Towards an explanation of inequality in pre-modern societies:the role of colonies and high population density

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ABSTRACT

Using the newly expanded set of 40 social tables from pre-modern societies, the paper tries to find out the factors associated with the level of inequality and the inequality extraction ratio (how close to the maximum inequality have the elites pushed the actual inequality). We find strong evidence that elites in colonies were more extractive, and that more densely populated countries exhibited lower extraction ratios. We propose several possibilities linking high population density to low inequality and to low elite extraction.

Key words: pre-modern, inequality, economic history

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1. Introduction: our very limited knowledge of pre-modern inequality

The past decade has seen substantial increase in the number of estimates of inequality for pre-modern societies (defined broadly as societies before they experienced the Industrial revolution). Most of these estimates are based on social tables, some originally created by the contemporaries and reused and modified more recently and some created recently from the archival evidence. In 2016, Lindert and Williamson (2016) published a book on US inequality with the first detailed social tables for the United States created for the years 1774, 1850, 1860 and 1870. Alvarez-Nogal and Prados de la Escosura have in several important publications (2004, 2007, 2013) charted the evolution of Spanish inequality over more than five centuries. Reis (2016) estimates inequality in Portugal over two centuries (between 1565 and 1770). Javier Rodriguez Weber's (2015) recent work, using "dynamic social tables", has done a similar thing for Chile, covering the period from the country's independence in 1820 to 1970. Bertola et al. (2008) and Prados de la Escosura (2007) have studied inequality in the Southern Cone countries around the turn of the 20th century. Marette (2013) and Lopez Jerez (2014) have produced recent papers (dissertations) on inequality in the colonial North and South Vietnam. Josiah Ober's (2015) book on Athens includes estimates of Athenian income inequality in the 4th century BC.

Very detailed empirical work on wealth inequality in the cities and larger areas (but falling short of a "nation-state" or Empire) was done recently by Alfani (2010, 2014), Alfani and Amennati (2014), Ryckbosch (2014) and Alfani and Ryckbosch (2016). In several papers, they study the cities of Northern Italy and the Low Countries in the Middle Ages. Their work has focused on the effects of the plague and the role of the commercial revolution in Europe from the 14th to the 19th century. There are also studies of inequality in the cities of Western Europe (Amsterdam in the 18th century by McCants 2007), the Iberian peninsula (Reis, 2016 for several cities and urban areas in Portugal between the 16th and the 18th century; Nicolini and Ramos-Palencia, 2016 for the cities in the Spanish province of Palencia in the mid-18th century), Middle East (Bursa by Canbakal, 2012, Kastamonu, a city in Anatolia, by Coşgel and Ergene, 2011). Ottoman surveys have also provided very valuable evidence for selected parts of the Empire (Coşgel, 2008; Coşgel and Ergene 2012).

While all this accumulation of the new evidence is remarkable, the work on causal factors that might have driven inequality and explanations of the changes in historical inequality, have hardly begun. In 1995 van Zanden published an important paper (van Zanden, 1995) that argued for the existence of a premodern Kuznets curve where inequality rose as mean income in Northern Europe went up. This could be viewed as the upward portion of a Kuznets curve. Van Zanden and then Ryckbosch posit that the explanation for the rising inequality resides in what they call the "classical factors", namely increased share of capital in national income. Since income from capital tends to be much more unequally distributed than income from labor, the change in factoral composition translates into an increase in inter-personal inequality.

Epidemics, wars and natural catastrophes were proposed, especially by Alfani (2010, 2014) and Herlihy (1978), as possible explanations for the declines in inequality. Here the mechanism is seen to go through a reduction in population which shifts the proportion between produced capital and labor, making labor relatively scarcer and increasing the wage rates. This then reduces inter-personal inequality. Scheidel (2017) in his forthcoming book "The great leveler" has taken this line of reasoning even further maintaining that all substantial declines in inequality over the course of recorded history are due to major natural or political dislocations, that is to epidemics, wars, revolutions and state collapses.

Pre-modern evolution of inequality can be, as argued by Milanovic (2016), placed in the same context as the evolution of inequality in the modern era. He claims that both can be explained as Kuznets wave-like movements, of waxing and waning inequality. The difference though is that in the pre-modern era the swings are driven by non-economic factors (epidemics and wars) while in the modern era economic and political factors became more important: technological change and transfer of labor from agriculture into manufacturing and nowadays from manufacturing into services, the spread of education, political demand for social transfers, trade union density and the like.

The objective of this paper is to push forward this line of research to pre-modern societies. We try to find out what are the regularities that exist between economic and demographic factors, and changes in inequality in the pre-modern era. It is important to note that while the agreement on the exact drivers of inequality in the contemporary period is not perfect, our knowledge of the changes in inequality in the latter part of the 20th century and in the first decade of the 21st is incomparably better than our knowledge of pre-modern inequality. And so is our reasoning about the factors that may influence inequality. When it comes to pre-modern inequality, we are very much at the beginning.

As far as the hypotheses of what might explain movements in pre-modern inequality our situation is now at about the same point as where the analysis of contemporary inequality was in the 1970s or 1980s: we do have some data, but they are fragmentary and often not fully comparable, and we have at best some guesses about the forces that might explain changes in inequality. The situation may be arguably even worse because the number of "independent" variables that we have for pre-modern societies is extremely limited, much more so than what in the 1970s or 1980s we had for the contemporary societies. With these severe limitations in mind, the present paper aims to collect in one place the evidence that we have on historical inequality and to suggest a hypothesis regarding the forces that are responsible for it.

The next section discusses the data used in the paper. Section 3 gives descriptive statistics of pre-modern Ginis and presents empirical evidence of the relationship between inequality and "independent" variables that might influence it. Section 4 concludes the paper by discussing possible next steps that should improve our understanding of pre-modern inequality.

