Chapter 7.

Inequality and social mobility in the Era of the Industrial Revolution

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1. Introduction

This chapter examines the effects of the Industrial Revolution on social mobility rates and inequality, as England experienced the onset of modern economic growth. It has previously been impossible to measure social mobility rates before the end of the Industrial Revolution, because population censuses showing family relationships only become available in 1851. However, we show how, using information on surname distributions, intergenerational social mobility rates back to 1700 can be calculated. These show that social mobility rates have always been low in England and were surprisingly unaffected by the Industrial Revolution. Modern growth did not speed up the process of intergenerational mobility. In addition we show that the Industrial Revolution era was probably one of declining inequality in England. While we do not have information on the individual distribution of income and wealth, we can show that the share of wages in national income increased in Industrial Revolution England. Since wages are distributed in all societies much more equally than income from property, this would have been a force for greater income equality within industrial society.

2. Social Mobility

Was the Industrial Revolution associated with a period of enhanced social mobility? And how did social mobility rates then compare with those of modern Britain? We might expect that the Industrial Revolution would have disrupted the old social classes and created a period of enhanced mobility, compared to what came before, both upwards and downwards. Change and disruption would favour mobility. Stasis and continuity would embed immobility.

Change there certainly was in Britain after 1760. There was the creation of new industries and new occupations. The old landed aristocracy began to be replaced by a new industrial, commercial and technical class, affording opportunities for mobility to those who had heretofore lived as agricultural labourers in semi-feudal dependence. At

the same time large numbers of relatively prosperous handicraft producers were displaced by the arrival of factory production. The hand-loom weavers, often owners of their looms and cottages, were displaced by low paid factory weavers. There was a large scale movement of the population out of agriculture and the countryside and into growing urban centers. The previously poor and economically underdeveloped north of England, together with Scotland, rose to become centers of wealth and power. There was an influx of poor immigrants from Ireland into the British industrial cities.

However, contemporaries had conflicted views of social mobility in Industrializing England. The so-called *Condition-of-England* novels of the Victorian Era, such as Benjamin Disraeli's *Sybil (*1845*),* Charles Dickens' *Hard Times (*1854*)*, and Elizabeth Gaskell's *North and South* (1855), for example, offer clashing perspectives on social mobility within the same works. These works feature self-made industrialists, men made upwardly mobile by the new economic possibilities. But they also feature a new class of industrial workers seemingly locked in place, facing a growing divide between themselves and the industrial aristocracy. What was the aggregate effect of these changes on social mobility? Did mobility increase as a result of the Industrial Revolution? And how do mobility rates in 1700-1870 compare with those of today?

The standard method of estimating intergenerational social mobility in England in the nineteenth century has been to compare the occupations of grooms versus their fathers in marriage registers; those occupations are systematically recorded only from 1837. Studies of these registers suggest that Industrial Revolution England remained a socially immobile society. Miles, for example, studying thousands of register entries for England, concluded that fewer than 40% of grooms in mid-nineteenth century England had an occupational class different from that of their father. England was "in terms of its inhabitants' relative life chances, a profoundly unequal society" (Miles 1999:177).

Table 7.1 about here%

Table 7.2 about here%

Table 7.1 shows social mobility rates at the end of the Industrial Revolution as estimated in this way from marriages in 1859-1874. Occupations are divided into five classes: I, Professional (Lawyer, Doctor, Clergyman, etc.), II, Intermediate (Teacher, Factory Manager, Clerk, etc.), III Skilled (Carpenter, Mason, Plumber, etc.), IV, Semi-Skilled (Cook, gardener, etc.), and V, Unskilled (Labourer, Porter etc.). The table shows for fathers of each occupational class how their sons were distributed in %ages across each occupational class.

In table 7.1 the columns show the %age of sons from fathers of each occupational class who are in the given classes. For Professional fathers, for example, 54% of their sons at marriage were also in Professional Occupations, and only 5% had fallen into the Unskilled category. For Skilled fathers fully 75% of their sons had equivalent status to their fathers at the time of their marriage. This is why Miles concluded that in nineteenth century England more than 60% of sons had the same occupational status as their fathers. Most of the sons are located in the cells along the diagonal.

Long has criticized estimates of mobility from marriage records as comparing fathers and sons at different points in the life course. He argues that many sons will change their occupational status over time, so increasing measured mobility (Long 2013). Comparing modern occupational mobility rates, measured for fathers and sons at similar ages, against such rates for nineteenth century England, measured for fathers at 55 against sons at 25, will thus bias the estimates against the Industrial Revolution era. It will seem that mobility then was slower.

Long has sought to improve on these measures by measuring occupational mobility, linking fathers from the 1851 census with their sons, who were aged 0-19 in 1851, a generation later in the 1881 census. Table 7.2 shows his estimates of occupational mobility for Britain; it implies significantly more mobility than the estimates from marriage records. The occupations of the sons are more dispersed compared to those of the fathers. However, the many cells in these tables make it hard to summarize just how different these mobility estimates are.

One elegant way to summarize these complex mobility matrices with one number is to assign a numerical value to each status, y (which could be based, for example, on the average earnings of people in each occupational class) and then calculate the b in the expression

$$y_{t+1} = a + by_t + e_t$$

which best describes the observed pattern, where y_t is the status index of the father, y_{t+1} the status of the son, and e_t an error term. The single number b then represents a summary measure of social mobility rates. b is thus a summary of the information in tables 7.1 and 7.2. It shows the strength of persistence of status. If b is 0, then the status of the father has no influence on the status of the son. If b is 1 then the status of the son is that of the father, with just some random noise component.

Figure 7.1 shows, with simulations, the case where we have extreme social mobility, and b=0, and the case of no mobility where b=1. With complete mobility, there is no prediction of son's status from that of their father's. The status outcomes for the sons looks like just a random variable. With b=1, social status is completely predictable from fathers, and there appears to be no randomness in the outcomes for sons.

Figure 7.1 about here

Long calculates b by assigning to each occupation a status value that equals the average earnings in that occupational category. Figure 7.2 portrays the information in table 7.2 summarized in this fashion. On the horizontal axis is an index of the occupational status of the fathers. This is measured as the average earnings of other occupational statuses, such as Unskilled, relative to the earnings in Professional Occupations in 1851. As can be seen the Unskilled then earned less than 20% of the earnings of Professionals. On the vertical axis is shown the average implied earnings of their sons measured in this same way. The slope of this line indicates what b was for the generations 1851-81. Long estimates this as

b = 0.36. The figure also shows the data for the mobility estimates from marriage certificates. Here the implied b is much higher at 0.64.

Figure 7.2 about here

Table 7.3 about here

The b estimated by Long implies that Britain, at the end of the Industrial Revolution, had a relatively high degree of social mobility. One way to see this is to consider that when we measure social mobility in this way, b^2 is the share of variation in social status that is predictable at birth. As can be seen in figure 7.1, when b=1, all the variation among sons is predictable at birth, when b=0, none of it is predictable. Long's b of 0.36 for 1851-1881 implies that by the end of the Industrial Revolution era, only 13% of occupational status variation came from inheritance. In contrast the marriage register data implies that 41% of the variation in status is explained by inheritance.

How does this Victorian occupational mobility compare to modern social mobility rates in Britain? Table 7.3 shows the equivalent occupational mobility table for modern Britain in 1972, based on the occupations of sons aged 30-49 in that year compared to their fathers' occupations when the sons were 14. As before each column shows the distribution, in %ages, of the sons of fathers of a given occupational class.

Again it is hard to see in this complex set of cells whether occupational mobility was much greater than in Long's equivalent table for 1851-81. But we can also portray this data in figure 7.2 as a curve relating the average status of fathers to that of sons. Because occupational wage differentials are more compressed in modern England, the social class of fathers is more compressed. But the slope of the line connecting fathers and sons seems similar to that for 1851-81. And indeed Long estimates, from Goldthorpe's data, that the b for 1972 is 0.32. This implies that modern Britain had modestly greater occupational mobility rates than late

Industrial Revolution Britain. But these studies suggest that both are actually mobile societies, with lots of significant transitions in status between fathers and sons.

However, there seems little prospect of extending Long's type of analysis of occupational mobility any earlier than the census of 1841. Before that, linkage of the status of specific fathers and sons on a systematic basis on a large scale has not yet been achieved.

