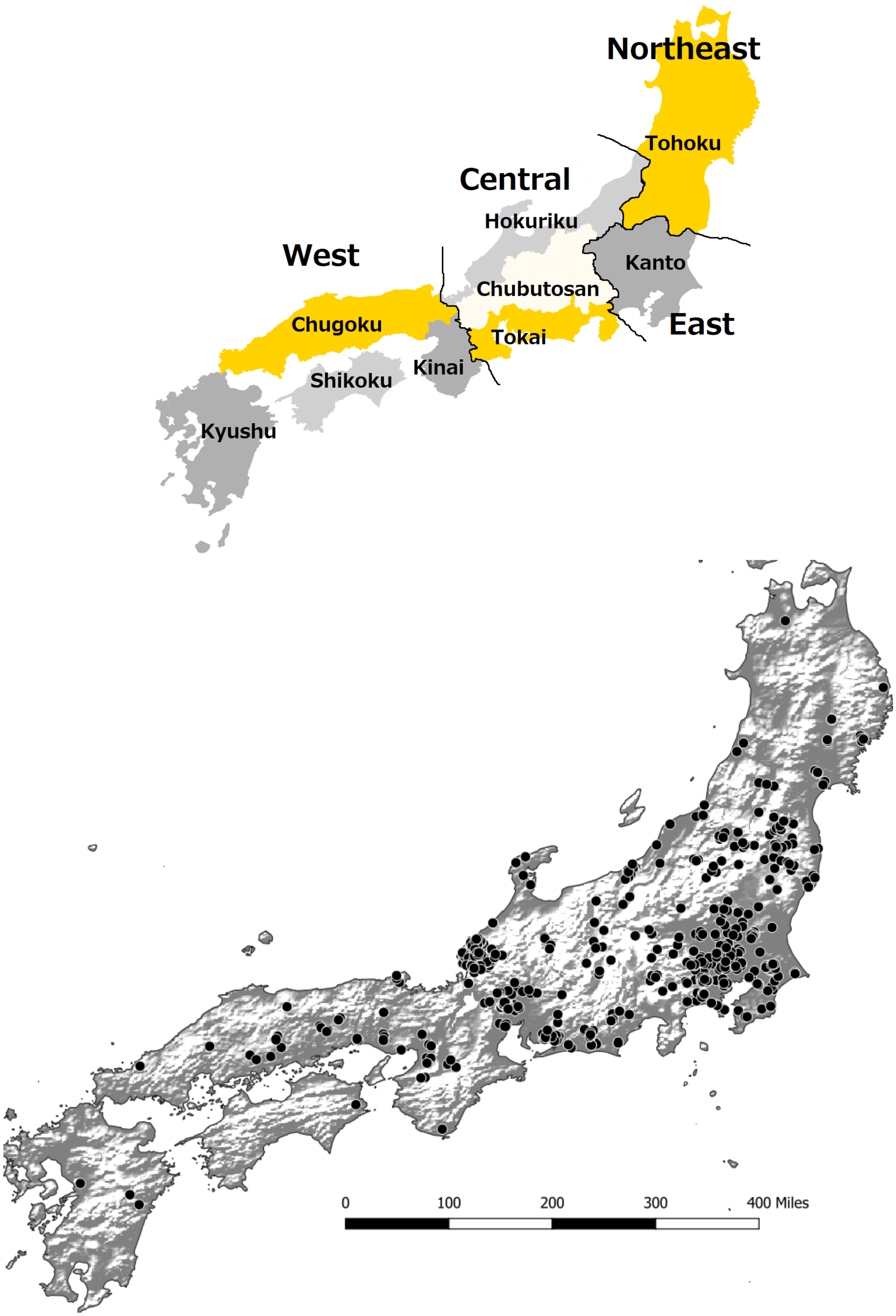



Figure 4: Maps of Japan
Top: Regions defined in data
Bottom: Locations of the 591 Villages (White shade indicates high elevation)

Overall, I have 944 village-year observations from 591 villages.[7] There are unsurprisingly less observations for earlier years, due to survival bias with a dip in the 1870s when the censuses ended (see figure 3). I also observe villages over the long-run, defined as multiple observations spanning more than 25 years, for 77 villages with which I investigate time trends. Unfortunately, the data is highly sporadic so that villages can reappear in my sample after being missed for decades. For econometric purposes, this precludes the use of many time series techniques that require complete time series.

The geographic breadth of the data is rich and representative of the main island of Honshu, with approximately 80% of the population (see figure 4). The topographic map shows how mountains dominate much of the landscape, amounting to approximately two thirds of land area. Unsurprisingly, there are few observations from mountainous terrain which had small pockets of habitable areas. On the other hand, there are many observations in the plains where population was concentrated. The sampling for the islands of Kyushu and Shikoku in the southwest are poor and results from these areas must be interpreted with caution.

For analytical purposes, I have grouped provinces into region as defined by figure 4.[8] The traditional regional divides are unsuitable for this purpose, so I have created these regions based on cohesion. In some cases, mountains naturally split up lands into economically cohesive units. The most notable is the Kinai region dominated by the Osaka plains, and the Kanto region dominated by the Kanto plains. On the other hand, other regions were less economically cohesive but were defined by features such as mountain ranges in the case of the Chubutosan region. These regions generally match the patterns in inequality making them useful geographic units. I also define larger geographical units, West, Central, East, and Northeast, but this is purely for purposes of presentation.

The landholdings were expressed in outdated value of the yield, most often from cadastral surveys in the late 16th to early 17th century, in units of *koku* (volume of grain) or mon (bronze coins) for lands within the village.[9] These "official yields" were simply copied from past cadastral surveys and were never updated to account for increased plot size or increased productivity.[10] The official yields were standardized to rice yields, whereby yields from other

[7] I originally had 2,455 village-year observations but I dropped multiple observations within decades as I am not interested in short-run fluctuations.

[8] There are a few notable tweaks. Chugoku refers to the combination of the *Sanin* and *Sanyo*. Kinai includes *Kii* province, which was traditionally grouped with Shikoku, to avoid complications in border. The Chubutosan region attempts to merge the current *Chubu* region with the traditional *Tosan* region. It attempts to capture the central mountain ranges so it notably includes *Kai* province.

[9] The date of the survey for each village is unknown. For a very small number of villages landholdings are measured in area. Dropping them does not affect the findings.

[10] Peasants undoubtedly knew the yield of their lands, as can be witnessed in a vibrant land market that involved peasants valuing land based on yield among other things. However, they did not declare it in official

crops were converted in value to rice crop equivalents. As tax rates could vary greatly by village, official yields are a poor measure of land values across villages so I confine my measurement of inequality to within the village (Kodama and Kitajima, 1979).

Ideally, I would want landholdings to be in the value of land rent net of tax. The land rent net of tax in each year is a function of official yields as in equation 1.

$$value_{i,t} = yield_{i,0} \times \Delta Prod_{i,t}(land\ rental\ rate_{i,t} - tax\ rate_{v,t}) \times \gamma_{i,t} \quad (1)$$

I refer to the land rent per year as the value of farmland on the left hand side. Yield is the value of the yield in period 0 (or the official yield) when yields were measured. $\Delta Prod_{i,t}$ is the change in productivity since the measurement of yield and period t. $\gamma_{i,t}$ captures other factors which cannot be controlled but affects land prices such as yield risk. This would include any investments or depreciation on the plot that affects the value. The land rental rate is the implicit or explicit share of yield being awarded to the landholder in return for his rights. Finally, tax rate is what was paid by the landholder to the lord.[11] Taxes were based on the outdated land yield and varied by village. This makes official yields across villages incomparable. As I am computing inequality measures that rely on wealth relative to total wealth, such as the Gini coefficients, there is no problem if relative value is a function of the official yields multiplied by a constant or

$$\frac{value_{i,t}}{total\ value} = \frac{yield_{i,0} \times \Delta Prod_{i,t}(land\ rental\ rate_{i,t} - tax\ rate_{v,t})}{\sum_{i=1}^{N} yield_{i,0} \times \Delta Prod_{i,t}(land\ rental\ rate_{i,t} - tax\ rate_{v,t})} = \gamma_v \times yield_{i,0}$$

where $\gamma$ is a constant within village. This would hold if changes in productivity, land rental rates, and taxes were uniform within the village. I must make this assumption due to the limitations of my data. However, this assumption leads to measurement error and I address each of these issues.

First, land rental rates were not uniform across all plots. The share of land rents going to the landholder depended on the crop. A survey in 1880 shows that wheat plots had average land rents of 40% compared to 54% on rice plots (Nourinshou-Noumu-kyoku, 1926). Wheat yields were converted to rice yield equivalent but the share of this yield going to the landholder is miss-measured. I do not observe crop types so I cannot directly control for this. A large problem arises if there is bias in crop types by landholding class. However, if land markets were well functioning, there is little reason to believe land rich households would accumulate plots for a specific crop type. Surplus lands were rented out in the vast

documents for fear of higher taxation.

[11] The burden of tax went to the landholder due to the highly inelastic supply of land rental. The inelasticity was due to laborers having limits to the area he/she could cultivate.

majority of cases so there was no economies of scales in specializing in particular crops.

Second, the change in productivity may not have been uniform across plots. There will be no issues if this measurement error was uncorrelated with yields but there are two potential issues. First, land rich households may have seen faster technological growth. However, when true land values have been compared to the outdated official yield, such correlations are not observed (Takeyasu, 1966). There was little reason for productivity growth to be widely different within villages when available technologies were similar. A second problem is if measurement errors are big enough to make inequality measures unreliable as hypothesized by some historians.[12] However, I can test the extent of this problem by comparing true yields to official yields. I do this using private records from large landholders in the 19th century that recorded both true yields and official yields. I show in appendix A that official yields explain approximately 80% of the variation in true yields for a region in the *Kinai* that saw perhaps the biggest increase in yields. I expect even less measurement error in other regions where yields changed less over years. Overall, this suggests my measure of landholdings is very accurate, perhaps more so than other sources that rely on tax surveys where there were incentives to lie.

A final issue is that landholdings only accounted for land within the village. I can check the degree of the problem by looking at the proportion of land held by outsiders in 47 villages for which outsider landholdings were also listed. The average was 15%, a small proportion of land. Those who held land outside the village were usually the richest peasants so I underestimate wealth at the top of the distribution. This causes a modest downward bias in my Gini coefficient estimates.

For documenting inequality, the main strength of this data is in its accounting for landless households. Most pre-industrial studies of wealth inequality rely on tax registers which commonly ignore those without assets. Other studies use probates but such samples are always biased and require re-weighting through an assumption of population shares by wealth (Bengtsson et al., 2018). This has been a serious shortcoming for studies that rely on taxation of property that do not include the landless. One exception is the studies on Italy where the share of landless can be estimated.

The summary statistics in table 1 shows that inequality appears to be low but with much regional variation. Only 13% of households were landless but the bottom 40% held very little land themselves. The middle 40% held 33% of wealth while the top 20% held 58% of wealth. The Gini is only 0.51 which is very low. Although this may seem like high

[12] Kinoshita (2017) presents evidence from a petition from peasants to lords asking for tax forgiveness. In this petition, peasants list their "true" incomes which is not correlated with landholdings but the source is obviously biased.

**Table 1: Summary Statistics**

| Region | Gini | Prop. Landless | Prop. Wealth top 20% | Prop. Wealth Bottom 40% | Villages |
|---|---|---|---|---|---|
| Kyushu | 0.44 | 0.06 | 0.51 | 0.10 | 3 |
| Shikoku | 0.35 | 0 | 0.51 | 0.15 | 1 |
| Chugoku | 0.53 | 0.11 | 0.59 | 0.07 | 27 |
| Kinki | 0.63 | 0.26 | 0.68 | 0.04 | 14 |
| Tokai | 0.49 | 0.08 | 0.54 | 0.10 | 44 |
| Chubutosan | 0.61 | 0.21 | 0.64 | 0.05 | 60 |
| Hokuriku | 0.64 | 0.36 | 0.70 | 0.03 | 152 |
| Kanto | 0.49 | 0.06 | 0.56 | 0.10 | 197 |
| Tohoku | 0.44 | 0.12 | 0.51 | 0.12 | 93 |
| All Regions | 0.51 | 0.13 | 0.58 | 0.09 | 591 |

*I take one observation per village that is closest to 1800 to avoid double counting villages. For all regions, I categorize observations by province. I then take a weighted average of the inequality within these villages by population of the province.*

**Table 2: Correlation Coefficients**

| | Gini | Prop. Landless | Prop. Wealth top 20% | Prop. Wealth Bottom 40% |
|---|---|---|---|---|
| Gini | 1.00 | | | |
| Prop. Landless | 0.71 | 1.00 | | |
| Prop. Wealth Top 20% | 0.96 | 0.70 | 1.00 | |
| Prop. Wealth Bottom 40% | 0.92 | 0.60 | 0.95 | 1.00 |

inequality, wealth inequality is always much higher than income inequality because wages are far more equally distributed, especially in a pre-industrial economy with unskilled laborers. Thus, these numbers translate into Gini coefficients of income as low as 0.26, a remarkably egalitarian economy.[13] These initial results suggest equality and I will show this holds when I account for various issues such as sampling bias or time trends. As all inequality measures are highly correlated (see table 2), I focus on Gini coefficients to avoid repetition.

[13]Given wages could sustain 3 people for a man at around 1800, I take the landholding equivalent of the wage to have been 4.4 *koku* of land, where 1 koku is about 3 quarters of the rice needed to survive a year. After distributing this equally among all households, I calculate the Gini coefficient. This is not entirely accurate for all villages, but suffices as an approximation.

### Other Data Sources

I use prefectural level data on the share of land under tenancy in modern Japan, 1879-1945, for two purposes. First, I use it to track the trends in inequality after the collapse of feudal Japan under the Tokugawa shogunate. These were originally recorded in prefectural statistic books and later compiled by Arimoto et al. (1984). The administrative units changed after the Meiji revoultion of 1868, so the prefectures are not comparable to the earlier provinces. The share of land under tenancy records the area of plots farmed by tenants divided by the total area. This is a very good measure of inequality because it captures the surplus (or deficit) of landholdings among households.

This measure is no longer at the village level as for my earlier measure so it also captures increased inequality due to land ownership by people outside the village making it directly incomparable.[14] However, cross-village holdings are thought to have stayed stable during the feudal period due to frictions in the land market across villages (Nakabayashi, 2013). Therefore within village inequality captured most aspects of inequality. This changed following the end of feudalism and it is a strength of this measure to be able to capture the inequality as a result of increased cross-village holdings.

Second, I use the data to backwardly project inequality levels in regions where I lack observations. I use the earliest years available for the projection because I expect higher correlation with temporal proximity. As a robustness check, I also use province level data from 1883-84 (Noshoumushou, 1959).[15]

For comparative purposes, I also use Italian data, (1307-1809) made available in Alfani (2015) and Alfani and Ammannati (2017). These are inequality measures from rural Piedmont and Tuscany in Italy calculated at the village level by using records on what effectively became a real estate tax. The data can be broadly considered real estate inequality excluding the landless and I refer to the original articles for further details on the data. As the landless were a key feature of Western Europe, the inequality measure has varying degrees of downward bias. In the case of Tuscany the downward bias is approximately 20% but only 5% or so in Piedmont[16]. Despite differences with my measure, the data are highly comparable to my data when just looking for a positive/negative trend.