2. The data

The data from which we estimate inequality in this paper come from social tables, and in a few instances from surveys of settlements (villages) or fiscal data. Social tables are the lists of salient socio-economic groups at a given pointy in time and in a given country, that can run for just a few groups to several hundreds. The prototype and the earliest example of a social table is Gregory King's famous social table for England and Wales in 1688 which includes 31 groups running from beggars to high nobility. Often, social tables have not been created by contemporary writers (such as Gregory King or William Colquhoun who created an almost equally famous social table for 1801 England and Wales) but by more recent researchers using archival evidence. Such are the social tables for the United States for 1774, 1850, 1860 and 1870 recently created by Lindert and Williamson (2016). In this paper I use only social tables that pertain, at least in principle, to an entire "political unit" or a significant portion of an entire "political unit", that is, to what we would call today a nation/county or Empire. This rules out social tables referring to individual cities. [2]

[2] As mentioned before, a number of such studies have been undertaken recently. They are extremely valuable for our understanding of inequality but in this context could lead to biased results where, for example, inequality in Paris is ascribed to the entire Kingdom of France. But the data on Tuscan (basically Florentine) income distribution obtained from the famous 1427 *Catasto* are acceptable because Tuscany was then a "political unit".

Most of the social tables used here (more exactly 29 out of 40) have already been used by Milanovic, Lindert and Williamson (in the further text MLW) (2011) and a detailed explanation of the procedure applied to the individual tables, their characteristics and sources is provided in that paper and in Milanovic, Lindert and Williamson (2007). However since MLW had published their paper a significant number of new social tables for pre-modern societies have been created and in this paper I take advantage of them. There are 11 new social tables and information for each of them is provided in Annex 1 (the new data are also highlighted by asterisks in Table 1).

Table 1 gives the summary of the main features of each social table. The data are arranged in chronological order, from the earliest one for Athens in 330 BCE to the 1938 social table for British India. As in the MLW paper, the cut-off point after which the label "pre-modern" no longer applies is, for the countries that were "early developers" (Western Europe and North America), mid-19th century, and for all the others, 1939, the outbreak of the Second World War. After that point, it could be argued, no pre-modern economies existed, not solely because many of them began to industrialize but also because they were part of what might vaguely be considered "modernity", that is they were all part of the international political and economic system and used economic policy to explicitly try to speed up development.

The average Gini of the countries included here is 44.1 with the standard deviation of almost 10 Gini points. The Gini range is from less or equal to 25 (South Serbia in 1455, China in 1880 and Tonkin in 1929) to more than 60 (Nueva España and the Netherlands, both in the 18th century). It may be noted at the outset that this range as well as the average Gini are similar to what we find for modern economies. Thus, for example, using the most recent global data for 2011, the average national Gini in the world is 38 with the standard deviation of 10 Gini points. The Gini range is from 25 (Belarus, Slovenia, Denmark) to 66 (South Africa). [3]

Pre-modern GDPs per capita range from just barely above the subsistence (South Serbia in 1455, Kenya in 1914, and Moghul India) to about $PPP 2,300 (US in 1870 and Chile in 1900). The latter amount is some 6 to 8 times the subsistence (depending on whether we assume the subsistence to be $PPP300 or $PPP400). Here, however, there are no similarities between pre-modern and present-day societies. The average (unweighted) country GDP per capita in 2011 was $PPP 13,000 which is some six times greater than the highest pre-modern GDP per capita in our sample.

[3] Calculated from LIS data.

Table 1. Key characteristics of countries included

Country (political unit)	Year to which social table refers	Estimated inequality (in Gini points)	Estimated GDP per capita (in 1990 PPP dollars)	Estimated population (in 000s)	Source of data
Athens *	330 BCE	37.4	1333	240	Social table
Roman Empire	14	39.4	633	55,000	Social table
Byzantine Empire	1000	41.1	533	15,000	Social table
England	1290	36.7	639	4,300	Social table
Tuscany	1427	46.1	978	38	Census
South Serbia	1455	20.9	443	80	Census of settlements
Holland	1561	56.0	1129	376	Fiscal data
Cracow voivodship*	1578	53.0	810	476	Social table
Levant (Syria, Lebanon)	1596	39.8	974	237	Survey of settlements
England and Wales	1688	45.0	1418	5700	Social table
Holland	1732	61.1	2035	2035	Fiscal data
Moghul India	1750	48.9	530	182,000	Social table
Old Castile (Spain)	1752	52.5	745	1980	Social table
England and wales	1759	45.9	1759	6463	Social table
USA (13 colonies)*	1774	45.7	1182	2376	Social table
France	1788	55.9	1135	27,970	Social table
Nueva España (Mexico)	1790	63.5	755	4,500	Social table
England and Wales	1801	51.5	2006	9,053	Social table
Bihar (India)	1807	33.5	533	3,362	Social table
Netherlands	1808	57	1800	2,100	Fiscal data
Kingdom of Naples	1811	28.4	637	5,000	Social table
USA*	1850	48.7	1292	23,580	Social table
USA*	1860	51.1	2178	31,839	Social table
Chile*	1860	46.6	1282	2,074	Social table
USA*	1870	51.4	2292	40,241	Social table
Brazil	1872	43.3	721	10,167	Occupational census
Peru	1876	42.2	653	2,469	Social table
China	1880	24.5	540	377,500	Social table

Java	1880	39.7	661	20,020	Social table
Maghreb	1880	57.1	694	5,002	Social table
Japan	1886	39.5	916	38,622	
Chile*	1900	45.0	2232	2,527	Social table
European Russia*	1904	37.5	1237	106,230	Social table
Kenya	1914	33.1	456	3,816	Social table
Java	1924	32.1	988	35,170	Social table
Kenya	1927	46.2	558	3,922	Social table
Cochinchina (South Vietnam)*	1929	36.8	1580	5,741	Social table
Tonkin (North Vietnam)*	1929	25.6	1122	9,036	Social table
Siam	1929	48.5	793	11,607	Social table
India	1938	49.7	617	346,000	Social table
Mean	---	*44.1*	*1060*	---	---

Note: Countries marked with * are not included in MLW (2011) dataset; they are for the first time used in this paper and the sources are given in Annex 1. The data are ranked in chronological order.

