Social Mobility in the Long Run: An Analysis with Five Linked Generations in China, 1300 – 1900

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September 2017

Abstract

This paper uses a multigenerational perspective to analyze social mobility over the long-run. The data covers information on about 10,000 unique men who lived in Anhui Province, their wives, and their children, for seven lineages of between fourteen to twenty generations. Among the more than 40,000 individuals in the sample, the earliest recorded birth is in the year 1298, and the last recorded death is in the year 1925. I document a pattern of lower inequality and higher mobility, which is consistent with the timing of social and institutional change during this period. Further, educational inequality is an important mechanism that correlates with mobility differences over time. The paper shows a temporal "Great Gatsby curve", in which over 100 sub periods, times of greater inequality among men in the father's generation is correlated with periods of less mobility in the son's generation.

1. Introduction

Recent studies on intergenerational social mobility have shown the extent to which outcomes between the parent and child are linked can vary substantially from country to country. In societies with high intergenerational elasticity (IGE), a person's economic status depends more on the status of his or her parents, while in low IGE societies, parental income or wealth matters much less. Even within countries, there are substantial regional differences in how much family or parental status can have on lifetime earnings of the son.[1]

These differences in social mobility can thus have important implications for welfare at the individual level. Figure A shows the positive relationship between inequality and intergenerational elasticity in recent data (Corak 2013 and OECD), where mobility and inequality is measured at roughly the same point in time. The relationship, sometimes referred to in this literature as the "Great Gatsby Curve", shows more equal societies, as measured by the Gini coefficient, tend to have greater intergenerational mobility. While the positive slope does not establish causality, it nevertheless suggests that individuals in societies with more equality are more likely than their counterparts in less equal societies to experience movement in status relative to their parents. At the same time, in less equal societies, children are likely to have the same social status as their parents. The relationship is interesting from a historical, comparative point of view, but it also raises important questions about what it predicts for the future, especially given current trends in increasing inequality observed in some countries.

It is not completely understood what drives differences in intergenerational mobility or its changing trends over time. The reasons why these differences in magnitudes of mobility exist across countries are potentially many and could be related to the overall influence of policies, labor markets, family influence, economic opportunity, or other factors (Björklund and Jäntti 1997, Krueger 2012). Persistence over generations could, for instance, increase if the

[1] Specifically, across administrative regions of the U.S., Chetty, Hendren, Kline, and Saez (2014) finds that on average a 10 percentile increase in parent income is associated with a 3.4 percentile increase in child income, but the probability that a child in the bottom quintile will reach the top quintile could vary substantially from region to region.

earnings return of human capital investments is higher, since parents with more resources and education can invest more in their children, and there is moreover a greater incentive to do so if the skill premium rises over time.[2] In addition, not only are there institutional differences across countries that might determine whether an economy is more regressive (or more progressive), but the population in each country is also differentially homogeneous. The latter becomes especially important if persistence between parent and child outcomes are related to the heritability of earnings-related endowments (Becker and Tomes 1979). Depending upon how genetically homogenous is the group being considered, this factor could be differentially important in different populations.

This paper investigates the determinants of intergenerational mobility. When mobility is viewed as a temporal phenomenon, one would need to observe how inequality in the previous generations is related to mobility in later generations, and to observe that relationship repeatedly over many generations. In this paper, I examine intergenerational mobility among seven surname lineages residing in a single region in China from 1300-1900, and focus on the temporal aspects of multi-generational mobility on households formed by around 10,800 men and 11,370 women.

I first provide historical evidence documenting that from the Ming (1368-1643) to the Qing Dynasty (1644-1911), social and institutional change resulted in fewer social and economic barriers and was likely to have produced greater scope for mobility. I then construct an income distribution based on the biographical data in the seven lineages from which all these individuals were drawn, and based on their income percentile, estimate the intergenerational elasticity to evaluate changes in relative mobility over time. Complementing these estimates, I also consider different configurations of transition matrices to give a sense of absolute changes in mobility over time.

Based on a sample of five-generation-linked observations, I then examine temporal patterns of mobility and inequality. I find that in the time-series, there is a strong negative relationship between inequality and mobility, which is related to the gradual but slow moving

[2] See Solon (2004, 2015) for reviews.

changes leading up to the Qing Dynasty (1644-1911) in which social and occupational distinctions were weakened. As mobility increased (lower estimates of the intergenerational elasticity coefficient) inequality decreased. In addition, one may be concerned in cross-regional correlations that the positive relationship between inequality and mobility arises because of heterogeneity in the populations being compared, since demographic diversity could also be a fundamental driver of the Great Gatsby Curve. However, in this case, because of the relatively homogenous population residing in this single region in China, it is highly improbable that population diversity from period to period is driving this pattern. The results show that educational inequality in the father's generation determines mobility of the son, and is robust to the inclusion of various correlates to intergenerational mobility.

This paper contributes to the quantitative analysis of mobility in historical times. An expanding recent literature has started to explore mobility trends in the 19th century and earlier: see Long and Ferrie (2012, 2013), Collins and Wanamaker (2015), Lindahl, Palme, Massih and Sjogren (2015), Olivetti, Paserman, and Salisbury (2015). For China, Chen, Naidu, Yu, and Yuchtman (2014) study mobility in 20th century China, while Mare and Xi (2014) examine imperial and other specific populations starting in the 17th century.[3]

A key contribution of this paper is in characterizing long-run social mobility across a much broader gamut of the income distribution than has been possible until now, in particular of those households at the middle to lower end of the distribution in China. Typically, much more information about richer households is preserved and available. Ho's (1962) classic study of social mobility in China, for example, focused exclusively on China's top (2-3% percentile) social status levels. But patterns of mobility at the very top of the income distribution are not representative of the rest of the households in the population and these results suggest rich families reveal far less about the mobility of the population at large than we might hope.

[3] In particular, the findings of this paper complement work on three generations includes Long and Ferrie (2012) and Olivetti, Paserman, and Salisbury (2015) on the United States, while four generations are examined in Lindahl, Palme, Massih, and Sjogren (2015), Mare and Xi (2014), and Braun and Stuhler (2015).

In addition, an important question that has been asked in this literature is whether more than two generations are needed to estimate the long-run trend in mobility. By using the two-generation mobility estimates to predict higher order mobility, and comparing the predicted mobility with actual higher-generation mobility, this paper contributes to this empirical issue as well. The answer seems to pivots on where in the income distribution we want to focus on: higher status families tend to regress much slower down to the mean, so the one generation estimate would provide a skewed (and over) estimate of mobility. This brings out the fact that there is heterogeneity in the determinants of social status that also changes over time.

The next section provides a discussion of the historical background, highlighting the temporal changes from that occurred in society during the sample period.

2. Social mobility in China during the sample period

By the 17th century, although there were large differences in wealth and status within Chinese society, there were few formal and institutionalized barriers that prevented commoners from rising across social classes. However, it had not always been this way. The process of change appeared to be more gradual and slow-moving, rather than a sudden shift. We observe hereditary aristocracies in China early on, but sometime over the Tang dynasty (670-906 AD), they had been eliminated. Beginning in the Song dynasty (960-1127 AD) officials of the state were selected on the basis of formal examinations. By about 1650, however, the only types of hereditary privileges and automatic status that remained belonged to the imperial lineage—where the throne was passed from the emperor to one of his sons—and the leading families of the Eight-Banner system. The latter was an exclusive hereditary institution that dominated certain military and command functions, and men born into banner families held a caste-like elite position.

The institution of using classical education to legitimize bureaucratic officials was a central aspect of governance until the last years of the Qing dynasty (1644-1911). Whereas in Europe, nobility status could be passed down across generations, social status in China relied to a far greater degree on investments made by each generation on behalf of the next. The regular

erosion of political power, at all levels below the throne, was in this way institutionalized from an early point on.

Thus, Chinese society was a meritocracy, where, at least in principle, even commoners with no family background in high status positions could gain entry into wealth, high status, and political power upon passing the state administered written examinations. At the same time, the question of the actual extent of mobility is debatable, since both genetics as well as resources are heritable, even if actual titles are not. Wealth alone would have meant better access to tutors for the sons of the rich, for example. In addition, it is possible that kinship networks and connections among the lineage in high status positions helped to extend personal advantages to other lineage members trying to stay in their high status positions or to climb the social ladder. It was not unknown for especially talented boys from families of low standing to be supported in study by a richer family member. Existing historical studies have attempted to examine the question of mobility by examining the family histories of officials.

For those who managed to become appointed to an official position upon passing the exams, the most important source of income for these officials was the state's compensation for their services (both in terms of official stipend and other remuneration). It was with this income that they were able to uphold their relatively high living standards, contribute to local community projects, and make investments in landed property.

Merchants who had accumulated fortunes could on occasion purchase minor titles and thus buy into some part of the governing elite. Degrees were offered for purchase in particular in times of revenue shortages. However, because by the Qing these degrees were distinguished by name and did not entitle the title-holder to any of the high ranked positions, participation in the state exams was the direct route and the only way to acquire the highest-level positions. Anecdotal evidence suggests that one use of merchant capital was to invest in the education of sons in order to climb the social ladder.

a. Institutional change from the 14th century to the 19th centuries

Of particular note is that despite the many traditions supporting social stratification from early on, the direction of change was towards greater social fluidity at both the upper

levels of society, as well as for commoners. One indication was that merit was not just a quality inherited or a natural birthright, but it also required personal effort. Two types of inherited status categories deserve mention, however. One is the inherited titles of nobility. The second are the occupational status designations. In both, there were trends towards greater mobility and less automatic inheritance. From the Tang dynasty (670-906 AD), hereditary aristocracies in China had been eliminated. Beginning in the Song dynasty (960-1127 AD) officials of the state were selected on the basis of formal examinations. As the state examinations became a more central tool of upward mobility, the barriers to commoners from taking part in these examinations went down. This was a long process, and by the time that the sumptuary laws that prevented commoners from taking the examinations were eliminated in the latter half of the Ming, the practice had already turned into a common occurrence.

The second type of inherited status had more of a rigid character during the Mongol Yuan Dynasty, from the 13th century to 1368, when the state's requirement for labor services resulted in an institution in which certain occupational status groups, such as commoner, artisan, soldier, salt producer, miner, scholar, astrologer, and many other categories, were required to be registered and strictly segregated. The Ming Dynasty (1368-1644) carried over this practice of compulsory occupational status registration. Although there were still remnants of the older practice of having these occupations be hereditary, the family histories of some high ranking officials who came to prominence in the 15th century reveal backgrounds in the artisan status group, strongly suggesting that the hereditary nature of the categories had started to break down by the Ming (Ho, 1962). The occupational status categories appear to have lost the rigidity of the Yuan and social mobility became more fluid. From the lists that are available of the exam candidates, it is possible to see that the status categories of the family backgrounds of the highest level *jinshi* degree holders during the Ming Dynasty included also people from different special occupational status designations, such as the soldiers, army officers, horse breeders, medical officials, official cook, and others (See Li Zhou Wang, 1746). In summary, despite the presence of different status groups in the registries of households, which can be

observed during the Yuan and also the early Ming, the permanence of the groups gradually were eroded, first in practice, and then in legal terms.

The breaking down of these legal barriers to inherited titles, which in turn loosened occupational rigidities, together with the preservation of social stratification are the two essential characteristics of the social changes over the long run. From the early Ming—in the 14th century—to the start of the Qing—in the 17th century—there came to be, apparently, more mobility across groups over time. The Qing Dynasty discontinued the Ming practice of family status registration, by which time there were no effective legal barriers to social mobility due to occupational status of the family (Ho, 1962).

Anecdotal accounts point to a path of upward mobility earned through investment, sometimes over multiple generations. For example, according to a biography of Wu Chung-liang of Huizhou, he was a blacksmith who spent his nights studying, and in 1593 passed the degree that enabled him to become a magistrate. Other biographies show that a number of successful candidates came from households of prosperous Yangzi Delta silk weavers, as well the families of merchants who prospered financially and found themselves able to afford books and tutors for their sons. A few cases highlight very humble occupational beginnings: the grandfather of Shang Lo, a prime minister from the 15th century who ranked first in the national palace examinations in his cohort, earned his living through hunting and gathering firewood. Although these are only few examples, they each point to the lack of legal barriers to upward mobility all the way to the highest ranks.

The institution of using classical education to legitimize bureaucratic officials was a central aspect of governance until the last years of the Qing dynasty (1644-1911), and it was an important tool by which automatic hereditary status was eliminated. Social status in China relied on investments made by each generation on the next. The possibility for political power, at all levels below the throne and the imperial families, to erode over time was in this way institutionalized.

Given the fact that titles could not be inherited, downward mobility was a real possibility as well. The sons of a ranking official would have been part of the leisure class, and

wealth and land could be inherited. But over time, the family's status would certainly have eroded if the descendants from later generations could not obtain the degrees and titles that would prevent sliding downward in the mobility ranks. Also here, anecdotal case studies have vividly illustrated the dramatic fall in household wealth among those descendants of famous officials who failed to earn any titles.