[14]In theory, a within village measure could register no change in inequality while an aggregate measure does due to increasing shares of land ownership from people outside the village. Such a scenario seems extreme and unlikely.

[15]This data is incomplete so I patch up the missing data using other data on total yields. I first use table 1 of Noshoumushou (1959) assuming the same paddy dry ratio to calculate total land within province for those that are missing. I then assume the provinces have the same share of land under tenancy as the prefecture in which they belong.

[16]The numbers are from (Alfani and Ammannati, 2017) section V. The number for Piedmont is calculated by taking the 10% landless they refer to and calculating its effect on a Gini of 0.7.

# Methodology and Results

## Time Trends

Using long-run data on inequality across 77 Japanese villages (1647-1872), 45 Japanese prefectures (1879-1945), and 18 Italian villages (1307-1809), I compare trends in inequality across time.[17] I begin by showing the trends in inequality by region for Japan (figure 5a) and Italy (figure 5b). A positive trend in both Japan 1879-1945 and pre-industrial Italy is immediately apparent, compared to a lack of any obvious trend in early modern Japan. I can formally test for a trend with a simple fixed effect specification 2.

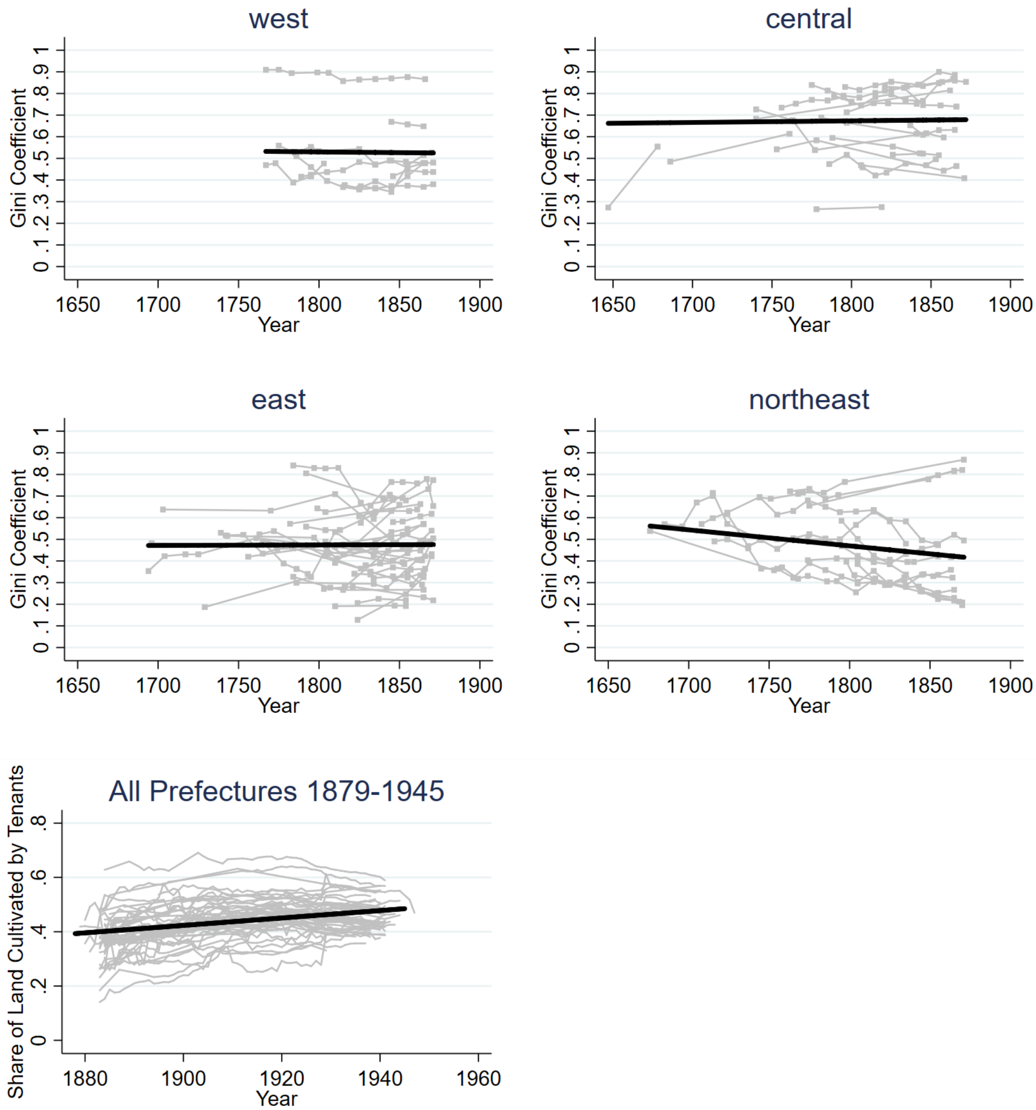
$$ineq_{v,t} = \alpha_v + \beta year_t + \gamma X_{v,t} + \epsilon_{v,t} \tag{2}$$

If there is a time trend, I would expect $\beta$ to be significant. I include large events as controls in the form of the black death and the second world war that can affect inequality. I do not include the major famines in early modern Japan mainly because the degree of the shocks were small. Moreover, they had differential effects by region which are not well measured. In any case, I will later show that they had little impact on inequality.

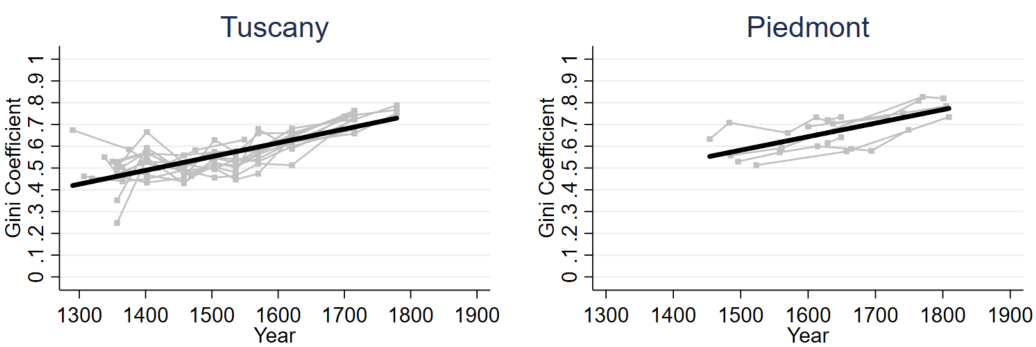
The results show early modern Japan had stable equality in contrast to Italy with gradually rising inequality. I find a large positive trend in the case of Italy, with Gini coefficients increasing by 0.07 per century (table 3) and most likely a higher pace if the landless could be included. In contrast, early modern Japan has no trend in inequality. This is not due to regional compositions within my data. If I split my data by region, I get similar results although the power is weaker. In contrast, inequality was on an upward trend after the Meiji revolution of 1868 which mirrors findings by others (Ono and Watanabe, 1976; Otsuki and Takamatsu, 2008; Moriguchi and Saez, 2008).

One concern is that dynamics in inequality over time are not captured by a simple linear trend. In the case of Italy, the black death reduced inequality and broke the trend. In the case of Japan, 1879-1945, the war years also saw a decrease in inequality. Both these results suggest large shocks can be great levellers as argued by Scheidel (2017). In the case of Japan, major famines hit regions to various degrees in the 1730s, 1780s, and 1830s which could have impacted inequality. Could the noise caused by such events have concealed the underlying trend? To account for this, I attempt to capture how the slope of inequality trends were

[17] For the case of pre-industrial Japan, I could also look at trends in inequality across time by region. However, the variation in inequality within region is rather high meaning any trend could reflect changes in sampling. Thus, this method is inferior and will only work with sufficient observations within each region-time.




(a) Japan




(b) Italy

**Figure 5: Pre-industrial Inequality Dynamics by Country-Region**

Table 3: Test for Trend

| **Japan 1694-1872** | (1) All Regions | (2) Tohoku | (3) Kanto | (4) Central | (5) Kinai | (6) Chugoku |
|---|---|---|---|---|---|---|
| century | -0.0282 | -0.0740* | 0.00231 | 0.00743 | -0.00246 | -0.0100 |
| | (0.0217) | (0.0379) | (0.0307) | (0.0298) | (0.0598) | (0.0467) |
| $N$ | 428 | 129 | 152 | 83 | 20 | 44 |
| adj. $R^2$ | 0.025 | 0.176 | -0.007 | -0.010 | -0.054 | -0.021 |
| **Japan 1879-1945** | (7) All Regions | (8) Tohoku | (9) Kanto | (10) Central | (11) Kinai | (12) Chugoku |
| century | 0.142*** | 0.378*** | 0.209*** | 0.0649*** | 0.0963*** | 0.0322** |
| | (0.0220) | (0.0344) | (0.0456) | (0.0243) | (0.0328) | (0.0140) |
| Post-1940 | -0.0219** | -0.0239 | -0.00292 | -0.0304*** | -0.0434*** | -0.0306*** |
| | (0.00972) | (0.0211) | (0.0127) | (0.0111) | (0.00946) | (0.00523) |
| $N$ | 2067 | 286 | 359 | 497 | 205 | 213 |
| adj. $R^2$ | 0.120 | 0.440 | 0.413 | 0.071 | 0.062 | 0.001 |
| **Italy 1307-1809** | (13) All Regions | (14) Tuscany | (15) Piedmont | | | |
| century | 0.0676*** | 0.0687*** | 0.0621*** | | | |
| | (0.00498) | (0.00556) | (0.0126) | | | |
| preblack | 0.108*** | 0.110*** | | | | |
| | (0.0310) | (0.0319) | | | | |
| $N$ | 126 | 99 | 27 | | | |
| adj. $R^2$ | 0.671 | 0.654 | 0.790 | | | |

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

*The dependent variable is Gini coefficient except for Japan 1879-1945 for which I take the share of land under tenancy. Standard errors are clustered by village.*

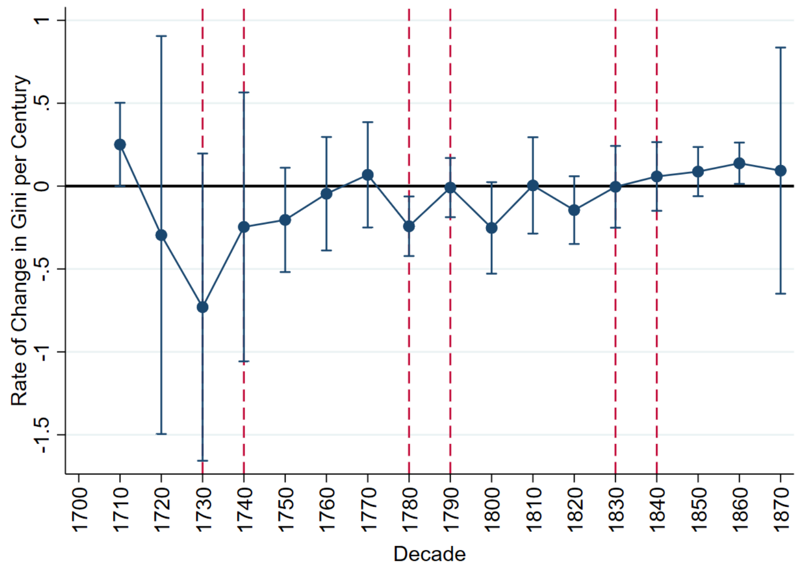



**Figure 6: The Rate of Change in Gini in Japanese Villages**
***95% confidence intervals plotted. Decades affected by famine enclosed in dashed lines. Standard errors calculated with Bonferroni correction.***

changing over time by estimating equation 3.

$$\frac{Gini_{v,t} - Gini_{v,t-k}}{k} = \beta decade + \epsilon_{v,t} \tag{3}$$

If there is an identical but changing trend among all villages, I should be able to detect patterns over time. I adjust for multiple testing using a Bonferroni correction.

The results show no obvious pattern with the slope meandering around zero change (figure 6).[18] Notably, the great famines appear to have had no clear impact on inequality dynamics.[19] Early modern Japan was clearly different from later periods or contemporaneous Italy, due to a persistent equality. Having established this lack of trend, I will now use a larger set of data to estimate the level at which inequality persisted in early modern Japan.

## Estimating Inequality Levels in Japan

I now estimate inequality for Japan as a whole while accounting for regional heterogeneity. I do this by estimating inequality by prefecture for regions with sufficient observations. For regions without observations, I use backward projection of inequality using the correlation between inequality in the Tokugawa and early Meiji period. For the Meiji measure of in-

[18]Unfortunately, the power is low before 1750 with less than 10 observations.
[19]An analogous exercise with Italian data reveals trends to have always been positive.

**Table 4: Correlation of Inequality: Early Modern to Modern**

| | (1) Gini Coefficient | (2) Proportion Landless | (3) Share of Wealth Bottom 40% | (4) Share of Wealth Top 20% |
|---|---|---|---|---|
| Share of Land under Tenancy | 0.524*** | -0.0208 | -0.236*** | 0.488*** |
| | (0.177) | (0.177) | (0.0786) | (0.148) |
| $N$ | 33 | 33 | 33 | 33 |
| adj. $R^2$ | 0.139 | -0.032 | 0.129 | 0.174 |

Standard errors in parentheses

$^{*}$ $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

equality, I use the earliest available prefectural level data on the share of land under tenancy. These mainly come from the early 1880s with a few exceptions. The key assumption is that inequality had a strong persistence over time. Inequality in the 1880s must be predictive of inequality in early modern Japan. A simple OLS regression of available average prefectural level inequality during the two periods show this assumption holds for most measures (table 4).[20] All coefficients are highly statistically significant excluding proportion landless. This does not come as a complete surprise because proportion landless is bounded at zero, and many villages had almost no landless households.

I use this correlation to predict early modern inequality for prefectures with few or no observations. I use the average inequality within villages if there are more than 3 observations because I want to avoid generalizing with outlier villages. This means 20 prefectures are imputed while the others are based on observations. Using these prefectural level estimates of inequality, I estimate regional and national inequality by weighting the observations by prefectural population levels taken from Ohkawa et al. (1983).[21]

Backwardly projecting inequality using this correlation results in table 5. Inequality averaged a Gini Coefficient of 0.53 which is extremely low considering it is a measure of wealth inequality. Given highly equal distributions of wages, this suggests income inequality below a Gini coefficient of 0.3 which would place the society among the most equal today. Another way of seeing inequality is to look at the proportion of land held by various classes. The top 20% held 59% of the land making them a large land rich class while the middle 40% held 33% of the land and the bottom 40% only held 8% of land. The poor were extremely poor but Japan remained far more equal relative to European societies dominated by landless

[20] I could also include region dummies in the regression but they turn out to be insignificant.