Gini is calculated from the social tables. GDP per capita is ether directly taken from the update of the Maddison files (Bolt and van Zanden 2013) or is calculated based on Maddison's approach by the authors of the tables. See also Milanovic, Lindert and Williamson (2007).

3. Pre-modern inequality: description and hypothesis

Pre-modern inequality in the context of the Inequality Possibility Frontier

Figures 1 summarizes the key features of pre-modern inequality. Figure 1 plots estimated Ginis against GDP per capita (in PPP terms). As can be readily seen, Ginis seem to increase with mean income.[4] This is consistent both with what we would expect from the Kuznets hypothesis and with what is argued in Milanovic, Lindert and Williamson (2014), namely that higher levels of income give more "space" to inequality to increase. When mean income is extremely low (barely above the subsistence), inequality is perforce limited if we require that people are at least able to survive. Then the surplus that can be appropriated by the rich is small and inequality, measured by a synthetic indicator like a Gini coefficient, has to be low. (We have to assume that it is not in the interest of the rich to allow substantial decrease of the population due to famine. It is also not likely that they would be able to implement such a policy without a major uprising that might destroy their power.)

Figures 2 and 3 extend this line of reasoning. Figure 2 does it by plotting the observed Ginis against the Inequality Possibility Frontier (IPF).[5] The IPF shows the maximum level of inequality obtainable at any *given* mean income under the assumption that all but an infinitesimal minority lived at the subsistence level. At the theoretical position of maximum inequality, the elite appropriates the entire surplus above the subsistence. The maximum "feasible" level of inequality increases as income goes up because with the greater surplus, there is simply more income for the elite to appropriate. The exact formula for the maximum Gini at a given level of income is $\frac{\alpha-1}{\alpha}$ where α is the mean income expressed in the number of subsistence baskets (for more detail, see MLW, 2011, pp. 256-259). Clearly, if $\alpha=1$, there is no surplus and Gini is 0. For $\alpha>1$, the maximum Gini becomes positive. In our sample, when the subsistence is assumed to be \$PPP 300, α ranges between 1.5 and 8, and the maximum Gini ranges between 0.33 and 0.87.

After an income level of approximately \$PPP 1,000, Ginis no longer remain as close to the Inequality Possibility Frontier (IPF) as for lower income values (Figure 2). In other words, IPF

[4] The terms "mean income" and "GDP per capita" are used interchangeably.
[5] Data points for England/UK and the United States are highlighted.

expands faster than the observed Gini. The ratio between the observed Gini and the maximum Gini at a given level of income is called the Inequality Extraction Ratio.[6]

Figure 3 plots the Inequality Extraction Ratios against mean income and highlights colonies (dark dots) for which we often find high extraction ratios. At very low levels of income, IER is around 100 percent, implying that inequality is pushed close (and in some cases even beyond) its maximum "feasible" level, that is beyond the level consistent with the maintenance of a society as a going concern. It is also notable that almost all poor countries (those with GDP per capita below $PPP 1000) that were colonies display very high inequality extraction ratios.

With the increase in GDP per capita however, IER declines which, as we have seen, means that observed Ginis increase less than the maximum feasible Gini. This regularity seems to hold throughout our sample with the exception of the richest countries where we find very high Ginis that make the IER go up again.

The relationship between on the one hand, Gini and the IER, and on the other hand, Gini and GDP per capita is worth exploring also for the three countries where we have at least three observations at different points in time. They are England/United Kingdom, the United States, and Holland/the Netherlands. For England/UK we expand our analysis to the Industrial era, up to 1911.

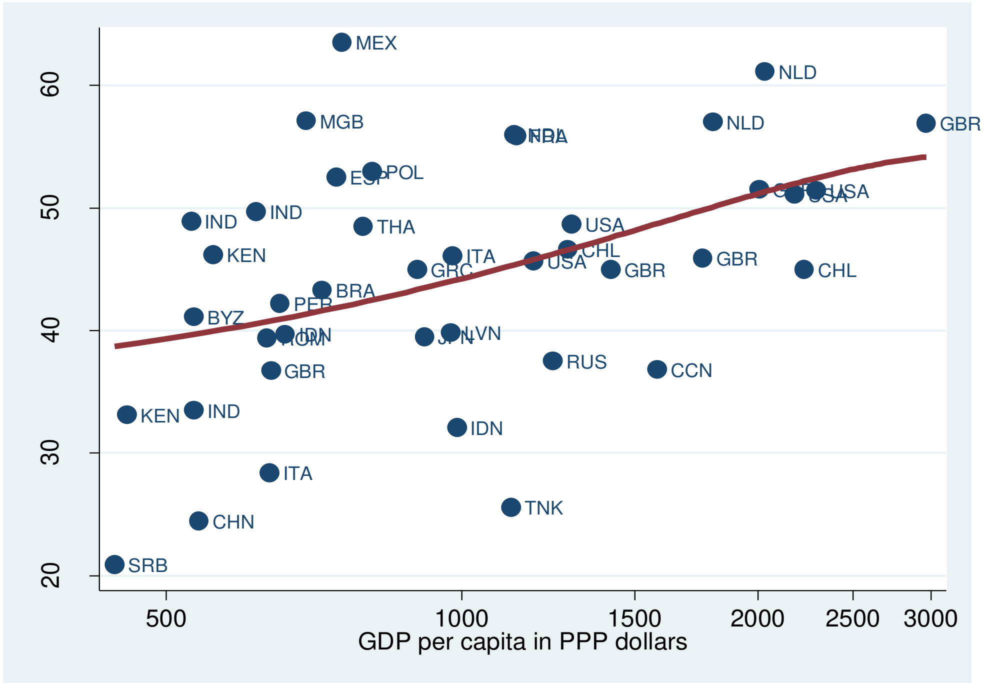
It is remarkable that for all three countries, increased GDP per capita went together with an increase in inequality. The evolution of inequality in England/UK is most interesting. The graph shows a steady rise of the Gini in the 19th century with a peak in the second half of that century. After that, there is a modest decline estimated for 1911. The level of UK inequality in the latter part of the 19th century (which is strictly speaking beyond our limit of pre-modern era) was extremely high if we use the present-day standards. UK Gini was around today's inequality level of Brazil and possibly even higher, given that the estimate we use here is based on social tables with information on income for some 20 to 30 groups (and with the assumption that the within-group inequality is zero) while today's estimates of inequality in Brazil are based on nation-wide household surveys that include several hundred thousand households. The former is thus (as discussed in Section 4) an underestimate of "true" inequality.

