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Survival of the Richest? Social Status, Fertility, and Social Mobility in England 1541-1824

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Survival of the Richest? Social Status, Fertility, and Social Mobility in England 1541-1824[1]

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Abstract: We use data collected by the Cambridge Group to investigate and explain differences in fertility by socio-economic group in pre-industrial England. We find, in line with results presented by Greg Clark, that wealthier groups did indeed have higher fertility until the 1700s. We demonstrate that this had to do with earlier age at marriage for women. We then turn to the likely social and economic impact of this, considering Clark's hypothesis that 'middle class values' spread through English society prior to the industrial revolution. Through the construction of social mobility tables, we demonstrate that the children of the rich were indeed spreading through society, but they were small in number relative to poorer sections of society, and moreover the children of the poor were also entering the middle classes.

Keywords: Demography, pre-industrial England, fertility, social mobility, survival of the richest

JEL Codes: N33

1. Introduction

This paper looks at the role of socio-economic status as a determinant of fertility and social mobility in pre-industrial England. We do this using demographic data compiled by the Cambridge Group and documented by Wrigley *et al.* (1997). The data covers 26 parishes scattered across England in a way that was intended to make them representative of the entire country. In addition to information on the number of children being born to each family, the data also sometimes records the occupations of parents and their offspring, which we use to describe the socio-economic status of individuals, as well as intergenerational social mobility within families.

We find that the Cambridge data support the findings of Clark and Hamilton (2006) and Clark (2007), who look at the relationship between wealth and fertility as implied by information recorded in wills, namely that individuals from wealthier social groups were more successful in terms of reproduction. We also investigate the mechanisms by which the poorer groups in society limited their fertility, finding that this was achieved primarily by women delaying marriage.

Clark suggests that a fertility gap between the rich and the poor could have had important implications for the spread of 'middle class values' through English society prior to the industrial revolution via downward social mobility. He describes the middle class as being 'patient, less violent, harder working, more literate, more thoughtful' (Clark 2007, pp. 183-184). Clearly by the nature of most of these terms we cannot test directly if 'middle class values' really did come to dominate in society. Nevertheless, he states that these values spread by virtue of the fact that the structure of society was rather stable, which meant there was not enough room at the top for the children of the rich, who thereby were forced to move into other classes.

This twin prediction, that the rich had more children and that society was socially static, is indeed a testable hypothesis. Yet, while Clark's postulates have been subject to a hefty debate, particularly in the present journal (Clark 2008; Grantham 2008; McCloskey 2008; Persson 2008; Voth 2008), very few attempts have been made to visit the relevant evidence in order to confirm or refute his propositions. Clark himself seems rather agnostic on the actual mechanisms spreading these values. If this was indeed happening then it raises a number of crucial questions: was the spread of middle class values due to a Lamarckian process of cultural transmission or one of genetic survival, which seems to be gaining ground as an explanation within Unified Growth Theory (Galor and Moav 2002; Galor 2005)? We also seek to shed light on this question.

2. The Data

2.1 Description of the data

Building on statistics collected from Anglican parish registers over the past forty years by the Cambridge Group, the family reconstitution data, documented by Wrigley et al. (1997), provides a extraordinary opportunity for testing the hypothesis of the survival of the richest, as well as investigating social mobility in England as a whole. The data cover an extensive period, 1541-1871, although the exact size of the samples we make use of below depend on the variables we look at.

The data is based on so-called *family reconstitution forms* (*FRF*s), each of which build on a marriage (with a unique FRF number). Table 1 offers an example of a family reconstitution form. While the handwritten text may be difficult to read, a *complete* marriage form (not all information are always reported) includes the dates of birth and death (or baptism/burial) of the spouses, their marriage date, their number of offspring and the offspring's birth and death dates and finally, the spouses' occupations at marriage and at death. Importantly, if the couple's offspring went on to marry themselves (as is the case for child number one, three and nine in table 1 below), then the family reconstitution form will link us to the marriage, and hence a family reconstitution form, for the offspring. That way we are able to draw a connection between the occupational status of the parents and their offspring.

MARRIAGE   **LITERACY**

M | 345 | EARSDON | 18-6-1767 |

HUSBAND

H | DRURY | Christopher | (6-5-1722 & 119) | 6-11-1816 | 72 | 10166 |

tp | | H | 1775 | H (pitman) | 1800 | H (poor) |

Husband's father

Husband's mother

WIFE

W | NICHOLSON | Sarah |

tp

Wife's father

Wife's mother

CHILDREN

		date of bapt/birth	date of burial/death	status	name	date of marriage	FRF no. of first marr	surname of spouse	age at bur.	age at marr.	birth interv. full	age of mother
1	C / F	20-3-1768			Mary	14-8-1790	52					
2	C / M	22-7-1770	2-9-1777		John							
3	C / M	22-7-1770	22-7-1770		James							
4	C / M	18-10-1772	29-12-1831		Robert	23-2-1802	346					
5	C / F	1-10-1775			Margaret							
6	C / M	9-11-1777	16-10-1778		Aaron							
7	C / M	13-2-1780			John							
8	C / M	19-5-1782	3-5-1783		James							
9	C / F	18-9-1785			Ann	23-8-1809	994					
10	C											
11	C											
12	C											
13	C											
14	C											
15	C											
16	C											

COMMENTS

F / C2 / 2 / C3 / 22

	Husband	Wife	Age group	Years	No. of births
Age at marriage			15 - 19		
Age at end of marriage			20 - 24		
Age at burial			25 - 29		
Length of widowhood (mths)			30 - 34		
Length of marriage (years)			35 - 39		
Number of births	total	sons / daughters	40 - 44		
			45 - 49		

Table 1: Family reconstitution form

The Cambridge data offer three main advantages compared to that on which Clark et al. draw their conclusions. Firstly, they include a wide range of the population, while Clark's data tend to cover just the wealthier, i.e. those who left a will. Secondly, while Clark's data cover only a fraction of England, mainly East Anglia but also London, Bristol and Darlington, the Cambridge data cover a much larger geographical area, comprising 26 parishes scattered across England in a way that makes them representative of the entire country.[2]

Last but not least, the Cambridge data offer much richer demographic information than the Clark data, both concerning the reproductive success of families and social mobility across generations within families. For example, 'surviving offspring' in the Clark-Hamilton study are the number of children

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[2] In three of these 26 reconstitution parishes no occupations were recorded, namely Earsdon, Hartland and Methley. These are located in different parts of England, however, so presumably this does not impact too badly on the representativeness of the data.

included in the will (Clark and Hamilton 2006). This is regardless of the offspring's age at the time of death of the testator, which of course is not specified in the will (indeed, an heir may be just one or two years old). In addition to that, there is a risk that children were excluded from the will. The Cambridge data, on the other hand, allows a calculation, not only of the number of children born to a family (as registered in the church books), but also the number of these children who *survived* their childhood, i.e. remained alive at least until age 15.

Figure 1: The 26 Parishes from the Cambridge Group's Family Reconstitution

There are also several weaknesses of the Cambridge data compared to that of Clark and co-authors. A major problem for us with the Cambridge records is that they include no direct information on the wealth of families: Clark and Hamilton (2006), Clark (2007), Clark and Cummins (2009) and Clark and Cummins (2010) all use wealth as the predictor of net fertility. However, the fact that the Cambridge data records parental occupation enables us to do a comparison of reproductive success based on occupational status. Moreover, since the will data occasionally reports the occupation of heirs, we can make some headway beyond the Clark-Hamilton study by analysing social mobility across generations within families.