[21] I use population in 1879 and subtract city population from 1875 for the 5 largest cities: Tokyo, Kanazawa, Nagoya, Kyoto, and Tokyo.

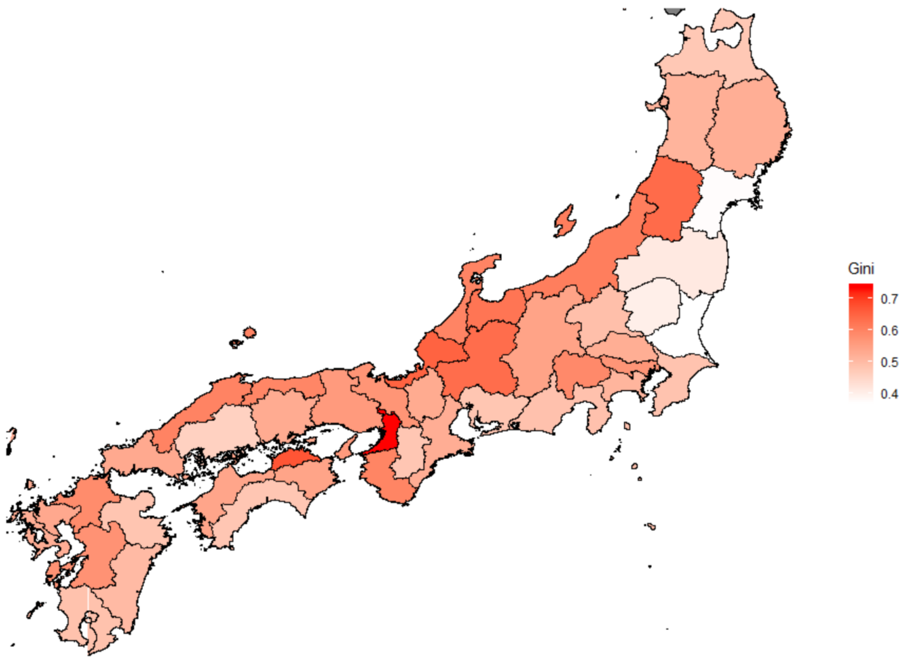



**Figure 7: Estimated Gini-coefficient by Prefecture in Early Modern Japan**

**Table 5: Estimated Inequality by Region**

| Region | Gini | Prop. Wealth top 20% | Prop. Wealth Bottom 40% | Villages |
|---|---|---|---|---|
| Kyushu | 0.53 | 0.59 | 0.08 | 3 |
| Shikoku | 0.56 | 0.62 | 0.07 | 1 |
| Chugoku | 0.53 | 0.59 | 0.07 | 27 |
| Kinki | 0.61 | 0.67 | 0.04 | 14 |
| Tokai | 0.50 | 0.54 | 0.08 | 44 |
| Chubutosan | 0.57 | 0.62 | 0.06 | 60 |
| Hokuriku | 0.62 | 0.68 | 0.04 | 152 |
| Kanto | 0.47 | 0.54 | 0.11 | 197 |
| Tohoku | 0.49 | 0.55 | 0.10 | 93 |
| All Regions | 0.53 | 0.59 | 0.08 | 591 |

*I take one observation per village that is closest to 1800. For all regions I take the weighted average by population. I backward project for all prefectures with no observations and for prefectures with less than 3 village observations.*

laborers where the bottom 40% likely held close to 0% of land.

This method of estimating inequality also yields a prefectural level estimate of inequality mapped in figure 7. A few features of regional inequality become apparent. First, the region neighboring the sea of Japan in the north down to Osaka was the area with highest inequality. However, they still remain less unequal than the most equal regions of Western Europe. Second, a large pocket of equality can be seen in the Kanto region and the neighboring region in modern day Fukushima. A smaller pocket of equality can also be seen in the southern central region. These equal regions may have counter-balanced the unequal tendencies of the central regions. Third, inequality appears much higher in Kyushu and Shikoku where there were few observations and backward projection predicted a far higher level of inequality. These results remain highly stable when I use alternative estimates (see appendix C). Although explaining this regional heterogeneity is beyond the scope of this paper, it is interesting that equal regions counterbalanced unequal regions to keep Japan as a whole an equal society.

## Estimating Inequality Levels in England

There are no estimates of wealth inequality for rural England due to the lack of data on land distributions by parish. However, one source that gives us a glimpse of land distributions are the 5265 parliamentary enclosure acts that enclosed commons by cataloging the land rights of all claimants and redistributing lands. Enclosure was enacted by redistributing lands of common right into privately held lands in accordance with the value of these rights. Commons were a minority of land, at 20% of total lands in 1750, so this will not be a nationally representative sample. However, I will have a lower bound estimate of inequality in the English countryside because there is a longstanding view that these lands were relatively equal areas since the narrative by Marx (1867). Moreover, Lindert (1987) shows that approximately 15% of people had sufficient wealth to vote in the 18th century, so it is likely privately held lands were highly unequally distributed. Therefore, this is a highly plausible lower bound estimate.

I use secondary data from 510 parliamentary enclosure acts. By measuring the inequality of the redistributed lands, I get a measure of inequality within the commons at the point of the act. I give a detailed discussion of the estimation in the appendix E.1 but the outline is as follows. The main issue was that the acts do not include the landless which likely composed a large proportion of the population. I therefore use data on total population and estimate the number of households in each parish at the point of the act. I then calculate Gini coefficients while accounting for the landless. There are three problems with the data. First, some counties did not have parish level data so I calculate inequality at the county aggregate level. For these cases, I assume the proportion landless was a conservative 30%. Second, the measure of land value is in acres which means I cannot account for land productivity differences. However, land value variation is likely to be small at the parish level where soils and climate conditions were likely to have been similar. Third, the data is secondary and is in bins of acres. I therefore assume equality of land ownership within bins to get a lower bound estimate.

Table 6 shows the new inequality estimates in the English commons by period. Most Gini coefficients range from 0.75-0.85 with some regions such as Cumbria potentially having lower inequality. However, the most equal regions have similar or greater inequality than the most unequal regions within Japan. Despite commons often being regarded as bastions of equality, in reality they were highly unequal by 1750.

Combined with higher inequality in already enclosed areas, as suggested by Lindert (1987), wealth inequality in rural England as a whole must have been greater than 0.8. This is also similar to the levels seen in contemporary Italy where Gini coefficients generally ranged 0.7-0.8 but with the exclusion of landless. The two societies in Western Europe were both unequal which is suggestive of a regional pattern. I now look at a larger range of inequality estimates, most of which are at the national level, that allow me to look at inequality patterns across regions.

# International Comparisons

I now compare my findings to those from a larger range of societies during the pre-industrial period. First, I compare inequality across countries on the eve of industrialization, when the most accurate measures of inequality are available. I show inequality is higher in Western Europe than East Asia. Second, I present evidence of inequality dynamics over the very long-run, spanning over a millennia. I show important patterns that imply differences in inequality between the two regions precede the black death.

## Inequality on the Eve of Industrialization

I compare my estimates with the available measures of wealth inequality before industrialization, including the results of this study for Japan, in table 7. I choose this period because this is when the most estimates are available and it also makes sense to compare similar periods. Before interpreting, a few notes of caution are required. First, the defined type, unit, and region of measurement vary. Many estimates based on tax records did not

**Table 6: Lower Bound Estimates of Inequality in English Commons**

| Region | County | Year | Awards | Gini | Prop. Landless |
|---|---|---|---|---|---|
| South East | Buckinghamshire+ | 1760-79 | 30 | 0.83 | 0.3 |
| | | 1780-99 | 29 | 0.81 | 0.3 |
| | | 1800-19 | 22 | 0.87 | 0.3 |
| | Warwickshire+ | 1720-49 | 12 | 0.85 | 0.3 |
| | | 1750-69 | 35 | 0.85 | 0.3 |
| | | 1770-89 | 38 | 0.80 | 0.3 |
| | | 1790-1815 | 25 | 0.80 | 0.3 |
| | | 1815- | 15 | 0.83 | 0.3 |
| East Midlands | Leicestershire | 1757-72 | 9 | 0.80 | 0.52 |
| | Nottinghamshire | 1760-79 | 49 | 0.81 | 0.49 |
| | | 1780-99 | 30 | 0.82 | 0.41 |
| | | 1800-19 | 23 | 0.86 | 0.56 |
| | | 1820-39 | 6 | 0.74 | 0.23 |
| | | 1840-68 | 6 | 0.82 | 0.52 |
| North West | Cumbria | 1805-20 | 6 | 0.64 | 0.11 |
| | Westmorland | 1770-1799 | 1 | 0.82 | 0.67 |
| | | 1800-1822 | 4 | 0.68 | 0.37 |
| | Yorkshire | 1725-1759 | 6 | 0.84 | 0.52 |
| | | 1760-1779 | 61 | 0.81 | 0.43 |
| | | 1780-1799 | 20 | 0.75 | 0.41 |
| | | 1800-1819 | 13 | 0.75 | 0.40 |
| | | 1820-1839 | 1 | 0.91 | 0.63 |
| | | 1840-1859 | 4 | 0.77 | 0.41 |

+ indicates regions for which estimation is done at the county aggregate level. The proportion landless is assumed to be 30%
Sources: Brown (1995), Crowther (1983), Martin (1967) Searle (1993), Turner (1980), Whyte (2006), Yelling (1977)

include those without wealth. Also, some are based on households while others on male adults. Some of these include all households, both urban and rural, while others are only rural. Of these, the biggest concern is the lack of landless in many estimates that are based on land taxes. In the cases where the share of landless can be estimated, the downward bias was 20% in the case of Tuscany in central Italy while it was likely much smaller for other regions[22].

Finally, the estimates for Japan, England and Italy are based on the village level while others are more aggregate. This is likely to downwardly bias inequality estimates relative to national level estimates because I will ignore across-region inequalities. However, a measure that is robust to this issue is the proportion of landless households. I could also compare the limited village level inequality estimates. In either case, the conclusions set out below do not change.

Second, there is potential measurement error due to rights over land rents other than land ownership such as land use rights. For instance, England had copyholding rights that were distinct from land ownership but nonetheless gave the holders access to land rents through subleases. This is an issue for the estimates by Lindert (1987) for England in 1750, where there is no accounting for such rights or the very small holdings of land. It was likely true to some extent for many communities, including Japanese villages where there were commons called *iriaichi* where peasants could collect fertilizer in the form of dried grass or firewood.[23] These lands could supplement incomes but the table shows that exclusively looking at English commons (the estimate for 1720-1850) does not seem to change the conclusion of high inequality.

Given these caveats, the biggest finding is that Gini coefficients for wealth or land in rural parts of Europe ranged between 0.7-0.9 while East Asia appears far more equal.[24] The Gini coefficient The landless were dominant in Europe (with perhaps the exception of Sweden). In 16th century Holland where rural inequality measures are unavailable, Van Bavel (2005) shows that up to 60% of the rural population were reliant on wage labor. Measures of income inequality, which should be highly correlated with wealth inequality, also sketch out similar patterns (Milanovic et al., 2010). The consistency of these results makes it unlikely that measurement error is driving these findings. One final concern is that these results

[22](Alfani and Ammannati, 2017) section V shows evidence for propertyless. They argue this region had higher levels of propertyless relative to other regions due to sharecropping institutions.

[23]Distinct from this is common fields studied by Brown (2011). Such lands had clear ownership rights over rents and are measured within the dataset used in this paper.

[24]Although wealth is more inclusive than land, land was the dominant form of wealth in the countryside. Moreover, many tax registers, on which this is based, would have had difficulties observing wealth other than land. I also note that in Eastern Europe, demesnes (farms that were managed by lords) that were owned by lords remained a large proportion of the economy, limiting peasant holdings (Cerman, 2012).

**Table 7: Wealth Inequality in Pre-industrial Societies**

| Country | Year | Type | Unit | Gini | Landless % |
|---|---|---|---|---|---|
| **East Asia** | | | | | |
| Philippines | 1903 | Land | Rural Households | | 19 |
| China+ | Qing | Land | Rural Households | 0.6–0.71 | 13-26 |
| China | 1930s | Land | Rural Households | 0.35–0.43 | 17–33 |
| Japan | 1647-1872 | Land | Rural Households | 0.53 | 13 |
| **Western Europe** | | | | | |
| England* | 1720-1850 | Land | Rural Households | 0.7-0.9 | 0.4-0.6 |
| Sweden | 1750 | Wealth | Rural Households | 0.72 | 20 |
| Denmark | 1789 | Wealth | Rural Households | 0.87 | 59 |
| Finland* | 1800 | Wealth | Rural Taxed Males | 0.87 | 71 |
| Northern Spain+ | 1749-59 | Land | All Households | 0.78 | |
| NW. Italy*+ | 1700-99 | Wealth | Rural Taxed Households | 0.77 | |
| Central Italy*+ | 1700-99 | Wealth | Rural Taxed Households | 0.75 | |

** indicates cases where inequality is underestimated. + indicates small samples of villages. Taxed households refer to estimates based on wealth taxation, for which those without wealth are not included. The Philippines estimate is the share of farms cultivated by tenants which likely results in an overestimate. Chinese estimates from the 1930s use figures for North China and South China to get a range of Gini coefficient. The proportion landless is from two different estimates for all of China in Buck (1937). England is from the Gini coefficient for commons estimated above. For Sweden, the estimates only include rural residents. If urban owners are included, the Gini Coefficient becomes 0.77. Northern Spain estimates are from Palencia, Northwest Italy estimates are from Piedmont, and Central Italy estimates are from Tuscany.*
*Sources: Bengtsson et al. (2018), Soltow (1979), Soltow (1981), Nicolini and Ramos Palencia (2016), Alfani (2015), Alfani and Ammannati (2017), Sanger (1905), Buck (1937), Brandt and Sands (1990) Chao (1986) Kung et al. (2012)*

are driven by the timing of observations. Western Europe was about to start an industrial revolution, and a symptom may have been growing inequality. Should these findings be interpreted as a peculiarities specific to the period and place or could they provide insights into trends in Western Europe or East Asia?

## Inequality Over the Very Long Run

I now look at the fragmentary evidence available across many centuries in both East Asia and Western Europe. The choice of these regional grouping makes sense because they shared many cultural institutions with respect to demography or governance that could have affected trends. To look at this, I use the available fragmentary evidence for the cases of England, Germany, Italy, Sweden, Japan and China, and I show the conclusions remain the same.

**Western Europe**

The upward trend in wealth inequality in the countryside, with the exception of large shocks, has been well documented for the period following the black death in Western Europe.[25] This is indicative of an economy heading back towards equilibrium after a temporary shock. In the case of Germany 1300-1850, (Alfani et al., 2017) uses tax registers to show rural inequality was consistently trending upward with the exception of the thirty years' war (1618-48).[26] Much like in Italy, Gini coefficients in rural areas that exclude property-less was increasing at approximately 0.07 points per century.[27] If the property-less were included, the rate of increase would be most certainly higher. For the case of Sweden, Bengtsson et al. (2018) uses probate records to show inequality increased from 0.72 to 0.83 from 1750-1850 which preceded the industrial revolution.[28] Moreover, inequality was generally high in Western Europe by the industrial revolution showing wealth inequality converged towards a high level everywhere.