[6] This is simply the distance between the dots in Figure 2 and the corresponding values of the maximum feasible Gini on the IPF, divided by the latter.

At the same time in all three countries, IER tended to go down with increased GDP per capita. An important exception however is England/UK where the period of the Industrial Revolution in the first half of the 19th century displays an uncharacteristically rising IER despite a substantial increase in mean income. It is of course driven by an even faster rising Gini. This is not unexpected though given what we know about the very unequal and wrenching process of British industrialization.[7]

[7] The IER is also very high in England in 1290 but this is expected due to the very low mean income at the time.

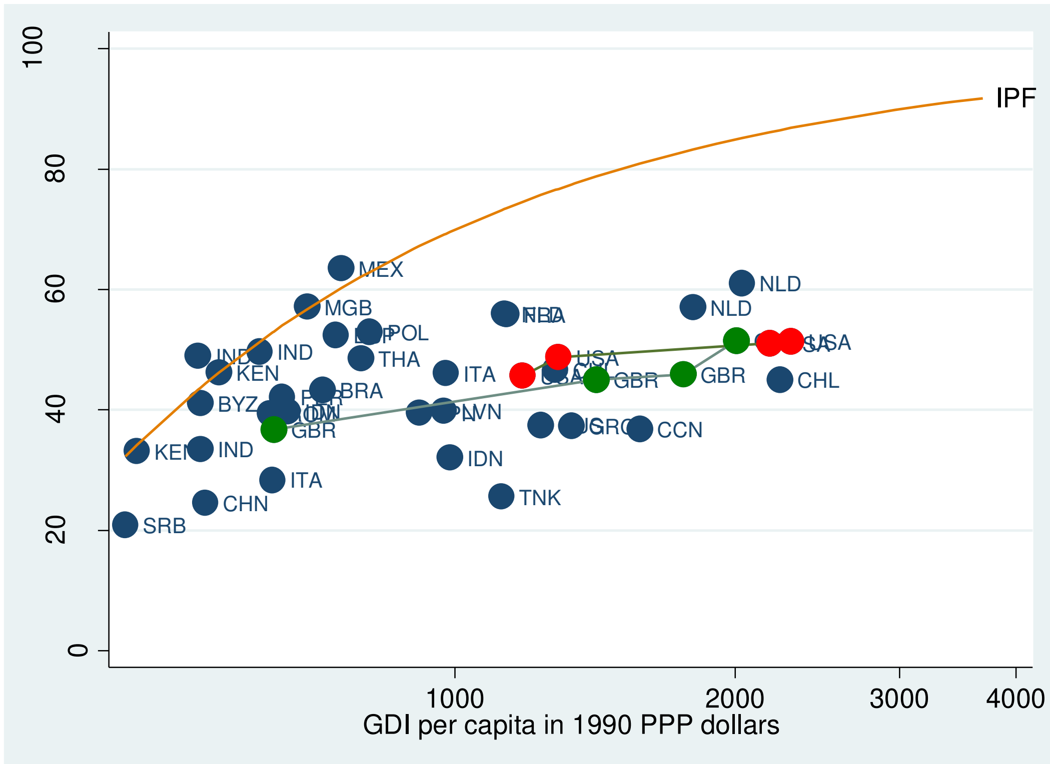
Figure 1. Gini coefficient and level of GDP per capita in pre-modern societies



Abbreviations: BRA=Brazil, BYZ=Byzantine Empire, CCN=Cochinchina, CHL=Chile, CHN=China, ESP=Spain (Old Castile), FRA=France, GBR=England/Wales or United Kingdom, IDN=Indonesia (Java), IND=India, ITA=Tuscany, JPN=Japan, KEN=Kenya, LVN=Levant (parts of today's Lebanon, Syria and Israel), MEX=Nueva España, MGB=Maghreb, NLD=Holland or the Netherlands, PER=Peru, POL=Poland, ROM=Roman Empire, RUS=Russia, SRB=South Serbia, THA=Siam, TNK=Tonkin, USA=13 colonies (the United States).