Another drawback of the Cambridge data is the data missing due to migration out of the parishes scrutinized by the Cambridge Group (Souden 1984). We will bias our estimates of fertility downwards if we do not take account of the fact that fathers might move out of the parish during their

lifetime, thus leaving us with an incomplete record of their offspring. We take account of this by only looking at fathers for whom we know the death dates, thus making it very likely that they stayed in the same parish after getting married.

Finally, it is worth mentioning that, while the Cambridge data is mostly rural in character, the data of Clark et al. also include men from urban areas. This means that our data becomes less representative as England urbanized – a point we will return to later. However, our data does also come from larger market towns such as Gainsborough and Banbury, and in general, the reconstitution parishes are larger than average, with an average of 2,187 inhabitants as opposed to 860 inhabitants for all parishes in England in 1801 (Wrigley et al. 1997).

2.2 Availability and classification of occupations

Since males at the time were far more often in the labour market than females, the occupations of women are very often missing in the data, so we focus exclusively on the occupational link in the data between fathers and sons. When available, we use the occupation at marriage for both sons and fathers. Often, we only have occupation at death available and we use this information instead. A possible concern is that occupations are only recorded for a biased subsample of the population. In an attempt to check this, we have compared fertility in each year for the whole sample with that for our subsample, and the numbers are virtually identical.

In the period up to 1825[3] the sample includes observations for a total of 89,887 fathers. Occupation is known for 15,159 of these, but since we also require that fathers have their death dates reported (so as to avoid the possibility that they left the parish before completing their reproductive activities), this leaves us with 9,925 fathers. Among these, 2,778 have reported occupation at the time of marriage; 8,309 occupation at the time of death; and 1,162 occupation at the time of death as well as at marriage. By regressing social class at the time of marriage on social class at the time of death, we cannot reject the hypothesis that the point estimate between the two social classes is one (the estimate is 0.982 with a standard error of 0.0101). That, in turn, means that that social class at death is a good proxy for social class at marriage, and vice versa. This subsample of 9,925 fathers is used for the analysis of fertility. For the results on social mobility, however, we also need to know the son's occupation. Here we have information on 1,396 sons and their fathers, in the period up to 1750.[4] The frequency of the

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[3] We do not use observations later than 1824 as it becomes more likely to observe only fathers with a relatively low life span towards the end of the period, which would imply unrepresentatively low fertility.
[4] The use of this shorter period will explained in more detail in section 3.1.

data is displayed in figure 2, where the year applied is the marriage year of the couple or, if not available, the birth year of the first child in the left panel and the birth year of the son in the right panel.[6]
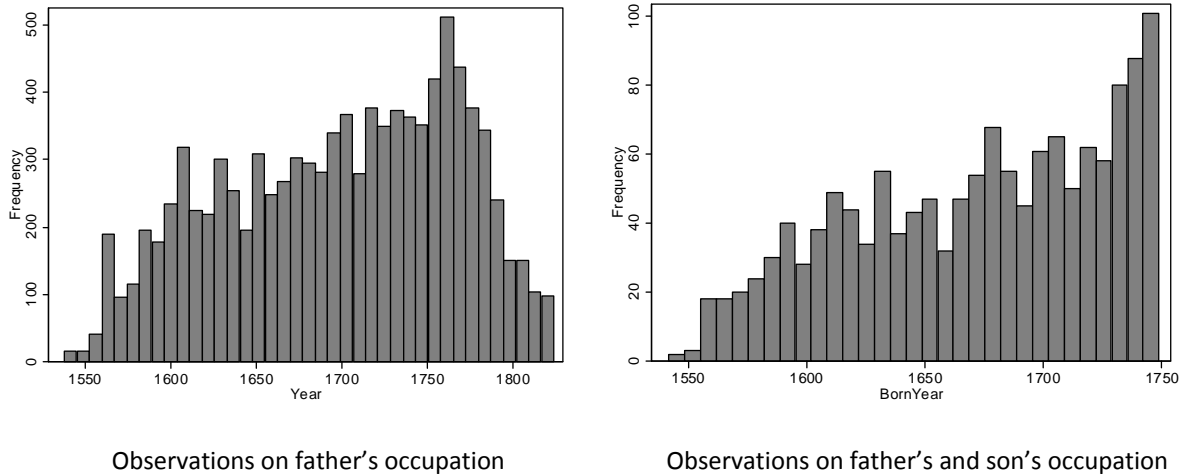

Observations on father's occupation   Observations on father's and son's occupation

Figure 2: Data frequency

As previously noted, Clark's hypothesis rests on data concerning the wealth of individuals, which is unavailable in the Cambridge data. We have, however, since Greg Clark kindly made the precise details of his classifications available to us, been able to map our occupations into the same seven social groups based on wealth as described in Clark and Cummins (2010), see table 2 below. A detailed breakdown of the composition of these groups is given in the appendix.

Social groups:	
7	Gentry / Independent
6	Merchants / Professionals
5	Farmers
4	Traders
3	Craftsmen
2	Husbandmen
1	Labourers / Servants

Table 2: Social Groups according to Clark and Cummins (2010)

As described above, Clark characterizes the middle class in terms of values and wealth. The social groups are classified by wealth in an ascending order. As to the values, the only variable we can

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[6] We use the marriage year or the birth year of the first child to classify families into 25- or 50- year periods for the results on fertility. For the mobility results the birth year of the particular son is applied, since all sons with available occupational information in a family are used here.

observe is literacy. We measure the percentage of fathers who are literate, where an individual will count as literate if the marriage form was signed with the name instead of a mark.

Social group	pre-1725	1725-1774	1775-1824	Total	N
7	1.00	0.91	1.00	0.96	53
6	0.67	0.76	0.84	0.79	153
5	0.45	0.83	0.89	0.84	113
4	0.67	0.95	0.90	0.91	112
3	0.67	0.87	0.82	0.83	298
2	0.31	0.66	0.56	0.59	185
1	0.50	0.29	0.29	0.30	376
Total	0.57	0.68	0.62	0.64	
N	72	546	672		1,290

Table 3: Literacy rate by group

Looking at the literacy rate by group in table 3 reveals that the higher classes do indeed have a higher percentage of literate men, a pattern which is particularly clear when comparing the highest groups to the lowest. Partly with this is mind, we choose to focus on the differences between groups 6 and 7 and groups 1 and 2 for the remainder of this paper.

3. Survival of the Richest?

This section uses the Cambridge data to reinvestigate the hypothesis advanced by Clark that wealthier families displayed higher fertility at a time when society was structurally static, and to examine the factors behind any differences in fertility between classes using information on age at marriage, length of reproductive period and spacing between the births of offspring.

3.1 Did wealthier fathers leave more children?

As discussed in the introduction, Clark argues that 'middle class' families had persistently higher reproductive success before the industrial revolution than their lower social class counterparts (Clark, 2007). This is a relatively simple matter to investigate using the Cambridge data, and we do indeed find support for this hypothesis when looking at fertility levels for the different social classes, as figure 3 illustrates.[7] For illustrative purposes, we have grouped the classes into four, and we have divided the sample into 25-year periods, within which we calculate the average number of children born to fathers

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[7] Here we look at the number of children born to a father. Thus, if a man was married more than once all his children are included.