However, it is less well known whether Western Europe already had high levels of inequality prior to the black death. A lot is at stake as it implies Western Europe's tendency towards high inequality is not unique to the early modern period. Could high inequality have been persistent? In the earlier case of Tuscany in Italy, the pre-black death wealth inequality Gini was higher by 0.11. This indicates higher inequality preceded the black death. However, it is a poor measure of magnitude as it excludes property-less households. The black death was a shock that likely vastly decreased the property-less class due to increasing wages and lower property prices. Thus, the actual drop in wealth inequality is likely to have been far more dramatic.

Another case where similar dynamics can be estimated is England, 1288-1800, the first economy to industrialize in Europe. Estimating wealth inequality in England has remained

[25]There is a larger literature on inequality within cities with similar findings in the case of Europe. See Scheidel (2017) chapter 3.

[26]In the case of cities, they show a decline in inequality due to the black death.

[27]I did not include these findings in my earlier estimates as the data is not yet available.

[28]A potential case for which the trend may not fit is Portugal. Reis (2017) finds income inequality, which is usually a good approximation of wealth inequality, was decreasing in a mix of rural and urban areas. However, the evidence from rural regions is weak. Moreover, wealth inequality may have remained constant or increased because decreased income inequality was partially driven by decreasing land-rent wage ratios.

controversial due to the existence of "common rights" that accrued land rent.[29] For instance, a copyholder (or tenant) had inheritable and legally enforceable use rights over land and subtenancy was highly profitable as rents to the landowner were fixed and decreased over time.[30] Such intermingling of rights were concentrated in commons, which included open-fields, wastes, meadows, and pastures. On the opposite end, enclosed lands or demesnes had full ownership rights for the landowner. Overall, looking at land ownership alone can be a poor measure of land distribution. Fortunately, ownership within the commons can be observed in both the 13th and the 18th century, in addition to trends in the post-black death period.

In the case of England in the 13th century, it is possible to estimate wealth inequality using data from the hundred rolls, 1279-80. The hundred rolls, also known as the second domesday book, was a survey of landholdings across the country that was never completed. The data from Cambridgeshire, Huntingdonshire, Oxfordshire and Warwickshire (in the midlands and the East of England) were collected by Kanzaka (2002) and peasant landholding rights are well measured. However, the landless were never recorded causing problems of measurement. Ignoring the landless, the Gini coefficient for landholdings was approximately 0.6 (see appendix for details of calculation).[31] If we assume the landless made up 47% of the rural population, as estimated by Campbell (2008) for the whole of England and Wales, the Gini coefficient increases to 0.8.[32] Moreover, even considering that 47% of rural households were landless implies high levels of wealth inequality preceded the black death.

The black death resulted in the permanent decline of serfs by the 1450s as many easily escaped out of such relationships during times of great labor scarcity (Whittle, 2000). Peasants also gained stronger rights over land through bargaining, and wealth inequality may have temporarily decreased. There are no accurate measures of inequality with which we can confirm the dynamics until the 18th century where I showed extremely high levels of inequality.

The evidence compiled in this section is consistent with Western Europe always converging towards high inequality for at least the half-millenia preceding the industrial revolution. Could the same be said of their East Asian contemporaries?

[29] More formally, common rights were "old-established rights exercised by the occupiers of farm lands and cottages, and varied considerably in nature and extent from place to place" (Mingay, 2014)

[30] Gayton (2013) shows that copyholders could sublet at 75.8 pence per acre per annum net of rents to the owner. This amounts to wheat flour that could feed about 3.5 people for a year on 2000 kcals per day if the copyholder had 30 acres. However, there has been no systematic exploration of the extent of copyholding in England to show how copyholdings were distributed so other approaches must be taken for now.

[31] This calculation uses tabulated data, categorized by landholding class. I assume the lack of inequality within category making this a downward biased estimate.

[32] With a more conservative assumption of 30% landless, the Gini remains just above 0.7.

### East Asia

The earliest available evidence of land distribution in Japan is from the *Handen* system of the 7th to 10th centuries which was adopted from the Chinese equal fields system.[33] At the time, lands were centralized by the state and much of it was allotted to peasants. Such plots, known as *kubunden*, were often paddy fields and allotted based on the peasant's age, sex, and class.[34] There were two classes of peasants; the *ryo* were standard peasant households and comprised the vast majority while the *sen* were the lower class who were similar to the unfree peasants of England. Males of the *ryo* class got 2 *tan* of land while females got two thirds of males. The *sen* class got one third of the *ryo* peasants in their respective age-sex category (see table 8). The system required large-scale population surveys that occured every 6 years to register all people. Any deaths resulted in confiscation of land, while those who were now older than 6 were allotted lands.[35] The system was far from perfect and there are known cases where allotted lands were far away from the homes of residents (Iyanaga, 1980).[36] Moreover, land quality must have differed to some degree. Yet, the system did give all people rights to cultivate land and keep surplus net of tax. The policy tended to keep peasant society equal.

**Table 8: The allotments under the *handen* system**

| Class | Sex | Age | Allotment | Estimated Yield net of tax and seed |
|---|---|---|---|---|
| Ryo | Male | 6+ | 2 *tan* | 2.25 *koku* |
| Ryo | Female | 6+ | $\frac{4}{3}$ *tan* | 1.5 *koku* |
| Sen | Male | 6+ | $\frac{2}{3}$ *tan* | 0.75 *koku* |
| Sen | Female | 6+ | $\frac{4}{9}$ *tan* | 0.50 *koku* |

**Tan units are in Nara tan which are 20% larger than the current tan. Estimates of yield are in current koku units, assuming 315 soku of yield per Nara cho, 15 soku of taxation per cho, and 20 soku of seed per cho.**

It was possible for cultivators to rent out their allotted fields if they had permission from officials. As government lands (*koden*) could be rented out in return for 20% of expected yields, similar rates of land rents must have been the norm in private fields (Iyanaga, 1980).[37]

[33] The accurate dates of the policy remain unknown but the earliest date may be 652. The policy weakened in 806 and collapsed by the mid 10th century. See Mitani (2015).

[34] Paddy fields comprised perhaps 82% of cultivated land at this time (Takashima, 2016).

[35] As surveys occurred every 6 years, those who were older than 6 must be registered for the second time. This allowed the identification of such individuals. This also meant that some peasants got lands as early as 6 to as late as 11 years of age.

[36] I emphasize that my argument rests on the right of the peasant to the land's share of income, rather than the legal definition for which there is considerable debate.

[37] The rent depended on the timing of payment in the system of *chinso*. If rent was paid before the harvest, the rent was 20% of yields. If paid after the harvest, an additional interest rate was collected.

Taxes are estimated to have been perhaps 5-7% of yields so there would have been 13-15% of yield being earned by peasants from land rights (Sawada, 1972). Given such lands, recent estimates of living standards suggest rice earnings amounted to perhaps 2300 kcals per day per family member of which 363 kcals of rice are earned from land rights (Midorikawa, 2016).[38] These incomes would be supplemented to some extent through non-agricultural work or tenancy. Although these figures are rough estimates due to the limited nature of the sources, the clear finding is that equality was a feature of Japan in the 7th-10th centuries. As it is unclear how lands were distributed preceding the *handen* system, it is unknown whether equality was driven by state policy or if policy simply acknowledged widespread equality.

After the collapse of the *handen* system, a feudal system based on privately held estates (*shoen*) were established. Land rights were distributed according to various rights called *shiki*. The lord was on the top of the hierarchy of ownership, while peasants also held rights over surplus net of tax (as the *sakute*) or use rights (as the *sakunin*) (Inagaki, 1981; Nishitani, 2006). Unfortunately there are few sources to study land distribution beyond the top hierarchy of elites and temples. Yet, it remains the case that peasants held landholding rights within this system through which relative equality could be sustained. Moreover, unskilled wages remained exceptionally low in this period at just 10 copper coins which could perhaps sustain 1-1.5 people in rice or perhaps double the number using inferior grains (Bassino et al., 2011). If the marginal value of labor was so low, it is doubtful that population could be sustained without supplementary income in the form of landholding incomes as can be seen in subsequent periods (Kumon, 2018). Although this remains speculation, there is a clear path through which Japan remained persistently equal for over 1200 years of history.

China has a far longer written history but the earliest reliable evidence comes from the equal fields system introduced in 485 by the Northern Wei then continued by the Sui and Tang dynasties up to the year 780. This was the policy that was later copied by the Japanese as the *Handen* system. During the Tang period, land was distributed to males of age 15-59 with 80 *mu* of personal share lands and 20 *mu* of permanent tenure lands for 100 *mu* in total.[39] The personal share lands reverted to the state upon death while the permanent tenure lands could be inherited to heirs. The amount of allotments were never more than ideals and lands were never fully distributed to everyone due to land scarcity.[40] However, the total allocation of 100 *mu* were also conceptualized as upper bound landholdings for peasants

[38] I calculate based on 314 *soku* of yield per cho, a standard assumption. The past literature had used wrong units of *sho*, a volume measure of rice, to measure yields. They suggested peasants earned 1100 kcals from their allotted fields and perhaps a little more from other work. Such numbers seem infeasible.

[39] See Von Glahn (2016) 185

[40] This contrasts with the *Handen* system of Japan where the allotments were policy goals that were deemed achievable.

and prevented the accumulation of landholdings (Mitani, 2015). Overall, the system tended to keep society relatively equal.

Estimates of inequality from other periods indicate equality relative to Western Europe but perhaps higher inequality than Japan.[41] Data from the household ranking system in the 11th century indicate only 33% of households were landless. In the period 1706–1771, the Gini coefficient of landholdings in acreage in Huolu county, Hebei province, hovered around 0.6. This includes landless households who composed 16–26% of households at any time. There is no clear trend in inequality. By the republican period, there are a number of figures for landless ranging from 17% by Buck (1937) and 33% by agricultural surveys.[42] Estimates of the share of land under tenancy range from 29-42% which are low and comparable to Japan in the 1880s Esherick (1981).[43] In terms of trends, (Brandt and Sands, 1990) investigates inequality in the republican period to find little change in inequality since the 1880s using the limited available data.

There are two important implications of my documentation. First, East Asia seems to have been on a different trajectory of greater equality relative to Western Europe. Second, any explanation of differing inequality must also be a long-run phenomenon that precedes the black death. I next show that many of the past explanations fail to fit these observations. I then show that differing demographic institutions can consistently explain the divergent outcomes of these two regions..

## Explaining Inequality: East vs. West

A number of hypotheses have attempted to explain differing levels of inequality in the pre-industrial era. I first briefly discuss these hypotheses and show they fail to fit the findings documented in this paper.

The most popular hypothesis is a positive relationship between economic development and inequality. For example, the "Kuznets curve" hypothesis predicts that inequality has a inverse U shaped relationship with economic development (Kuznets, 1955; Van Zanden, 1995).[44] This theory may seem consistent with increasing inequality in Italy, Germany, and

[41] The figures for the 11th century–18th century come from Von Glahn (2016).

[42] The figures by Buck are an under-estimate as they most likely over-surveyed literate peasant who tended to have land.

[43] Brandt and Sands (1990) computes the Gini coefficient for acreage including the 33% of landless households in the 1930s to have been 0.72. This estimate is an upper bound estimate of inequality levels as the country grew both wheat and rice with very different acreage requirements. Rice based lands could have more than triple the land value compared to wheat. Thus, even a perfectly equal distribution of land in value will have unequally distributed land acreage. Furthermore, this estimate does not account for topsoil rights which were enjoyed by many smallholders.

[44] Other theories also predict a similar relationship. The inequality possibility frontier posits that very

Sweden from the 15th-18th century shown earlier. However, inequality was also high before the black death, which acted as a shock to reduce inequality. Further, evidence from Japan in this paper also cuts against the hypothesis because it experienced highly stable level of inequality despite slight increases in living standards due to infanticide.

**Table 9: The Effect of Rice Cultivation on Measures of Inequality**

| | % Land under Tenancy (China) | | % Households Tenants (China) | | Gini (Japan) | % Land under Tenancy (Japan) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Rice cult. | 0.479*** | 0.418*** | 0.298*** | 0.269*** | 0.664*** | 0.0855 |
| (%) | (0.0542) | (0.0988) | (0.0577) | (0.0941) | (0.137) | (0.0967) |
| Region FE | No | Yes | No | Yes | No | No |
| $N$ | 168 | 168 | 168 | 168 | 39 | 63 |
| adj. $R^2$ | 0.351 | 0.406 | 0.192 | 0.271 | 0.335 | -0.003 |

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A second hypothesis that agricultural endowments influence inequality outcomes (Engerman and Sokoloff, 2000). Although much of this literature is centered around Latin America, it is tempting to attribute greater equality in East Asia to rice cultivation. However, the available evidence within both China and Japan show rice cultivation is associated with higher levels of inequality than the cultivation of wheat. Table 9 shows the results of a simple cross-sectional regression of rice cultivation area on measures of inequality using Chinese data from Buck (1937) and the Japanese data used earlier.[45] The results show that rice cultivation had a positive correlation with inequality within the country. The results are slightly weaker for Japan but the coefficient is never negative.[46] It was also not agricultural endowments that caused equality in East Asia.

A third hypothesis is that inheritance institutions can affect equilibrium distributions of income. In particular, Lavely and Wong (1992) argues that parible inheritance institutions, where wealth is equally distributed among children, in China had a levelling tendency for

poor economies cannot have high levels of inequality without starvation. The implication is that economies at very low levels of GDP per capita must have low inequality (Milanovic et al., 2010). However, the authors themselves do not declare any direction of causation giving it little explanatory power. Moreover, very few economies actually hit the constraint meaning it was unbinding for many societies.

[45] I take data on inequality from 1883 in Noshomusho (1959) and use proportion of rice in total grain production from 1876 in Noshomusho (1878). I use earlier data on grain production to reflect the status before technological changes. Subsequent technological changes should not have affected inequality too much as inequality changes slowly.

[46] In the case of China, I also add region fixed effects as it is a large country but the results remain similar.

**Table 10: Probability of male heir conditional on births**

| Number of Births | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| No Heir | 0.30 | 0.19 | 0.13 | 0.09 | 0.06 |
| 1 Male heir | 0.44 | 0.40 | 0.33 | 0.26 | 0.21 |
| More than 2 Male heirs | 0.26 | 0.41 | 0.54 | 0.65 | 0.73 |

lands in China. Although the mechanism is valid, the choice of inheritance institution is also endogenously influenced by population pressures.[47] For example, both Japanese and Korean families widely practiced partible inheritance in the 17th century but moved on to impartible inheritance as splitting land became disadvantageous as an heir-ship strategy (Hirai, 2003; Zhu et al., 2015). A wider literature has also found a transition to impartible inheritance as resources became less abundant in England and colonial New England (Hrdy and Judge, 1993). The evidence for partible inheritance in China also comes from a frontier region where land must have been relatively abundant. Therefore, it is difficult to argue that the choice of inheritance institution determines inequality over the long-run.