The question of the actual extent of mobility is still open to empirical analysis, however, since the lack of institutional barriers does not necessarily imply that commoners were more likely to move up in status; or that upper status sons were in danger of losing the status of the family in which they were born. Wealth alone would have meant better access to tutors for the sons of the rich, for example. In addition, networks and connections among the clan in high status positions could have helped as well. Richer lineage members could support talented boys from poor households, and the presence of lineage-supported schools would have made this type of investment feasible in practice.

The common descent group, or lineage, may have acted as an organization aiding the mobility of poorer members of the group through the sharing of resources among members.[4] Lineages that had more resources in particular could set aside common lands or lineage funds for the education of the children of poorer kin as well as the fees and expenses associated with taking the examinations. This was also a strategy that could potentially pay off for the lineage later if a member succeeded in the civil service examinations. The lineage as an organization form did not experience fundamental institutional change over the period, however, if the wealth had to be shared among a large group of people, the practice of resource sharing may have also created disincentives to accumulate wealth in the first place. In which case we would find wealthier and poorer lineages, but wealthier lineages as a group facing similar choices.

Other variables in the genealogical data can help determine the strategic factors that were used to influence mobility. Families could invest more in the education of their sons by shifting spending and having fewer sons. Other demographic variables that could influence

[4] Instead of lineage, the literature uses terms such as clan, extended family, and common descent group.

mobility could be life expectancy, health, and marriage. With respect to marriage, for example, the status of the wife's clan or the wife's father could be a factor in mobility of the sons.

3. Data Sources and Characteristics

a. The Tongcheng genealogies

The data of this paper comes from genealogies of individuals and households who lived in Tongcheng County of Anhui Province. Tongcheng County is approximately 30 miles by 60 miles, and is situated on the Yangzi River about 300 miles inland from the coast of the East China Sea. The county is about 150 miles from Nanjing, the early Ming Dynasty capital, and 650 miles from Beijing, the later Ming and Qing capital. Anhui Province was representative of the more developed and densely settled regions of China, with Tongcheng considered a centrally important economic region in the relatively developed agricultural economies of the lower Yangzi. The region was mainly a rice-producing area where the wealthiest families were typically landowning gentry (Beattie, 1979, pp. 130-131). Over the Ming and Qing Dynasties, the region gained some fame for having produced a number of the highest officials of the empire.

The dataset is created from genealogies of seven lineages of Tongcheng County (Shiue, 2017). Typically, genealogies start with the progenitor of the lineage from which all following lineage members descend (Shiue, 2016). In the Tongcheng genealogies, the lineages' progenitor is recorded usually in the 14th century, with the earliest date being the year 1298. The Tongcheng genealogies cover typically 18 consecutive generations, with a maximum of 21. The latest death recorded in the data set is 1925.[5] Generally, the coverage of genealogies at the turn to and into the 20th century becomes patchy (for example, see Harrell's 1987 analysis of lineage data from Taiwan). While my sample covers part of the Yuan (1271 to 1368) and the Ming

[5] The Tongcheng genealogies are not unique in the length of the period covered; Fei and Liu (1982), for example, examine ten lineages over the period of 1400 to 1900.

(1368 to 1644) dynasties it should be noted that the large majority of observations are for the Qing (1644 to 1911), as shown in Figure 1.[6]

The purpose of genealogies was to keep a record of the rituals of the family and a record of the achievements of its members. They were compiled and updated by the literate members of the lineage to aid in the ritual of ancestral worship. The genealogies were valued and kept in the hometown of the family in ancestral halls, providing future generations with a record of the location of graves, texts relating to grave worship, family rules of conduct, biographies of prominent members, a record of lineage lands, and an overall history of the family.[7]

Given their purpose and method of collection, genealogies do not completely match up to census data, official population registers, and other administrative data. Census data typically record the observed population at a certain date, either at the time of registration or in retrospect. One would need repeated observations throughout the lifetime of the same individual in order to determine the highest lifetime achievement of that person. By contrast, genealogical data presents one entry per person in biographical format. When the birth and death dates are given, the achievement listed in that individual's record can be considered the highest position achievement over the lifetime of the individual. In addition, the voluntary nature of data assembly of genealogies may induce selection, the retroactive updating of the genealogy might lead to recall bias, and there may be survivor bias. Given these issues are studied in Shiue (2017, 2016), less detail is given here.

Genealogies give a window to examine questions that are hard to address otherwise, in China or elsewhere. This is particularly true when the link between generations is of central interest, as is the case here. Census data in the U.S., for example, becomes available around the year 1800. The influential study of Long and Ferrie (2013) studies occupational mobility based on two generations, in 1850 and 1880 (see also Collins and Wannamaker 2015, Olivetti, Paserman, and Salisbury 2015). Chinese genealogies approach the same issues, but the linking of across generations is more straightforward. The following section introduces the data and

[6] This is typically the case in Chinese genealogies (e.g., Fei and Liu, 1982, Figure 6).
[7] Surveys of the content and scope of Chinese genealogies include Liu (1978), Telford (1986), and Shiue (2016).

provides summary statistics for the estimation sample. I will also compare this Tongcheng data with other available information on China during this time.

b. Sources of information in the data

Generally, genealogies provide information on male lineage members, their wives, and their children. The data can be inter-generationally linked because male children who survive to adulthood and marry re-appear in the genealogy as grown men.[8] The core information in the genealogies is on married men, their wives, and their children. One may also employ elements of information other than the status of a man, which might potentially matter for social mobility, such as the status of the man's wife's father, or how many brothers he had. I begin therefore by summarizing the available information on the men, women, and children separately before turning to the five-generation linked sample on which most of the results are based.

The data gives information on a total of 9,787 men, all of whom were over the age of 17. Around the year 1790, Tongcheng county had a population of approximately 1.3 million, suggesting that my sample covers about 1.5% of the Tongcheng population.[9] The status coding, detailed in Table 1, follows Telford (1986), which in turn draws on Chang (1956) and Ho (1962). Table A (appendix) provides summary statistics for the 9,787 married men in my sample. There are vital statistics such as the year and month of birth and death, with somewhat more complete data on birth than on death. The status measure is the highest status obtained during each man's lifetime, which ranges from 0 (no status) to 22 (highest status). Table A shows that the mean status level of these men is 1.65. Because this is a lifetime measure, it is not subject to the frequently encountered problem that status (or income) is measured early in the career, leading to measurement problems. The status of the father-in-law

[8] The potential selection arising from survival to adulthood and marriage are discussed below.

[9] I observe about 3,600 men that would be alive in the year 1790 in my sample. These men had more than 4,200 wives, and the data records more than 7,500 sons and 4,100 daughters, for a total of just under 20,000 persons. Gazetteers were local histories about a certain place. Three county-level gazetteers about Tongchong cover the period under analysis: *Tongcheng xian zhi* (1490), *Tongcheng xian zhi* (1696), *Tongcheng xuxiu xian zhi* (1827).

is also a lifetime measure. Furthermore, in this data set all status measures of the linked generations are lifetime measures, so that life-cycle issues do not arise.

About 70% of the sample consists of men without status. During the sample period, covering part of the Yuan and all of the Ming and Qing dynasties, high status came in no small part by holding an official government position. Generally, obtaining such a position required to successfully participate in tournament-style state examinations, given in several rounds. Holders of the highest degree, which was the gateway to the highest government positions and the highest status levels, were called *jinshi*. They account for about 0.2 percent of the sample.

Preparation for the state exams, not only passing, entailed substantial human capital investments, and Table 1 shows as well a simple indicator variable which is equal to one for individuals that are educated in the sense of making these human capital investments, and zero otherwise.[10] Some of the lower government positions were also open to men who purchased degrees, as noted in Table 1. Intermediate levels of social status were held by wealthy landowners, farmers, and merchants (status level 8), or by students of the Imperial Academy (status level 12).

Because these 23 status levels are, for some purposes, too detailed for analyzing social mobility, I aggregate them to a classification with nine status classes. None of my main results is sensitive to plausible changes in the status coding or aggregation. Thus, unless noted otherwise, all results presented in this paper are based on the 9-level status classification. The mapping from 23 to 9 status classes is shown in Table 1, columns 1 and 2. Table 1 shows that in the son's generation, about seventy percent of the men has the lowest status level, and 0.2%, or 18 individuals, are *Jinshi*.

c. Summary statistics

The following are summary statistics for the five-generation linked sample. The number of men in this sample is n = 7,328; the number is lower than 9,787 because linking additional

[10] Shiue (2017) analyzes the relationship between human capital investments and fertility in China using this data.

generations implies losing observations, analogously to lagging in time series analysis. The link is based on the mens' birth vitals (month and year) and death vitals (month and year), together with their father's status. This leads to a successful match rate of 97%. I have experimented with more identifiers (e.g. lineage, generation) to establish the intergenerational link, finding that this does not affect the main results. I refer to the five generations from the perspective of the youngest generation as "Son", "Father", "Grandfather", "Great-Grandfather", and "Great-Great-Grandfather". In the father's generation of this sample, about two thirds of the men have the lowest status level, and 0.3% are *Jinshi* (see Table 2 Distribution of status). Another 1% in my sample can be considered in the group of *Juren* and *Jinshi* (see Table 2, bottom).

Because more than 70% of men have no status (level 0), the average status of men is 0.69 at the son's level (note that the status included in the top of Table 2 is based on the 9-status sample). At the father's level, status is on average equal to 0.93. The slightly higher average status at the father's level is related to the secular decline in the probability that men could obtain an official position—this is in turn explained by the fact that the Qing government did not expand official positions in proportion to the population increase. Below I will examine the role of this for my estimates in a number of ways to ensure it is not driving the key results.

The oldest five-generations-linked observation in my linked sample has 1443 as the birth year of the son. The average birth year in the sample is 1770, indicating that the bulk of the men lived during the Qing, not Ming dynasty. Live expectancy of the parents was about 57 years, and the men were typically born when their parents were about 30 years.[11] These figures suggest that the typical five-generation linked observation covers more than one hundred fifty years. Table 2 indicates that there are typically five siblings in the sample, with a higher recorded share of men. The fact that genealogies provide more information on men than on women is related to their focus on patrilineal relationships.

[11] The life expectancy is conditional on (1) surviving to childhood, (2) marrying, and (3) the year of death is recorded. Life expectancy at birth was below 40 in China for much of this period.

d. Descriptive evidence

After transcribing individuals' biographical information from the genealogies, the data can be used to examine intergenerational mobility. Because the appropriate mobility measure depends on normative objective, it is useful to examine multiple measures (Fields and Ok 1999). I begin by employing transition matrices between different status levels, followed by the canonical regression of son status on father status.

The simplest approach in assessing absolute mobility is to divide the sample into poor and rich groupings and ask two questions. First, "what are the outcomes of children from poor families?", and second, "what are the outcomes for children from rich families?" Here, a man is "poor" if status equals zero, and "rich" if status is greater than zero. In the sample, the fraction of fathers without any of the special notations that provide evidence of above-normal status is 66%. Table 3 indicates that the great majority of status transitions across generations are from no-status fathers to no-status sons (top left cell).

The off-diagonal cells in this transition matrix are measures of absolute mobility. The chance for a son from a poor family to become rich is about 12% (top right cell). In contrast, the chance that a child from rich parents will be equally rich is about 58%. Notice that there are about half as many cases of upward mobility compared to downward mobility (1,064/582 is about 2).

This distinction between rich and poor is relatively coarse, so in the next assessment it is useful to examine additional status distinctions. Table 4 gives the one-generation transition matrix where rows indicate the nine status levels of the father and columns give the same nine status levels of the son generation. The transition matrix provides information on the outcomes of children from families with different status levels, addressing specifically the question of "What are the outcomes of children from poor families?" as well as the question, "What are the outcomes for children from rich families?" Close to 88% of all sons of fathers without status (status level 0) end up at the same status level 0 (top left corner). The probability that the son of a father without status reaches status level 7 (a *juren*) is 4 in 10,000, while the chance that

the son reaches *jinshi* (status level 8) status is zero in this sample (top right of Table 4). This is consistent with mobility being a gradual process of investment over multiple generations.

These are measures of absolute mobility, in this case upward mobility. We also see that of the fathers with status level 1, about 80% of their sons will be without status (status level 0), and of the sons of *jinshi* (status level 8), 92% will achieve a lower status level than their fathers. Furthermore, 13% of the sons of *juren* fathers (status level 7) stay at the same level, 1.3% move up to become *jinshi*, and more than 85% of the sons have lower status than their father. For the families with the intermediate status level 4, mostly students at the Imperial Academy, the chance that their son rises in status, versus the chance that he falls is about 1 in 6. These figures shed new light on status mobility, especially for the non-elites on whom we know very little, in China or anywhere else during this period.