Some authors have sought to measure mobility rates by looking at linkages between the occupations of fathers and sons in partial sources. Sanderson, for example, used the records of the Charity School in Lancaster in 1770-1816, which gives the occupation of the fathers of the boys attending as well as the occupational destination of the boys, to measure upward mobility rates in the early Industrial Revolution. He finds that of 38 sons whose fathers were labourers, only 2 ended up in similarly unskilled occupations (Sanderson 1972:99). There is substantial upward mobility. But this is a selective group of sons of labourers, those who ended up at school. Naturally they display substantial upward mobility. They cannot tell us about general mobility rates.

A more promising source is that employed by Humphries: 617 working class autobiographies of the years up to 1878, which portray the careers of members of the working class in this era (Humphries 2010). This dataset also offers measures of the linkage of parent and child occupational status earlier in the Industrial Revolution. Humphries' data is not organized in a way so as directly to measure intergenerational social mobility. But it does suggest that these working class autobiographers overwhelmingly had fathers with lower class origins, all through the Industrial Revolution years. This is what explains the frequency of child labour by the writers, the lack of formal education, and the accounts of childhood hunger so frequent in these autobiographies. If Long's data in table 7.3 is correct, then about 20% of working class males would have middle or upper class fathers in Industrial Revolution England. So Humphries' autobiographers seemingly show much less social mobility than would be expected from the Long study. Social mobility may indeed have been low in Industrial Revolution England.

However, even though Humphries' shows that the working class biographies are representative of the occupational structure of Industrial Revolution England, there will be questions about whether the autobiographers are representative in terms of social mobility. Could it be that in the age of Samuel Smiles' *Self Help* (1859), those who survived adversity, or even triumphed over adversity, would be more inclined to record their histories than those who, despite the privileges of birth, fell into the working class through illness, bad luck, alcoholism, sloth, mental incapacity, or bankruptcy?

There is another way, however, of measuring social mobility, which exploits the fact that surnames are inherited, which can be applied to England all the way back to 1700. If social mobility is rapid, then surnames which in the current period have a high or low average social status, should quickly regress towards mean status. Surnames are inherited by sons, and if sons of fathers of high and low status are regressing quickly towards average status, so should the surnames they bear move quickly to average status. The speed of the loss of information content about status in surnames can be translated into an implied rate of social mobility, the b above.

To carry out this calculation of b from surnames all we need to observe is the share of a surname in the general population in each generation, and their share in an elite group within the population (Clark and Cummins, 2012). From this we can calculate for each surname its *relative representation* among the elite: its share among the elite divided by its share in the general population. For common surnames, such as *Williams, Green or Clark*, their *relative representation* will always be close to 1 in England by 1700. They have the same frequency in elites as in the general population, and people at all statuses in the society hold the surname. However, some rare surnames, such as *Pepys*, *Boscawen,* or *Champion de Crespigny* will be found disproportionately among elites in 1700. Their relative share in elites can be 10 or 20 times as great as in the general population. The decline of that *relative representation* in each generation towards 1 shows the rate of social mobility. The slower is the rate of decline, the less is social mobility, and the lower the implied value of b.

Figure 7.3 illustrates this process. Suppose in generation 0 a set of surnames is 10 times as common in the top 5% of the status distribution as in the population as a whole. Their implied decline in relative representation across each generation is shown for different values of b: 0.25, 0.5, and 0.75. As can be seen if b is 0.25, which would be similar to some values estimated for occupational status persistence in England both in the nineteenth and twentieth centuries, then within 3 generations the high status surnames would have declined to average status. While if b is 0.75, then even after 5 generations these surnames would still be overrepresented among elites.[1]

Figure 7.3 about here

One elite group we observe all the way from 1700 to 1858, for example, are the people whose estates were probated in the highest probate court in the land, the Prerogatory Court of the Archbishop of Canterbury (PCC). This was the court where the elites of English society, by wealth and occupation, had their wills proved at death. The share of men dying in England with wills proved in this court was fairly stable over these years, averaging 5.3% of all adult male deaths. Thus we can take those testators proved in this court as representing the top 5.3% of wealth holding in English society.[2] In the north of the country the estates of high status individuals might instead be probated in the Prerogatory Court of the Archbishop of York. But in 1809 when we can first observe the values of the estates proved in each court, the estates proved in the York court were significantly less substantial on average than those of the Canterbury Court.

By 1700 about a quarter of the wills probated in the PCC were from women, typically from women who were widows or spinsters. So while

[1] The assumptions required for this calculation are just that status is normally distributed with the same variance in the general population and the elite surname subgroup.

[2]

this measure will mainly show the inheritance of wealth by men, the inclusion of these women means that it is a bit broader, and is about the general inheritance of wealth within families.

Using the PCC we can form sets of rare surnames that showed up in these probates 1680-1709, 1710-39, 1740-69, 1770-1799, corresponding to generations of 30 years.[3] We can tell which surnames appearing in the PCC are rare in each period from their frequency in the parish records of marriages. (Large numbers of these records have been transcribed and are available on the Family Search website, https://familysearch.org/.) We can then examine what the relative representation of these same surnames was in subsequent generations, and how quickly that representation was returning to 1.

Table 7.4 and Figure 7.4 show the basic data. They show the relative representation of these various groups of rare surnames across adjacent generations. They also show for comparison the relative representation of the surnames *Clark(e)* in these records. As a common surname *Clark(e)* shows up in the PCC records just slightly more than its proportion among marriage records all through these years. But the rare surnames all show up in the PCC records as heavily overrepresented in the period in which they are identified.

The 1680-1709 rare surnames, for example, had a relative representation in 1710-39 of 4.2. More than 4 times as many people with these rare surnames were probated in the Canterbury Courts as were people with the common surnames of England. These rare surnames became more average by generation, as again Table 7.4 and figure 7.4 show. It is immediately clear from figure 7.4 that the rate of decline of the relative representation of these surnames does not increase in the Industrial Revolution era. There is no sign that the Industrial Revolution increased rates of social mobility, or led to a rapid decline in the position of old elites from the pre-industrial era.

The picture of these rare surnames becoming more average in their characteristics may create the mistaken impression of a general decline in

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wealth inequality 1700-1860. But while the process of social mobility always pulls surnames of unusually high status towards the mean, at the same time, other rare surnames are moving away from the mean and so maintaining the inequality in wealth. This counterbalancing process will be seen in operation in figure 7.5 below. Even with universal regression to the mean, random fluctuations in wealth ensure that new families ascend to the top and bottom of the wealth distribution in each generation.

Table 7.5 summarizes the b implied for each period and each rare surname sample from the rate at which the surnames were regressing towards average representation among the PCC elite. In terms of the three questions posed at the beginning of this chapter the results are quite surprising. First the average b for the entire Industrial

Table 7.4 about here

Figure 7.4 about here

Table 7.5 about here

Revolution period is 0.82, much higher than the estimates of b found by Long from the 1851 and 1881 censuses. The high status surnames of 1710-39, as can be seen in figure 7.4, are still relatively high status in 1830-59, four generations later. This implies very slow rates of social mobility.

Second there is no sign of any increase in social mobility rates as the Industrial Revolution proceeds. The average b for those dying in 1830-58, who would have lived through the heart of the Industrial Revolution, is 0.86, higher than for the period as a whole. For the elites of 1710-39 or 1740-69 the Industrial Revolution had little impact on the rate of downwards social mobility. They are not suddenly being displaced from their position in society by the *nouveau riche* of the cotton mills, coal mines, steel mills, and railways. This confirms the finding of Rubinstein,

looking at the value of bequests 1858 and later, that most of those dying wealthy in England circa 1870 still had occupations and wealth associated with the old economy of land, finance, law, and trade (Rubinstein 1981). The impression noted above in the working class autobiographies of a strong persistence of status is confirmed.

If we compare these social mobility rates with those of Goldthorpe above for modern Britain, it would seem that Industrial Revolution England was a world of much slower social mobility than modern Britain. There must have been significant increases in rates of social mobility in England after 1858. However, suppose we

Table 7.6 about here

construct an equivalent measure of social mobility, using rare surnames and the proportions of people wealthy enough to be probated in modern England. What would such modern mobility rates look like compared to Industrial Revolution England?

Clark and Cummins (2012) includes just this type of exercise. Two rare surname groups were formed based on wealth at death 1858-1887. The first was the rich, surnames in the top 5% of the wealth distribution. This includes well known surnames such as *Rothschild*, but most of these names are obscure and unremarkable, such as *Benthall* and *Bigge*. The second was the prosperous, surnames in the top 5-15% of the wealth distribution. Since they are rare, again most of these surnames would not mean anything to the average person: *Goodford, Goodhart, and Grazebrook*, for example. Clark and Cummins look at the relative representation of these surnames among those with assets at death across four subsequent generations, up to deaths in 2011. Table 7.6 shows the b estimated for each of these generations. There are some fluctuations, but the overall implied b, the rate of persistence of these surnames among the wealthy, at 0.72 is close to that estimated for Industrial Revolution England. It is certainly far higher than the rates for occupational persistence of 0.32 estimated by Goldthorpe above. Wealth

persistence was and is always very high. Mobility on this measure improved little in England over 300 years.