## Adoption and Inequality

Adoption is where a person becomes the legal parent of an adoptee and the adoptee gains the rights associated with being a biological child. Adoption affects wealth distributions because it gives the adoptee rights over wealth inheritance. Unlike in the modern era, where adoption is mostly about the welfare of the adoptee, most adoptions in the pre-industrial era was about the continuation of family lines. Therefore, adoption was a strategy of heir-ship when biological heirs were lacking, allowing wealth to be retained within the male line of families. How important were heir-ship strategies in getting an heir?

The pre-industrial demographic regime of random fertility and mortality meant having an heir was left to chance. The more important factor was the high mortality rates, with at least one third of children dying before adulthood in the case of Japan and England.[48] Table 10 shows the probability of having a male heir in a case with a one third mortality rate before adulthood, conditional on the number of births. The average family would give birth to just over 3 children when population was in equilibrium but 30% of such households

[47]One exception may be the effect of partible inheritance through Islamic law. However, there is some evidence that partible inheritance institutions did not affect wealth distributions in the next generation (Coşgel and Ergene, 2011).

[48]About 30% of children died by age 15 in England (Wrigley et al., 1997). Life tables from Meiji Japan, 1891-98, suggest about one third of children would also die before adulthood. The data is available online from the statistics bureau of Japan.

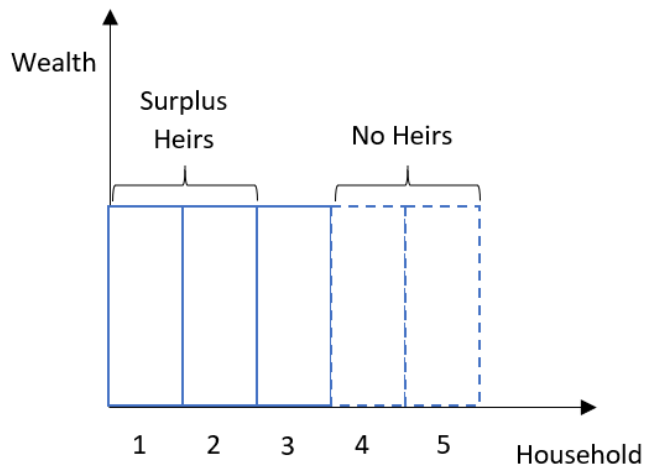
would not have a male heir. Even families giving birth to 5 children, a large number at this time, would have a 13% chance of having no male heir. High fertility failed to fully solve the problem of becoming heir-less. The opposite risk was having too many heirs. This happened for 26% of households with 3 births and 54% for those with 5 births. A large number of children were destined to be wealth-less in societies of impartible inheritance. Together, this large variation in the number of heirs generated inequality.

I show the implications in a simple model. Suppose a society where land is passed fully intact down a single male line (impartible inheritance). In the case that the male line fails (household extinction), suppose household lands are redistributed to another household. This is consistent with the Western European system in which daughters inherit lands when sons are lacking and marry into another male line. If there are no daughters, wealth is passed onto relatives.

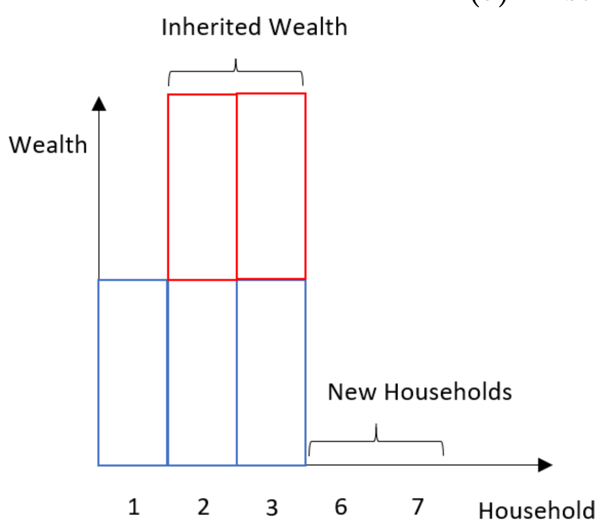
Figure 8 shows what can happen over two generations in a society with land distributed equally across five households. In the first generation (figure 8a), two households have surplus heirs and two households have no heirs. In a society without adoption (figure 8b), the households without heirs go extinct and its wealth is passed onto other households. As a result, households 2 and 3 become relatively rich. The surplus heirs form new households but get no wealth in a society with impartible inheritance. Overall, the second generation is more unequal in a society without adoption. This is regardless of the initial distribution of wealth. In contrast, a society with adoption will have the surplus heirs redistributed to the households without heirs and there is no change in wealth distribution. The gradual concentration of wealth due to household extinctions is shut down by adoption.

I show more precise implications using a simple model. Suppose a society with two classes, the rich with share $\alpha_t$ of households at time t and the poor with share $1-\alpha_t$. The rich own all land in the economy and share it equally within their class while the poor have no land. $\alpha_t$ can be considered a measure of inequality, with a lower $\alpha_t$ implying wealth being in the hands of fewer households and hence higher inequality. Each generation produces heirs, with probability $\gamma \in (0, 0.5)$ of having either 0 or 2 heirs and $1-2\gamma$ of having one heir so that in expectation there is one heir per household. If there is adoption, all households will get one heir each as they effectively insure against the risk of uncertainty in fertility. Without adoption, households go extinct if they have no heirs. If a household has surplus heirs, they practice impartible inheritance so that surplus heirs become landless.

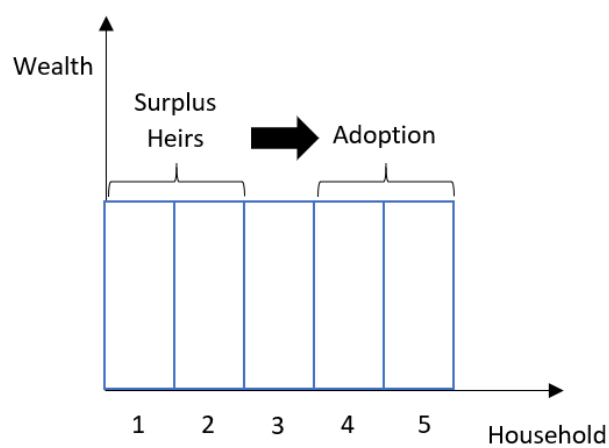
So far, the model is similar to the case study in figure 8 which has a shortcoming of implying perfect inequality over many generations. This is unrealistic because there was wealth (or social) mobility in reality which acted as a force that pulled households back toward the mean. I therefore include wealth mobility via parameter $p \in (0, 1)$ which is




(a) **First Generation**




(b) **Second Generation: No Adoption**




(c) **Second Generation: Adoption**

**Figure 8: Wealth Distribution Across Two Generations**

the probability of remaining in the same class in each generation. A higher $p$ implies lower wealth mobility. This yields two equation showing inter-generational movements in the share of each type.

$$\alpha_{t+1} = \alpha_t(1-\gamma)p + (1-\alpha_t+\alpha_t\gamma)(1-p) \tag{4}$$

$$1-\alpha_{t+1} = (1-\alpha_t+\alpha_t\gamma)p + \alpha_t(1-\gamma)(1-p) \tag{5}$$

Equation 4 shows how the share of rich transitions across generations while equation 5 shows the share of poor. A critical component of the equations is $\gamma$ which captures changing household composition. The rich naturally decrease in share due to household extinction and the disappearance of surplus heirs into the poor class. The poor class are increasing in share as all surplus heirs, rich or poor, enter their class. In addition, wealth mobility represented by $p$ is also causing changing class composition.

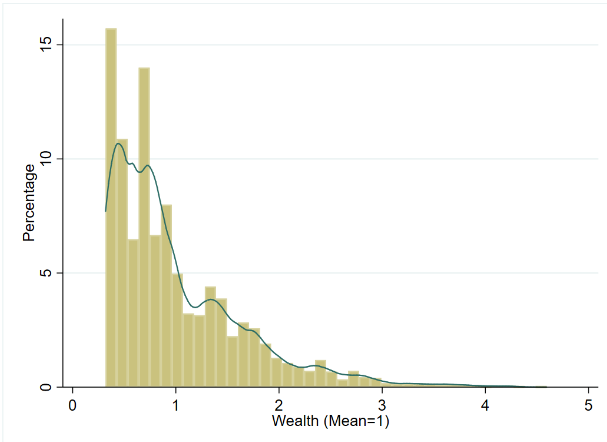
I can solve for equilibrium by taking $\alpha = \alpha_t = \alpha_{t+1}$ which yields the following.

$$\alpha = \frac{1}{2+\gamma(\frac{2p-1}{1-p})} \leq \frac{1}{2} \tag{6}$$

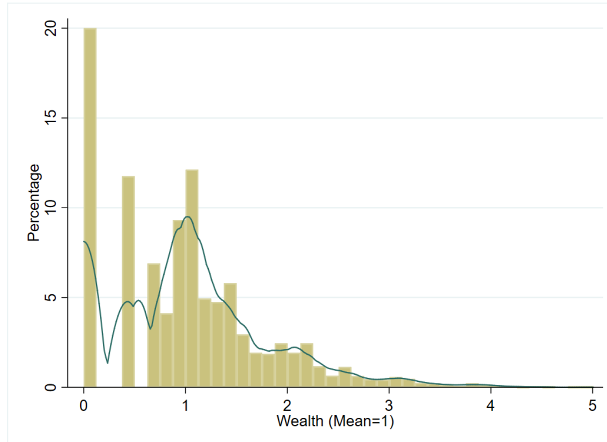
In the case with adoption, the parameter $\gamma$ is equal to zero because surplus heirs are given to those without an heir. This yields a unique solution where $\alpha = 0.5$ because it is only at this level that the number entering a class is equal to the number leaving through mobility. Only in this special case does wealth mobility completely determine inequality.

If adoption is not available and $\gamma > 0$, I find $\alpha < 0.5$ so that inequality increases. The magnitude of effect depends on two factors. First, $\frac{d\alpha}{dp} < 0$ for $p \in (0,1)$ so that inequality increases as wealth mobility decreases. This intuition is consistent with the "Great Gatsby curve" which has shown the negative correlation between mobility and inequality. Second, $\frac{d\alpha}{d\gamma} < 0$ so that inequality increases as the risk of having too few or too many heirs increase. There are three distinct channels functioning. First, the surplus heirs do not become landless because they get redistributed to households with wealth. Second, the households with wealth do not go extinct which prevents the re-distributions of its wealth through a social mechanisms. Third, the social mechanism redistributes wealth unequally by giving land to only the rich. There was some variation in the degree of inequality of redistribution across societies as I discuss below. As a consequence of these three channels, the society without adoption sees increasing inequality through gradual concentrations of wealth. The changing household composition across generations has received relatively little attention in the literature but it is a key parameter determining inequality.

A shortcoming of the above model is that wealth is equally distributed within class.




**(a) Partible Inheritance**




**(b) Impartible Inheritance**

**Figure 9: Inheritance Institutions and Inequality: A Simulation**

Therefore, if I consider partible inheritance, I find it results in an inequality of $\alpha = 0.5$ regardless of adoption institution. Yet, this is due to oversimplification whereby within-class inequality is left unaccounted. By making wealth continuous, I can account for within-class inequality. In this case, mobility changes to the following classical empirical equation.

$$ln(1 + w_{i,t+1}) = \beta_0 + \beta_1 ln(1 + w_{i,t}) + \epsilon_{i,t} \tag{7}$$

I add one to wealth because the natural logarithm is undefined at zero. However, the addition of one can be interpreted as a wage so that I am now looking at income mobility. The inheritance rule will be that partible inheritance results in each heir getting an equal share. Also, extinct households will pass on wealth to one heir that will have a similar level of wealth. This reflects the assortative marriages of heiresses to those with similar wealth.

The results of a simulation of this model shows adoption has a bigger impact under a system of impartible inheritance.[49] I explain a simple case, without loss of generality, where there is no randomness in social mobility, or where $\epsilon_{i,t} = 0$. In the baseline case with adoption, there is zero variance in the number of heirs. Due to the absence of any randomness in outcomes, all household converge towards the mean over the long run. There will be pure equality in this extreme case. In the case with partible inheritance, the Gini coefficient converges to 0.35 and the standard deviation to 0.65. In the case of impartible inheritance, the Gini coefficient converges to 0.44 and the standard deviation to 0.8.

The distribution shown in figure 9 also reveals the mechanisms. In the case of partible

[49] I simulate 10,000 households for 1,000 periods starting with an equal distribution. I keep the simulation simple with the following parameters: $\epsilon_{i,t} = 0$, $\gamma = 0.2$ $\beta_1 = 0.5$. The results do not change depending on the initial distribution. Changing $\epsilon$ to have a variance increases inequality due to the added randomness in outcomes but does not change the fundamental result.

inheritance, the wealth distribution has a positive skew with more observations to the left. Many households fall below the mean wealth of one due to having two heirs. However, a few fortunate households are far above the mean due to having one heir and inheriting wealth from the extinct. In the case of impartible inheritance, the distribution is more bi-modal. A large number of households are land-poor due to being surplus heirs. The surviving male lines only slowly climb back toward the mean. In contrast, there is also a land-rich class due to successful inheritance of the wealth of the extinct. Due to assortative marriage, the wealth gets passed within each class and the extinction of one household assures the doubling of wealth of another household. This element is weaker with partible inheritance which works as a channel that disperses wealth and prevents concentration. This is also why adoption can have less of an impact reducing inequality in such a system.

There are a number of concerns with the model. First is the potential endogeneity of the existence of adoption institutions. For instance, could high inequality have encouraged the emergence of a ban on adoption? Second, was household extinction a big concern and did adoption function as conceptualized in the model. Unfortunately, there is no micro-econometric setting where these concerns can be empirically addressed. Instead, the remainder of this paper presents strong evidence for the validity of this channel in three steps. First, I use historical narrative to show Western Europe and East Asia had similar adoption institutions until the 5th century. Further, I show the lack of any historical link between inequality and the decision to preach against adoption in Western Europe. Second, I use rich data from pre-industrial Japanese villages to show adoption was highly effective at preventing the extinction the wealthy and prevented concentration. Where relevant, I show contrasting evidence from Western Europe for the case of a society without adoptions. Third, I use the Japanese data to calibrate and simulate the model above to show plausible effects of adoption on inequality in the Japanese demographic setting.