To compare the one-generation transition matrix with that over more generations, Table 4b presents evidence on absolute mobility over five generations, that is, between the generations of the Great-Great-Grandfather (row) to Son (column). In particular, if the Great-Great-Grandfather is without status, the probability that the Son is also without status is 82% (compared to 88% for the father-son probability). The table also reveals that the chance of a *jinshi* descendant to be without status over five generations is 2.4% (lower left corner), whereas the descendent of an Imperial Academy member (Great-Great-Grandfather status level 4) to without status over five generations is about 60%. These figures provide direct evidence on long-run social mobility. In the absence of a long-run linked sample those transition probabilities have to be estimated, typically by iterating on one-generation transition probabilities (as those in Table 4). A key assumption for this to be accurate is that the transition matrix does not change over time—a later section will address how good the assumption is.

Additional evidence on long-run mobility comes from analyzing the evolution of status over five consecutive generations. I follow Chetty et al. (2014) and convert the status levels into ranks in the percentile status distribution. In particular, note that 72% of men in the son generation have status level equal to zero (Table 2, bottom). Each of them is assigned the percentile rank of 0.36, which is the midpoint for the status class (=[0+0.72]/2). Next come the

men with status level 1, which account for about 8.5% of all men; these men are assigned the percentile rank of 0.763 (= 0.72 + [0.805-0.72]/2), and so forth. Analogous mappings into percentile ranks are performed also for the Father, Grandfather, Great-Grandfather, and Great-Great-Grandfather generations.[12] Furthermore, for present purposes I aggregate the nine status levels to three, called No Status, Moderate Status, and High Status in order to avoid a too thinly parsed analysis. No Status is status level 0, Moderate Status corresponds to status levels 1 to 4, and High Status corresponds to status levels 5 to 8.[13]

To begin with, consider the top of Figure 4. High-Status Great-Great-Grandfathers are roughly at the 97th percentile in the status distribution (0.968 in the figure). Given their high status, regression to the mean would imply that consecutive generations have on average lower status, and that is what Figure 4 shows: conditional on the Great-Great-Grandfather being at the 97th percentile, their sons—the Great-Grandfathers—will be on average at the 86th percentile, followed by the Grandfathers at the 83rd percentile, Fathers at the 78th percentile, and Sons at the 75th percentile. This evolution is based on n = 468 observations for which the Great-Great-Grandfather status is High. Naturally, the average is based on rather diverse status transitions across families. For example, while in some families after two generations the Grandfather is a top-level *jinshi*, in other families the Grandfather is in the group of men with No Status.

Figure 4 also shows the group of Great-Great-Grandfathers with Moderate Status (n = 3,192). While lower in status they are still in the upper half of the status distribution, and over five generations they experience on a fall in their status. With a Great-Great-Grandfather at the 72nd percentile of income, the Son four generations later will typically be at the 53rd percentile. Finally, the lower series in the figure shows the evolution of status for those families in which the Great-Great-Grandfather had No Status (n = 3,652). Being at the bottom up is the only one way in the status distribution, and Figure 4 shows that after four generations the son in the typical family has moved to the 44th percentile in the status distribution, up from the

[12] In a later section below I will drop this mid-point procedure in favor of modeling the within-status level distribution.

[13] The transition matrix for this 3-status level analysis is shown in Table 5.

25th percentile. It is striking that low status families did not simply stay in the bottom rungs of society forever.

The lower line in Figure 4 gives a visual depiction of how upwardly mobile non-elites were in China during the sample period, as aspect of mobility that has so far eluded existing studies. The figure also quantifies *differences* in social mobility across status levels. Perhaps most striking is the degree to which High Status families can maintain their status. Note that the percentile rank of the High and Moderate Status groups in the Great-Great-Grandfather generation is 0.968 and 0.718, respectively. Given both of these are above the mean, regression to the mean implies that status will fall for both on average in the following generations. This is confirmed by the figure; for example, after two generations the rank of the High group is 0.831 (down from 0.968), while the rank of the Moderate group after two generations is 0.576 (down from 0.718).

At the same time, notably, the difference between High and Moderate group does not fall by much across generations. Specifically, the advantage of the High Status group in the Great-Great-Grandfather generation is 0.25 = (0.968-0.718), whereas two generations later, in the Grandfather generation, it is 0.255 = (0.831-0.576). If there would be a common rate of mobility in society, the descendants of High Status families would, given their initial position, be expected to lose (more) percentile ranks than the descendants of Moderate Status families.

The fact that High Status Great-Great-Grandfathers can preserve their status so well—even in the fifth generation the difference is 0.23 to Moderate Status, only down 2 percentage points—indicates that (downward) mobility at the top is much lower than in other parts of society. Note that high rates of persistence at the top are not necessarily only a feature of pre-industrial Asian countries. They have been found as well by Bjorklund, Roine, and Waldenstrom (2012) for 20th century Sweden. The results in Figure 4 differ in that they apply to a larger share of the population, the top 3-4 percent as opposed to the top 0.1 percent in Bjorklund, Roine, and Waldenstrom (2012). I will examine the top 1 percent below.

4. Estimation results

a. The Intergenerational Elasticity, 1300 - 1900

One of the most widely applied methods in mobility studies is a regression of (log) son outcome on (log) father outcome to estimate the so-called intergenerational elasticity (IGE).[14] To allow a comparison of the mobility in this sample to existing estimates, I estimate the IGE by regressing son status on father status, employing the percentile rank as in Chetty et al. (2014). I begin by estimating the mean IGE using OLS before allowing for different degrees of social mobility below.

The OLS results are shown in Table 6. The IGE is estimated at 0.58, as shown in Column 1. On average, a 10 percentage point higher father status, e.g. from the 70th to the 80th percentile, is associated with a 5.8 percentile higher son status. Including either a trend (Column 2), or, more flexibly, one hundred time fixed effects (Column 3) does not change the IGE estimate by much. Thus, the secular decline in status during the sample period has a negligible impact on the estimated average IGE. I have also calculated the rank in the percentile status distribution separately for each quarter of the sample separately to account for a changing distribution of status over these six hundred years (Column 4), finding that this does not have a major effect on the IGE estimate. The last specification shows the results when I employ the nine status classes (0 to 8) directly, instead of the respective percentile ranks; the IGE is estimated to be quite similar (Column 5).

How do the IGE estimates of Table 6 fit into the existing literature? Most existing estimates are in the range of 0.2 to 0.6, see Solon (1999), Jantti and Jenkins (2013), and Clark (2014). In particular, Chetty et al. (2014) report an estimate based on income data of 0.34 for the U.S. around the year 2000. For historical samples, Lindahl et al. (2014) and Braun and Stuhler (2016) present evidence on IGEs from education and occupation regressions starting in late 19th century Sweden and Germany, respectively, finding IGE estimates around 0.33 and 0.56, respectively. In comparison, my IGE estimate of 0.58 appears to be on the high side

[14] This is a measure of relative (not absolute) mobility because implicitly the regression framework compares the mobility of individuals with a certain status with that of other individuals.

(relatively low levels of social mobility). However, compared to these studies, my sample period is several hundred years earlier, essentially ending when the sample period in these studies begins.[15] An exception to this is Clark (2014) whose analysis over several centuries tends to yield high IGE estimates, perhaps around 0.75, although it is not clear whether Clark's (2014) approach, based on elite surnames, yields estimates comparable to mine. Finally, this IGE is based on a sample of 5-generations', which restricts the sample somewhat. In Section 7, I return to this issue by comparing IGE estimates from different samples.

b. Mobility as a multigenerational process

Having estimated the average extent of mobility for the father-son relationship, Table 6b shows the IGE estimates by regressing son status on father status and comparing that to the coefficient from regressing son status on previous generations. That is: son on grandfather status, son on great-grandfather status, and son on great-great-grandfather status. This 5-generation linked sample gives actual estimates on mobility over longer time periods, and usefully sheds light on whether one can validly iterate the son-father coefficient for several generations in order to get accurate estimates of mobility over longer periods.

These estimates can shed light on the empirical question of whether the first-order autoregression between two generations allows us to understand the multigenerational association across higher-order associations. The simple answer, based on these results, is no. For example, using the son-father coefficient twice would yield 0.335 (0.579 x 0.579) as the IGE mobility coefficient between son and grandfather, as given in the last row—whereas the actual, directly estimated coefficient is 0.398. Notably, the percentage difference between actual and iterated mobility gets larger with every generations, so that one would make an increasingly larger error by iterating the son-father coefficient.[16]

The reason why the predicted coefficient deviates from the actual estimate over higher generational links is related to how intergenerational mobility varies with status in the population. In particular, the IGE varies in a hard-to-predict way over the income distribution

[15] In addition, the extent to which educational and status mobility are comparable is unknown.

[16] Note that: $(0.398-0.335)/0.398 < (0.326-0.194)/0.326 < (0.273-0.112)/0.273$.

so that generalizations about the applicability of the first-order association to higher-orders cannot reasonably be made for all populations.

There are a number of important sources of heterogeneity. First, intergenerational mobility varies with status. This can be seen comparing the average IGE coefficient, which implies that a 10-percentile difference in the status of fathers translates into a 5.8 percentile difference for sons, with the difference between a High and Moderate status Great-great-grandfather (which is produced in Figure 4). The latter shows a 25-percentile difference in status, which implies that the predicted difference in the next generation should be about 14.5. However, the actual percentile difference in the next generation is 23. The implication is that high status households tend to regress to the mean at a slower rate than moderate status households. Mobility is thus conditional on where the household is in the income distribution

Second, along with status, mobility also varies sometimes quite substantially across surname lineages, which may in turn be a proxy for genetic or environmental factors, but also capture differences in education and income across families. Table 6c shows the IGE estimates by each of the seven clans that are in the sample. The IGE for clans that have a higher status is on average higher than for low average-status clans, as we would expect (around 0.8 and 0.69 for the *Ma* and *Ye* clans, respectively). Also worth noting is that the average status for the clan with the lowest IGE estimate is not too different from the average status of some other clans—evidence of heterogeneity in IGE even across lineages with similar average status, thus suggesting that there is more to IGE than a mechanical relationship to income. In separate results (not shown in the table), the IGE is 0.54 for the 5-generation relationship in the *Ma* clan (a relatively educated clan), much higher than the essentially zero IGE estimate found in four other (less educated) clans.

c. Non-linear (Horizontal) sources of mobility

Beyond the vertical relationship of the son to father to grandfather, it is possible that horizontal relationships of people sharing the same generation as the father are important. The baseline relationship between father and son is shown in Column 1 of Table 6d. Adding

grandfather status to this OLS regression yields a small positive coefficient, significant at the 10% level (Column 2). Going further back in the sequence of ancestors, Great-Grandfather as well as Great-Great-Grandfather status enter positively as well (Column 3 and 4, respectively). Notice that the point estimate of the Grandfather coefficient is not larger than that of Great-Grandfather or Great-Great-Grandfather, as one might have expected based on the likelihood of personal interaction.

I also examine the role of non-lineal relationships by adding another variable, the status of the son's uncles, "Av. Rank Uncle". It is computed as the average status of all lineage members of the father generation, except the son's father. The Uncle variable enters with a highly significant positive coefficient (Column 5).

When Grandfather is included together with either earlier lineal relationship variables (Great-Grandfather, Great-Great-Grandfather) or with the Uncle status variable, the Grandfather coefficient turns insignificant (columns 6, 7, and 8). This provides, in this comparison, evidence against a strong influence of the grandfather relative to the Uncles.

All lineal status variables are included jointly in column 9. Great-Grandfather and Great-Great-Grandfather enter positive and significantly, in contrast to Grandfather. A plausible interpretation of this finding might be that the positive coefficients on Great-Grandfather and Great-Great-Grandfather mostly help to define the 'quality' of the father.

The inclusion of the Uncle status variable yields again a positive coefficient. At the same time, the coefficient on Father is with 0.53 not much lower than in the baseline of column 1. This is consistent with the idea that high status uncles make a net difference for mobility by raising persistence. Standardized beta coefficients (not shown) indicate that father status accounts for about three-quarters, and uncles for about one-quarter, of the overall correlation with son status.

On the whole, the findings point to important non-linear and network effects in the same generation as the father, as picked up by the role of uncles. This is an area where more research seems to be warranted, and I will return to this issue when examining the impact of inequality in the father's generation on the intergenerational mobility from son-father in Section 7.

5. Estimation of the distribution of IGE

a. IGE over household status

The previous sections have shown that the evidence from regressions estimating the IGE strongly suggests the IGE differs depending on household income of status. Here, I directly estimate the distribution of IGEs across status levels.

Consider the IGE for a particular percentile p of the status distribution, denoted by IGE(p), $p \in (0,1)$. For example, IGE(0.8) would be the intergenerational elasticity at the 80th percentile of the status distribution. In principle, this can be estimated using a standard quantile regression. However, in the present case I have only nine distinct status levels, from level 0 to 8 (see Table 2, bottom). All sons with status level 0 have percentile rank 0.36, those with status 1 have percentile rank 0.763, and so forth, which limits the quantile analysis.