This raises two further questions. The first is: could downwards mobility, dropping out of the propertied classes of Industrial Revolution England, be much slower than upwards mobility? The second is: is wealth mobility just unusually slow compared to educational or occupational mobility in any society, so that other types of mobility could have been much greater?

The answer to this first question of upwards mobility rates is, in part, a matter of logic. Since the wealth elite here is a pretty constant 5% share of the society, if the existing members are leaving this elite at a low rate, then by definition there cannot be a very fast rate of entry from the other 95% of the society. So low downwards mobility has to imply low upwards mobility.

But we can use the same rare surname data to show that this logic is backed by empirical evidence in the Industrial Revolution era. For as well as following what happens to those with rare surnames over-represented among those probated in the Canterbury Court in 1680-1709 over subsequent generations, we can also follow those over-represented in 1830-58 over previous generations from 1680-1709 to 1800-29. If upwards social mobility rates are the same as downwards, then the slope of the curves showing relative representation against generation should be the same upwards as they are downwards.

Figure 7.5 shows this pattern for rare surname wealth elites identified for 1830-58, 1800-29, 1770-99, and 1740-69. As can be seen the wealthy rare surnames of 1830-58 become more average the further back in time we go. They rise across the generations in their relative representation, though this process is again very slow. The elite surname group of 1830-58 which was 6 times as common among probates in the Canterbury Court than in the general population, was already 2 times as common in the Court than in the general population for deaths 1680-1709.

Table 7.6 summarizes the implied bs that these rates of increase in relative representation imply. The overall average estimate of b for

upward mobility is 0.77, close to the 0.82 calculated for downwards mobility. We take this as an indication that, allowing for the random fluctuations inherent in any measure that involves sampling, rates of upwards and downwards mobility were indeed similar.

Figure 7.5 also shows that there is no sign again that the Industrial Revolution period was associated with any gains in the rate of social mobility. The rise of new elite surnames was not any more rapid in the years 1800-1858 than in previous generations.

Figure 7.5 about here

Table 7.7 about here

We see above very slow rates of regression to the mean for wealth in England, both in the Industrial Revolution and in more modern times. But is wealth peculiarly immobile? It may be objected that of various components of social status – education, occupation, earnings, health, and wealth – wealth since it can be directly inherited will be the slowest to regress to the mean. However, we can perform an exactly analogous exercise with another elite group in England that spans pre-industrial society, the Industrial Revolution, and the modern era. That is students at Oxford and Cambridge. Throughout these years these were the two most prestigious English universities, indeed before 1832 they were the only English universities In the years 1500-2012 on average they admitted only about 0.7% of each cohort of the eligible population.

In this case we employ two sets of elite rare surnames. First, rare surnames associated with high average wealth at death in 1858-1887, as discussed above. Second, rare surnames – on the criterion that 40 or fewer people were recorded with the surname in the 1881 census - where someone with the surname matriculated at Oxford or Cambridge, 1800-29. For these surnames we calculate the *relative representation* at the universities for the succeeding generations, 1830-59,…2010-2. We can

also calculate their *relative representation* in the preceding generations, going all the way back to 1530-59. Figure 7.6 shows these results.

The patterns in figure 7.6 are very striking. Surnames associated with the rich are always more over-represented at Oxford and Cambridge than those associated with people who happened to attend the universities 1800-29, in all subsequent or prior generations. In 1830-59, for example, the rich surnames were 54 times as frequent in Oxford and Cambridge as in the general population, and the earlier Oxbridge surnames 34 times as frequent. But the rates of decline of the over-representation of these surnames at the universities is similarly slow. It is so slow that even now in 2010-2, just knowing that a rare surname was on average wealthy at death in 1858-87 tells us that it will be 6 times more likely to show up on the Oxbridge rolls than the average English surname. Just knowing that a rare surname had at least one enrollee at Oxbridge in 1800-29 allows us to predict that it will still be 3 times as likely to appear at the universities now as the average surname.

The implied b measure of persistence for the rich surnames in 1830-2012 is 0.82, while for the 1800-29 universities cohort it is 0.77. The implied bs for persistence implied by the slow rise of these surnames from close to average status to high status

Figure 7.6 about here

in the period 1530-1800 are very similar: 0.83 for the rich surnames, 0.77 for the 1800-29 Oxbridge cohort. But what is amazing is that social mobility rates just do not seem to vary much across different epochs in English history. They are the same for the pre-industrial period, for the Industrial Revolution period, and for the modern period. The persistence rates are also just as high for education as for wealth.

Note that we assume here that the surnames themselves are not sources of social status. That is, that people do not get treated differently because they possess the rare surnames held by previous generations of the

wealthy or the highly educated. The obscurity of most of these surnames makes this seem to us a reasonable supposition. Also if surnames themselves matter to status, then the rate of rise of surnames from average status to high status would be slower than the rate of decline once the surname has gained a reputation. Figure 7.6 does not show this, but instead an absolute symmetry of rise and decline.

Thus surnames show that whether we look at wealth or education, both upwards and downwards social mobility is slow both in Industrial Revolution England and in modern England. The Industrial Revolution did not move us from a world of low mobility to one of rapid movement up and down the social ladder. Instead it had surprisingly little impact on the underlying slow rates of social mobility in the society.

This creates a puzzle. Why do these measures, whether of wealth or education, show much slower mobility than standard measures of earnings, education and occupation? Why does Long find much more evidence of social mobility in Victorian England than the surname distributions would suggest?

The answer developed in Clark and Cummins (2012) is the following: conventional estimates of social mobility look at the mobility of particular aspects of social status: wealth, earnings, occupation, education, longevity. They correctly answer such questions, as does Long for 1851-1881, as "How strongly is the occupational status of sons inherited from that of fathers?" The answer here is that there is always substantial mobility within particular aspects of social status.

However, each of these aspects of social status can be thought of deriving from a deeper more general social status or competence of families. The observed aspect of status y derives from a deeper fundamental status x, along with some random element e in the form

$$y_t = x_t + e_t$$

where t represents the generation. The random component linking underlying status to the various observed aspects exists for two reasons. First there is an element of luck in the status attained by individuals, given their underlying aptitudes. People happen to choose a successful field to

work in, or firm to work for. They just succeed in being admitted to Oxbridge, as opposed to just failing. But, second, people make tradeoffs between income, education, occupational prestige, and other aspects of status. They choose to be philosophy professors as opposed to finance executives.

The existence of the random component, e, means that the observed persistence of any aspect of status y will be lower across any two generations than the true persistence of the underlying status of families. Looking just at aspects of status will give a false impression of how fast families are moving up and down the social ladder. More comprehensive measures of the status of families, as in Humphries (2010), will show much more persistence of status between generations than measures such as Long (2013) which cover mobility on just particular aspects of status such as occupations.

The conventional measures of regression to the mean are correct in the question that they answer. If a father, for example, has characteristic y, what is the predicted measure on this characteristic for his son unconditional on other information? But if we want to predict inheritance of characteristics over multiple generations the conventional measures will fail. If we want to predict even in one generation how a broader measure of family status – a measure that averages earnings, wealth, education and occupation - will be inherited, the conventional estimates will similarly fail. The conventional estimates will always overestimate mobility in the long run, and for broader measures of social status.

It turns out, as Clark and Cummins (2012) shows, that by grouping people by surnames the b that is estimated is the b for the underlying persistence of status. This, as we see, is always significantly higher than the measure would be over one aspect of observed status. And the message here is that this underlying persistence rate was high in pre-industrial England, high during the Industrial Revolution, and is just as high even now.

3. Inequality

Remarkably, 150 years after the end of the Industrial Revolution, there is still debate over who were the beneficiaries of the economic growth of that era. From the nineteenth century onwards, a strong pessimist faction has believed that the gains in living conditions for the working class in this era were meagre, and much less than the gains to landlords, capitalists, and the middle classes. Karl Marx and Frederick Engels, in the Communist Manifesto of 1848, famously denounced the Industrial Revolution under capitalism as causing both the immiserization of workers ("*In proportion, therefore, as the repulsiveness of the work increases, the wage decreases..")* and the increasing polarization of society into classes of the propertied and the dispossessed. But even contemporaries who were less extreme in their political outlooks thought of Industrial Revolution Britain as a society of growing inequality. Thus Mill, for example, noted in his *Principles of Political Economy*

> *Hitherto it is questionable if all the mechanical inventions yet made have lightened the day's toil of any human being. They have enabled a greater proportion to live the same life of drudgery and imprisonment and an increased number of manufacturers and others to make fortunes (*John Stuart Mill, *Principles of Political Economy*, 1848, Bk.4, Ch.6 (same text in 1871 edition)).