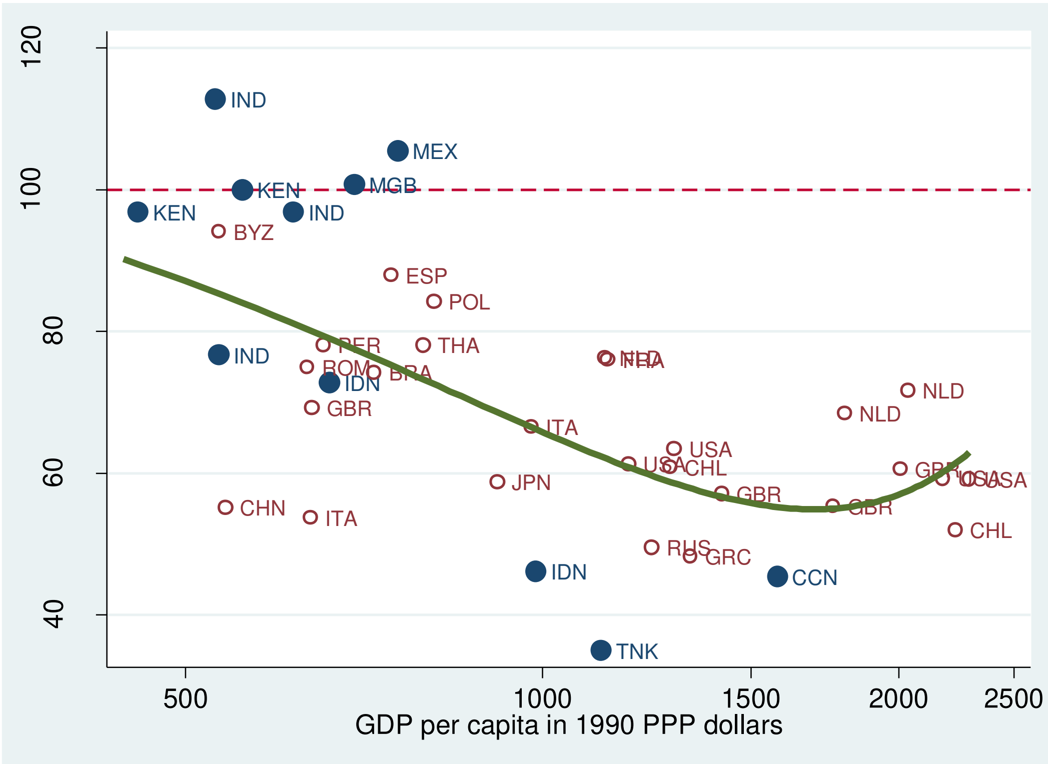
Gini shown in percentage terms (i.e., Gini of 0.3=30). Horizontal axis in logs.

Figure 2. Observed Gini coefficients against the Inequality Possibility Frontier in pre-modern societies



Note: For country abbreviations, see Note to Figure 1. Horizontal axis in logs.

Figure 3. Inequality extraction ratio and level of GDP per capita in pre-modern societies



Note: Inequality Extraction Ratio in percent. Colonies marked by full (dark) dots. Horizontal axis in logs.

Figure 4. Gini coefficient and GDP per capita over time in England/UK, United States and Holland/Netherlands

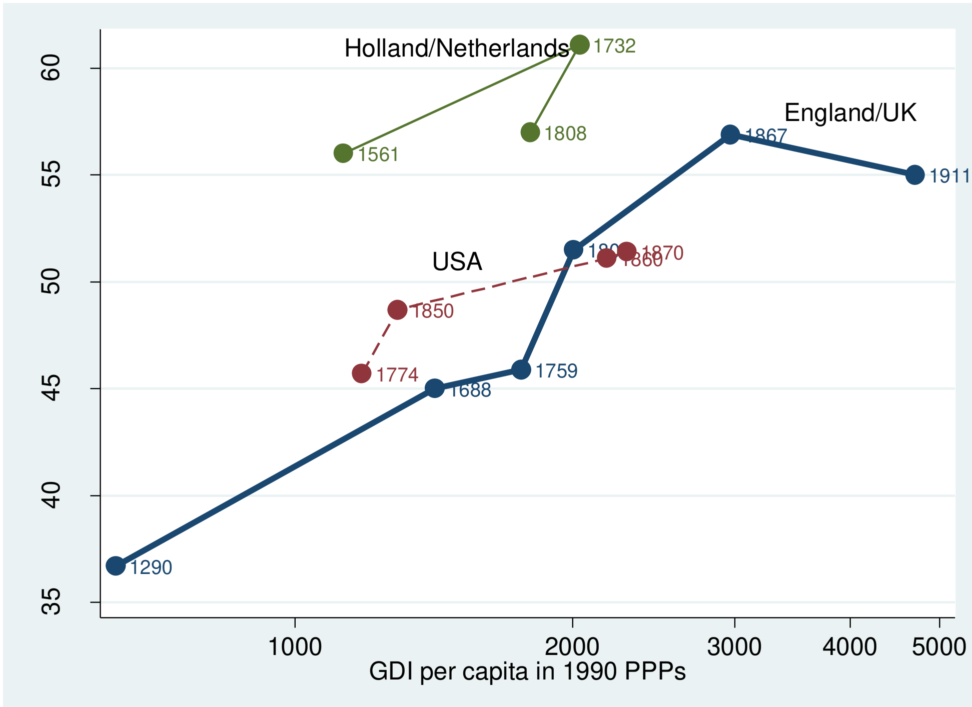
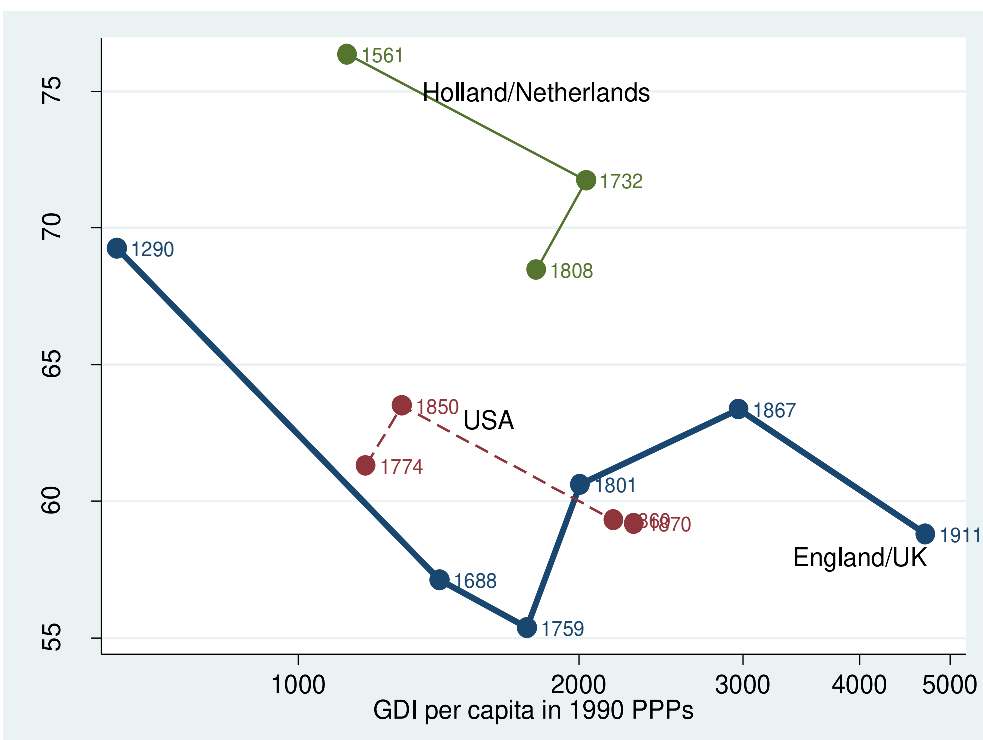