Because of this limitation, in the following, I model the unobserved within-status distribution to address this issue. Specifically, let *son(i,s,m)* be the percentile rank of son i with status s, where i = 1,..,7,317, and s = 0,1,.,8, and sample m. So far, for status level $s = 0$, so far I have employed *son(i,0,m)* = 0.36, all i, see Table 2, bottom. Now, I now model the unknown within-status distribution by assuming the percentile rank of son i with $s = 0$ is randomly drawn on the interval 0 to 0.72 in a given sample m; this is repeated for all i with status level $s = 0$, and analogously for the other status levels. For example, the sons with status level $s = 1$ are randomly assigned percentile ranks between 0.72 and 0.805, and so forth. This random sample of percentile ranks *son(i,s,m)* of size n = 7,317 has the same status means but the percentile rank is continuous between 0 and 1. Finally, to ensure that specific assignments do not matter I repeat the procedure M=100 times and report the average across the hundred quantile regressions to obtain the intergenerational elasticity at percentile p. An analogous approach is adopted for the percentile rank of the father.

Across the M = 100 random samples, the average OLS IGE estimate is virtually equal to that in Table 6, column 1. This is as expected because my approach does not change the means. Figure 4a shows results for IGE(p) by decile, as well as the 1st, 5th, 95th, and 99th

percentile of the status distribution. The figure shows the distribution of IGE estimates across the status distribution together with the confidence interval (dashed lines). The IGE estimates vary strongly from around 0.9 at the 30th decile to less than 0.05 at the 1st percentile. In contrast, recall that the OLS estimate is equal to 0.58. Evidence for high levels of mobility (low IGE) is found especially at the extremes. To some extent this is not surprising. A son who is at the 99th percentile of the distribution will typically have risen substantially over the status of his father, and similarly a son who ends up at the 1st percentile will have typically dropped considerably relative to his father's status; both reflects relatively high levels of mobility.

Notice, however, that mobility at the top and at the bottom is not symmetric. This becomes clear from Figure 4b, which shows the IGE(p) for the top and the bottom 10 percent of the distribution. On the left in Figure 4b, I compare the IGE estimate for the 1st (Poor) and the 99th (Rich) percentile. It turns out that the IGE estimate for the 99th percentile is almost 4 times as large as the IGE for the 1st percentile. There is less mobility for the top 1% than for the bottom 1%. Relatively rich men can maintain their high status relatively well. Conversely, on the lower end of the distribution mobility is higher, both upward and downward (this analysis does not distinguish the two). Figure 4b indicates that this result is not limited to the top and bottom 1%, as it is also at the 5th/95th and 10th/90th percentiles. Overall, the analysis confirms the descriptive finding from Figure 4 above and confirms mobility differs quite strongly across social status.

6. Did Social Mobility Change over Time?

A reading of the historical background during this period suggested that there may have been institutional changes that made it more likely barriers to occupational mobility were reduced. In this section, I exploit the relatively long time series of the sample to study whether there were changes in mobility over time that can be observed. First, I ask whether the chance of moving out of the lowest status has changed over time (upward mobility). To do so, I break the sample period into 100 subsamples with roughly the same number of observations, and for each subsample I compute the probability that the son has some status ($s > 0$) while the father

has none (s = 0). Second, I ask whether the chance that a son has the lowest status (s = 0) even though his father has some (s > 0) has changed over time (downward mobility).

The analysis shows that both upward and downward mobility have changed over time. Confirming the trend picked up in the coefficient of Table 6, Figure 2 shows increases in absolute mobility (as defined earlier). The chance of moving up is about 17% around the year 1500 and about 19% in the year 1850. The chance of moving down has changed more in comparison, from about 28% in the year 1500 to approximately 50% in the year 1850. In sum, both upward and downward mobility have increased over time, with downward mobility exhibiting a greater change.

Next, I obtain the IGE estimate using OLS for the same one hundred subsamples; Figure 3 shows the results. It is apparent that IGE has fallen over time, or equivalently, that relative mobility has increased. While during the 16th century and before, the IGE point estimate is about 0.7 it is around 0.5 by the middle of the 19th century. The result is obtained for a given sample region so differences in measurement or definitions should not play a major role. One might still be concerned however that over time there were changing numbers of single men—because single and unmarried men by definition do not have long intergenerational linkages. The IGE might be different depending on whether the sample includes a larger or smaller share of single men, who on average tend to have less status than married men. Figure 8 shows that adjusting for the changing numbers of single men over time (as sons) does change the average IGE estimate. However, the trend lines in IGE over time are very similar across samples that include or do not include single unmarried men of different ages, showing that accounting for unmarried men does not explain temporal trends.

To see how mobility changed over time from higher to lower status households in the sample, I employ the same quantile approach from above except that I estimate quantile-specific IGEs separately for two sub periods, Early versus Late (before and after the year 1786). The two periods, Early and Late, are divided so that the number of observations is roughly the same. Figure 4c shows the results. Overall, there is a higher level of mobility over time in the

sense that the coefficients for the Late-period are typically below those of the Early-period.[17] The IGE coefficients estimated by OLS are 0.65 (s.e. 0.016) and 0.50 (s.e. 0.021) for the Late and Early period, respectively. The exception to this finding is mobility for the top 5% (95th percentile and higher), which is virtually unchanged from the Early to the Late sub period. Is this because downward mobility did not change for these rich men, or because the probability of moving up into these ranks did not deteriorate over time? One interpretation is that high-status families were relatively well able to maintain their status. This conjecture is based on the idea that in China as a (largely) pre-industrial society during this time, high status is more associated with maintaining high status than moving into it.

A more detailed examination of these changes by status is shown in Figures 5 and 6, which indicates that increased mobility over time varies according to status. Figure 5 shows the upper half of the status distribution. I show the average status of men from families in which the Grandfather had Moderate, High, or *jinshi* status, for two cohorts before (Great-Great-Grandfather and Great-Grandfather) and two cohorts after (Father and Son) the Grandfather achieved his status. This gives the figure the character of a mobility event study. With the age of death being above forty years and father's age at the birth of the son being about 30 in much of the sample, typically the status evolutions shown in Figure 5 cover around one hundred fifty years.

For each Grandfather status level (Moderate/High/*jinshi*), the figure shows two series, one for the earlier and one for the later half of the sample.[18] Consider first the set of Moderate Status Grandfathers at the bottom of the figure. The general pattern is inverse-V shaped. Given that I condition on the Grandfather having Moderate Status, and given that Moderate Status is higher than the status mean, *rising* status in the cohorts before and *declining* status in the cohorts after Grandfather is a reasonable outcome in light of a tendency to regress towards the mean.

[17] The figure does not report confidence intervals for readability; they are available upon request.

[18] The earlier subsample is for 1443-1785, the later for 1786-1863, by birth year of the son.

Turning to the changes over time, the series for the earlier years is dashed while that for the later years is solid. There is virtually no difference between the earlier and the later years in the climb up to Moderate status—it is about 8 percentile ranks between Great-Great-Grandfather and Great-Grandfather, and about 7 percentile ranks more in the following generation. The figure shows that in cohorts after the Grandfather, however, the descent in status is faster, on average, in the later years. While in the earlier years the step down occurs from the 78th percentile to the 66th, in the later period the step is larger—it is to the 64th percentile rank in the status distribution (a 17% larger descent). To be sure, this difference in the average speed of downward mobility masks substantial heterogeneity, though it is exactly these effects that explain the overall increase in mobility over time that were documented above.[19] For families of High Status (i.e., those with a High-Status Grandfather), both upward and downward mobility is higher in the later than in the earlier years: the inverse-V has become sharper. Notice that the increase in downward mobility is larger than the increase in upward mobility (8%, compared to 4%, measured at two cohorts before and after).

Finally, for the subset of families where the Grandfather was a *jinshi* (n = 34), there is also a pattern of increased mobility over time.[20] However, in contrast to both Moderate and High Status levels, now the increase in mobility over time is entirely the result of greater upward mobility, not downward mobility. In the later period, men who become *jinshi* climb on average 21 percentile ranks in the status distribution (0.79 in the Great-Great-Grandfather cohort to 0.997 as *jinshi* in the Grandfather cohort), whereas in the earlier years *jinshi* men climbed only 4 percentile ranks over the previous two generations.

Overall, these transitions paint a rich and varied picture of how the overall increase in mobility in China during this period resulted from heterogeneous changes in the mobility at different status levels, and tend to confirm results in the preceding Figures and Tables. For the highest status men, the *jinshi*, upward mobility substantially increased while downward mobility did not: individuals were able to shield themselves from substantial downward

[19] As a measure of dispersion, the standard deviation of Father status here is about 0.25.

[20] There is roughly the same number of *jinshi* in the earlier and later years (16 and 18, respectively).

mobility. Men with Moderate status tended to fall faster than they had before, with no corresponding increase in upward mobility. Only for men with High status is there both a substantial increase in up- and downward mobility. The overall picture is much more complex than existing conclusions in the literature, which tend to emphasize population growth and declining in opportunities for upward mobility. I find that this is not in fact true in general, and is not true in particular for the highest status men that have thus far received the bulk of study.

Figure 6 shows the patterns at the lower end of the status distribution. The patterns now are V-shaped because these families have the lowest status level in the grandfather cohort by construction, and any achievement of status in cohorts before and after them will yield the V-shaped pattern. We see that downward mobility—in the two cohorts before the No Status Grandfathers--decreased somewhat over time, while upward mobility—the Father and Son cohorts—increased. The descent into poverty is not as rapid in the later compared to the earlier years. This finding enriches the mobility picture further, because the decline in downward mobility goes against the general trend of increased social mobility over time. The reason why this decline does not determine overall mobility is that the increase in upward mobility exceeds the increase in downward mobility: Great-Great-Grandfather status is 3.9% lower in the later than in the earlier years, while Son status is 5.4% higher in the later than in the earlier years.

In summary, the previous analysis indicates that the earlier finding of increased social mobility is present at most status levels, although not to the same extent. In particular, there is no evidence that a more rapid descent into lower income or status is important for my overall finding of increased mobility over time in this period. Rather, greater possibilities for upward mobility across the spectrum while more rapid downward mobility at moderately high status levels all play a part.

7. Mobility and its correlates

The previous sections showed how heterogeneity in status, both in the cross section as well as over time, are related to mobility across generations. In addition, there is evidence that

intergenerational mobility, as a multigenerational process, increased over time from the first to the second half of the sample. Notably, the increases in mobility were not confined to any one class of society, but appear to have had an impact across upper and lower ends of the status distribution. The changes are consistent with the historical evidence on lower barriers of entry out of lower classes, and into moderate or upper classes.

In this section, I examine the likely mechanisms behind the increased social mobility observed. I regress the IGE estimate from 100 periods on measures of demographic change and parental resources, based on equal sized divisions of the data sample. The sample of about 7,300 observations is thus divided into one hundred equal-sized subsamples. This implies that the following results exploit variation across 100 time periods, where each variable is based on about 73 observations.

Table 9 shows the results of the IGE average regressed on a time trend (column 1), and shows it is significantly negative, which means the IGE is falls over time, consistent with increasing mobility. In Columns 2-5, the IGE is regressed on the mean of father's status, father's age at death (which captures aspects of longevity and health), the number of marriages that the father had (a measure of household resources and health), and the father's education (a 0/1 variable of whether the father had any education). The results shows that in sub periods when the mean status, resources, and education tends to be high, the IGE is high. This is consistent with the idea that the rich experience low mobility because they are relatively more capable of insulating themselves from a loss of status, or downward mobility. Notably the strongest predictor of IGE is the father's education, and it is the only variable that renders the time trend insignificant.

In Columns 7-10 in Table 9, I include the time trend and variation in the measures of status, resources, and education of the father. This shows whether, in addition to the mean, dispersion of education matters for social mobility. The results on standard deviation of father's status and father's education suggest that both matter, above and beyond the means of these variables. The demographic variables, marriage and longevity, do not have a significant role in explaining patterns IGE over time once variation in education and status is accounted for.

Economically, the effect of variation in education is strongest, with a beta coefficient of 0.65, compared to the also important coefficient 0.36 for variation in status.

Figure 7a plots the Educational Inequality of the father on the Intergenerational Mobility of the son-father estimate, across n=100 sub periods from 1300-1900. The two figures show the strong temporal relationship between educational inequality in the father's generation, and subsequent intergenerational mobility in the son's lifetime outcome. During times of greater educational inequality, there is also less mobility, and this is the most important explanation for trends in mobility over time. This relationship holds even while controlling for the secular trends in education over time. Figure 7b reveals the timing of the periods by labeling each point chronologically from 0 to 99. The negative relationship is also robust to dropping certain periods or certain points from the graph.

The result that inequality is associated with lower mobility in the time series is consistent with negative correlation of inequality and mobility across countries (Kruger 2012, Corak 2013) and across U.S. regions (Chetty et al. 2014), both for the late 20th century. These results demonstrate that education inequality is the most important mechanism underlying this relationship.