The pessimism about working class living conditions has been recently echoed in the work of Mokyr (1988), Feinstein (1998b) and Allen (2009). Allen, in particular, argues that the rate of growth of real wages in the Industrial Revolution era was substantially below the growth rate of output, so that the share of profits in national income rose sharply in these years.

An extensive investigation of heights of soldiers and criminals in the Industrial Revolution era has similarly found little sign of the substantial gains in average height that would be expected with improved living conditions, though urbanization and its deleterious effects on heights is a confounding factor here. Cinnirella (2008), in the latest round of these

estimates, indeed finds that average heights, controlling for location, declined for birth cohorts from 1800 to 1869. He concludes:

> *"*Whatever the rise in the wage rate during this period, we provide substantive evidence that it was not enough to maintain a given nutritional status for children and not enough to counterbalance the negative effects linked to urbanization." (2008:351*).*

In contrast a faction of optimists, including Lindert, Williamson, and Clark have argued that working class living conditions improved substantially in Industrial Revolution England (Lindert and Williamson 1983, 1985; Clark, 2001, 2005, 2007). Clark, in particular, argues that the share of wages in national income rose in the Industrial Revolution period, and that unskilled wages rose relative to skilled, so that unskilled workers were the major beneficiaries of modern growth (Clark 2007, 2010).

Inequality at the top of the income and wealth distribution has received significantly less attention than the condition of the workers, because the data demands are so much greater in studying this topic for earlier populations. The main source in all periods are the values of estates at death. The most significant work in this area is that of Lindert, who estimated for benchmark years (1700, 1740, 1810, and 1875) the distribution of wealth in England from probate and other records. Table 7.8 summarizes his findings. Lindert concludes that the share of wealth held by the top 1% in England rose from 39-44% in 1700-40, to 61% by 1875, implying a significant rise in inequality at the very top of the wealth distribution. However, when Lindert looks at the top 10% of the wealth distribution

Table 7.8 about here

Table 7.9 about here

he finds instead that wealth inequality shows little sign of change. The top 10% had 81-86% of wealth in 1700-40, and still 84% of wealth in 1875.

So the judgement on whether wealth inequality increased or decreased with the Industrial Revolution is a bit ambiguous. It clearly did not decline, but the share of the middle and upper classes in all wealth holding in the economy probably did not increase. Wealth inequality in both 1700 and 1875, as estimated by Lindert, is however, much greater than in the modern UK, even in the past decade when there has been concern about widening inequality. Thus, from data collected on Estate Taxes, it is estimated that in the UK in 2005 the top 10% of wealth owners possessed only 54% of all wealth. In 2005, the share of the top 1% was just 21%.(HMRC 2007:Table 13.4).

The social effects of wealth inequality also depend, however, on the share of labour income in total income; a crucial determinant of income inequality in any society is that share of labour income. The larger is the share of labour income, the lower will inequality tend to be, because inequality in possession of non-human wealth is always much greater than inequality in wage income. Table 7.9 shows this difference in the distribution of wages versus wealth for the UK in 2003-4.

Even if there was no increase in the share of wealth held by the top 10% over the Industrial Revolution era, if that wealth – land, houses and buildings, roads, mines, canals, railways and working capital – generated a larger share of income by 1860 then, even without an increase in wealth inequality, the income inequality of the society would increase. Lindert also gives data on total wealth per person in England, shown in table 7.8. How did net worth move compared to the likely wage income in the economy per person? The second to last row of table 7.8 shows an estimate of average male day wages in England across these years. Finally the last row shows the ratio of these two, with 1740 set at 100. Net

worth rose by 15% less than average day wages 1740-1875. Thus in the Lindert data, asset income was probably becoming a smaller share of all income in the economy as the Industrial Revolution proceeded. The stock of assets was rising more slowly than payments to workers. The Lindert data thus suggests that workers, as a class, made modestly greater gains in the Industrial Revolution era than did capitalists and land-owners.

The work of Feinstein confirms the impression that wealth was, if anything, declining relative to wage payments in Industrial Revolution England. Figure 7.7 shows the net wealth per person in Britain, 1770-1860, relative to the average earnings of full time workers, both as estimated by Feinstein. Net wealth per person fell relative to the wage rate by a full 20%, which is consistent with the Lindert data. Again, unless returns to property were increasing in Industrial Revolution England, the rising importance of wage income would have been an equalizing force in the Industrial Revolution era.

Allen (2009), however, argues that returns to capital did increase greatly in the Industrial Revolution period. What drives his conclusion is a comparison of the growth rate of real wages versus the growth rate of output per person in England in 1770-1870. The real wage estimated by Charles Feinstein in 1770-1870 rises much less than the level of output per person estimated by Crafts and Harley (Feinstein 1998a; Crafts and Harley 1992). The inference is that, if output was rising faster than wages, someone must have been receiving the benefits of that output, and given that farmland rents declined as a share of output, it must have been the capitalists. Marx and Engels were right when they wrote about the increased polarization of the economy in the *Communist Manifesto* of 1848.

The ratio of the real wage to real output per person indicates the movement of the share of labour in national income. Figure 7.8 shows the shares of labour, capital, and land in national income estimated by Allen (2009) in this way. In this picture the share of labour in total income falls from around 60% in 1770 to less than 47% by the 1870. Over the same

interval the share of capital rises from 19% to 47%. Capital owners appear as the big winners of the Industrial Revolution period compared to both labourers and land owners.

As we saw, the net wealth per person relative to wages was declining in 1770-1870 rather than increasing. So the increase in the estimated share of capital in national income implies, in turn, that the profit rates on capital must have sharply risen in 1770-1870. Taking capital stocks as estimated by Feinstein, Allen estimates a rise in the gross return on capital from circa 10% 1770-90 to 24% by 1870. This rise is shown in figure 7.9.

Figure 7.7 about here

Figure 7.8 about here
Figure 7.9 about here

But this raises a host of puzzles. The first of these is: where in the economy did these extraordinary returns on capital appear? The observed rate of return on many assets was very low in Industrial Revolution Britain. The gross rate of return on traditional assets such as farmland and housing remained low throughout the Industrial Revolution era. The returns on holding farmland indeed had fallen to 3% or less by 1870. (Clark 1998, 2002.

It might be argued that high returns to capital would show up only where innovation was more important, in the technologically transformed sectors of the Industrial Revolution. However, railways, which Feinstein reports contained one sixth of all fixed capital in Britain by 1860, 35 years after their introduction, also typically generated low returns to investors (Feinstein, 1988:452). Thus in the 1860s the average return on investments in railways in the UK had already fallen to only 3.8%, and by the 1870s that had dropped to 3.2% (Arnold and McCartney 2005: table 2; Davis and Huttenback 1986: table 3.8).

Returns were low because, while initial railway investments often proved profitable, even relatively modest initial profits induced a flood of new entrants into the industry. By 1870 there were more than 12,000 miles of railway line in England alone. The ramification of the railway network in 45 years into a dense net of competing lines created substantial competition on all routes. Thus while, for example, the Great Western controlled the direct line from London to Manchester, freight and passengers could cross over from Manchester through other companies to link up with the East Coast route to London. This kept rates low and profits slim.

The engineering innovators who created the modern railway system also benefitted only modestly. George Stephenson, for example, played an enormous role in the development of the modern railway and was a pioneer in the design of locomotives and steel rails and in the engineering of lines. But he died in 1848 only modestly wealthy. He designed many innovative locomotives, but there were always a host of competing locomotive builders. His discovery through experiments at Killingworth Colliery that even modest gradients absorbed much of the power of steam locomotives was crucial to the design and engineering of the new railway lines, such as the *Liverpool and Manchester.* But such knowledge was not patentable innovation and was available to all his competitors.