## Adoption in History

Adoption was widely practiced across Eurasia and is seen in early records. In East Asia, the practice began by the Han period in China (206 BCE - 220 CE), the Nara period in Japan (710 - 794), and the early Chosun dynasty in Korea (1392-1910) (Hayashi, 1988; Brown and de Crespigny, 2009; Peterson, 1996). It was also practiced in both ancient Greece and ancient Rome, where the English term "adoption" originated (Goody, 1969; Corbier, 1991).[50] For

[50]The practice of adoption was also seen in areas practicing Hinduism but not in places practicing Islam (Leonard, 2011). It is beyond the scope of this paper to discuss this mechanism in these contexts in detail. However, it is known that areas with Islam also practiced in theory partible inheritance that tended to mitigate the effects of adoption as shown in the simulation below. The degree of partible inheritance in

instance, many Roman emperors were adopted, including the infamous Nero, when the male line failed. Adoption was not limited to kin among the Romans, although kin were favored, and they could also adopt children or adults making it an extremely flexible institution. Nature played little role in the conception of family in these societies.

An important question is why adoption became a demographic institution in both East Asia and Western Europe preceding Christianity. One explanation is that societies of intensive agriculture tended to value property creating a strong emphasis on the transmission of property, including rights over deciding inheritance. As part of such preferences, these societies developed cultures that worshipped the dead, much like is observed in East Asia.[51] This was not the case in Africa where agriculture was extensive (Goody, 1969). Therefore, both Eurasian cultures seem to have been similar in early times.

The institution of adoption continued to be practiced in East Asia into the 18th century. In particular, adoption is well-studied for the elite class and adoption rates were as high as 8% in China (1750-1849), 21% in Korea (1750-1849), and 37% in Japan (1700-1799) (Moore, 1970; Feng and Lee, 1998; Kim and Park, 2010).[52] The practice continued to be motivated by the succession of families as can be seen by the increase in adoption when birth rates fell (Feng and Lee, 1998; Kim and Park, 2010).

The rules for adoption in these societies was modeled on the Chinese legal code with the adoption of an agnatic nephews (that is nephews of the father's side) being the standard. These rules were enforced to a greater extent among the elite classes but less so among the peasant class who were more flexible and willing to adopt strangers (Waltner, 1991; Kurosu and Ochiai, 1995; Peterson, 1996). The timing of adoption could also be flexible with both children or adults (some even beyond child rearing age) being adoptable. Adopting adults had the advantage of reducing risk associated with mortality at younger ages. The preferred form of adoption was for adopted sons to marry daughters but the next generation could be composed of total strangers if the parents had no surviving children.[53]

In contrast, the general abandonment of adoption in Western Europe began in the fourth century when the church made concerted efforts to discourage the institution. The institutional change was highly effective and the use of adoption beyond the early middle ages

reality remained debated, with some arguing it was limited (Coşgel and Ergene, 2011).

[51] In the case of Japan, the emphasis was on the continuation of the male line and ancestors were worshipped well into the modern era.

[52] The Chinese case is from the Qing nobility, the Korean case is from the *Bulcheonwye* families, and the Japanese case is from the samurai of a small sample of lords.

[53] There may have been some variation in the flexibility of the institution of adoption across countries. For instance the stricter adoption rules among the Korean upper class may have tended to create more household extinction and thereby increase inequality. However, too little is known about adoption among the peasant classes in Korea and China to see whether these limitations affected inequality.

became rarities. A few cases of adoption include that by Joanna II, queen of Naples, 1414-35, adopting heirs when she was childless. There were also documented cases of adoption in France and Spain (Vassberg, 1998; Gager, 2014). Yet, these were rare exceptions to the rule. Many royal families faced extinction due to the lack of heirs. Also, the cases of child adoption in rural areas were uncommon and motivated by the welfare of orphans which continues to motivate adoption in the present day (Mignot, 2019).[54] Overall, these negligible cases can be safely ignored and I can class Western Europe as an area with no adoption.

For the purpose of this paper, a key concern is the motive behind the change in church policy. Two potential explanations have been raised in the literature. The first is a theological argument against the motive behind adoption. Contemporaries argued that adoption can overshadow "divine adoption" and "inherited salvation" through baptism.[55] Also, the church discouraged emphasis on earthly concerns through adoption of "offspring of perjury". One fifth century priest, Salvian, made this point by stating that through adoption, "some very wretched and most unholy people, who are not bound by the bonds of children, nevertheless provide for themselves chains with which to bind the unfortunate necks of their own souls".[56] Despite the bible including a few cases of adoption, such as that of Moses, the idea was that adoptions motivated by wealth inheritance were wrong. In turn, such concerns may have been the product of the widespread use of adoption but this would have also been the case in contemporary East Asia. It is unlikely that contemporary inequality was a key concern of religious authorities when making this argument.

An alternative argument by Goody (1983) argues is that the change was motivated by potential financial benefit by the church. The shift in policy happened after laws changed allowing the church to own property from the 4th century. This encouraged the church to increase its properties by accepting "god's share" of bequests from childless families. This may have been a highly successful source of revenue as one estimate states one third of the productive land in France was owned by ecclesiastical hands by the end of the seventh century.[57] In this case, institutional changes in Western Europe led to the change in policy by the church. However, it is difficult to argue for a link between the calculations of the church to increase their wealth and contemporary inequality. Instead, increasing inequality seems to have been an unintended consequence of the change in institution.

[54] Similar institutions for such cases also existed in Japan (Fauve-Chamoux, 1998; Sawayama, 2008).
[55] Gager (2014) 44.
[56] Goody (1983) 101.
[57] Goody (1983) 105.

## Empirical Evidence

I use annual panel data from three Japanese village censuses to study two key questions. First, how did fertility affect outcomes in producing male biological heirs. Second, how did adoption change the final outcomes in heirship. The content of the data is the same as the village census used above but it also includes information on landholdings, household compositions, and the existence of adopted heirs. Adopted heirs are noted as such in village censuses unless they become the household head, as they often did, which made their adopted status invisible. As adopted heirs could become household heads within a few years, annual data is required to fully identify the adopted. This also means the cross-sectional or unbalanced panel data used earlier provides insufficient information resulting in the smaller sample of villages. Two villages, Ishifushi village (1752-1812) and Tonosu village (1790-1859), are from the current day region of Fukuoka in northeast Japan where birth rates were low and extinction a greater concern. The other village, Hanakuma village (1789-1869), is from the current day region of Kobe next to Osaka where birth rates were far higher. These villages are a very limited sample of Japan but much of what follows should apply to much of Japan, with perhaps the exception of Western Japan where adoption remains understudied (see appendix F).

Japanese families were stem families at this time, where an heir is selected and he remains in the household to eventually become the household head. The siblings of the heir mostly left the household upon reaching adulthood through marriage, adoption, work, or to form new households. The older generations will remain in the household and live with their heir until death. No individual in the household was conceptualized as the owner of the wealth. Rather, the whole family jointly owned the household wealth so there is no clear point of inheritance. Yet, this does not form a practical problem as the family line down which wealth flows is obvious.

I focus on three factors as motivated by the earlier model. First, I look at fertility and the number of surviving heirs within households. In particular, the number of households facing biological extinctions is a key determinant of wealth concentration if adoptions were not available. Second, I look at how far adoptions were mitigating inequality through its demand and supply. Were surplus sons being adopted? Were the households without heirs adopting? Third, I look at the share of land needing redistribution had households without heirs gone extinct. This allows me to measure the magnitude of effect that adoption had on inequality. For each case, I focus on differential outcomes by wealth class because fertility and adoption outcomes clearly differed by class. Further, extinction has a greater impact on wealth distribution for rich, for whom a larger amount of land requires redistribution, than the poor.

First, I estimate how successfully households secured heirs by landholding class through the following specification.

$$Y_{i,g} = \beta_v + \beta_1 f(land_{i,g}) + \epsilon_{i,g} \tag{8}$$

Y is the dependent variable which is measured as the total number of male heirs at the end of reproduction for a generation. The end of reproduction is defined as the total number of male biological heirs within the household at benchmark years with the preferred benchmark being when the wife is 45 years old, the age at which most fertility ends.[58] However, not all households are observed with 45 year old wives, due to death or out-migration, so I use alternative benchmark years in such cases.[59] In total, I have 350 household-generation observations. I use village fixed effects to absorb some differences across villages. The main variable of interest is landholding level at the end of reproduction in both landholding bins and as a linear function. There is concern for reverse causality because households who see no hope of having an heir may begin selling land. Therefore, I use a decade lag of landholdings as an instrument which should precede any decisions made due to finalized fertility outcomes.

The above dependent variable has a number of shortfalls. First, it does not show whether the biological heir will inherit the household. Some male heirs will die before potential inheritance or be deemed unsuitable as an heir. Second, I only observe male heirs in the village but some may be unobserved due to out-migration or adoption. They may be available as insurance if the intended heir dies. However, this measure will be highly correlated with the final outcome of the existence of a biological heir making this a valid measure. Moreover, alternative measures cannot overcome issues with unobserved either.

I find a positive effect of landholdings on the survival of male heirs and this is robust to the use of an instrument (Table 11). The greater fertility of the rich in this Malthusian society gave the rich an advantage in producing biological heirs. The magnitude was large as a one standard deviation increase in landholding, of 3.7 *koku*, increased the number of surviving male heirs by 0.18. More critical is the variance in outcomes of heirship. I look at this by estimating a similar regression but I change the dependent variable into a binary of having no heirs or having surplus heirs. Consistent with the first results, I find the probability of having no heirs decreased with landholdings. The smaller slope is also consistent with the statistical prediction that additional fertility has decreasing returns on getting a male heir in a environment with random mortality. Finally, there is a much stronger positive relationship

[58] Only 1% of births occur after this age.

[59] Specifically, I use the following method to pick the benchmark year if the first option fails. First, I look for the last occurrence of a wife or widow in the household below age 45. Second, I take the year in which the household head reaches age 45. Third, I take the last occurrence in which a family member of the generation is observed aged 20-45.

Table 11: **Landholdings and Biological Male Heirs**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Number of Heirs | | No Heirs | | Surplus Heirs | |
| Landholdings | 0.0340*** | 0.0485*** | -0.0142** | -0.0114 | 0.0172** | 0.0276*** |
| | (0.0131) | (0.0168) | (0.00601) | (0.00853) | (0.00712) | (0.00885) |
| IV | No | Yes | No | Yes | No | Yes |
| $N$ | 350 | 299 | 350 | 299 | 350 | 299 |
| adj. $R^2$ | 0.034 | 0.031 | 0.057 | 0.058 | 0.028 | 0.022 |

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

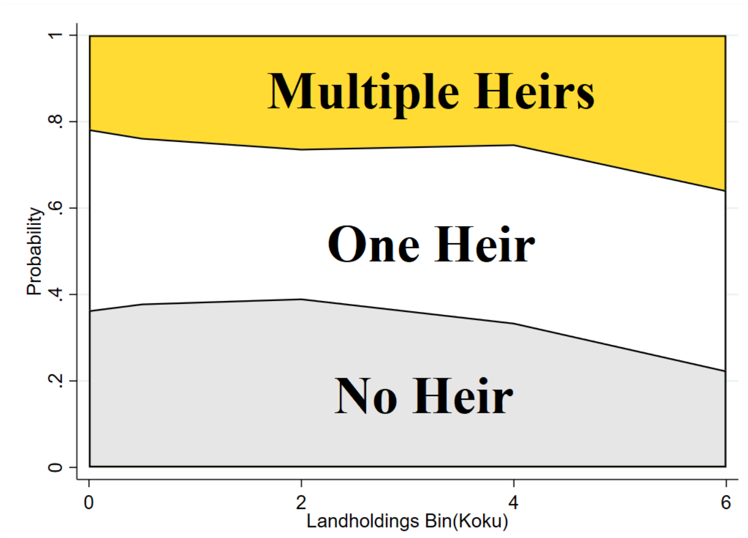



**Figure 10: Share of Households by Number of Heirs**

between the number of surplus heirs and landholdings.

I can visualize the magnitude of effects by plotting the share of household in each category by landholding bin in figure 10.[60] The average landholding was 4 *koku* and those below can be considered land poor and those above as land rich. The land poor class, on average, had a 36-39% chance of not having any heirs and a 22-26% chance of having multiple heirs. For the rich, there was a 22% chance of having no biological heir and a 41% chance of having multiple heirs. It is clear that the natural production of heirs was a problem faced by households of all wealth levels at this time.

I next look at how adoption was resolving the issue of heirship within these villages.[61]

[60]The results are estimated using the OLS specification of equation 8 by landholdings bins. The bins are landless, 0-1, 1-3, 3-5, and 5+ *koku*.

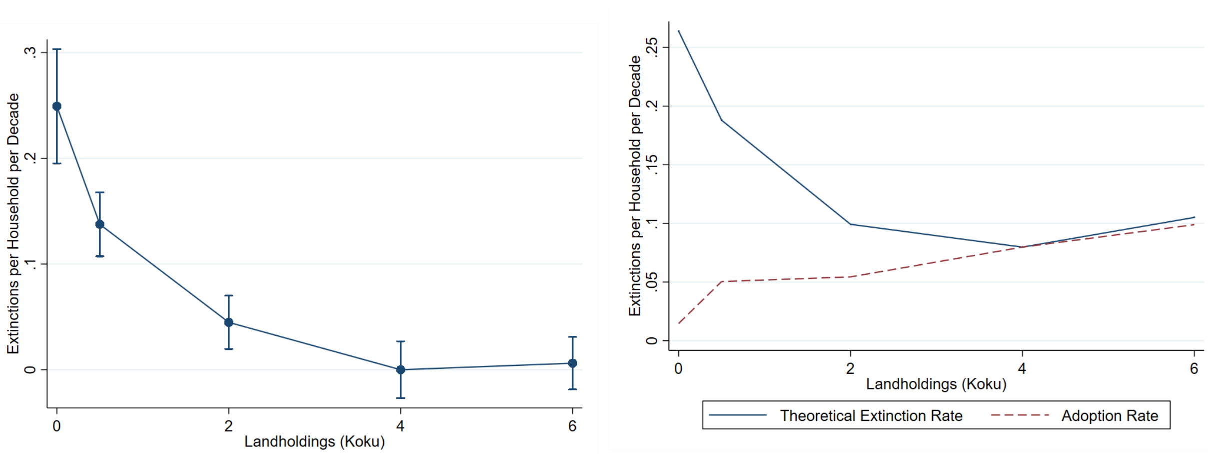
[61]Adoption was not always denoted in a uniform way in village registers. Therefore, I include all episodes

One way of doing this is to look at what happened to the 115 households in the data with no male biological heirs. Due to the small sample size, econometric analysis is not useful but I can show summary statistics. Of those with no biological heir, 94 households can be observed for 10 subsequent years in which 55% found adoptees while only 6% went extinct. The other 36 households continued to have no heirs but this does not necessarily mean they had no heir. For instance, if one wished a daughter to marry an adopted son, households may have to wait many years for daughters to come of age before adoption. Of the households going extinct, only one household had above average landholdings and the rest were land-poor.