8. Conclusions

Employing genealogical data on thousands of Chinese men where status in many successive generations is observed, this paper examines multi-generational mobility during the period 1300 to 1900. I document a pattern of higher mobility over time, which is consistent with the timing of social and institutional change during this period. The results also show a great deal of heterogeneity in the degree of mobility at all levels of status, where educational inequality is the most important factor related to social mobility. Periods of less inequality in the father's generation correspond to periods of greater mobility from father to son. This provides temporal evidence that echoes the cross-sectional evidence in other studies showing a positive relationship between the IGE and the Gini coefficient across regions.

Why periods of higher inequality are significantly and positively correlated with the IGE may be in part explained by the pattern of mean regression. Regression to the mean implies that mobility is fastest at the bottom (where the direction is upwards), the top strata. However, empirically, when inequality increases, there is a fundamental lack of symmetry: the top is unaffected (IGE unchanged), while the bottom rungs become relatively less mobile because the poor are less able to climb out of poverty – together these dynamics suggest that the IGE on average increases.

In addition to the primary importance of the parent in determining son lifetime outcomes, there is a multigenerational effect. The comparison shown in this paper between the predicated and actual higher-order mobility suggests mobility is not a Markov process. Because gains from the past are built up slowly, and show more persistence than the one generation IGE estimate implies, inequalities from the past might therefore have more pronounced impacts on mobility than we would otherwise expect. Complementing this empirical finding is that there is an important impact coming from men in the same generation as the father. On this score, the results suggest uncles' status is even more important than grandfathers in their correlation to son lifetime outcome. Yet, it is not just a narrow family effect, even in China where lineage is quite important. More broadly, the results show that when the sample contains all men in the father's generation, and not just the related uncles, the degree of variation in the status and education is powerfully correlated with son-father mobility. Average levels of status are also significant, but its effects on mobility are weaker. Finally, demographic factors like marriage, numbers of single men, and longevity doesn't appear to matter much in this case, but could in other contexts where there are changing marriage patterns over time.

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Figure A. Inequality and intergenerational elasticity (household income for 1985 and child's adult-outcomes in mid to late 1990s)

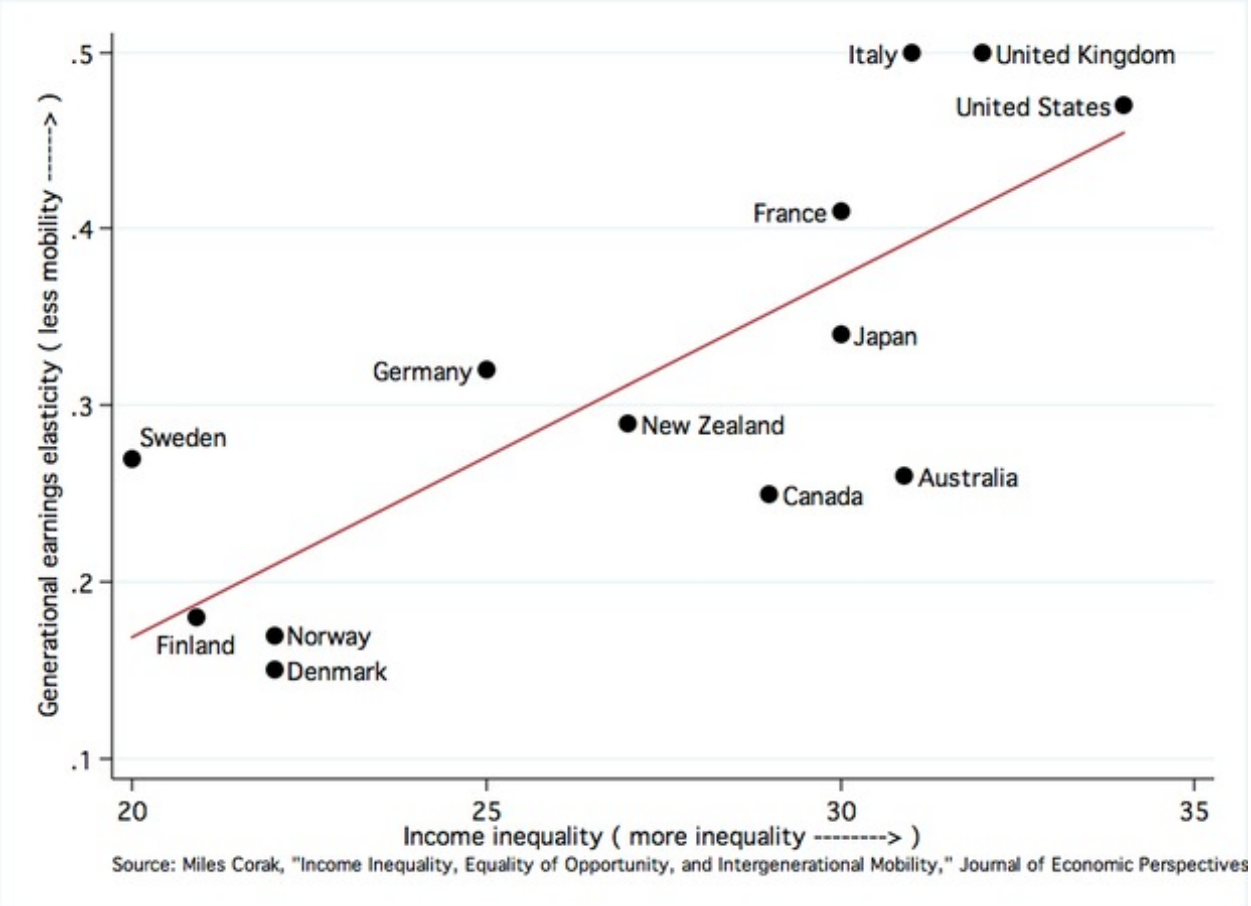


Figure 1. Frequency of birth year

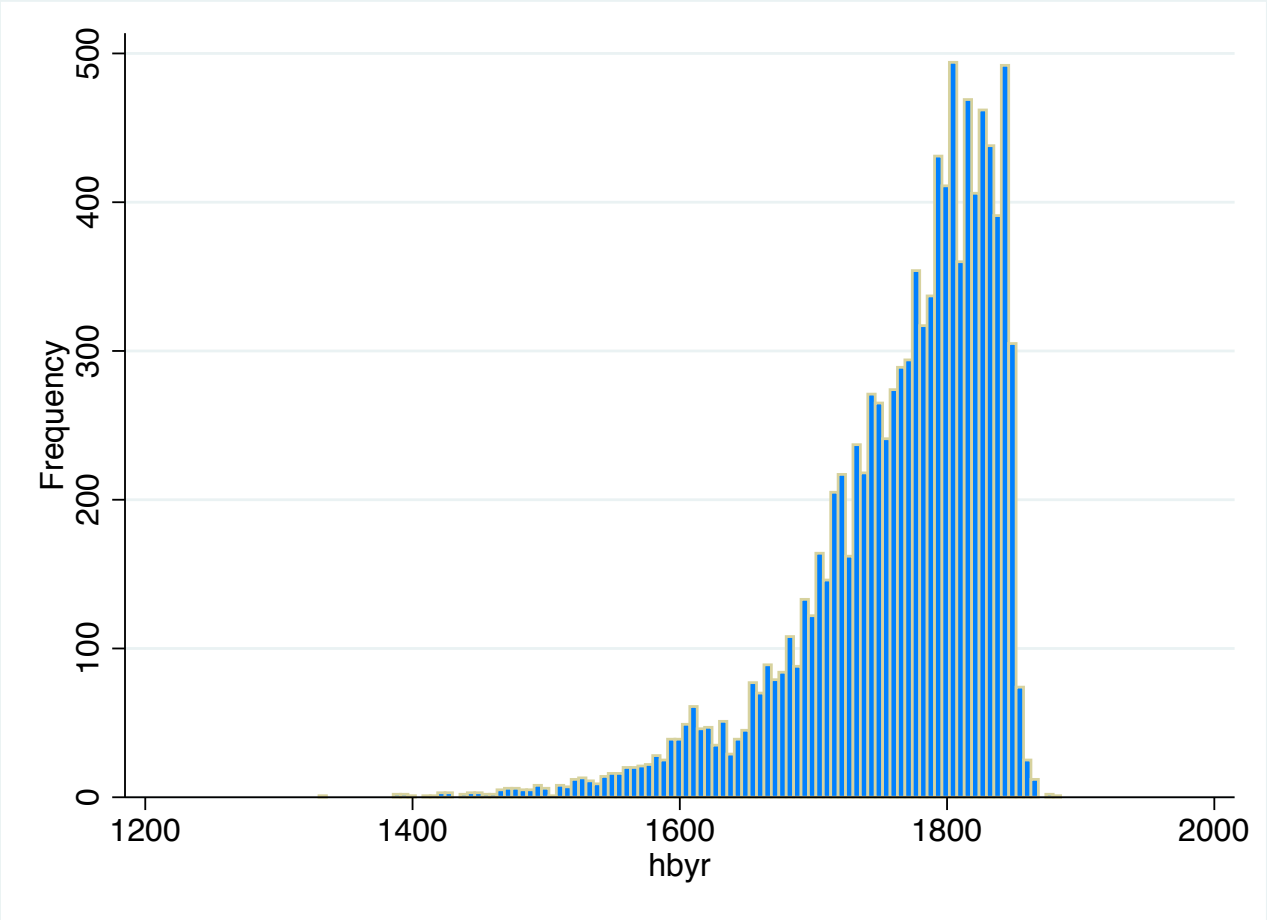


Figure 2. Upward and Downward Mobility over Time

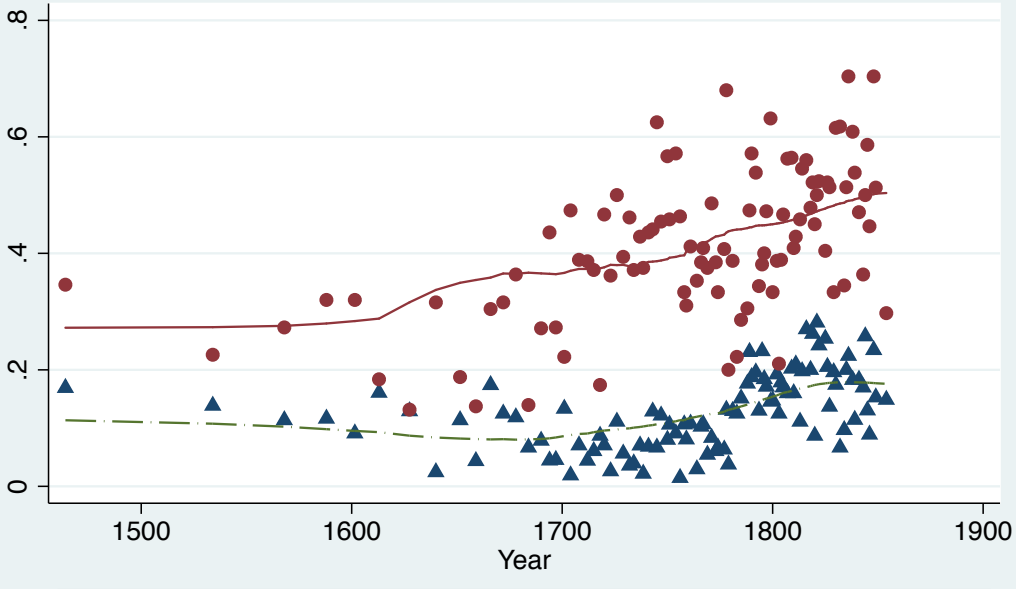
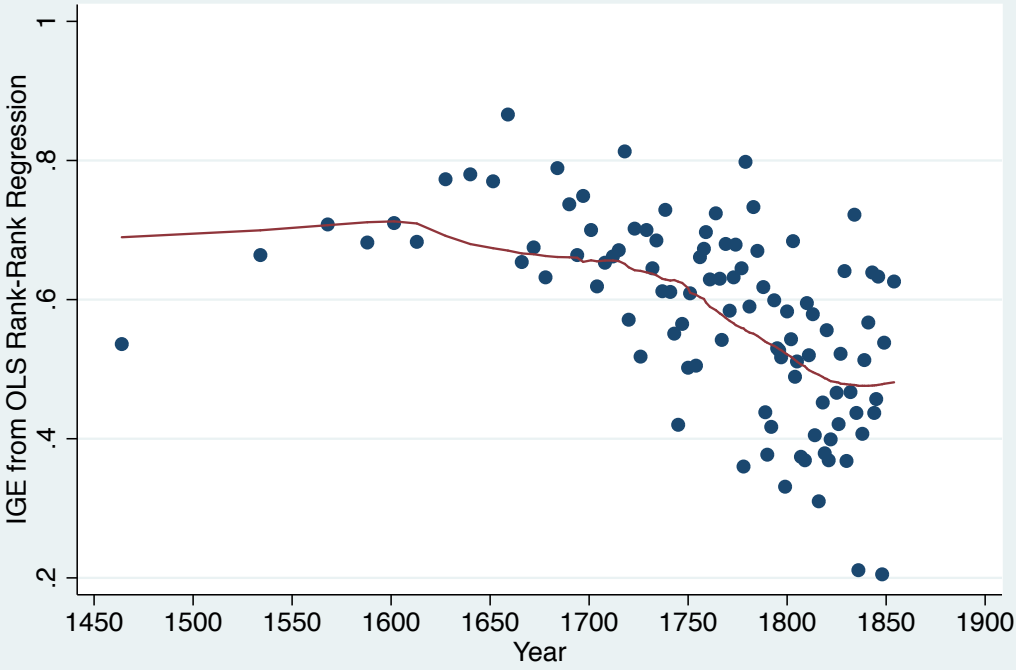