In coal mining, another great Industrial Revolution industry, investors again found slim returns. Coal output rose twenty fold between the 1700s and the 1860s in England. Coal heated homes, made ore into iron, brewed beer, and powered railway locomotives. Yet there were no equivalents of the great fortunes made from oil in America's late nineteenth century industrialization. Good coal seams abounded, so the rents for coal lands were always an extremely modest share of the price of coal. And even as pits pushed ever deeper in search of rich coal seams, the patentable innovation in the industry was modest, so coal owners competed with each other on an equivalent basis. Competition between such pits producing a homogenous output kept prices of coal low. Consumers, not capitalists, were the great beneficiaries. The returns on the capital embodied in sinking pits, in underground tramways, and in winding gear all remained limited (Clark and Jacks 2007).

Even in the cotton textile industry, the heart of the Industrial Revolution, returns on capital remained modest. Of the known textile innovators, only a handful, such as Arkwright and the Peels, became wealthy. Thus of the 379 people dying in the 1860s in Britain who left estates of more than £0.5 million, only 17, 4%, were in textiles.[4] (Rubinstein, 1981:79-92) .Yet the textile industry produced ten % of national output in the early nineteenth century and a substantial fraction of

[4]

all growth in England 1760-1860 can be attributed to the efficiency gains of the textile industry. Cotton textiles was characterized throughout the Industrial Revolution by intense competition between thousands of modest sized individual mills. This competition, at least in the early Industrial Revolution, kept profits modest, in the order of 10% even for the most innovative firms (Harley 1998).

If area after area of Industrial Revolution industry and enterprise had extremely low returns on capital, for capital as a whole to have earned nearly a nearly 25% rate of return by 1870 would require the remaining sectors – shipping, retailing, brewing, gasworks – to have earned extraordinary returns, many times even this 25%. These supernormal returns should have produced a legion of wealthy entrepreneurs. Yet Rubinstein's survey of testators dying leaving £0.5 or more in personalty in the later nineteenth century finds that the great majority of such estates still came from those investing in the traditional sectors of land, banking or law.

So what has gone wrong with Allen's reasoning that leads to this implausible account of fantastic gains for Industrial Revolution capital owners, and ever widening income inequality? One problem is conceptual. Allen compares the rise of the real purchasing power of wages with the rise in the real value of output in the economy. But this is not the right comparison. To see what happens to distribution, what needs to be compared is the real purchasing power of wages with the real purchasing power of output. In Industrial Revolution England there was a significant difference between the gains in output and the gains in purchasing power. As population increased, England switched from being largely self-sufficient in food and other raw materials in the 1760s, to being a substantial importer by the 1860s. These imports were paid for by huge exports of textiles, iron, and coal. But the prices of these exports, spurred by technological advances, fell substantially relative to the prices of imports. This implies that many of the output gains of the Industrial Revolution era were being exported to consumers of British textiles, iron and coal around the world. They did not fall into the pockets of the capitalist class.

Thus the output of the English economy rose much more than did the purchasing power of the economy. This helps create the illusion that output gains were much greater than the gains of the workers. But to compare like with like, we should compare the rise in purchasing power of workers with that of the other contributors to production, the land owners and the capitalists. When the comparison is done on this basis, much of the Allen puzzle disappears.

Another problem with this approach of comparing real wages to real output per person is the question of what is the appropriate measure of the real value of wages in the Industrial Revolution period. Allen and Feinstein adopt a pessimistic deflator for wages compared to those used by Lindert and Williamson and Clark, one that shows workers as facing an ever rising cost of subsistence, despite the productivity gains of the era. There is no simple demonstration that the pessimistic estimate of living costs is better than the optimistic ones, since these differences are the product of a variety of decisions on the weightings of items in the cost of living and the appropriate prices to use.

Bread, for example, was the single most significant item of working class consumption throughout this period. The ratio of bread prices to wheat prices should be close to constant in the long run, given that wheat constituted at least 80% of the cost of bread. The Feinstein series uses bread prices in London as its measure of national bread prices. However, London bread prices were regulated until 1815. When regulation ended these London prices showed an abrupt upwards jump relative to wheat prices of nearly 10%. If these London prices reflected a true price index for bread of constant quality, then either London bakers after 1815 were enjoying substantial and sustained profits, or before 1815 they suffered from substantial and sustained losses. Given the competitive and small scale nature of baking in this era, neither seems a plausible alternative. The quality of bread in the absence of regulation must have improved, so the nominal bread prices overstate the rise in the cost of living.

There is an alternative way of looking at the distribution of the gains of the Industrial Revolution between workers and property owners, that avoids this problem of what is the appropriate way of converting wages and other earnings into real purchasing power. This is just to compare the distribution of all earnings in the economy between workers, land owners, and capital owners, in nominal terms without having to worry about what is the correct price index. We can do this for the 1860s for wages using the work of Leone Levi (1867). This suggests that all labour income for England was then £411 million. The Property and Income Tax Returns of 1842 and later years provide estimates of the rental payments to land, and the incomes of capital owners These returns distinguish income from property of the following types: lands, houses, tithes, manors, fines, quarries, mines, iron works, fisheries, canals, and railways. For the 1860s the average of these reported incomes, reduced to the basis of England, was £46 million for farmland rents, and £189 for housing and other forms of capital income. This implies a labour share in all income of 64% in the 1860s, far in excess of the 47% that Allen infers should apply to 1870.

Based on estimates of the movement of wages, population, farmland rents, coal land rents, house rents, and other returns on capital in earlier years we can estimate the share of wages versus property income back to the 1700s. (Clark 2010).These estimated shares are shown in figure 7.10. As can be seen, the clear implication is that labour incomes were rising modestly as a share of all incomes in England from 1700 to 1870: from 59% to 66%. Consequently distribution, measured just in terms of nominal incomes, was shifting away from property owners and towards workers.

The driver of this shift in distribution was the decline of farmland rents as an important source of income. These fell from 21% of all incomes circa 1700 to less than 7% circa 1870. The declining property incomes of the land owners was only partially made up in greater property incomes among capital owners, the share of capital in incomes rising from 21% to 27%.

Thus the various sources of evidence above present a consistent picture: the Industrial Revolution did not result in any widening of income and wealth inequalities in England. However great were the disruptions to British society of technological shocks, population growth, urbanization, and foreign trade in the years 1700-1870, inequalities of wealth and income likely either stayed stable or declined in

Figure 7.10 about here

4. Conclusion

England underwent profound structural changes in 1770-1870. Rapid population growth and technological advance led to the industrialization and urbanization of the economy. Farming declined rapidly in importance, and industrial and service activities correspondingly increased. Capital was poured into new investments in canals, railways, ports, mines, and urban infrastructure.

Yet we see that in terms of social mobility and income and wealth inequality, none of this had much effect. The disruptions of the old patterns of a heavily agrarian economy did not lead to a period of rapid upward or downward social mobility. Mobility continued at the slow rates of the pre-industrial economy and at the slow rates observed even to this day.

Nor did the new economic opportunities generate extravagant returns for investors. Capital was sufficiently abundant, and competition within industries sufficiently vigorous, that the returns on capital remained modest throughout these years. Indeed the declining relative value of rents from farmland was not even fully compensated by increased profits from urban capital goods within the economy. Thus the distribution of income between property owners and workers actually changed in favour of labour, though only by moderate amounts.

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Table 7.1: Intergenerational Mobility in England, 1854-1874, from Marriage Registers

	Father's Class				
Son's Class	I	II	III	IV	V
I	**54**	4	0	0	0
II	30	**53**	6	5	3
III	7	23	**75**	33	20
IV	5	10	8	**47**	12
V	5	10	10	15	**65**

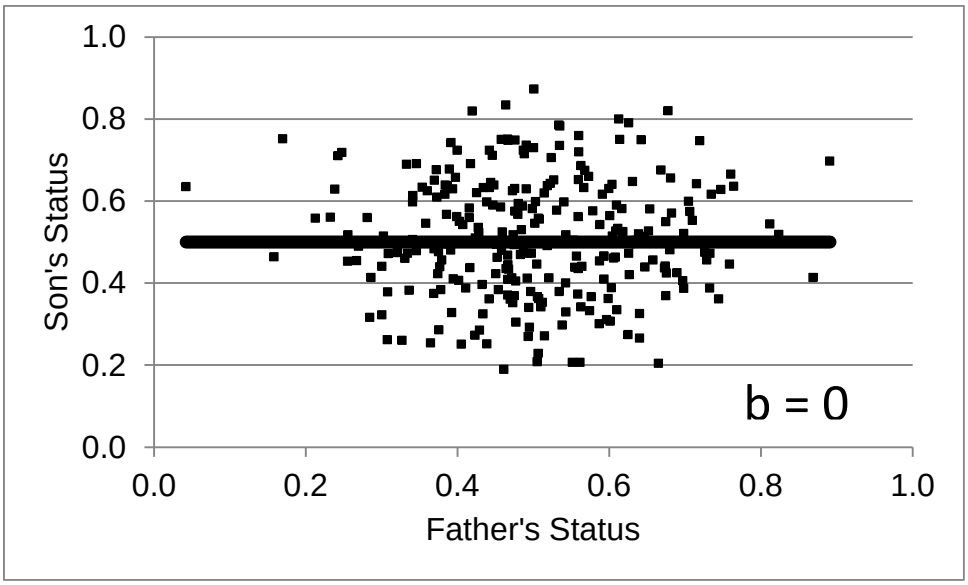
Notes: The columns show the %age of the sons of fathers of each occupational class by their occupational class. Source: Miles, 1999, table 2.3 (N=2,483).