who got married or had their first child within each particular 25-year period. The same periods are also used for the remaining results in this section.
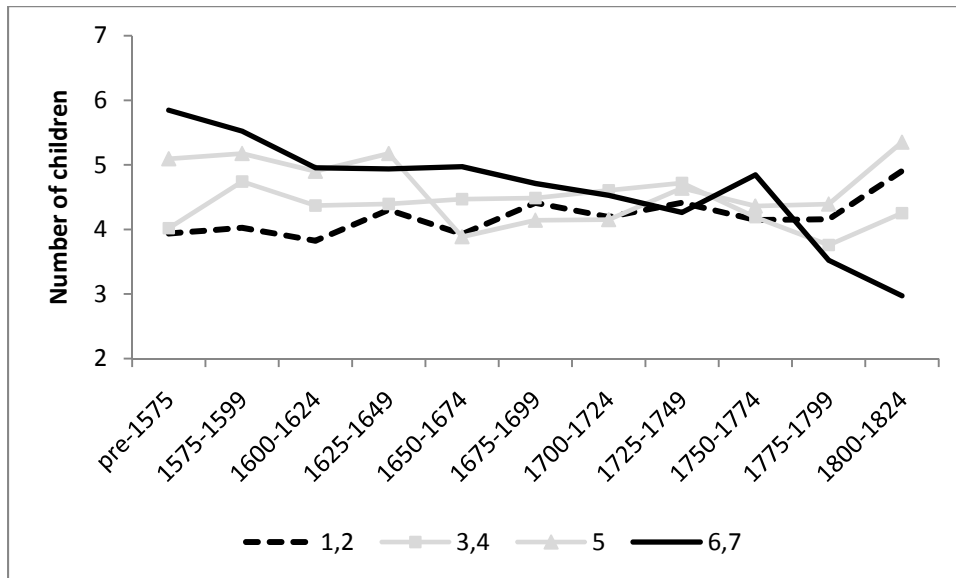

Figure 3: Fertility by social group

Figure 3 shows that the wealthiest families, i.e. those in groups 6 and 7, gave birth to roughly one more child than their class 1 and 2 counterparts, especially in the beginning of the period, with groups 3 and 4 lying in between. Group 5, which is predominantly 'farmers', seems to follow a pattern more akin to the wealthier groups in the start of the period, and more like the poorer groups towards the end, which probably reflects the changing status of the word 'farmer' over this period[8].

What ultimately counts for the hypothesis of value spreading, however, as was stressed by Clark and Hamilton (2006) and by Clark (2007), is not the number of children born to a family (gross fertility), but the number of *surviving* children, i.e. offspring who reach 15 years of age. Offspring who have no death date reported are counted as surviving offspring, following Wrigley et al. (1997). This builds on the implicit assumption that children remain with their parents (who we know stayed in the parish) up until the age of 15. Figure 4 shows the number of children surviving by social class. Remarkably, Figure 4 is virtually identical to Figure 3[9], with the wealthier families producing roughly one more surviving

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[8] We are grateful to Leigh Shaw-Taylor for pointing this out to us.
[9] This is a strong argument against the widespread hypothesis that families have a fixed target number of surviving children, and that a decline in mortality was responsible for the fall in fertility associated with the demographic transition. Instead, the present findings suggest a conscious fall in the target size of the family, possibly in response to increasing costs of raising children.

offspring than the poorest groups, where this difference is most prominent in the sixteenth and seventeenth centuries. Clark and Cummins (2010), using a larger dataset on testators, reach a similar conclusion, that wealthier testators were more successful in terms of reproduction until around 1780.
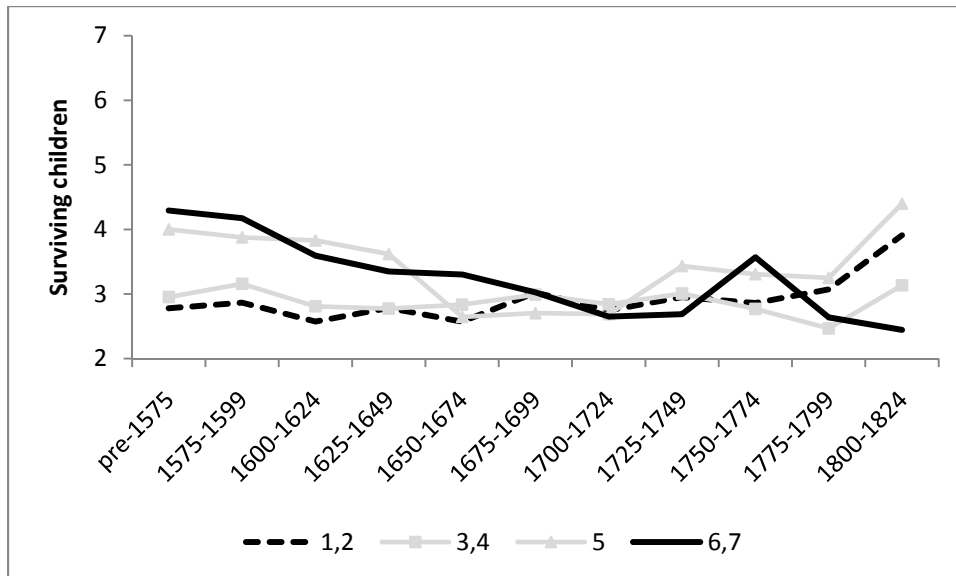

Figure 4: Reproductive success by social group

Interestingly, figure 3 also reveals that the decline in the number of children born – one of the main components of the historical demographic transition – started much earlier among wealthier families than among the lower social classes. This led to a point where by the nineteenth century they were generally having *fewer* children than poorer groups in society, a finding supported by Clark and Cummins (2009, 2010). A similar story, including the same spike in fertility at the end of the eighteenth century, has been documented for the British and Irish Quakers, a group who was certainly better off than average (Vann and Eversley 1992, pp. 132, 173).

It is also striking that the onset of the fall in fertility among middle class families coincides with that of French families (Weir 1994), where it also seems to have been the richest groups who reduced fertility first (Cummins 2009). The early fertility decline in France has been a great puzzle to scholars of demography, since it is difficult to explain why the fertility of the French declined before the fall in mortality. The Cambridge data points to the fact that England, at least among non-manual families, saw a pattern that was similar to that of the French.

In order to test more formally whether the differences in reproductive success are statistically significant we conduct a regression analysis, regressing the number of surviving children on the social group of the father. The results are presented in table 4. Since the relationship between wealth and

fertility seems to change sometime in the eighteenth century, we limit our sample to the period before 1750. We control for differences owing to parish level differences in net fertility by including parish dummies[10] and the results are found using a negative binomial regression, to take account of the discrete nature of the dependent variable.

Dependent var.: Surviving sibship size Period: pre-1750		
	Coef.	Std. error
Group7	0.166***	0.048
Group6	0.208***	0.035
Group5	0.164***	0.040
Group4	0.136***	0.035
Group3	0.093***	0.029
Group2	0.105***	0.029
Constant	0.944***	0.083
Parish controls	yes	
N	7,047	
Pseudo R^2	0.007	

***: significant at 1%

Table 4: Regressing net fertility on social group for the period until 1750

Clearly, all social groups have significantly more children than group 1, which is the reference category. It is also clear that there is no significant difference between the parameter estimates for groups 6 and 7 – justification for our aggregation of these groups in the figures above. To interpret the coefficients it is necessary to take the exponential function to the constant, in the case of group 1, or the constant plus the coefficient, in the case of the other six groups. So for example, the expected number of children for a person in group 1 is $e^{0.944}$ = 2.57, whilst for someone in group 6 it is $e^{(0.944+0.208)}$ = 3.17.

As was seen in figures 3 and 4 above, however, the reproductive advantage of the wealthier classes does not last throughout the whole period. Table 5 illustrates the results of the same regression, but where we divide the data into 50-year periods. Since the focus of our work is to compare fertility of the wealthier to that of the poorer classes, we only report the coefficients of groups 6 and 7 as opposed

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[10] Controlling for literacy drastically reduces the number of available observations, yet the results remain largely unaffected, even though standard errors on the parameter estimates are then much higher.

to groups 1 and 2, as well as the number of additional children that groups 6 and 7 are predicted to have.