Figure 5. Inequality extraction ratio and GDP per capita over time in England/UK, United States and Holland/Netherlands



Correlates of pre-modern inequality

So far we have concluded that pre-modern inequality (measured by the Gini coefficient) tended to rise as mean income increased. We have also found some evidence that the observed Gini increase was not as fast as the increase in the maximum feasible Gini and thus that the Inequality Extraction Ratio was smaller in more advanced economies.

The next step is to look at possible correlates of pre-modern inequality. The task there is both more complicated and simpler than when we do analogous exercises for contemporary economies. It is simper because the number of economic and social variables that are available for pre-modern economies and can be thought related to inequality is small. Unlike the situation for the contemporary economies where factors such as educational attainment, age composition of the population, trade union density, government spending as a share of GDP, trade as the percentage of GDP etc. have been adduced, and tested, as possible explanans of inter-personal inequality, for the pre-modern times we have only very few such variables. Thus our choice is rendered relatively simple.

But on the other hand, the dearth of information on possibly relevant variables makes our conclusions much weaker. We may simply be not including some factors that are important but for which we lack numeric information. Such factors could be thought to be distribution of land holdings, fiscal pressure, the size of the armed forces, type of government (oligarchic, despotic, with a weak or strong fiscal capacity) and the like. Therefore, the conclusions that we make will be necessarily very provisional and may be subject to revision when additional and better socio-economic data regarding the past become available.

Our next step is to look at the correlates of both Gini and IER in our sample of 40 pre-modern economies. The results are shown in Table 2 (columns 1 and 3).[8] They are as follows. GDP per capita (in curvilinear formulation) is borderline significant (positive relationship up to a certain level) when it comes to inequality but not at all when we consider the IER. It would thus appear that the changes in the IER may not be explained simply by countries becoming richer but by the changes in other variables. This is indeed what we find for population density which is strongly negatively associated with the extraction ratio. Also, being a colony is strongly positively associated with the extraction ratio. Urbanization, which is often argued to be a strong correlate of inequality in

[8] We also control for specific features of the social tables. These control variables are explained in the notes to Table 2.

both pre-modern (see van Zanden 1995) and modern societies, is positively correlated with the IER, but is not statistically significant. Overall, it could be argued that (not surprisingly) colonies were more extractive and more populous countries were less extractive. The latter finding is probably the most interesting one and I will return to it.

When we look at the correlates of inequality, the situation is similar although both the overall R^2 and the significance of the coefficients are weaker than in the case of the Inequality Extraction Ratio. The only variable significant at less than 5% level is population density (negatively correlated with Gini coefficient). Urbanization is, as expected, borderline positively correlated. No other variable seems to matter.

The preliminary conclusion is therefore that growth of income as such did not have a discernable effect either on inequality or the level of extraction of surplus.[9] In pre-modern economies, it could be argued, change in GDP per capita does not act as a proxy for a structural transformation that we normally associate with it in modern societies (e.g. richer economies are now more service-oriented than the poor, and in the recent past they were more manufacturing-oriented than the poor). It is thus perhaps not surprising that the mean income does not play much of a role in explaining either inequality or IER changes. [10]

The second important conclusion is that colonies were not necessarily more unequal, but were more exploitative in the sense that inequality was pushed closer to the frontier than in non-colonized societies. The fact of being a colony raises the inequality extraction ratio by almost 13 points which is about ½ of the standard deviations of IER in our sample.

Another important conclusion concerns the role of population density: it reduces both measured inequality and the extraction ratio. Thus, high number of people per square kilometer seems to be a strong predictor of relatively egalitarian economic outcomes.