Table 7.2: Intergenerational Mobility in Britain, 1851-1881, from Long

	Father's Class				
Son's Class	I	II	III	IV	V
I	**35**	5	3	1	1
II	21	**35**	10	6	7
III	36	46	**68**	38	56
IV	2	9	8	**38**	15
V	6	6	11	17	**21**

Note: Sons aged 0-19 in 1851. The columns show the %age of the sons of fathers of each occupational class by their occupational class. Source: Long, 2013, table 2, (N=12,516).

Figure 7.1: The Extremes of Mobility Illustrated



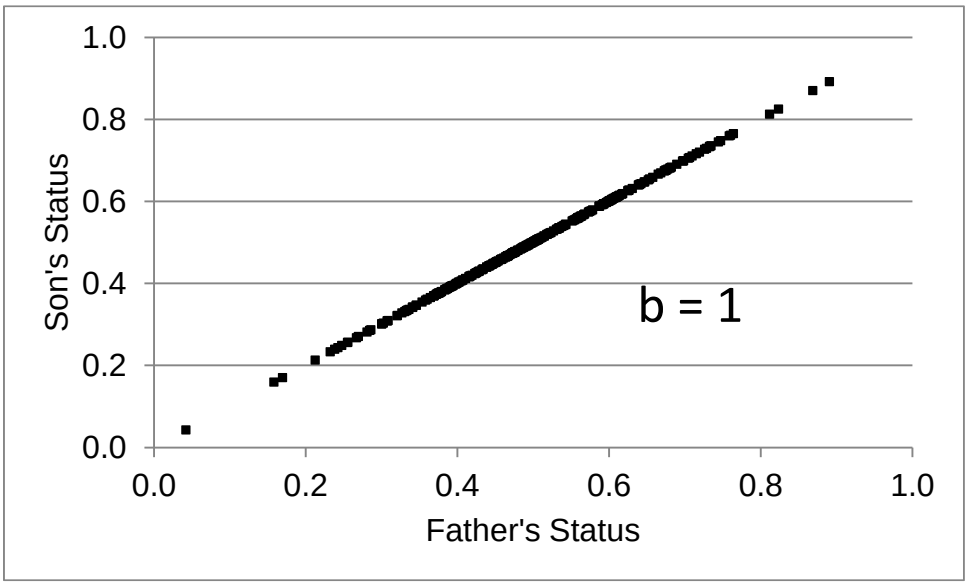
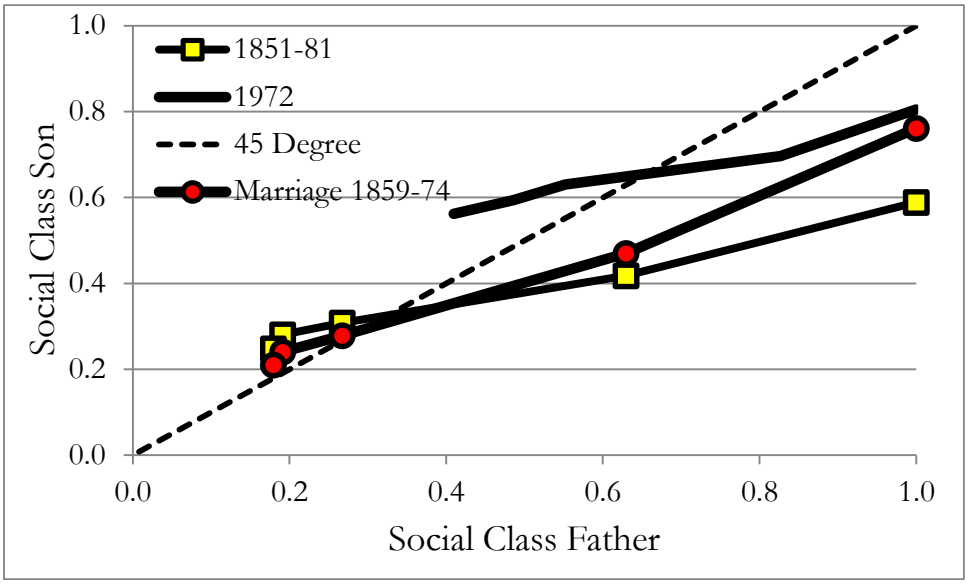


Figure 7.2: Intergenerational Occupational Mobility Compared



Notes: Social Class has been assigned a status from 0 to 1, based on the average earnings of each social class, as estimated by Long, 2013.

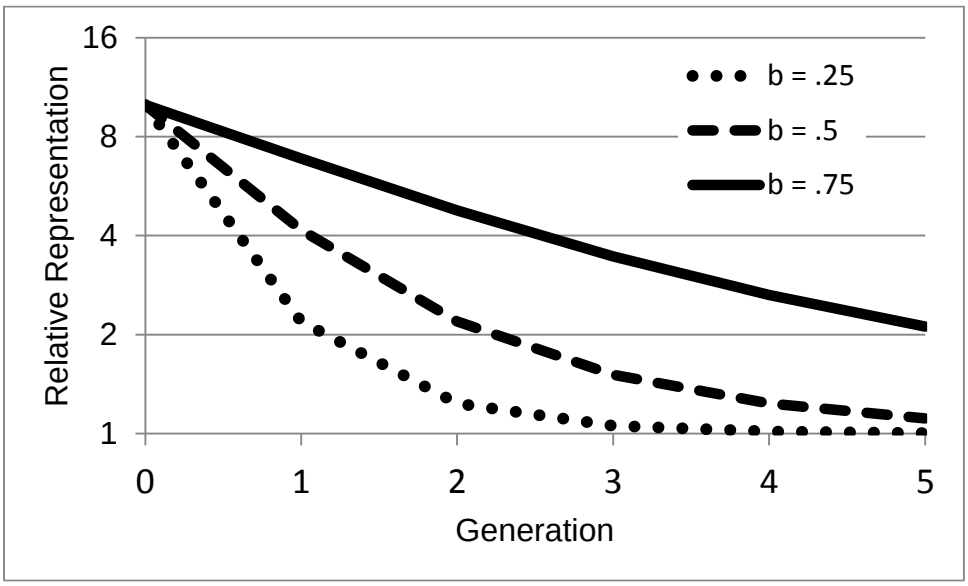
Sources: Tables 1-3, and earnings by occupation from Long, 2013, table 9.

Table 7.3: Intergenerational Mobility in Britain in 1972

	Father's Class				
Son's Class	I	II	III	IV	V
I	**32**	9	6	3	2
II	42	**41**	24	16	10
III	23	36	**52**	56	55
IV	4	12	15	**22**	24
V	0	3	3	3	**8**

Note: Sons aged 30-49 in 1972, father's occupation when son was 14.
Source: Goldthorpe, 1987, as reported in Long, 2013, table 8. (N=3,460).