Period	Groups	N	Constant	Coefficient	Std. error	Pseudo R^2	Extra children
pre-1575	6,7 vs. 1,2	357	1.125	0.461 ***	0.113	0.025	1.802
1575-1624	6,7 vs. 1,2	1,470	1.084	0.354 ***	0.061	0.023	1.256
1625-1674	6,7 vs. 1,2	1,789	1.089	0.226 ***	0.052	0.006	0.752
1675-1724	6,7 vs. 1,2	2,203	0.861	-0.005	0.052	0.009	-0.011
1725-1774	6,7 vs. 1,2	2,744	0.444	-0.009	0.053	0.016	-0.014
1775-1824	6,7 vs. 1,2	1,362	1.305	-0.175 **	0.083	0.047	-0.593

***: significant at 1%   **: significant at 5%

Table 5: Regressing net fertility on social group by 50 year period

As also indicated in figures 3 and 4, groups 6 and 7 have more than one additional surviving child compared to groups 1 and 2 in the beginning of the period, but this difference becomes insignificant around 1700.

We also considered fertility differences by region within England, but we find no obvious systematic differences – a similar conclusion to that reached by Wrigley et al (1997), although in marked contrast to that presented by Vann and Eversley (1992).

Summing up, the Cambridge data confirms the first part of Clark's hypothesis, that wealthier social classes had more surviving offspring than their lower-class counterparts, although this only seems to hold true until the 1700s.

3.2 What explains fertility gaps between classes?

It is interesting to consider briefly how parents were able to regulate their fertility at a time of limited or no access to contraception.[11] Generally, demographers consider three main methods: delaying marriage (since most children were born within marriage), 'stopping' or the decision to stop having children before the menopause, and 'spacing' i.e. regulating time intervals between the birth of each child.

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[11] For a more detailed discussion, see the chapter on this in Wrigley et al (1997).
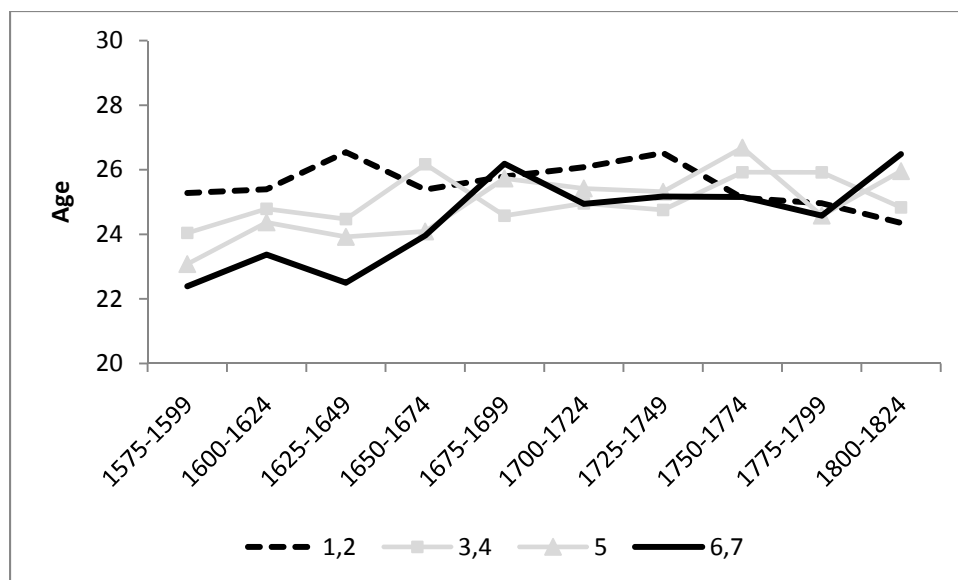
Figure 5: Wife's age at first marriage

Figure 5 illustrates the mother's age at first marriage for 25 year periods. This clearly corresponds to the pattern we saw in figure 3, since the groups with higher fertility simply got married earlier.[12] To begin with, these are the wealthier groups (based as usual on the occupation of the husband/father), but later these are the poorest groups. Regression results, reported in the appendix, confirm that this difference is statistically significant when looking at the period up to 1750. Note that we do not illustrate the pre-1575 period since here there are too few observations where we know the age of the mother (this is also the case for figure 6, below).

The fact that wealthier women got married two to three years earlier in the early years clearly prolonged the time span over which children could be born within marriage. Whether these parents, on average, fully enjoyed this as a longer fertile period, however, also depends on their 'stopping behaviour'. As figure 6 demonstrates, the age of a wealthier woman at the time of the birth of her last child was slightly lower than that of the poorer groups.[13] Prior to 1700, women in groups 6 and 7 on average had their last child at the age of 39.05 whereas women in groups 1 and 2 had their last child at the age of 40.2. However, statistically this difference is not significant. Thus, wealthier families did indeed experience a longer fertile period than less wealthy parents.

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[12] Also families who might have left the parish later on are included here. For exact sample sizes in this section see the Appendix.

[13] Here, only 'completed' marriages are included where the wife survived at least until age 50 and the husband did not die before that point in time.
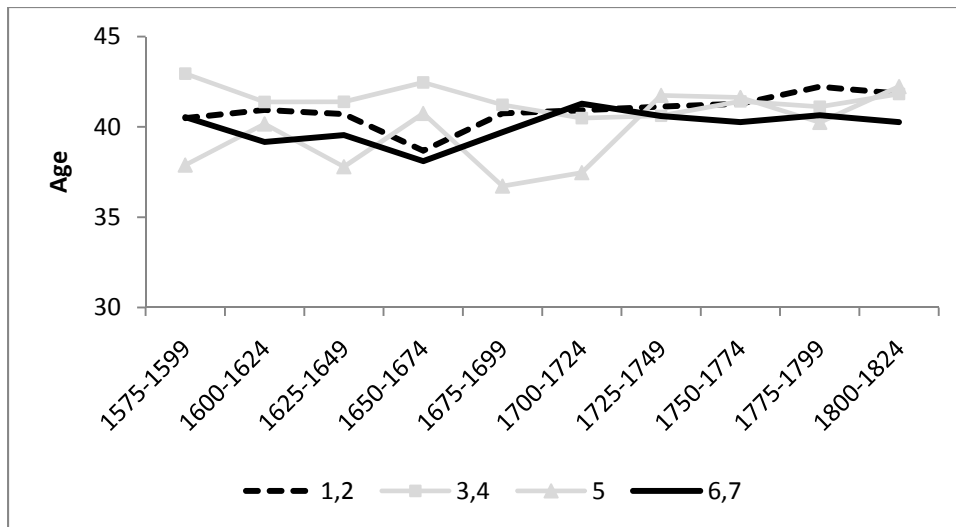
Figure 6: Wife's age at last birth
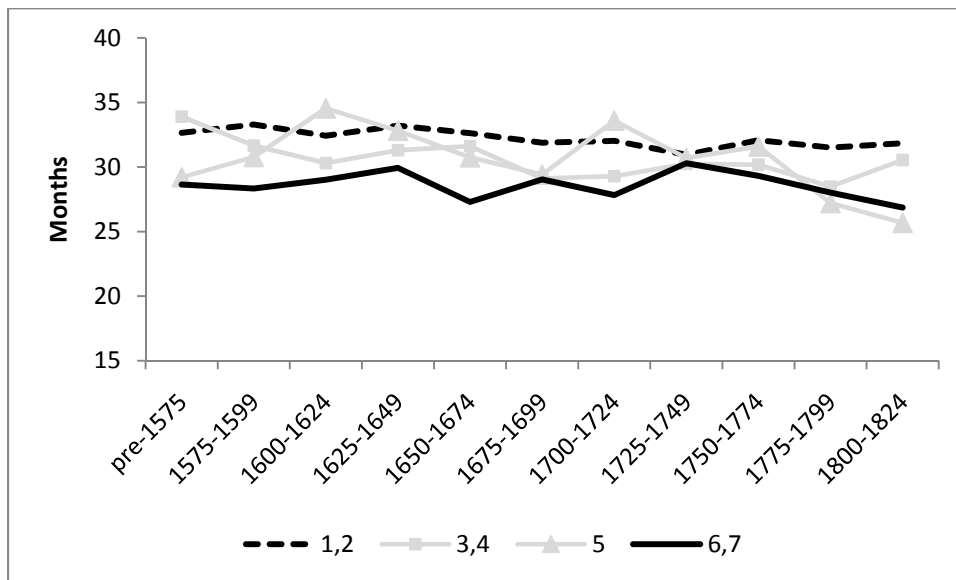
Figure 7: Average length of birth interval (in months)