Figure 3. Relative Mobility over Time



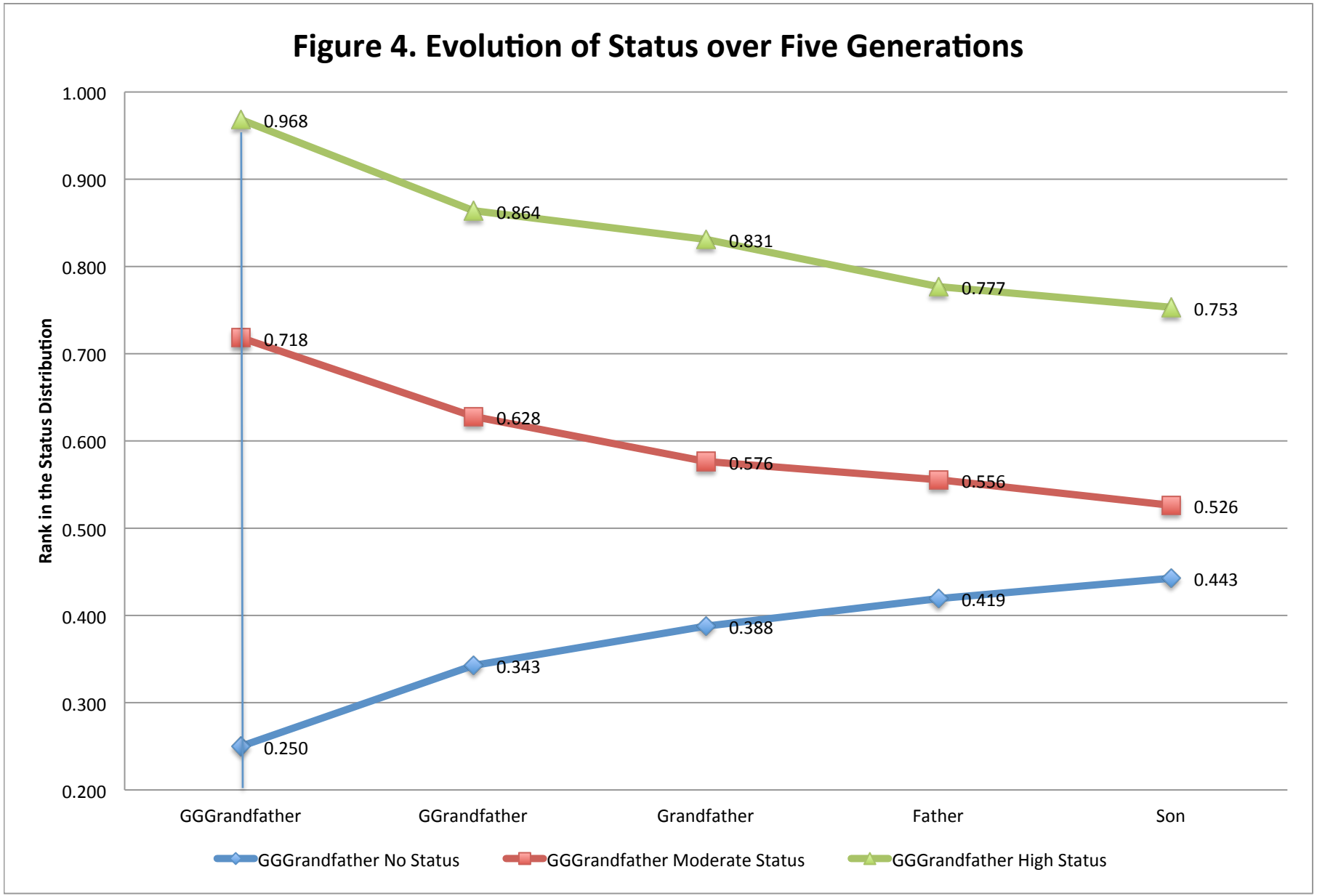


Figure 4. Evolution of Status over Five Generations
Rank in the Status Distribution
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.968
0.864
0.831
0.777
0.753
0.718
0.628
0.576
0.556
0.526
0.443
0.419
0.388
0.343
0.250
GGGrandfather
GGrandfather
Grandfather
Father
Son
GGGrandfather No Status
GGGrandfather Moderate Status
GGGrandfather High Status

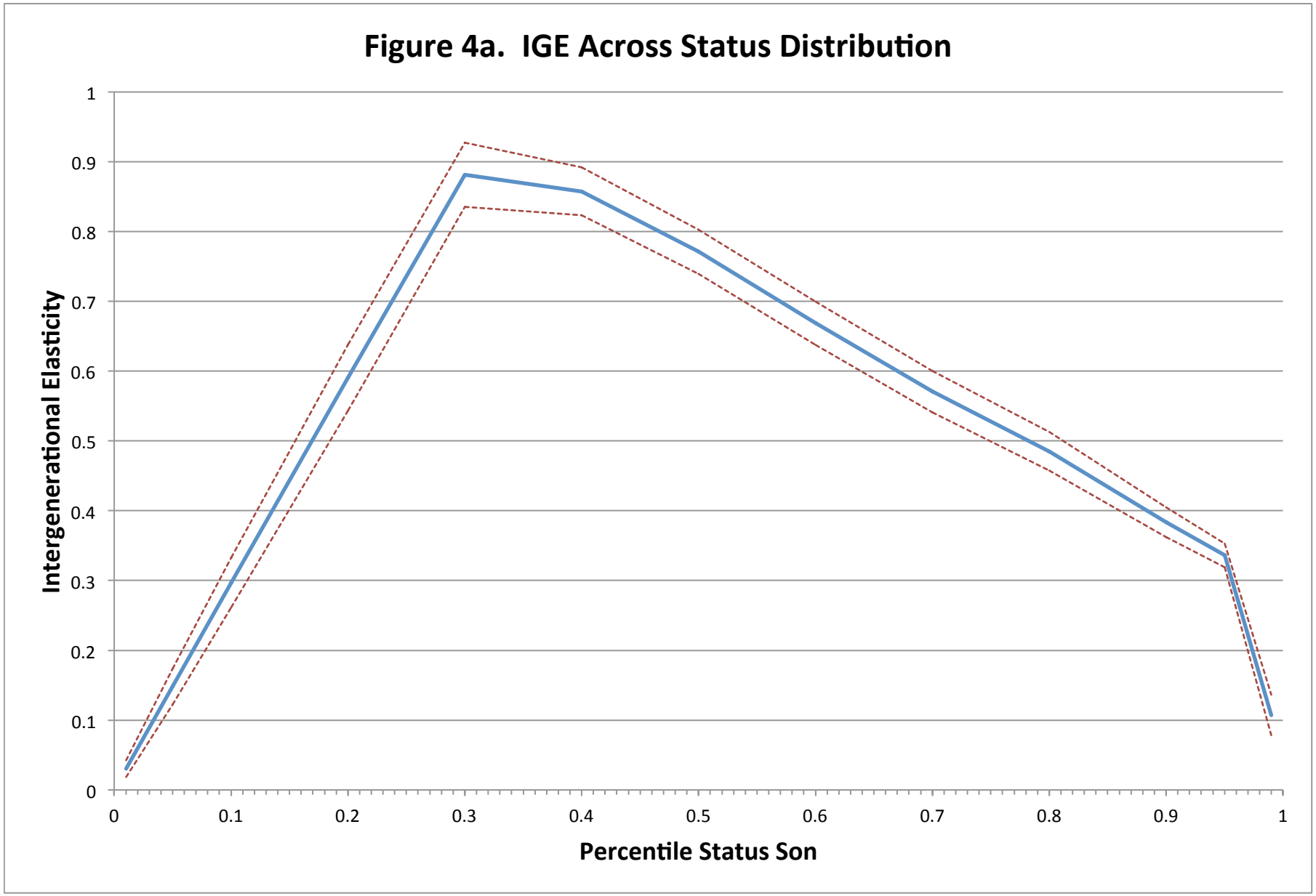


Figure 4a. IGE Across Status Distribution
Intergenerational Elasticity
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Percentile Status Son

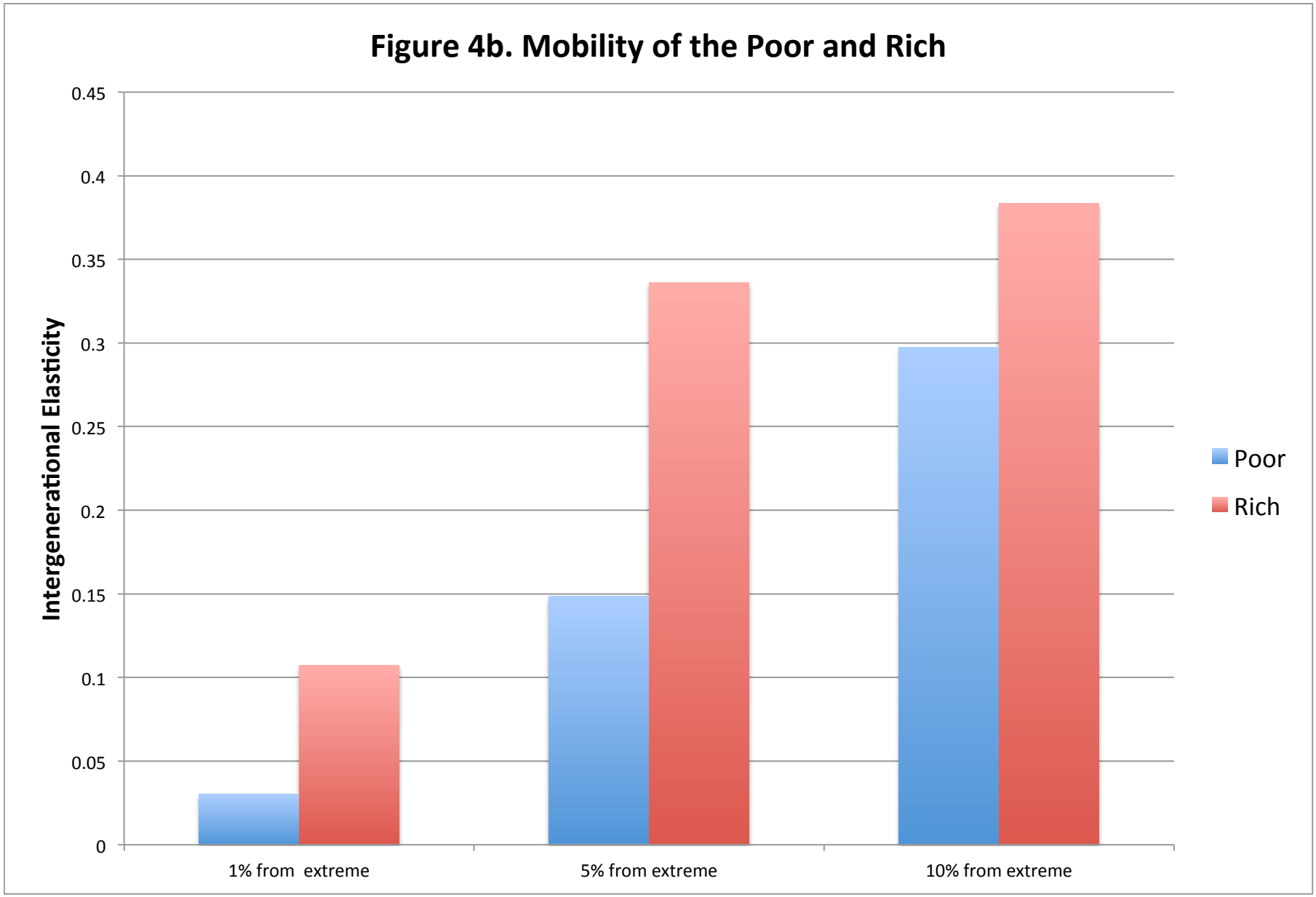


Figure 4b. Mobility of the Poor and Rich
Intergenerational Elasticity
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1% from extreme
5% from extreme
10% from extreme
Poor
Rich