Figure 7.3: Change in Relative Representation and b



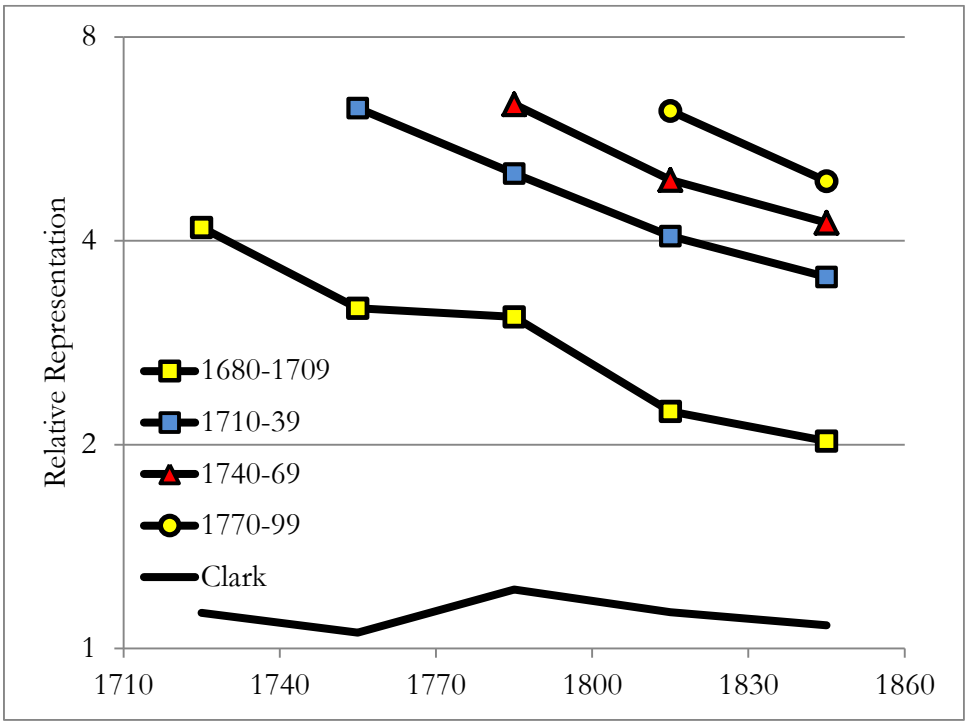
Note: For clarity the vertical scale is logarithmic.

Table 7.4: Relative Representation of Rare Surnames by Period and Cohort

Generation	Clark(e)	1680-1709 Sample	1710-39 Sample	1740-69 Sample	1770-99 Sample
1710-39	1.13				
1740-69	1.13	4.18			
1770-99	1.06	3.18	6.28		
1800-29	1.22	3.09	5.03	6.36	
1830-58	1.13	2.24	4.06	4.92	6.22

Notes: The relative representation of these surnames in each period is measures as their share among PCC wills compared to their share of marriages in England.

Figure 7.4: Relative Representation of Cohorts of Elite Surnames in the PCC, England, 1710-1858



Note: The vertical axes is on a logarithmic scale, so that a constant rate of decline of relative representation would appear as a straight line.

Table 7.5: Implied bs, England, 1710-1858, Downward Mobility

Generation	1680-1709 Sample	1710-39 Sample	1740-69 Sample	1770-99 Sample	Average
1740-69	0.77				0.77
1770-99	0.97	0.84			0.90
1800-29	0.68	0.83	0.81		0.78
1830-58	0.86	0.88	0.88	0.83	0.86
Average	0.82	0.85	0.85	0.83	0.82

Table 7.6: Wealth b Inferred from the Proportion Probated, 1888-2011

Generation	Rich 1858-1887	Prosperous 1858-1887	Average by period
1888-1917	0.70	0.87	0.78
1918-1952	0.74	0.79	0.77
1953-1989	0.59	0.48	0.54
1990-2011[a]	0.68	0.91	0.79
Average	0.68	0.76	0.72

Note: [a]b estimate adjusted down to reflect incomplete generation observed.

Figure 7.5: Relative Representation of Rare Elite Surnames in earlier Generations, England, 1680-1829

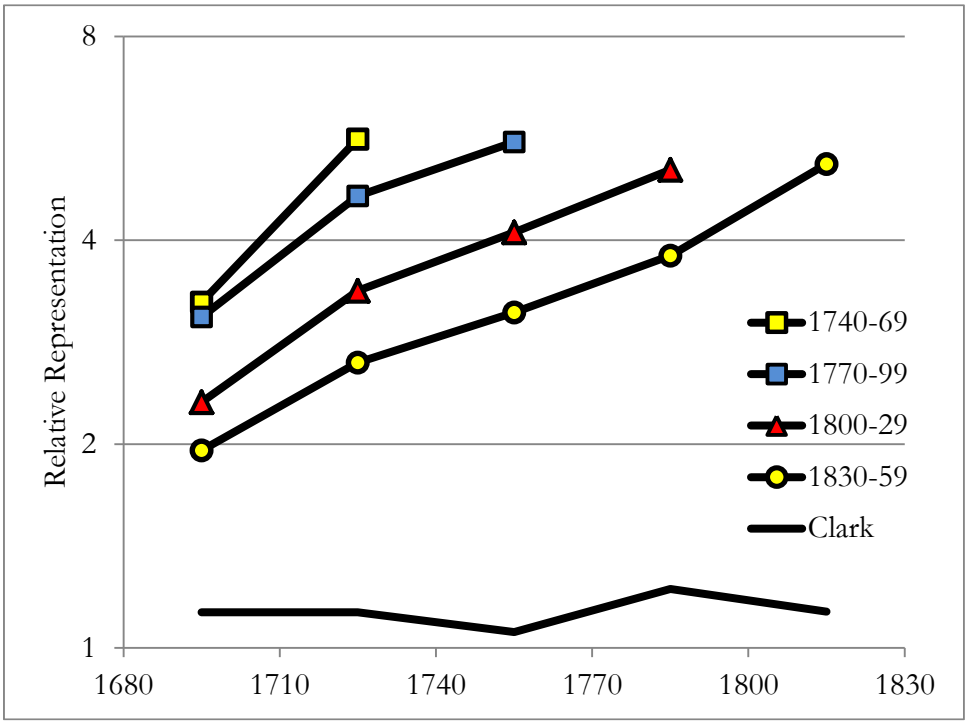
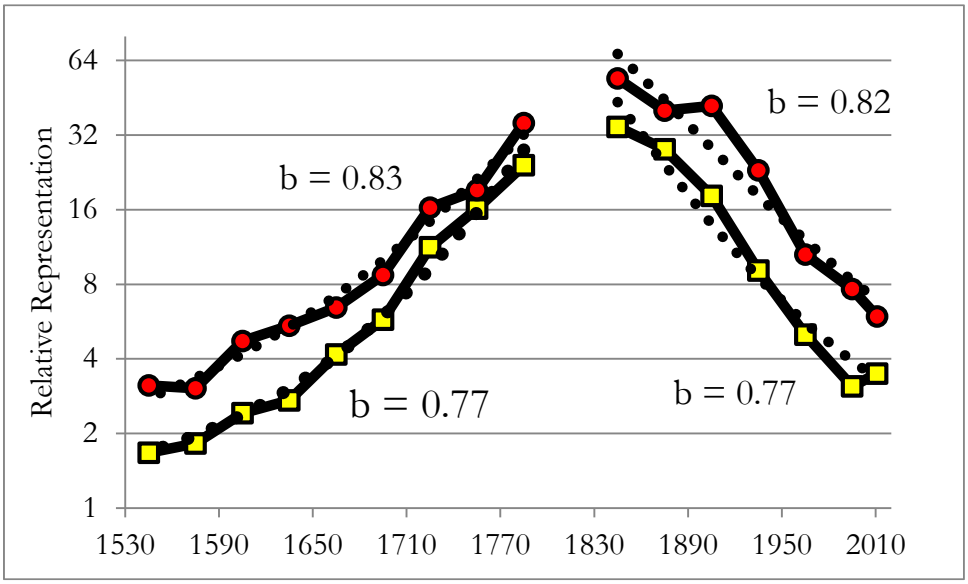


Table 7.7: Implied bs, England, 1710-1858, Upward Wealth Mobility

Generation	1740-69 Sample	1770-99 Sample	1800-29 Sample	1830-58 Sample	Average
1710-39	0.61	0.68	0.65	0.67	0.65
1740-69		0.86	0.83	0.83	0.84
1770-99			0.84	0.83	0.83
1800-29				0.77	0.77
Average	0.61	0.77	0.77	0.77	0.77

Figure 7.6: Relative Representation and Implied bs at Oxbridge, 1530-2012



Note**:** The circles indicate the observations for the wealthy surnames, the squares those for the rare surnames appearing at Oxford and Cambridge 1800-29.

Source: See Clark and Cummins, 2012.