Finally, we look at the 'spacing' intervals as illustrated in figure 7.[14] As expected, the wealthier groups have shorter intervals between consecutive births, thus allowing them to have more children over the same time span.[15] Rather than a conscious choice, these differences were likely to do with the fact that women's fertility declines with age. Hence, since women in the higher groups got married

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[14] Only the average number of months between all births is shown here. The average number of months between individual births (1st to 2nd, 2nd to 3rd, etc) was also calculated but since the pattern of the groups was the same, only the aggregated measure is shown here.

[15] This difference is statistically significant at the 1% level, see the appendix.

earlier, they were more fertile at any particular birth order compared to women of the lower social group. This is confirmed by table 6 below, where the average number of children (gross) of women in 5-year age groups is calculated. Clearly, women in higher social groups had more children earlier in life. Later in life the pattern seems to reverse, although it should also be noted that this calculation does not take mortality into account.[16] Another explanation could be that women in the poorer groups had to work physically harder, or simply suffered from deficient nutrition or sanitary conditions, thus increasing their risk of miscarriage (see Livi-Bacci 1977 for a discussion on the relationship between living conditions and fertility in Italy).[17]

Social group	Age group						
	15-19	20-24	25-29	30-34	35-39	40-44	45+
6,7	0.317	1.197	2.034	1.759	1.586	0.521	0.085
5	0.170	1.327	1.980	2.222	1.500	0.788	0.063
3,4	0.180	1.035	1.827	1.870	1.607	0.944	0.196
1,2	0.090	0.814	1.802	2.030	1.607	0.791	0.168
N	720	712	680	634	561	501	486

Table 6: Average number of children by woman's age group

In conclusion, it seems that the reason that wealthier groups gave birth to more offspring was that less time went by between each birth, and also the fact that they married earlier, where the latter might explain the former.

3.3 Did society remain static?

For middle class values to spread throughout society, it was of course necessary that the middle classes were not closed or cut off from the rest of society. If society was socially static, meaning that the middle class' fraction of society was constant, or if their proportion was falling over time, then given that they also had higher fertility, this would imply that their children would be forced to work in lower socio-economic groups. Figure 8 illustrates the evolution of the relative size of each of our seven social classes over time.

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[16] Also note that this is the average number of children born to women who survived to a certain age group. Before we were looking at the total number of children born to a man throughout his life.
[17] Note that the analysis here looks at *all* births, not taking into account whether the child died shortly after birth, or considering whether any birth order was the last birth – usually there was a longer interval to the last birth.
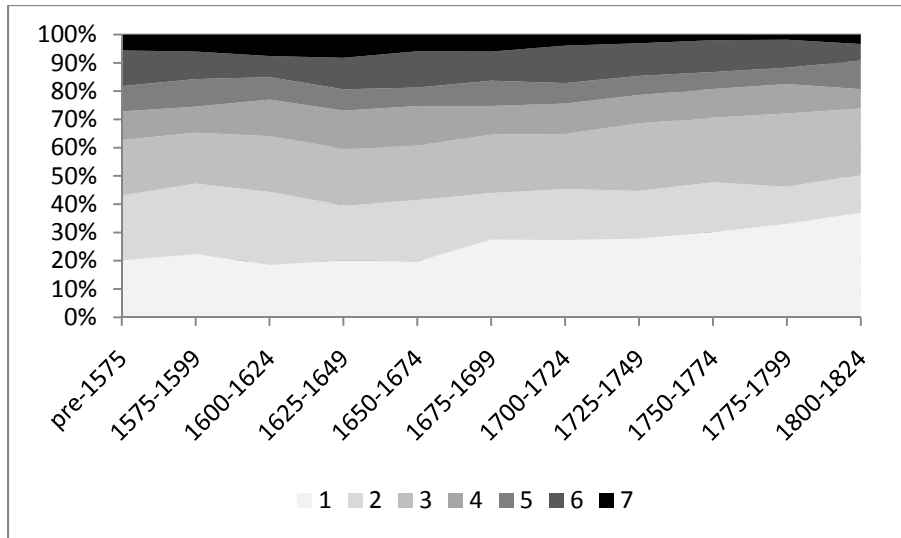
Figure 8: Shares of social groups

It does indeed seem that the data support Clark's hypothesis of a socially static society, since the shares were relatively constant up until the end of the seventeenth century. The poorest groups, 1 and 2, comprise around 40 percent of society, while the richest groups, 6 and 7, are at around 20 percent. Perhaps not surprisingly, given what we know about the huge structural changes taking place in England during the industrial revolution, something changes from the eighteenth century. Specifically, and not unexpectedly, groups 1, labourers, and 3, craftsmen, are growing as a share of society. Regarding the growth in the latter, this seems to be consistent with the findings of Leunig *et al.* (2009), who showed that education grew in importance over this period, particularly in the form of apprenticeships requiring skills needed for manual labour, such as that used in manufacturing (van der Beek, 2010).

More worrying is the precipitous decline in the share of groups 6 and 7 towards the end of the period, which we think implies that our sample becomes less representative of the whole country as the professional classes moved out of the rural parishes documented by the Cambridge Group and into the towns. This is consistent with a comparison of the occupational structure we find with that from various other sources, as illustrated in figure 9.
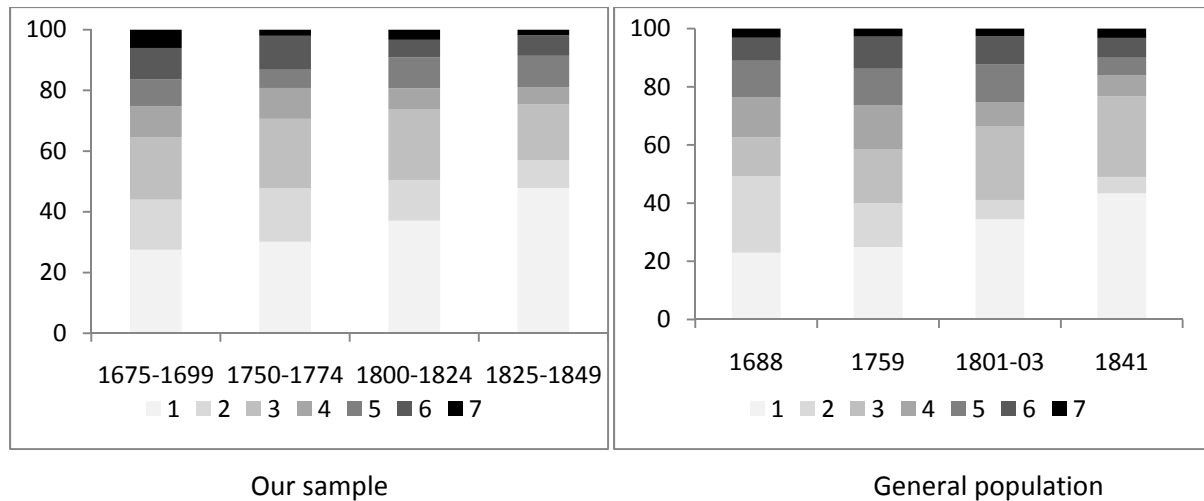
Figure 9: Representativeness of the data (Source for general population: 1688, 1759, 1801-03: Lindert and Williamson (1982); 1841: Booth (1886), Census)

The data for 1688 (Lindert and Williamson, 1982) is aggregated into rather broad occupational categories, and is thus difficult to classify according to our groups. But it still looks acceptably similar to ours. From this date we have the same trend in group 1 (labourers) and 3 (craftsmen) as in the general population. Both for the estimates of 1801-03 as well as the census data from 1841 we can see that groups 6 and 7 are underrepresented in our sample. Indeed, this could be due to these people increasingly moving to cities, where we would not be able to observe them. Thus, for the analysis of social mobility in section 4 below, we concentrate on the period before 1750 where our data seems to be largely representative of the general population.