Figure 5. Changes in the Climb Up versus the Path Down over Time

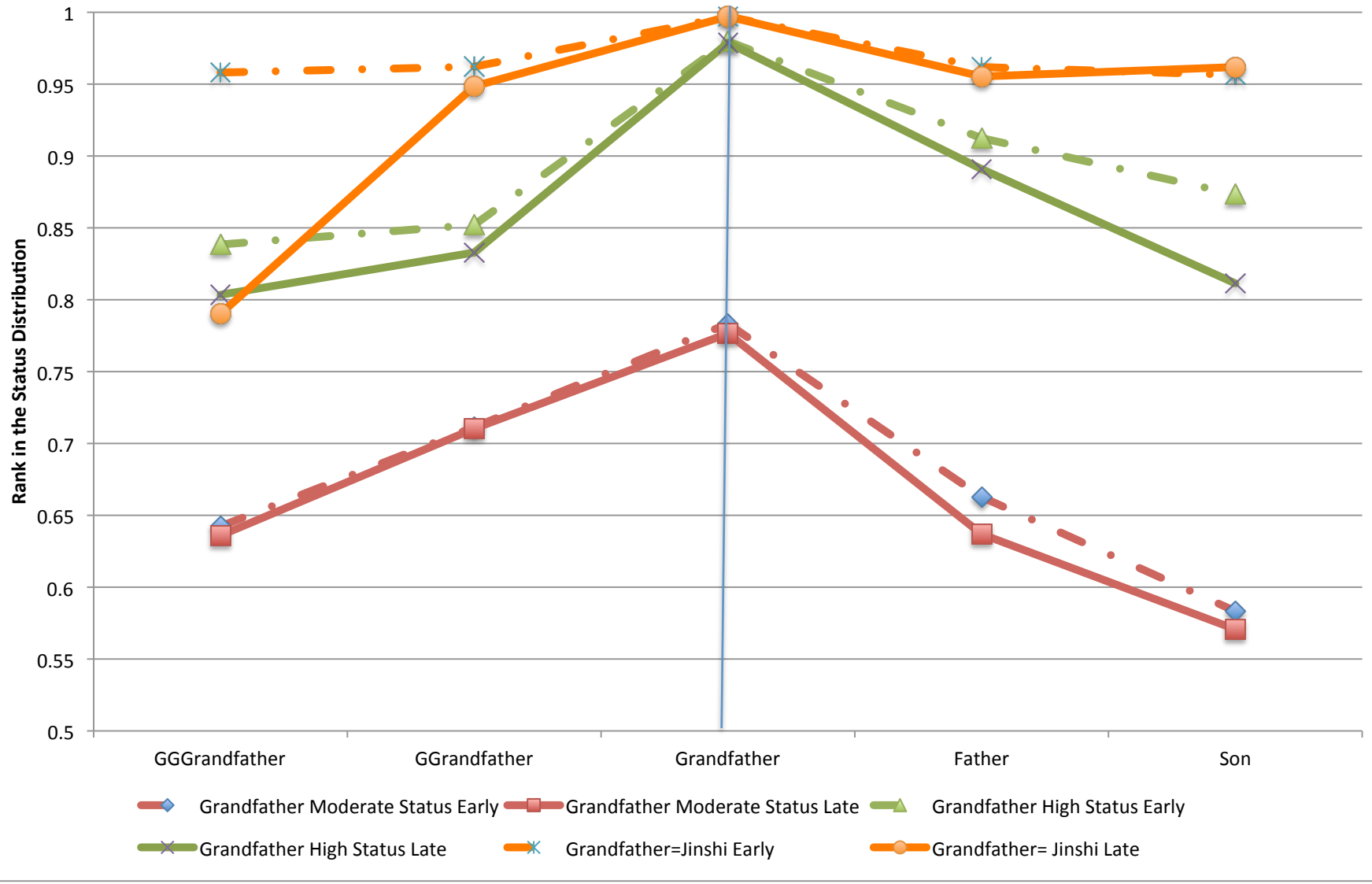


Figure 6. Changes in Mobility over Time for Low-Status Families

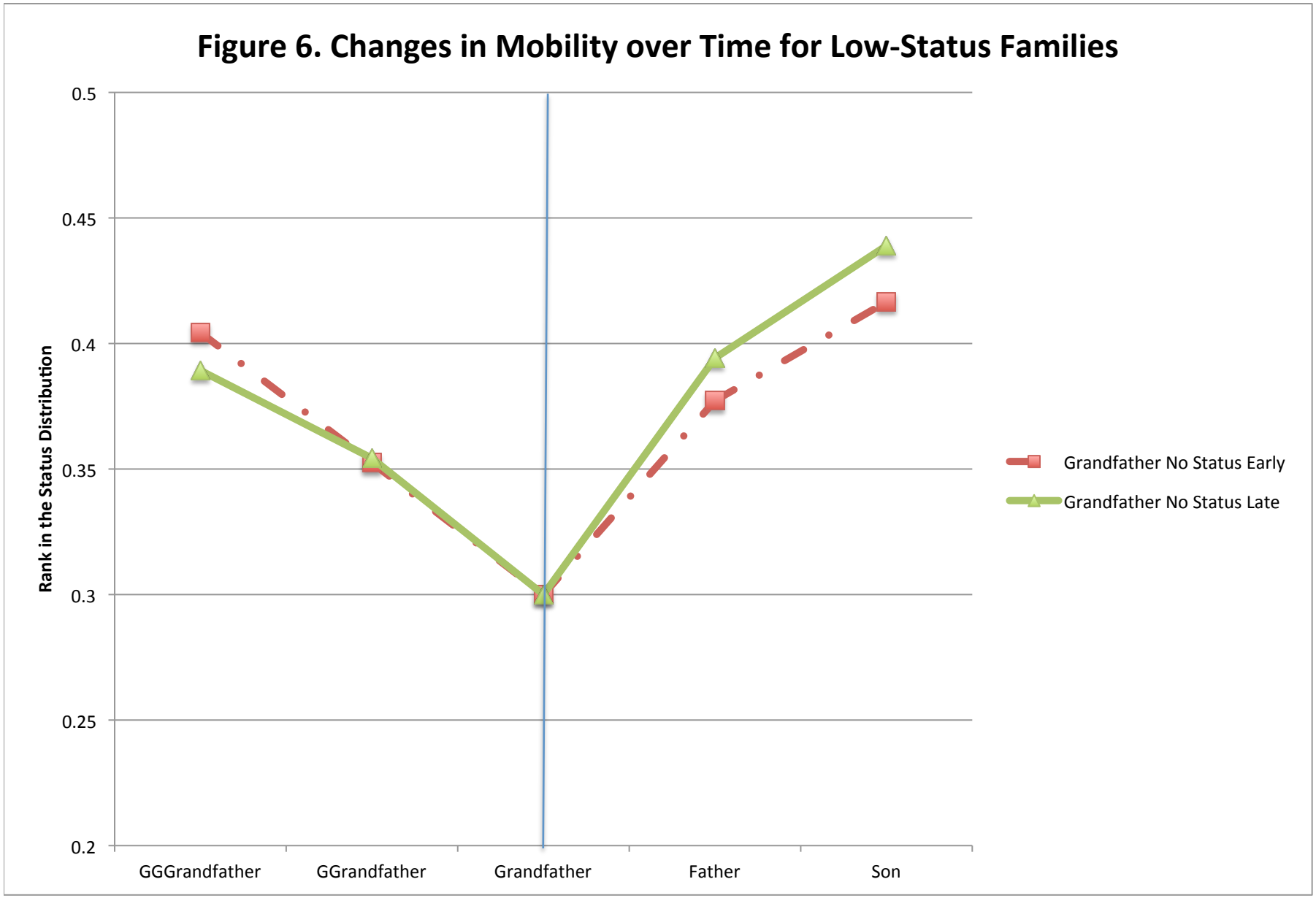


Figure 7a. Educational Inequality and Intergenerational Mobility

Across n = 100 subperiods from 1300 to 1900

Figure 7b. Educational Inequality and Intergenerational Mobility

Across n = 100 subperiods from 1300 to 1900

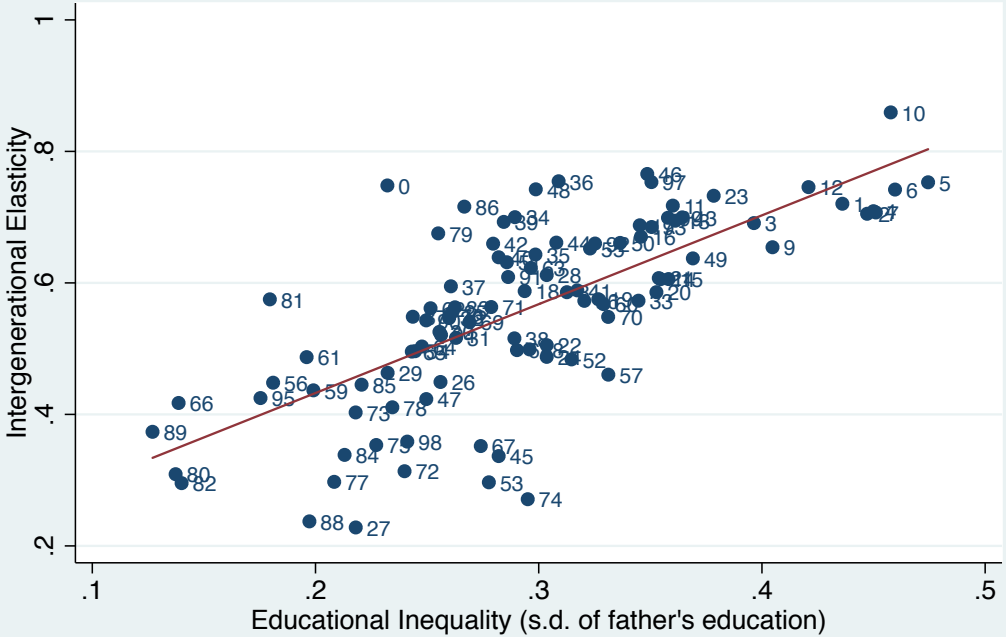


Table 1. Status: Description and Coding

Status 9	Status 23	# of obs	Percent	Description	Education
0	0	6,956	71.08	No titles, degrees, office, other evidence of wealth	0
1	1	36	0.37	Honorary or posthumous titles; main guest at the county banquet; village head	0
1	2	786	8.03	Multiple wives in consecutive marriage, two or more not living at the same time	0
2	3	912	9.32	Father a *sheng-yuan*, minor official, or official student; evidence of wealth, *jian-sheng*, expectant official	0
2	4	23	0.24	Grandfather a *juren*, *gongsheng*, *jinshi*, or official	0
2	5	38	0.39	Father a *juren*, *gongsheng*, *jinshi*, or official	0
3	6	163	1.67	Educated, scholar, no degrees or office; editor of genealogy, refused office, or prepared for but did not pass exam	1
3	7	89	0.91	Concubinage (i.e. polygyny, two or more wives or concubines at the same time	0
3	8	11	0.11	Substantial evidence of wealth and property; set up ancestral estates, large donations, philanthropy; wealthy farmer, landowner, or merchant	0
3	9	193	1.97	Official students	1
4	10	1	0.01	Military *sheng-yuan*, minor military office	0
4	11	146	1.49	Purchased *jian-sheng* and/or purchased office	0
4	12	99	1.01	Students of the Imperial Academy (non-purchased)	1
5	13	53	0.54	Civil *sheng-yuan*; minor civil office	1
5	14	102	1.04	Expectant official, no degrees	0
5	15	4	0.04	Expectant official with one of the lower degrees	1
6	16	28	0.29	Military *juren, jinshi*; major military officer	1
6	17	45	0.46	Civil official with no degree, minor degree, or purchased degree	0
7	18	27	0.28	*Juren, gongsheng*, with no office	1
7	19	56	0.57	*Juren, gongsheng*, with expectant office	1
8	20	0	0.00	*Jinshi*, no office	1
8	21	11	0.11	*Jinshi* with official provincial post or expecant official	1
8	22	7	0.07	*Jinshi* with top-level position in Imperial bureaucracy (Hanlin Academy, Grand Secretariat, Five Boards, Prime Minister, etc.)	1

Notes: Table gives education and status for 9,787 of the adult men in the sample; coding developed using Chang (1956), Ho (1962), and Telford (1986)
See text for descriptions of the degrees titles.