Another way of looking at adoption is to use the data as panel data and look at household extinctions per year by landholding class. I plot extinction rates per decade by landholding bin and adoption rates per decade by landholding bin in figure 11. I do this with an OLS regression with adoptions or extinctions as the y variable and the landholding bin along with a village dummy as the x variable. Here, I define extinction as the disappearance of households from the village register. Extinction did not necessarily mean all household members died. Often, when the household became in-viable as an economic unit, they left the village along with their lands (if any). Land rights were weak in that holding onto lands from other villages was difficult. For adoption, I only consider those that were successful and the adoptee went on to become the household head. This avoids counting adoptions that failed and ended in divorce which occasionally occurred. These people could have personal issues with family members which led to such failures, meaning adoption did have an unpredictable element. I also plot the theoretical extinction rate which is the amount of extinction in each landholding bin if adoption were not allowed.

The surprising finding is the extremely low extinction rate among the wealthier households (see figure 11a). The average landholding had approximately 3.5-4 *koku* in these villages. Those households that had landholdings close to or above the average were not going extinct and thus prevented their wealth from getting re-distributed. Adoption was clearly working remarkably close to its theoretical ideal as it was preventing a large share of potential household extinctions which would have occurred had nature determined household extinction (see figure 11b). This was true to a lesser degree among those with half the average wealth and it was those households with lands less than 1 *koku* that were going extinct with the landless having the highest rate of extinction. However, such households had less lands so the effect on inequality was likely small. Also, the extinction of the landless must have been increasing equality as the poor households tended to disappear, decreasing

where a non-biological heir came into the household and became a family member who inherited the household. This includes episodes where the final member of a household dies but a new member enters in the next year to continue the household. (This is often denoted as *ato*). For practical purposes, this is similar in effect to adoptions when one is alive.




**(a) Extinction Rates**

**(b) Adoption and theoretical extinction rates**

**Figure 11: Rates of extinction and adoption per decade by landholding bin**

the share of the poor within villages.

It is also possible to see the effect of adoption on potential land redistributions by looking at the share of land facing redistribution had adoption not occurred. I do this by looking at the share of land held by households at the point they were succeeded by adoptees. This is imperfect because households without adoptees may have behaved differently and they also would not have immediately gone extinct had the adoptee not existed. These limitations mean my findings would most likely be an upper bound. I find that approximately 8% of village land would have faced re-distribution per decade had adoption been unavailable. Thus, the majority of land would have been redistributed over a century.

In contrast, the extinctions in the village with adoption were only leading to redistributions of 1% of the land per decade, a minimal amount with little effect on land distributions. Such lands were taken by relatives or passed to village organizations who at times found families to take over the land (Okada, 2006). The second option tended to equalize land distributions and this social mechanism was another factor in the equality of land distributions. However, its effects were also minimal as such cases were rare due to adoption. What were the potential effects of a society not having adoptions?

To contrast with the Japanese case, I look at how wealth was being inherited in the case of early modern England according to the available secondary literature. In England, impartible inheritance was the most common form of inheritance for land although moveable wealth may have been overwhelmingly given to surplus sons in compensation (Whittle, 1998). Thus, one male heir would commonly inherit all of the lands. If there was no male heir but a daughter existed, she would become the heiress and marry into another male line with the land. If there were no children, which occurred 17% of the time among the English peers (the holders of hereditary noble rank), the wealth would be passed onto relatives by will or common law (Gobbi and Goñi, 2018).[62] Thus, for the latter two cases in which the male line went extinct, the social mechanism of redistributing wealth was highly inegalitarian.

There are abundant examples of increasing land concentration due to gaining lands from extinct households (Clay, 1968; Payling, 2001). The best documented cases come from strategic marriages of heiresses. Habakkuk (1994) terms these "prudential marriages" in which the whole family intervened to assure the eldest sons married a wealthy partner leading to assortative marriages. Heiresses were especially sought after. For example, Broad (2004) documents the rise of the Verney family from the 17th century as a consequence of three generations of eldest sons marrying substantial heiresses with no evidence of initial sentimental attachment. Alternatively, there could be unexpected deaths of heirs which suddenly turned wives into heiresses.

Although the actual wealth of these households cannot be systematically tracked due to the limitation of the sources, the potential magnitude of this mechanism can be illustrated by looking at household extinction rates. Had 20% of male lines gone extinct per generation, which seems likely among the richest families, approximately half of the households would have gone extinct over 3 generations.[63] Thus, the majority of wealth must have been transmitted into new households over just one hundred years causing greater concentrations of land among the lucky few.

A drawback of this comparison is that many demographic factors were different between Western Europe and East Asia. To isolate the effect of adoption alone, I now conduct a simulation of Japanese society but I look at what will occur if adoption were suddenly not allowed in this society. This will give me a plausible estimate of the magnitude of the effect of adoption.

# Simulation

I now simulate the cases of partible inheritance or impartible inheritance against adoption or no adoption. Suppose fertility is a random variable correlated with wealth ($b(w_{i,g})$) and has the distribution below

$$b(w_{i,g}) \sim N(g(w_{i,g}), \sigma^2) \quad s.t. \ \frac{dE[g(w_{i,g})]}{dw_{i,g}} > 0 \tag{9}$$

[62]This was also driven by whether a settlement over the wealth existed. Depending on this factor, fertility rates varied widely (Gobbi and Goñi, 2018).

[63]I note that 17% of the English peers had no children, both female and male. Thus, the probability of having no male heir is slightly higher.

where g is the average number of children given wealth. I estimate this function using data from 4 villages where I have data on births.[64] I specify $\sigma$ to be 40% of average births. I want births to be discrete so I round to the nearest whole number.

Each of these births would either be male or female. As males were the main inheritors of wealth in this society, I focus on the male heirs. Females are assumed to marry into another household and will disappear from the model for simplicity. Each of these male heirs have a probability of dying before adulthood. To keep things simple, I assume mortality rates for each child is constant as there is little evidence that it varied considerably by household wealth. If the survival rate of infants to adulthood is specified as $\delta$, the number of surviving heirs male H has the following distribution

$$H(w_{i,g}) \sim Binomial(b(w_{i,g}), 0.5\delta) \tag{10}$$

I specify $\delta$ to be one third using data from life tables in the Meiji period. The magnitude of this risk was surprisingly high even for large families (see table 10). Even a family with 7 children had a 6% chance of going extinct. At the same time, one could also have too many male heirs which could also be problematic.

The final stage is inheritance. For simplicity, I look at the extreme cases of perfect partible inheritance and impartible inheritance if there is more than one heir. If there is no male heir, the wealth gets passed onto the household into which the daughter married. If a daughter does not exist, the wealth is passed onto a near relative. As household wealth was correlated with that of their marriage partners and relatives, I assume there is a lottery for the wealth among all households with the probability of winning correlated with proximity of the household's wealth with those that went extinct. In the case of partible inheritance, wealth of households in the next generation is given as follows.

$$w^i_{j,g+1} = \frac{w_{i,g+1} + \bar{w}_{i,g}}{H(w_{i,g})} \quad if \quad H(w_{i,g}) \geq 1 \tag{11}$$

where the superscript on w specifies the household number of the parent in generation g. $\bar{w}_{i,g}$ denotes all wealth won from the lottery from extinct households. In the case of impartible inheritance, the wealth is all inherited to one heir and the others get nothing. Wealth of household i goes through an inter-generational mobility through random events in life before reaching the next generation.[65]

Finally, suppose the institution of adoption results in all households with no biological

[64] I use the data from DANJURO to estimate how births varied against a cubic of landholdings. Because infants who died before the census are not included, I blow up total births to account for this.

[65] I based inter-generational wealth mobility on findings above.

| | impartible inheritance | Partible Inheritance |
|---|---|---|
| No Adoption | 0.74 | 0.60 |
| Adoption | 0.56 | 0.55 |

**Table 12: Gini Coefficient by Type of Institution**

heirs adopting an heir such that

$$\hat{H}(w_{i,g}) = \begin{cases} 1 & if \quad H(w_{i,g}) = 0 \\ 1 & if \quad H(w_{i,g}) = 1 \\ H(w_{i,g}) - \bar{H}(w_{i,g}) & if \quad H(w_{i,g}) \geq 2 \end{cases} \tag{12}$$

where $\tilde{H}$ denotes total heirs after adoption and $\bar{H}$ denotes heirs that are adopted away. Given this institution, the $\bar{w}_{i,g}$ term in equation 11 disappears (where $\tilde{H}(w_{i,g})$ replaces $H(w_{i,g})$) if total male children equal the number of households, which is expected in equilibrium.[66] Adoption will decrease inequality because it acts as an insurance policy against zero or multiple heirs. However, it can also reduce partible inheritance by the rich that can counteract the effect.

Table 12 shows the simulation results. The clear finding is that adoption reduces inequality although to a lesser degree in societies with partible inheritance. Comparing the case of adoption and no adoption for impartible inheritance, inequality is 0.2 points higher without adoption. The effect is large enough to explain a large portion of the differing outcomes between East Asia and Western Europe. However, I am simulating the case where everybody adopts, which was not true among the land poor. Changing the threshold of land required for adoption tends to increase inequality towards the case with no adoption but reasonable thresholds suggest an impact of at least 0.1 gini points.

The impact is smaller in a society with perfect partible inheritance. Extinctions still cause an increase in inequality, as some heirs win the lottery and become richer than their siblings creating temporarily higher wealth and increased inequality relative to the case of adoption. This occurs each generation to continually generate inequality. Yet, this increased wealth has lower persistence compared to the case of impartible inheritance. This is because the lottery winners tend to have more children and their wealth quickly dissipates among the larger number of heirs.

I prefer the results from the case of impartible inheritance because peasants in both Northwest Europe and Japan most commonly practiced impartible inheritance for landhold-

[66] This does not always happen due to randomness. In such cases, a lottery for inheritance occurs.

ings. Despite movable wealth having more egalitarian inheritance, land was a more important component of wealth and determined the observed land distributions seen in these societies. Overall, the simulation shows that adoption had a plausibly large role in decreasing inequality and can explain a large part of the different trajectories of inequality across the pre-industrial world.[67]

## Conclusion

This paper had two components. The first was to document wealth inequality in East Asia and show that high inequality was not the universal norm as suggested by Scheidel (2017). Detailed data from 591 villages in Japan, 1640-1870, shows no trend in wealth inequality. Moreover, an estimate of wealth inequality for Japan as a whole suggests low inequality with Gini coefficients of 0.5. This was not limited to this time and place because fragmentary evidence from over a millennia across East Asia is also consistent with a very long-run equilibrium of low inequality. This contrasts with the finding in the literature that Western Europe converged towards high inequality, with Gini coefficients above 0.7, leading to societies based on landless laborers. This trend was also a long-run phenomenon that preceded the black death. The west converged towards a society of landless laborers while the east converged towards a society of landowning peasants. The past literature had largely passed over this dimension of heterogeneity which could help explain the great divergence.

The second component looked for answers to why East Asian inequality was so different from Western Europe. As with the past literature, there is clearly no link between economic development and inequality in pre-industrial Japan. I also discard the hypothesis that geographic endowments, through rice cultivation, can explain regional differences because rice was associated with higher inequality within East Asia.

Instead, I showed that the church's teachings against adoption can explain the different outcomes. Eurasia seemed very similar in adoption institutions, until one half (Western Europe) was treated via church preachings to mostly abandon adoptions. I showed through a model that such changes in adoption have large effects on wealth transmission beyond the channel of wealth mobility that has received much attention in the literature. Higher household extinctions, due to lower adoptions, increased wealth inequality. The Japanese household data confirms the importance of this channel as wealthy households very rarely went extinct, preventing unequal re-distributions via social mechanisms. I also show the channel had large impacts on wealth inequality, as a plausible simulation shows a 0.1-0.2

[67] One issue with the simulation is that I compared Japan with and without adoption. Other demographic differences, such as the lack of universal marriage in Western Europe, is also likely to have increased inequality.

Gini coefficient increase in wealth inequality without adoption. An interesting implication is that it was not enlightened men implementing capitalism which made Western Europe unequal. Instead, it was a band of greedy bishops and priests in the 5th century which decisively turned Western Europe into a society of high inequality.

This mechanism is not intended to explain everything as other factors were also at play. Many other factors were different across these regions which may have also changed inequality outcomes. For example, feudalism may have played a role in limiting land rights and thereby discouraging land accumulation among peasants. In Japan, property rights were only secure if land was held by a resident of the village. Any landholdings that went beyond village borders were not under the protection of the law, and risked being lost (Nakabayashi, 2013).[68] Furthermore, permission from the village council was required for some management decisions on land. For those with cross-village holdings, the holder did not belong in the village council weakening management power and thereby making such holding less attractive. Such costs may have been a disincentive to the accumulate land across villages, preventing the emergence of large landholders.

A final question is when this mechanism stopped having an effect. Interestingly, there were 80,790 cases of adult adoption in the year 2000 in Japan. This amounts to 10% of marriages which is a remarkably large share.[69] Thus, adoption may have continued creating a relatively equal society in Japan to today.

[68]The lords could intervene if an appeal was made to them by the owner as cited in the cadastral survey.

[69]The numbers are available on the e-stat database created by the Japanese government.

# Appendices

## A Testing the Accuracy of Official Yields as a Measure of Value

I can find the extent of measurement error by looking at private records of large landholders in the 19th century primarily from the *Kinai*. The *Kinai* region had highly commercialized agriculture and also saw the most technological advance during the period. The large landholders recorded both the official yields and the true yields to value their lands for potential sales or rentals.[70] A smaller subset also recorded the amount of land rent collected per year. I test for the strength of official yields in predicting actual yields by taking logarithms of equation 1 to get

$$ln(value_i) = ln(\Delta Prod_{i,t}) + ln(land\ rental\ rate_{i,t} - tax_{v,t}) + \beta ln(official\ yield_i)$$

Assuming productivity, land rental rates, and taxation are constant within village I get specification 13.

$$ln(value_i) = \alpha_v + \beta ln(official\ yield_i) + \epsilon_i \tag{13}$$

I do not have data on the particular village of the plots so I instead use landowner dummies to partially control for differences in tax rates across villages. The error terms absorbs any measurement error due to assuming official yields reflected true yields. One issue with this specification is that these landowners owned land spanning multiple villages so the owner dummy does not fully control for differences in tax rates across villages. I lack the data to control for plot location. Therefore, this can be considered an over estimate of measurement error. The parameter of interest is the significance of $\beta$ and the $R^2$ which measures how well official yields explain true land values.

Alternatively, I can estimate a specification with the true yield as the dependent variable for a larger sample. This would get at the issue of measurement error if land rental rates and taxes were similar within village so that changes in productivity is the big issue. This can be considered as an underestimation of measurement error. The specification is as follows.[71]

$$ln(true\ yield_i) = \alpha + \beta ln(official\ yield_i) + \epsilon_i \tag{14}$$

I get rid of the owner fixed effect which primarily controlled for differing tax rates across

[70] I use data from (Takeyasu, 1966), (Shoji, 1986)

[71] This will have $true\ yield_{i,t} = yield_{i,0} \times \Delta Prod_{i,t}$

| | (1) log(true value) | (2) log(true yield) | (3) log(true yield) |
|---|---|---|---|
| log(official yield) | 0.317*** | 0.819*** | 0.813*** |
| | (0.120) | (0.0446) | (0.0325) |
| Owner FE | Yes | No | Yes |
| $N$ | 89 | 153 | 153 |
| adj. $R^2$ | 0.366 | 0.779 | 0.862 |

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table 13: Testing for Measurement Error**

villages and assume changes in productivity were uniform within the *Kinai* region. However, I also include the results when I do include owner fixed effects.