4. Memes or Genes?

Clark's hypothesis, and his findings which by and large can be supported with our data, raise some rather important questions, about which Clark himself seems rather agnostic. Of course, as mentioned in the introduction, there is no way to test whether the values considered by him really did spread through society in the way he suggests. But we can consider *how* they might have done so, given that we know that the offspring of the richer classes did indeed move down through society. In considering this, we move more into the realm of evolutionary biology, which is somewhat beyond the scope of this article. Nevertheless, we feel that our findings have some important implications for this debate.

Two mechanisms have been suggested for the propagation of values through society. The first relates to the so-called Lamarckian view (after the French biologist Jean-Baptiste Lamarck 1744–1829), that an organism can pass on characteristics acquired *during its lifetime* to its offspring. In a social

context this corresponds to the transmission of memes, a word first suggested by Richard Dawkins (Dawkins 1976) to provide a framework for understanding the evolutionary principles underlying the spread of ideas and cultural phenomena.[18] The second, perhaps more controversial, theory, suggests that these values might be intrinsic to individuals, because they are encoded in their DNA. Many social scientists might shy away from this interpretation, associated as it is with the work of eugenicists in the 1930s, but in reality the evolutionary forces governing the spread of genes or memes are rather similar. Economists are, in fact, leading the way in reopening the debate about the role of genetics for society, starting with the pioneering work of Gary S. Becker (Becker 1976). More recently, this has become a growing area of interest for those working within the field of Unified Growth Theory, relying as it does on the development of preferences for quality as opposed to quantity of offspring (see Galor 2005, p. 231, and Galor and Moav 2002). What can our results tell us about whether memes or genes might have governed the transfer of middle class values?

The Cambridge data permit us the possibility of going one step further in addressing the issue as *to what extent* middle class values were trickling down by middle class children leaving the social class in which they were born, because for a subsample of our sample, we have information on the occupations of both fathers and sons. We can use this to construct social mobility tables, as commonly used in sociology. Because we know that our data becomes less representative as we move into the period of the industrial revolution, we perform our analysis until 1750, where the year applied is the birth-year of the son.

Looking at social mobility causes us to dwell a little more on a problem with our data which we mentioned briefly above: that even if a father stays in the same parish, his sons might migrate when they become adults. This could bias our mobility results if the sons from fathers of one group had a greater chance of moving out of the parish than those of the other groups. To get an idea of whether this might be the case, table 7 shows the number of surviving sons the couples in our subsample (where we know the occupation of the father) have and the percentage of sons observed for each social group. The idea is that if they stay in the parish and get married, we would be able to observe the son, so differences in the proportions in each group for which we know the marriage date of the son would indicate differences in the tendency of sons to move out of the parish.

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[18] For more on this see Blackmore (2000).

Father's social group	Pre-1750		Post-1750	
	N (surviving sons)	% marriage date known	N (surviving sons)	% marriage date known
7	716	17.0	162	17.3
6	1,355	22.9	795	21.1
5	931	26.7	624	21.2
4	1,223	20.6	584	19.9
3	2,185	21.0	1,911	18.5
2	2,289	20.9	1,274	22.8
1	2,287	20.4	2,898	22.4
Total	10,986	21.3	8,248	21.0

Table 7: Percentage of sons with marriage date observed

Fortunately, the percentages are similar at around 20% for all groups, although we observe sons of group 7 slightly less often. This implies that group 7 will be slightly underrepresented in the mobility results. It is not clear whether these sons would follow the same mobility pattern as those staying in the parish, have a greater tendency to remain in group 7 or have greater downward mobility. This is not crucial to the results but should be kept in mind when interpreting the results on intergenerational mobility for this group.

When examining social mobility tables, one should be aware of the fact that for the higher classes there is only the possibility of staying high in society or moving down, whereas the lower classes are only faced with the possibilities of staying low or moving up. The former is, however, exactly what we are looking for, namely the fact that the additional children of the higher classes had only one way to go. Taking this as a starting point, we are only interested in the degree of downward mobility of the higher classes and the degree of upward mobility into these classes.

First, we look at outflow mobility: see table 8. This shows us the destination classes of sons contingent on their father's social class. Diagonal numbers refer to the percentage of sons remaining in the social class of their fathers. From the row percentages, it can be seen that, on average, only around 50 percent of group 6 fathers had sons remaining within the same group, with the remainder largely moving to lower groups. This was to some extent balanced by upward mobility into these classes (shown by the column percentages), but there is no escaping the fact that there was mainly downward mobility from the richer groups. This is in line with our previous results, that these groups had higher fertility at a time of a static social structure.

		Son's group								
		7	6	5	4	3	2	1	Total	N
Father's group	7	81.08	4.05	4.05	2.7	1.35	4.05	2.7	100	74
	6	4.62	50	3.85	12.31	11.54	9.23	8.46	100	130
	5	4.17	4.17	51.67	6.67	7.5	17.5	8.33	100	120
	4	2.66	7.98	5.85	51.06	13.3	10.64	8.51	100	188
	3	0.97	5.18	1.62	7.12	62.46	10.36	12.3	100	309
	2	0.31	5.57	6.81	5.88	13	51.7	16.72	100	323
	1	0	4.37	1.98	6.35	17.86	15.08	54.37	100	252
Total		5.73	9.53	8.09	12.82	23.64	20.99	19.2	100	
N		80	133	113	179	330	293	268		1,396

Table 8: Outflow mobility (row percentages), pre-1750

It might be noted that the greatest mobility, in terms of both upward and downward mobility, was between groups 6 and 4, the non-manual occupations, in line with modern findings of a 'buffer-zone'. This has been widely observed for Britain in more recent times, e.g. Heath and Payne (2000) and Miles (1999), although this is most stringent when looking at relative mobility rates (relative to perfect mobility) as noted by Goldthorpe, Llewellyn and Payne (1980). As for group 5, most mobility occurs with group 2, as could be expected taking into account that both of these groups concern agricultural occupations. Group 7 seems to be most persistent, with around 80% of sons born in this group being able to stay. This is rather intuitive as this group is largely concerned with titles, rather than with occupations. Nevertheless, also here we observe that downward mobility, especially to the lowest groups of labourers, is generally larger than upward mobility of these groups into group 7.

Although we have now demonstrated that there was indeed downward mobility from the richer groups, it is important also to consider patterns of inflow mobility, i.e. where the members of each group came from, as shown in table 9. This is crucial for understanding the impact potential of this downward mobility. As can be seen, only around 5 to 10 percent of groups 1 to 5 came from groups 6 and 7, whereas around 50 percent of group 6 and around 20 percent of group 7 came from lower income groups. This reflects the fact that, despite the downward mobility from the richer groups, they were a relatively small share of the population,[20] so their impact on the other groups was fairly minor. On the other hand, small movements from the lower income groups had a large impact on the higher income groups.