Why could it be the case? We cannot establish the reason with the data we have but we can make conjunctures. There may be two possibilities. Less extractive economies would imply, everything else the same, that the poor would have a higher income than in more extractive economies. This relative comfort of the poor might in a Malthusian fashion lead to a greater increase in population. (Note that in the extreme case when the IER is 100%, population is likely merely to

[9] This is when we control for other variables. In two-way displays such as in Figures 1 and 3, GDP does play a role.
[10] This point is similar to the one made in Milanovic (2016, Chapter 2) that pre-industrial inequalities are not driven by economic factors.

reproduce itself.) Thus, over time, we may notice the association between less extractive regimes and higher population density but the true causality would go from having a more lenient (egalitarian) regime to higher population growth.

The other possibility implies an exactly opposite causal mechanism. Population density may turn out to be high for an entirely different reason wholly independent of the level of extraction, but once in existence this relatively high number of people per unit of land may make the ruler's position more precarious and subject to an implicit popular veto, especially in pre-modern economies where the military force of the ruler, compared to that of people, is not overwhelming. Then the policy of the ruler or of the elite may be "milder" and less extractive principally because of fear of being overthrown (see Do and Campante, 2009). The causality here runs from high population to low extraction ratio. In real life, it is of course, likely that both mechanisms played a role.

Finally, there is another line of argument that I think however we should reject. It is noticeable that the countries with the highest population density are from Asia. In effect, all top four countries by population density are Asian: Java (Indonesia), Japan, India and Cochinchina. The might lead us to add in the regressions an Asia dummy. Columns (2) and (4) in Table 2 show the results. The interesting result is that for the Gini, population density now becomes insignificant whereas GDP per capita turns significant, exhibiting the usual Kuznets like inverted U shape. For IER, population density also ceases to matter and the only statistically significant variable that remains is colonial status.

The question is whether it is reasonable to add the Asia dummy. I think that the arguments against it are strong. Asian countries that we have in the sample (China, India, Indonesia, the two Vietnams, Japan and the Levant) do not share anything in common that could be considered as "Asian", other than the fact that they belong to a continent whose borders are to a large degree arbitrary. In other words, it is hard to see what factor could be put under the heading of "Asianess" for the countries as different among themselves and over time, as the Levant in the 16th century and Thailand (Siam) in 1929. There is nothing obvious in terms of economics, religion, social or political organization that could be considered common. It is for this reason that I believe that the introduction of an Asia dummy even if econometrically sensible since that variable seems to matter (although not that much by itself as it is not statistically significant) should be rejected. This in turn leads us to keep the conclusions about the role of population density and colonial status in explaining the level of pre-modern inequality, and more importantly, the Inequality Extraction Ratio.

Table 2. Explaining Gini and Inequality Extraction Ratio

	Gini		Inequality extraction ratio	
	1	2	3	4
GDP per capita in PPP dollars	164.9 (0.10)	179.2 (0.07)	-63.9 (0.68)	-40.2 (0.79)
GDP per capita squared	-11.6 (0.11)	-12.8 (0.08)	2.7 (0.81)	1.0 (0.93)
Urbanization rate (% of population)	0.35 (0.06)	0.32 (0.09)	0.55 (0.06)	0.51 (0.08)
Population density (people per km^2)	-0.07* (0.03)	-0.05 (0.12)	-0.12* (0.02)	-0.10 (0.08)
Asia dummy		-5.2 (0.20)		-8.7 (0.18)
Colony (dummy variable)	5.6 (0.15)	7.5 (0.07)	13.6* (0.03)	16.70** (0.01)
<u>Survey controls a/</u>				
No foreign rulers included (dummy)	-13.5 (0.06)	-13.2 (0.06)	-27.8* (0.01)	-27.2* (0.01)
Tax-data (dummy)	-1.2 (0.82)	-0.6 (0.91)	-4.3 (0.60)	-3.3 (0.68)
Number of social groups	-0.0002 (0.81)	-0.0002 (0.78)	-0.0004 (0.77)	-0.0005 (0.68)
Constant	-543.6 (0.11)	-592.4 (0.09)	311.6 (0.57)	209.2 (0.74)
R^2 adjusted	0.28	0.30	0.58	0.61
F value	2.9	2.8	5.4	5.1
Number of observations	40	40	40	40

Note: *p*-values shown between brackets. One (two) asterisks denote coefficients statistically significantly different from zero at 5(10) percent level.

a/ These are variables that control for the differences in the survey (social tables) set ups. “No foreign rulers included” is a dummy variable (=1) if a country is a colony but foreign colonial population is not included in the survey; “tax data” is a dummy variable (=1) if the source is not a social table but tax data; “number of social groups” gives the number of social groups included in a social table.

4. Conclusions and further directions

Despite an impressive recent progress in the availability of historical data on income distribution our knowledge of past inequality is woefully inadequate. Continuous historical data for a hundred or so years (from the turn of the 20th century to today) exist for barely a dozen countries. Even for those countries, the earlier data are available only sporadically. The situation with other countries is much worse. The extraordinary advances like estimates of wealth or income inequality in mediaeval Northern Italy or the Low Countries have to be set against the fact that these data exist for only a few years and a few localities, and that between such mediaeval data and our estimates of Roman income distribution, there is a yawning gap of more than a millennium—with almost no information at all.