The regression shows the official yield is always highly statistically significant at the 1% level. The $R^2$ is 0.37 when using true values as the dependent variable but this is a lower bound as explained earlier. On the other hand, taking true yields as the dependent variable, I get an $R^2$ of 0.78 (or 0.86 if I include fixed effects) indicating official yields remained highly relevant.[72] The true explanatory power is likely closer an $R^2$ of 0.8 within the Kinai region because the default distribution of tax within village is likely to have simply multiplied tax rates to official plot yields.[73] Further, these values are from a technologically advanced region which saw large changes in technology so the values must be considered lower bound estimates for the country as a whole. Official yields remained good indicators of value.

# B Raw Estimates of Inequality Across Space

# C Alternative Estimates of Inequality

Table 14 shows estimates of inequality when I only backwardly project inequaliy within prefectures if I have no village observations. Table 15 shows estimates of inequality when I only use predicted levels of inequality. In either case, there is little notable change.

[72]Moreover, I also find a Malthusian relationship holds within the registers, whereby birth rates are positively correlated with landholdings.

[73]The distribution of tax within village is not visible, as as a whole had to pay the tax rather than any individual.

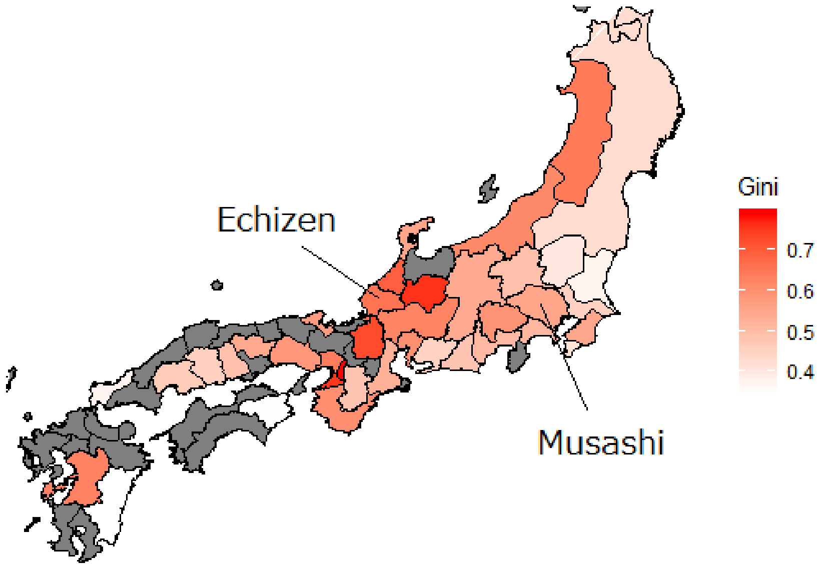



Figure 12: Average Inequality by Province

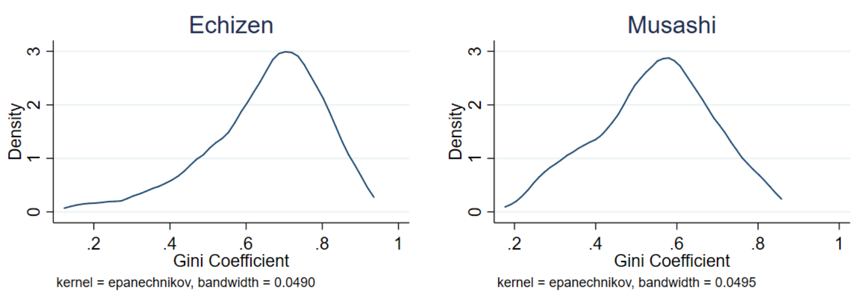



Figure 13: The Kernel density of Gini coefficients within Province

**Table 14: Estimated Inequality by Region**

| Region | Gini | Prop. Landless | Prop. Wealth top 20% | Prop. Wealth Bottom 40% | Villages |
|---|---|---|---|---|---|
| Kyushu | 0.53 | 0.11 | 0.58 | 0.07 | 3 |
| Shikoku | 0.51 | 0.10 | 0.60 | 0.08 | 1 |
| Chugoku | 0.51 | 0.08 | 0.56 | 0.08 | 27 |
| Kinki | 0.61 | 0.27 | 0.67 | 0.04 | 14 |
| Tokai | 0.50 | 0.10 | 0.54 | 0.08 | 44 |
| Chubutosan | 0.62 | 0.18 | 0.65 | 0.05 | 60 |
| Hokuriku | 0.62 | 0.22 | 0.68 | 0.04 | 152 |
| Kanto | 0.47 | 0.06 | 0.54 | 0.11 | 197 |
| Tohoku | 0.51 | 0.16 | 0.57 | 0.09 | 93 |
| All Regions | 0.53 | 0.13 | 0.59 | 0.08 | 591 |

*I take one observation per village that is closest to 1800. For all regions I take the weighted average by population. I only backward project for prefectures with no observations.*

# D Inequality in Meiji Japan

I plot the regional dynamics of rural inequality in the post-Tokugawa era in figure 14. The gradual spread of inequality across Japan is clear, as tenancy became more widespread and the heterogeneity by region disappeared.

# E Inequality in Pre-industrial England

## Medieval England

Medieval English peasants were split into free and unfree peasants at this time. The difference was that unfree peasants had labor obligations for the lord in addition to higher rents, no access to courts, and other taxations such as the heriot, a death-duty. Therefore, free peasants received more income from holding land than unfree peasants, resulting in one type of inequality. Kanzaka (2002) lists the rent paid by each of these types of laborers, in addition to the shares of each type by landholding class. Unfortunately there is no estimate of land income for each type of peasant.

Therefore, I estimate this by estimating total land's share of income and subtract the rents of each type of laborer. I take land's share of income as 40% of yields and labor's share

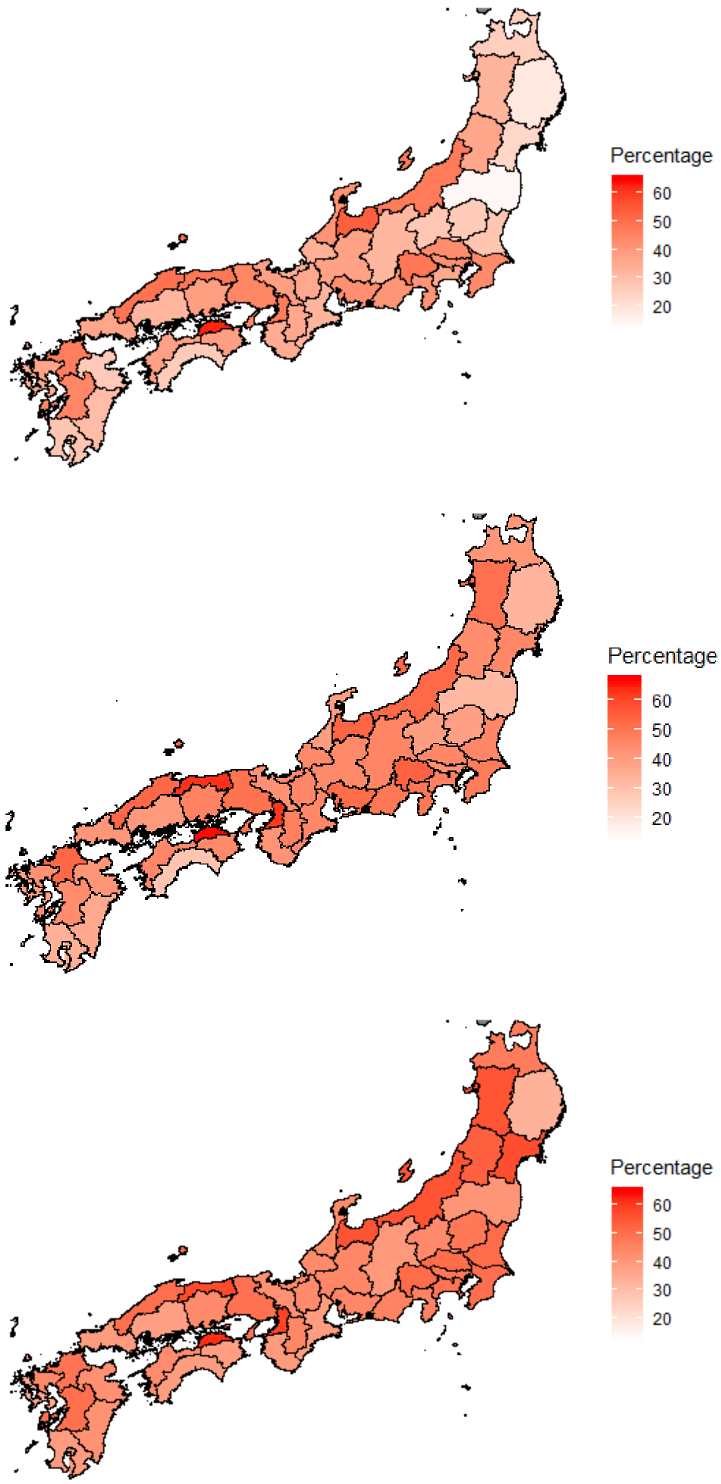



**Figure 14: Share of Land Farmed by Tenants: Post-Tokugawa Period 1880 (Top) 1910 (Middle) 1935 (Bottom)**

**Table 15: Estimated Inequality by Region: Predicted**

| Region | Gini | Prop. Landless | Prop. Wealth top 20% | Prop. Wealth Bottom 40% | Villages |
|---|---|---|---|---|---|
| Kyushu | 0.53 | 0.13 | 0.60 | 0.08 | 3 |
| Shikoku | 0.56 | 0.13 | 0.62 | 0.07 | 1 |
| Chugoku | 0.55 | 0.13 | 0.61 | 0.07 | 27 |
| Kinki | 0.55 | 0.13 | 0.61 | 0.07 | 14 |
| Tokai | 0.55 | 0.13 | 0.60 | 0.07 | 44 |
| Chubutosan | 0.53 | 0.13 | 0.59 | 0.08 | 60 |
| Hokuriku | 0.58 | 0.13 | 0.63 | 0.06 | 152 |
| Kanto | 0.53 | 0.13 | 0.59 | 0.08 | 197 |
| Tohoku | 0.47 | 0.14 | 0.53 | 0.10 | 93 |
| All Regions | 0.54 | 0.13 | 0.60 | 0.07 | 591 |

*For all regions I take the weighted average by population. I backward project for all prefectures.*

as 50% of yield taken from table 14 of Allen (2006).

$$Land\ Income\ net\ of\ rent = days\ of\ work \times wage \times \frac{0.4}{0.5} - land\ rent\ per\ acre \times acres\ worked$$

I assume a laborer worked 250 days. Using average wages (1277-1282) from Clark (2007), the total wage income is 432.5 pence. This brings land's share of income, the first component on the right hand side, to 346 pence. If a farmer owned and cultivated 30 acres over one year with 250 days of work (the standard virgate in this region), the land income net of rents for the peasant is 133 pence for unfree peasants and 214 pence for free peasants. This is 4.4 pence per acre for unfree peasants and 7.1 pence per acre for free peasants. Thus, free peasants are assumed to earn 1.6 times more rent per acre.

I then estimate the implied Gini coefficient assuming differences in land incomes net of taxation by peasant class. The resulting Gini range between 0.7-0.8 depending on assumptions of the share of unrecorded landless ranging from 30% to 50%.

## E.1 Inequality in the Commons

I first estimate parish population in the act year by assuming population growth rate of 0.04% per decade between 1700-1801 from aggregate population statistics from England. Although I could have also estimated by projecting backwards from populations in 1801, 1813, 1831, and 1841, the population growth rate during this period was too high resulting in implausible numbers by this method. Second, I use the proportion of adult males to total

**Table 16: Heirs by Region**

| | Central Japan | Northeastern Japan | | | |
|---|---|---|---|---|---|
| Prefecture | Gifu | Fukushima | | Yamagata | |
| | Nishijo | Shimomoriya | Niita | Yoshikawa | Tsukanome |
| | 1773-1870 | 1716-1869 | 1720-1870 | 1758-1845 | 1814-55 |
| **Male Heirs** | | | | | |
| Biological son | 75% | 51% | 53% | 71% | 67% |
| Adopted son | 18% | 32% | 25% | 23% | 22% |
| Others | 7% | 17% | 22% | 5% | 10% |

Sources: (Ofuji, 1996; Okada, 2006)
Note: Two more villages from Yamagata are available on Ofuji (1996) but the numbers are similar. They have not been included for space limitations but adoption rates were 16% and 22%.

population in 1831 to get an estimate of this share. I find that this average one quarter across all parishes. Third, I use the estimated number households (or adult males) in the year of the act using the above two steps.

A final problem is that the enclosure acts often only enclosed part of the parish. To get a conservative estimate, I assign a population that is proportional to the share of land getting enclosed which is estimated using total land area in 1841.[74] This is likely to be an underestimate of the parish's inequality because I am assuming similar levels of landless in the areas that were not enclosed. However, the non-enclosed lands were mostly already enclosed and was likely to have had higher inequality. Using these steps I can estimate the number of landless households by subtracting total assigned households from those with an allotment.

An alternative method could be to only use parishes with large shares being enclosed. Although this is more robust, the problem is that the sample size becomes very small. For the parishes where this is possible, I find the average inequality increases. For example, the Gini coefficient for Nottinghamshire increases from 0.82 to 0.85 for the whole period suggesting the conservative method underestimates inequality.

# F Adoption in Other Japanese Regions

This section attempts to show external validity of the findings on adoption within Japan.

[74] I occasionally get the share of enclosed land being larger than one. In such cases, I set the share of land enclosed to one.

Table 16 shows the evidence on adoption in other Japanese villages within the secondary literature. I limit the figures to male heirs because female heirs were often temporary household heads until a male head was found. They show high adoption rates ranging 18-32%. Adoption rates were likely lower in central Japan due to higher birth rates meaning less need for adoption. The evidence is again rather limited due to the need for continuous linked series of censuses that are rare but adoption itself has been widely documented to the West of the Kansai region (the region with Kyoto and Osaka) and it likely functioned similarly here (Hayami, 1973; Kurosu and Ochiai, 1995; Toishi, 2016). One limitation is that little is known about Western Japan, where birth rates were higher and adoptions may have consequently been less common, although the redistribution of children among families is known to have occurred (Ochiai, 2004; Ohnuma, 2018). Despite this limitation, it seems likely that the many, if not all, Japanese regions used adoption as an heirship strategy that helped retain wealth within the family.

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