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[20] Miles (1999) draws the same conclusion for the 1800s based on historical evidence.

		Son's class									
		7	**6**	**5**	**4**	**3**	**2**	**1**	**Total**	**N**
Father's class	**7**	75	2.26	2.65	1.12	0.3	1.02	0.75	5.3	74
	6	7.5	48.87	4.42	8.94	4.55	4.1	4.1	9.31	130
	5	6.25	3.76	54.87	4.47	2.73	7.17	3.73	8.6	120
	4	6.25	11.28	9.73	53.63	7.58	6.83	5.97	13.47	188
	3	3.75	12.03	4.42	12.29	58.48	10.92	14.18	22.13	309
	2	1.25	13.53	19.47	10.61	12.73	57	20.15	23.14	323
	1	0	8.27	4.42	8.94	13.64	12.97	51.12	18.05	252
	Total	100	100	100	100	100	100	100	100	
	N	80	133	113	179	330	293	268		1,396

Table 9: Inflow mobility (column percentages), pre-1750

What does this imply for the idea that middle class values were spreading through society? Leaving aside the question of whether groups 6 and 7 really did reflect the values which Clark associates with the middle class, it is difficult to draw clear conclusions. The mobility into lower groups was certainly rather little in relation to the large size of these groups, and besides, many were moving up the other way. However, it could be the case that the great mobility of English society could lead to a demonstration effect, whereby other socio-economic groups learnt by example from the offspring of the rich. On the side of the genetic argument, even a small reproductive advantage could cause certain individuals to dominate if there genes were being mixed into all tiers of the population over a long enough period of time.

In both cases, it was the great *mobility* of English society which could have given rise to the sort of phenomenon Clark suggested, but we are still not much closer to knowing whether it really did happen. The changing view of genetics amongst modern biologists does not make the job any easier. A rather brief foray on our part into the recent literature shows that the general belief that genetics somehow determine phenomes (i.e. appearance, physiology, behaviour etc.) is incorrect. What is known as developmental plasticity means that genes can be 'activated' or 'deactivated' depending on environmental conditions.[21] The implications of this are rather profound. It might well have been the case that certain attributes began to be favoured in the English population prior to the Industrial Revolution, but was this due to genetic or memetic mutation and reproductive success, or simply due to the activation of certain genes given new environmental conditions? If the latter was the case, the

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[21] Memes can then impact on genes as for example maternal effects or cultural transmission passes information about the environment between generations. For a popular explanation of modern views of genetics, see Shenk (2010). For a textbook account see West-Eberhard (2003).

differing reproductive success of social groups becomes an interesting statistical finding, but perhaps of little or no long run practical importance whatsoever.

One final point: much interesting work has been done recently on historical social mobility, and it is natural to compare our results with this. Generally, the levels of social mobility in Britain found for the nineteenth century are considered to be rather low, although increasing again in the twentieth century (see for example Ferrie and Long 2010). Our evidence suggests a longer story of high but decreasing social mobility before the nineteenth century, although much needs to be done to make our work fully comparable to studies of more recent years, where the methodology and the classification of socio-economic groups is usually rather different. There remains in fact plenty of room for more research based on the evidence from the Cambridge data, not just in extending this analysis to the period after 1750, but also in investigating intra-generational mobility, since we sometimes have observations for one individual of both occupation at marriage and at death (see the work from the nineteenth century by Long 2010).

5. Conclusion

This study offered an attempt to investigate the notion forwarded by Greg Clark that the spread of middle class values to lower social classes, through social mobility, might have been a stimulus to England's industrial revolution. We used data from the Cambridge Group's population history of England from family reconstitution to carry out two specific analyses required to test Clark's hypothesis. One was to find out whether middle class families were more successful in terms of reproduction than their lower social-class counterparts. The other was to test if pre-industrial England was socially static over time. According to the Cambridge data, both were true up until sometime in the eighteenth century.

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Appendix

A Main occupations in social groups:

Group 7	N	Percent
Bachelors	46	10.22
Esquires	39	8.67
Gentlemen	347	77.11
Knights	12	2.67
Others	6	1.33
Total	450	100
Group 6		
Teachers	41	3.8
Clerics	81	7.52
Clerks	113	10.49
Government officials	43	4
Higher working proprietors	410	38.08
Medical, dental, veterinary and related workers	96	8.91
Brewers	68	6.31
Masters	73	6.78
Others	152	14.11
Total	1,077	100
Group 5		
Farmers	718	98.22
Others	13	1.78
Total	731	100
Group 4		
Lower working proprietors	111	10.22
Innkeepers	228	20.99
Tanners	146	13.45
Millers	83	7.64
Butchers	216	19.89
Bakers	151	13.9
Malters	48	4.42
Others	103	9.49
Total	1,086	100
Group 3		
Textile workers	192	9.04
Tailors	387	18.21
Cabinetmakers and related woodworkers	199	9.36
Stone carvers	91	4.28
Blacksmiths	167	7.86
Bricklayers and other construction workers	188	8.85
Carpenters	357	16.81
Others	544	25.59
Total	2,125	100
Group 2		
Husbandmen	635	34.08
Agricultural workers	216	11.59
Fishermen	74	3.97
Weavers	299	16.05
Shoemakers	323	17.34
Others	316	16.97
Total	1,863	100
Group 1		
Servants	122	4.7
Farm workers	57	2.2
Seamen	314	12.11
Labourers	1,798	69
Paupers	207	7.98
Others	95	3.66
Total	2,593	100

B Regression results, Surviving sibship size

Period: pre-1750

Negative Binomial Regression				Number of obs =		7047
				LR chi2(28) =		223.01
Dispersion =		mean		Prob > chi2 =		0
Log likelihood =		-14957.6		Pseudo R2 =		0.0074

SurvSibshipSize	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Group 7	0.166	0.048	3.470	0.001	0.072	0.260
Group 6	0.208	0.035	5.970	0.000	0.140	0.277
Group 5	0.164	0.040	4.100	0.000	0.085	0.242
Group 4	0.136	0.035	3.910	0.000	0.068	0.204
Group 3	0.093	0.029	3.170	0.002	0.036	0.151
Group 2	0.105	0.029	3.600	0.000	0.048	0.163
Aldenham	0.121	0.095	1.270	0.205	-0.066	0.308
Ash	0.050	0.113	0.440	0.658	-0.171	0.271
Austrey	0.196	0.095	2.060	0.039	0.010	0.383
Banbury	0.053	0.084	0.630	0.530	-0.111	0.217
Birstall	0.265	0.091	2.920	0.004	0.087	0.444
Bottesford	0.165	0.090	1.830	0.068	-0.012	0.342
Bridford	0.282	0.132	2.140	0.032	0.024	0.540
Colyton	0.099	0.091	1.090	0.275	-0.079	0.276
Dawlish	0.198	0.199	1.000	0.319	-0.191	0.587
Gainsbro	-0.066	0.083	-0.800	0.425	-0.230	0.097
Gedling	-0.117	0.261	-0.450	0.654	-0.628	0.394
GreatOakley	-0.241	0.103	-2.340	0.019	-0.443	-0.039
Ipplepen	0.189	0.129	1.460	0.144	-0.065	0.442
Lowestoft	-0.164	0.086	-1.900	0.057	-0.333	0.005
March	-0.157	0.106	-1.480	0.140	-0.364	0.051
MorchardBishop	0.188	0.151	1.250	0.212	-0.107	0.483
Odiham	0.113	0.098	1.150	0.250	-0.079	0.304
Reigate	-0.019	0.090	-0.210	0.834	-0.194	0.157
Shepshed	0.156	0.093	1.680	0.093	-0.026	0.337
Southill	0.086	0.087	0.980	0.325	-0.085	0.257
Terling	0.277	0.199	1.390	0.165	-0.114	0.668
Willingham	-0.094	0.127	-0.740	0.458	-0.342	0.154
constant	0.944	0.083	11.340	0.000	0.781	1.108
/lnalpha	-1.271	0.042			-1.352	-1.189
alpha	0.281	0.012			0.259	0.305