There are also problems with social tables. The number of included social groups can at times be very small. Even when the number is adequate and we trust that the creator of the table has indeed included all salient groups and made correct estimates of their incomes, the assumption that we have to use is that inequality within each group is zero. In other words, the overall inequality as calculated from the social tables is a between-group inequality only. Some attempts to allow for within-group inequality have been made by Modalsli (2015) but the problem there is the arbitrary nature of such within-group inequality adjustments. We can perhaps argue that merchants might have been distributed along the entire income distribution, ranging from those very rich to those very poor (even if we do not know how that particular distribution looked). For the top classes, like senators in Rome, or for the bottom classes (slaves or peasants), we do know that their distributions were extremely narrow—that is, no peasant was likely to be among the rich, and no senator was by definition poor (since there was a wealth census requirement). But for other classes, we have no prior evidence or information about their distributions and moreover putting a number on such distribution (how equal or unequal) is impossible. Thus the between-group-only approach still seems to be the best, not the least because it dispenses with the arbitrary widening of within-group distributions and forces us to be conservative in our estimates of overall inequality.[11]

Dynamic social tables introduced by Rodríguez Weber (2014) represent an important innovation. If the information for the benchmark years is well chosen and reasonably plentiful (as indeed it is for Chile), then keeping the social class structure unchanged and allowing income of each

[11] If we allow for very wide within-group distributions, we can produce almost any overall Gini.

class to rise or fall in accordance with other available macro data (e.g., occupational wages) provides annual social tables. The same class structure is maintained until a new benchmark year when information on the (slightly different) class structure becomes available. Hopefully, this approach could be replicated in other countries.

Historic data are not, compared to the current standards, poor only on the side of the variables to be explained (Gini or another indicator of inequality). They are also, as mentioned before, poor for the explanatory variables. It is unlikely that some of these omissions will ever be remedied: data on government spending for some ages or countries will probably never be retrieved, and in many places might not have existed to start with. However, political data could be produced from the information that we have about those societies. Similarly to the modern political databases that score democracy and autocracy in different societies it is not difficult to imagine applying a somewhat similar approach to historical societies. We have a pretty good knowledge about the way the political system functioned in Athens, or Rome, 11th century Byzantium or 17th century Netherlands. Another important advance would be a more accurate and consistent codification of slavery. Many of the societies we include here have had slaves. But there is an obvious difference between an open slavery of the Roman type (what Paul Veyne, 2001 calls a "vertical slavery") where slaves may be distributed along the entire income distribution and where manumission is frequent and a closed or "horizontal" slavery, as in the ante-bellum United States where being a slave implied not only the lowest social status but also the lowest income.

Advances in numerical information or coding of pre-modern political regimes seem to me especially important because political factors (including wars and civil strife) are likely to have played a disproportionate influence over inequalities in the past. The fact that the only political variable that we have in this dataset, colony, plays an important role, both in explaining the level of inequality and the extent to which the elite was able to push inequality close to its maximum, calls for greater attention to political variables.

Our conclusion is twofold. First, the past range of observed inequalities is not very different from what exists today; but the inequality extraction ratios tended to go down with development, that is inequality did not rise as much as it theoretically could (with the possible exception of England during the Industrial Revolution). Second, being a colony and having high density of population are shown to be associated with respectively high and low inequality extraction ratio. The role of colonies is hardly unexpected. Population density presents a much more intriguing proposition and further work should help to reinforce the hypothesis or reject it. If the former, we should to try to tease out whether the causality went from high population density to low extraction rates or from low extraction rates to high population density. Choosing one or the other has obvious implications for the Malthusian view of pre-modern societies.

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ANNEX 1. Sources and description of new social tables

This Annex gives the essential information on new social tables used in this paper (the ones denoted by asterisks in Table 1). Other social tables were already used in Milanovic, Lindert and Williamson (2011) and their detailed description is provided there while full listing of social classes in each table and other information is given in Milanovic, Lindert and Williamson (2007, Appendix 1). The tables are also available on the Global Price and Income History Group website http://gpih.ucdavis.edu/.

Athens 330 BC. All data come from a social table (34 classes) created by Josiah Ober and personally communicated to me. Ober' analysis is based on his book *Rise and Fall of Classical Athens*, Princeton University Press, 2016, and a similar assessment of inequality and social composition for the "core Hellas" (that is, an area larger than Athens but not coterminous with the Athenian empire) is presented there on pages 89-100.

Cracow voivodship 1578. The social table is created in a paper by Mikolaj Malinowski and Jan Luiten van Zanden "National income and its distribution in pre-industrial Poland in a global perspective", European Historical Economics Society Working paper No. 76, May 2015, p.17. It includes 13 social groups from beggars to the King and his retinue.

United States 1774, 1850, 1860, 1870. The first detailed social tables for the 13 colonies and then for the United States were created recently by Peter Lindert and Jeffrey Williamson. The tables provide the basis for their book *Unequal Gains: American growth and inequality since 1700*, Princeton University Press, 2016, and are discussed on Appendices A to G (pp. 262-348). The tables, with their many assumptions, were kindly provided by Peter Lindert. The tables consist of 74 social classes in 1774 and six income classes (the top 1%, top 5%, top 10%, top 20%, next 40% and bottom 40%) with their income shares and mean incomes for 1850, 1860 and 1870. These last three tables therefore display cumulative income distributions. Lindert and Williamson also give similar distributions for ten geographical areas of the United States. Slaves are included throughout although Lindert and Williamson also show the distributions for free households only.

Chile 1860 and 1900. The data come from Javier Rodriguez Weber doctoral dissertation (Rodriguez Weber 2014). The data pertain to the benchmark social tables created for respectively 1860-73 and 1900-05 with 49 social groups each and then converted (compressed) by Rodriguez

Weber into ten deciles of income distribution with their income levels and shares. The tables were kindly provided by Javier Rodriguez Weber.

European Russia 1904. The table is created in a paper by Peter Lindert and Steven Nafziger, "Russian inequality on the eve of the revolution", March 13, 2011, mimeo, available at http://web.williams.edu/Economics/wp/Nafziger_Lindert_Inequality_Sept2013.pdf. The version used here is the one kindly supplied by Peter Lindert and termed by Lindert as "the preferred version". It consists of 19 social groups and is in part based on the Russian population census of 1897.

Tonkin and Cochinchina 1929. The social tables come from Merette (2013). Chapter III (p.9 ff) estimates the social tables for the two parts of Vietnam. There are nine social groups for Tonkin and eight for Cochinchina. Foreign colonizers are included.