Table 7.8: Wealth Distribution in England, 1700-1875 from Lindert

	1700	1740	1810	1875
Share - Top 1%	39	44	55	61
Share - Top 10%	81	86	83	84
Net Worth per Person (£)	58	95	247	279
Average Male Wage (d./day)	13.4	14.4	34.4	49.7
Net Worth Relative to the Wage (1740 = 100)	66	100	109	85

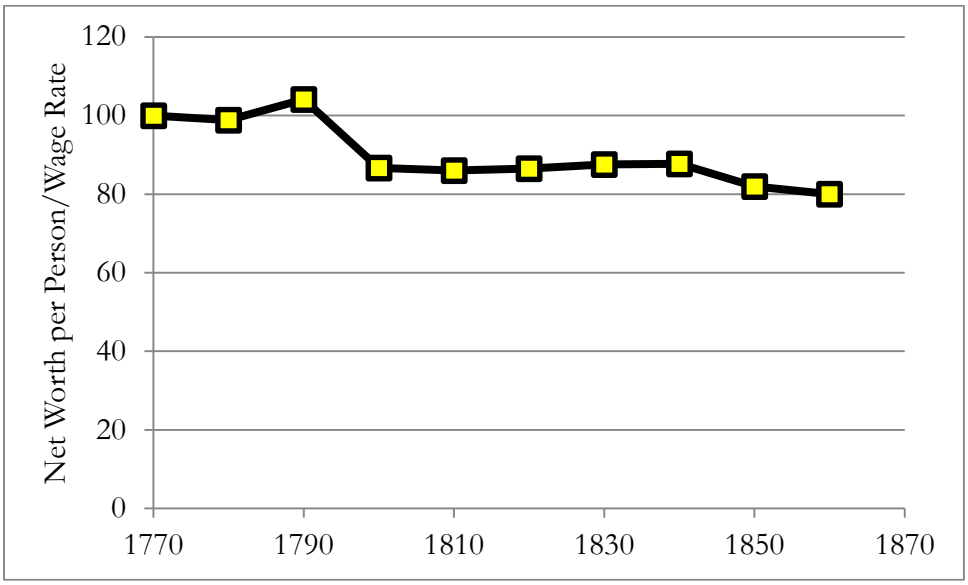
Source: Lindert, 1986, tables 1, 4. Male Wage, 1700, 1740, 1810, Clark, 2010. Male wage 1875 from Feinstein, 1998a (matched to Clark series based on 1860-69).

Table 7.9: Distribution of Wages and Wealth, UK, 2003-4

Decile	Share of wages (%)	Share of net assets (%)
90-100	26.3	44.6
80-90	14.2	16.2
70-80	11.5	10.3
60-70	10.0	9.7
50-60	8.7	7.9
40-50	7.7	5.3
30-40	6.7	3.5
20-30	5.8	1.8
10-20	4.9	0.1
0-10	4.2	0.0

Source: United Kingdom, Office of National Statistics, 2006. United Kingdom, H. M. Revenue and Customs, 2007, table 13.1. Note: Wages for full-time adult workers. Wealth from the assets of those dying 2003.

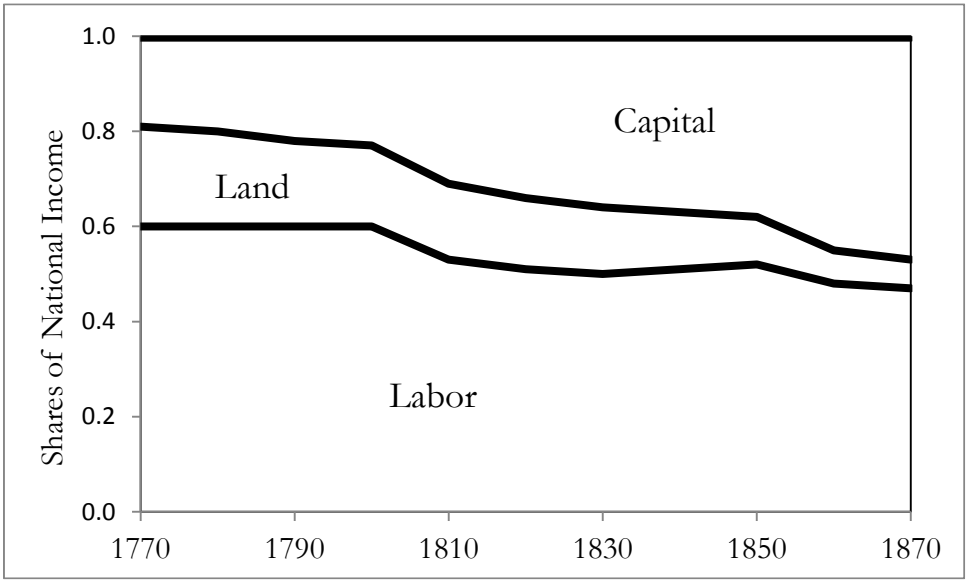
Figure 7.7: Net National Wealth per Person Relative to Wage Rates



Note: 1770 = 100.

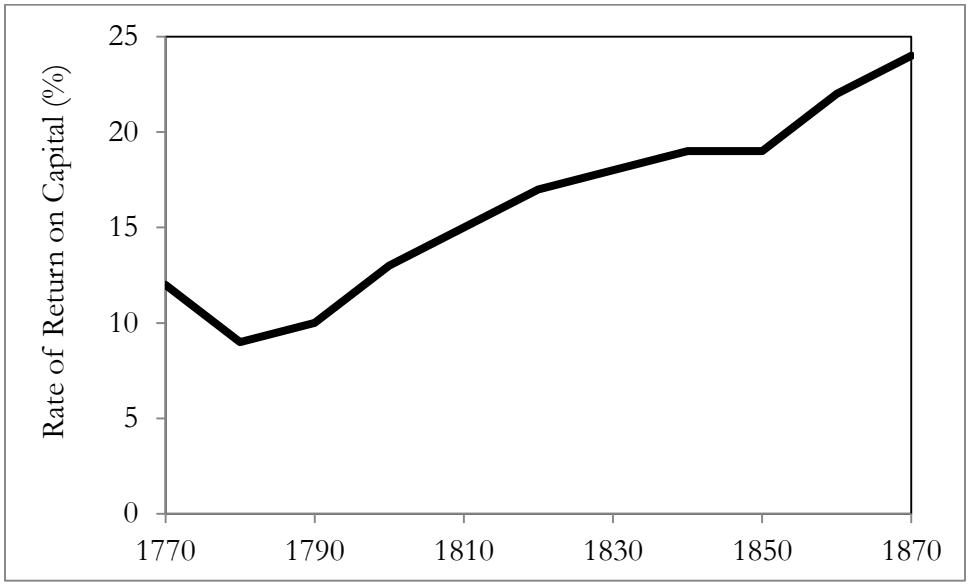
Sources: Feinstein, 1988, Appendix, Table XIX. Feinstein, 1998a, ----.

Figure 7.8: Allen estimate of factor shares, 1770-1870.



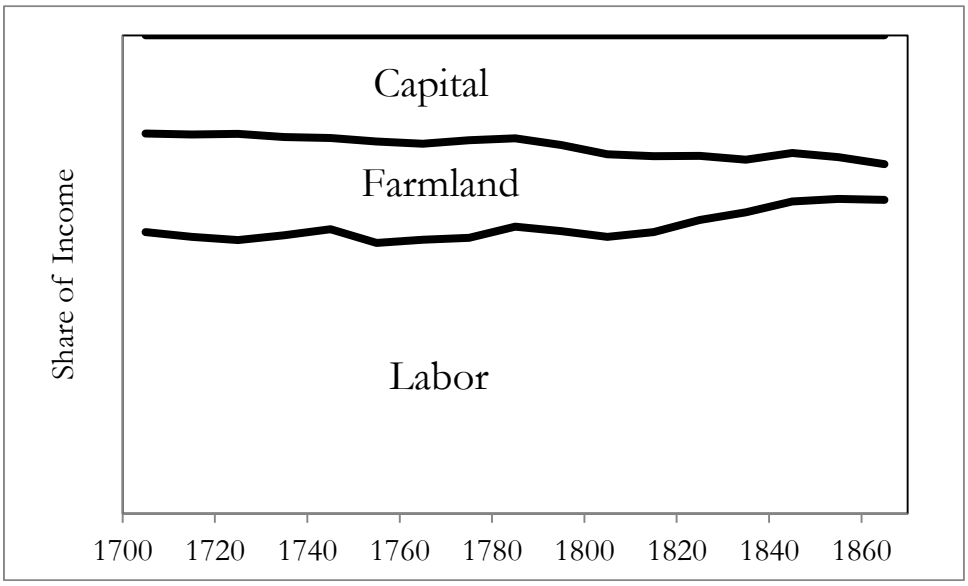
Source: Allen, 2009, figure 2.

Figure 7.9: Allen's Estimated Gross Profit Rates on Capital



Source: Allen, 2009, figure 3. The profit rate is measured relative to Feinstein's estimated "real capital stock" (Allen, 2009, 421). It is clear this is a gross stock,

Figure 7.10: Shares of Capital, Land and Labour in Income, 1700-1870



Source: Clark, 2010.