Likelihood-ratio test of alpha=0: chibar2(01) =   1286.92   Prob>=chibar2 = 0

C Regression results, Marriage age

Period: pre-1750

OLS Regression

Number of obs	=	1597
F(25, 1597)	=	3.160
Prob > F	=	0.000
R-squared	=	0.047
Adj. R-squared	=	0.032
Root MSE	=	4.913

MarriageAge	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Groups 6&7	-1.069	0.383	-2.790	0.005	-1.820	-0.318
Group 5	-1.734	0.523	-3.320	0.001	-2.760	-0.708
Groups 3&4	-0.681	0.289	-2.360	0.019	-1.249	-0.114
Aldenham	-2.246	1.685	-1.330	0.183	-5.551	1.059
Ash	0.390	2.096	0.190	0.852	-3.720	4.500
Austrey	-0.894	1.483	-0.600	0.547	-3.803	2.016
Banbury	-0.246	1.330	-0.180	0.853	-2.854	2.363
Birstall	-1.191	1.340	-0.890	0.374	-3.819	1.437
Bottesford	0.519	1.399	0.370	0.710	-2.224	3.263
Bridford	-0.017	2.176	-0.010	0.994	-4.286	4.252
Colyton	0.333	1.395	0.240	0.811	-2.404	3.070
Dawlish	7.381	3.115	2.370	0.018	1.272	13.490
Gainsbro	-0.732	1.321	-0.550	0.579	-3.322	1.858
Gedling	-0.884	1.971	-0.450	0.654	-4.749	2.981
GreatOakley	1.701	2.025	0.840	0.401	-2.271	5.673
Ipplepen	0.560	2.786	0.200	0.841	-4.903	6.024
Lowestoft	-0.657	1.343	-0.490	0.625	-3.292	1.978
March	1.514	3.714	0.410	0.684	-5.771	8.799
MorchardBishop	3.275	1.879	1.740	0.082	-0.410	6.961
Odiham	-1.465	1.436	-1.020	0.308	-4.282	1.352
Reigate	-1.121	1.414	-0.790	0.428	-3.895	1.653
Shepshed	1.484	1.408	1.050	0.292	-1.277	4.245
Southill	-1.243	1.402	-0.890	0.376	-3.992	1.507
Terling	1.491	3.714	0.400	0.688	-5.795	8.776
Willingham	1.211	2.025	0.600	0.550	-2.761	5.183
constant	26.030	1.313	19.820	0.000	23.455	28.606

D Regression results, Mother's age at last birth

Period: pre-1750

OLS Regression

Number of obs	=	801
F(24, 776)	=	1.320
Prob > F	=	0.137
R-squared	=	0.039
Adj. R-squared	=	0.010
Root MSE	=	5.852

AgeLastBirth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Groups 6&7	-0.153	0.627	-0.240	0.808	-1.384	1.079
Group 5	-1.253	0.941	-1.330	0.183	-3.099	0.594
Groups 3&4	0.355	0.507	0.700	0.484	-0.640	1.351
Aldenham	-0.370	2.351	-0.160	0.875	-4.985	4.244
Ash	3.608	2.552	1.410	0.158	-1.401	8.618
Austrey	-0.601	2.136	-0.280	0.779	-4.795	3.593
Banbury	0.360	1.771	0.200	0.839	-3.117	3.837
Birstall	-1.194	1.753	-0.680	0.496	-4.635	2.246
Bottesford	1.447	1.908	0.760	0.449	-2.300	5.193
Bridford	0.547	2.801	0.200	0.845	-4.952	6.045
Colyton	1.721	1.927	0.890	0.372	-2.062	5.504
Dawlish	-2.229	3.752	-0.590	0.553	-9.594	5.136
Gainsbro	0.682	1.734	0.390	0.694	-2.722	4.086
Gedling	0.213	4.485	0.050	0.962	-8.591	9.018
GreatOakley	4.494	4.453	1.010	0.313	-4.247	13.235
Ipplepen	-1.151	3.396	-0.340	0.735	-7.817	5.514
Lowestoft	-0.247	1.777	-0.140	0.890	-3.735	3.242
March	0.400	4.482	0.090	0.929	-8.399	9.199
MorchardBishop	0.365	2.909	0.130	0.900	-5.346	6.075
Odiham	-2.875	2.037	-1.410	0.159	-6.875	1.124
Reigate	0.577	2.087	0.280	0.782	-3.520	4.673
Shepshed	1.521	1.930	0.790	0.431	-2.268	5.309
Southill	-0.193	1.908	-0.100	0.919	-3.938	3.551
Willingham	3.070	3.392	0.910	0.366	-3.588	9.727
constant	38.837	1.723	22.540	0.000	35.455	42.220

E Regression results, average spacing

Period: pre-1750

OLS Regression

Number of obs	=	5993
F(25, 5967)	=	6.790
Prob > F	=	0.000
R-squared	=	0.028
Adj. R-squared	=	0.024
Root MSE	=	12.976

AvrgSpacing	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Groups 6&7	-3.587	0.508	-7.070	0.000	-4.582	-2.592
Group 5	-1.040	0.685	-1.520	0.129	-2.383	0.302
Groups 3&4	-1.297	0.401	-3.230	0.001	-2.084	-0.510
Aldenham	1.952	1.731	1.130	0.260	-1.442	5.346
Ash	-0.825	2.050	-0.400	0.688	-4.844	3.195
Austrey	-0.173	1.678	-0.100	0.918	-3.462	3.116
Banbury	-1.939	1.438	-1.350	0.178	-4.759	0.880
Birstall	0.780	1.576	0.490	0.621	-2.310	3.870
Bottesford	-0.561	1.565	-0.360	0.720	-3.629	2.507
Bridford	5.158	2.369	2.180	0.029	0.514	9.801
Colyton	1.433	1.605	0.890	0.372	-1.714	4.580
Dawlish	2.032	3.729	0.540	0.586	-5.279	9.342
Gainsbro	-2.705	1.431	-1.890	0.059	-5.509	0.100
Gedling	12.189	4.333	2.810	0.005	3.695	20.683
GreatOakley	-3.373	1.819	-1.850	0.064	-6.939	0.193
Ipplepen	2.622	2.288	1.150	0.252	-1.863	7.107
Lowestoft	-0.140	1.471	-0.100	0.924	-3.024	2.743
March	-5.146	1.807	-2.850	0.004	-8.688	-1.604
MorchardBishop	-0.736	2.679	-0.270	0.783	-5.988	4.516
Odiham	-1.273	1.804	-0.710	0.481	-4.810	2.264
Reigate	0.899	1.572	0.570	0.567	-2.182	3.981
Shepshed	1.587	1.613	0.980	0.325	-1.576	4.750
Southill	-0.171	1.526	-0.110	0.911	-3.163	2.820
Terling	-0.953	3.431	-0.280	0.781	-7.679	5.774
Willingham	-2.131	2.197	-0.970	0.332	-6.437	2.176
constant	33.053	1.413	23.390	0.000	30.282	35.824