Table 2. Summary Statistics

Variable	Obs.	Mean	Std. Dev.
Son Status	7,326	0.69	1.38
Father Status	7,327	0.93	1.56
Grandfather Status	7,327	1.16	1.70
Great-Grandfather Status	7,327	1.36	1.80
Great-Great-Grandfather Status	7,327	1.52	1.85
Father-in-law Status	4,488	0.58	1.58
Rank Son Status	7,326	0.50	0.23
Rank Father Status	7,327	0.50	0.24
Av. Rank Uncle Status	7,322	0.50	0.11
Son Birth Year	7,327	1770.22	66.14
Father Birth Year	7,327	1738.33	65.74
Father Longevity	7,135	57.48	12.92
Mother Longevity	6,793	58.49	14.70
No. of Son's Siblings	7,327	4.87	2.22
No of Son's Brothers	7,327	3.28	1.62
Share Male Siblings	7,326	0.71	0.24

Distribution of status			
	Frequency	Percent	Rank
Father Status Level		of sample	Father Status
0	4,812	65.67	0.330
1	520	7.10	0.690
2	877	11.97	0.790
3	486	6.63	0.880
4	354	4.83	0.940
5	144	1.97	0.970
6	30	0.41	0.984
7	79	1.08	0.991
8	25	0.34	0.998
Total	7,327	100.00	

Table 3. Transition Matrix between No Status to Positive Status

	Son No Status Freq [Percent]	Son >0 Status Freq [Percent]	Total Freq [Percent]
Father No Status	4,218 [87.88]	582 [12.12]	4,800 [100.00]
Father >0 Status	1,064 [42.29]	1,452 [57.71]	2,516 [100.00]

Table 4. Transition matrix between nine status levels

	Son Status									
Father Status	0	1	2	3	4	5	6	7	8	Total
0	4,211	435	56	54	20	16	3	2	0	4,797
	87.78	9.07	1.17	1.13	0.42	0.33	0.06	0.04	0	100
1	415	78	10	5	7	6	1	0	0	522
	79.5	14.94	1.92	0.96	1.34	1.15	0.19	0	0	100
2	650	88	28	46	32	14	9	5	3	875
	74.29	10.06	3.2	5.26	3.66	1.6	1.03	0.57	0.34	100
3	0	0	312	81	43	20	14	12	4	486
	0	0	64.2	16.67	8.85	4.12	2.88	2.47	0.82	100
4	0	1	207	59	45	21	7	12	2	354
	0	0.28	58.47	16.67	12.71	5.93	1.98	3.39	0.56	100
5	0	0	73	30	9	14	5	11	2	144
	0	0	50.69	20.83	6.25	9.72	3.47	7.64	1.39	100
6	0	0	7	9	2	10	1	0	1	30
	0	0	23.33	30	6.67	33.33	3.33	0	3.33	100
7	0	0	14	19	10	16	9	10	1	79
	0	0	17.72	24.05	12.66	20.25	11.39	12.66	1.27	100
8	0	0	3	2	3	6	7	2	2	25
	0	0	12	8	12	24	28	8	8	100
Total	5,276	602	710	305	171	123	56	54	15	7,312
	72.16	8.23	9.71	4.17	2.34	1.68	0.77	0.74	0.21	100

Notes: For each cell of the transition matrix, table shows frequency on top and fraction of the row sum on bottom.

Table 4b. Transition Matrix over Five Generations

Son Status										
Great great grandfather status	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
0	3,004	330	210	69	22	21	4	3	0	3,663
	82.01	9.01	5.73	1.88	0.60	0.57	0.11	0.08	0.00	100.00
1	324	46	17	6	5	3	1	1	0	403
	80.40	11.41	4.22	1.49	1.24	0.74	0.25	0.25	0.00	100.00
2	795	81	92	36	19	13	2	2	2	1,042
	76.30	7.77	8.83	3.45	1.82	1.25	0.19	0.19	0.19	100.00
3	686	84	222	74	61	33	12	15	6	1,193
	57.50	7.04	18.61	6.20	5.11	2.77	1.01	1.26	0.50	100.00
4	337	55	80	27	9	18	21	8	2	557
	60.50	9.87	14.36	4.85	1.62	3.23	3.77	1.44	0.36	100.00
5	80	8	44	30	21	14	2	1	2	202
	39.60	3.96	21.78	14.85	10.40	6.93	0.99	0.50	0.99	100.00
6	19	2	11	23	8	5	5	4	0	77
	24.68	2.60	14.29	29.87	10.39	6.49	6.49	5.19	0.00	100.00
7	34	4	32	19	19	13	7	14	3	41
	23.45	2.76	22.07	13.10	13.10	8.97	4.83	9.66	2.07	100.00
8	1	0	2	21	7	2	2	6	0	41
	2.44	0.00	4.88	51.22	17.07	4.88	4.88	14.63	0.00	100.00
Total	5,280	610	710	305	171	122	56	54	15	7,323
	72.10	8.33	9.70	4.16	2.34	1.67	0.76	0.74	0.20	100.00

Notes: For each cell of the transition matrix, table shows frequency on top and fraction of the row sum on bottom.

Table 5. Transition matrix between Low, Moderate, and High Status

	Son Status			
Father status	Low	Moderate	High	Total
Low	4,211	565	21	4,797
	87.78	11.78	0.44	100.0
Moderate	1,065	1,042	130	2,237
	47.61	46.58	5.81	100.0
High	0	181	97	278
	0	65.11	34.89	100.0
Total	5,276	1,788	248	7,312
	72.16	24.45	3.39	100.0

Notes: For each cell, the table gives the frequency on top and the share of the row sum below.

Table 6. Relative mobility results

	(1)	(2)	(3)	(4)	(5)	(6)
	Rank Son Status	**Rank Son Status**	**Rank Son Status**	**Rank Son Status (timevar)**	**Son Status (23)**	**Son Status (9)**
Rank Father	0.579**	0.577**	0.575**	0.574**		
	(0.013)	(0.013)	(0.013)	(0.013)		
2nd quartile				0.039**		
				(0.007)		
3rd quartile				0.047**		
				(0.007)		
4th quartile				0.028**		
				(0.008)		
Trend		-0.010*			-0.089	-0.040
		(0.004)			(0.075)	(0.028)
Father stat (23)					0.567**	
					(0.017)	
Father stat (9)						0.620**
						(0.014)
Observations	7,319	7,319	7,319	7,319	7,318	7,319
R-squared	0.384	0.385	0.398	0.375	0.434	0.492

Notes: Regression by OLS; robust standard errors clustered by father in parentheses; **/*/+ is significance at the 1%/5%/10% level. Ranks of Father and Son are based on the quartile status distribution in column 4; first quartile is son's birth years 1443 to 1739, second quartile: 1740 to 1785, third quartile: 1786 to 1818, and fourth quartile 1819 to 1885.

Table 6a. 5-Generation Linked Sample

VARIABLES	(1) son	(2) son	(3) son	(4) son
father	0.579** (0.013)			
grandfather		0.398** (0.016)		
g-grandfather			0.326** (0.015)	
gg-grandfather				0.273** (0.015)
Constant	0.208** (0.006)	0.300** (0.007)	0.336** (0.007)	0.363** (0.007)
Observations	7,315	7,315	7,315	7,315
R-squared	0.385	0.200	0.141	0.104
Robust standard errors in parentheses ** p<0.01, * p<0.05, + p<0.1				
for comparison		0.335241 .579^2	0.194104539 .579^3	0.112386528 .579^4

Table 6c. Heterogeneity in status across lineages

VARIABLES	ALL sons	1 CHEN	2 MA	3 WANG	4 YE	5 YIN	6 ZHAO	7 ZHOU
father	0.579**	0.245**	0.807**	0.436**	0.692**	0.486**	0.481**	0.435**
Observations	7,315	256	500	4,016	1,282	474	538	249
average status of lineage		0.408	0.720	0.467	0.578	0.461	0.467	0.409

Table 6d. Analyzing relative mobility beyond the father-son relationship

	(1)	(2)	(3)	(4)	(5)	(10)
Rank Father	0.578**	0.557**	0.541**	0.548**	0.526**	0.526**
	(0.013)	(0.017)	(0.014)	(0.014)	(0.014)	(0.018)
Rank Grandfather		0.029+				-0.040+
		(0.017)				(0.021)
Rank Great-Grandfather			0.069**			0.043*
			(0.012)			(0.020)
Rank Great-Great-Grandfather				0.066**		0.024
				(0.011)		(0.015)
Av. Rank Uncle					0.293**	0.255**
					(0.030)	(0.031)
Time Trend	N	N	N	N	N	Y
Observations	7,318	7,318	7,318	7,318	7,313	7,313
R-squared	0.383	0.384	0.388	0.388	0.398	0.413
Robust standard errors in parentheses						
**** p<0.01, * p<0.05, + p<0.1**						

Table 7. Attenuation bias and group effects

	(1)	(2)	(3)	(4)	(5)
Father Rank	0.579**				
	(0.013)				
Father Rank/Longevity		0.637**			
		(0.021)			
Father Rank/Education			0.767**		
			(0.008)		
Father Rank/Longevity/Education				0.868**	
				(0.015)	
Average Lineage Father Rank					0.930**
					(0.052)
Observations	7,316	7,131	7,316	7,131	7,316
R-squared	0.384	0.225	0.467	0.379	0.109
Notes: Dependent variable is Rank Son; estimation by OLS.					
Son and Father variables in columns 2, 3, and 4 are standardized with mean zero and standard deviation					
of one; independent variable in column 5 is the average rank of the father by lineage					

Table 8. Absolute mobility over time

A. Early versus late half of sample

Early (n=3,634)			
	Son =0	Son >0	Total
Father =0	0.64	0.36	100.00
Father >0	0.08	0.92	100.00
Late (n=3,679)			
	Son =0	Son >0	Total
Father =0	0.51	0.49	100.00
Father >0	0.16	0.84	100.00

Notes: Early covers son birth years from 1443 to 1785, Late covers 1786 to 1885.

B. Before 1700 and after 1700

Before 1700 (n=944)			
	Son Low	Son High	Total
Father Low	0.75	0.25	100.00
Father High	0.09	0.91	100.00
After 1700 (n=6,369)			
	Son Low	Son High	Total
Father Low	0.54	0.46	100.00
Father High	0.12	0.88	100.00

Table 9. Correlates of Mobility

	VARIABLES	(1) IGE	(2) IGE	(3) IGE	(4) IGE	(5) IGE	(6) IGE	(7) IGE	(8) IGE	(9) IGE	(10) IGE	(11) IGE	(12) IGE	BETA COEFF
	time trend	-0.002**	-0.002**	-0.002**	-0.003**	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.009
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	
mean	father status		1.078**				-0.080							
			(0.257)				(0.499)							
	father's longevity			-0.004			0.001							
				(0.005)			(0.005)							
	# wives of father				0.370**		-0.060							
					(0.120)		(0.196)							
	father's education					1.335**	1.454**	0.666*	0.672*	0.749**	-0.705*	-0.496	-0.496	-0.229
						(0.222)	(0.319)	(0.269)	(0.276)	(0.282)	(0.351)	(0.485)	(0.588)	
std deviation	sd_father's status							2.711**	2.705**	3.290**	2.063*	2.475**	2.475**	0.359
								(0.807)	(0.818)	(0.825)	(0.794)	(0.937)	(0.909)	
	sd_father's longevity								0.001			-0.003	-0.003	-0.032
									(0.009)			(0.009)	(0.008)	
	sd_# wives									-0.198+		-0.103	-0.103	-0.097
										(0.106)		(0.113)	(0.102)	
	sd_father's education										1.424**	1.233**	1.233*	0.654
											(0.395)	(0.456)	(0.517)	
	Constant	0.668**	0.096	0.881**	0.253+	0.438**	0.446	-0.143	-0.154	-0.232	-0.267	-0.256	-0.256	
		(0.021)	(0.146)	(0.298)	(0.145)	(0.047)	(0.368)	(0.182)	(0.201)	(0.186)	(0.162)	(0.197)	(0.203)	
	Observations	100	100	100	100	100	100	100	100	100	100	100	100	
	R-squared	0.207	0.322	0.211	0.262	0.449	0.451	0.505	0.505	0.527	0.549	0.555	0.555	

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table A. Characteristics of men and their wives

	Variable	Obs	Mean	Std.	Min	Max
Men						
	Demographics					
	Birth year	9,787	1760.55	74.69	1298	1885
	Birth month	9,787	6.90	3.51	1	12
	Death year	8,142	1796.64	72.51	1348	1929
	Death month	8,142	6.53	3.41	1	12
	Wealth					
	Status	9,786	1.65	3.67	0	22
	No. of wives	9,783	1.17	0.44	1	5
	Education					
	Education	9,787	0.07	0.25	0	1

	Variable	Obs	Mean	Std.	Min	Max
Women						
	Demographics					
	Birth year	11,378	1766.24	75.31	1300	1887
	Birth month	11,378	6.75	3.47	1	12
	Death year	8,708	1797.10	73.66	1355	1930
	Death month	8,708	6.54	3.39	1	12
	Status					
	Father's status	6,179	1.86	4.74	0	22

Table B. Characteristics of sons and daughters

Sons

	Variable	Obs	Mean	Std. dev.	Min	Max
Demographics						
	Birth order	20,177	2.17	1.33	1	11
	Birth year	20,176	1792.21	74.18	1330	1909
	Birth month	20,175	6.79	3.49	1	12
	Death year	14,849	1806.75	67.67	1380	1929
	Death month	14,858	6.62	3.43	1	12
Their fathers						
	Birth year	20,177	1759.80	73.56	1298	1866
	Birth month	20,177	6.95	3.51	1	12
	Age at death	16,448	55.40	13.12	17	91
Their mothers						
	Birth year	20,177	1763.88	74.02	1300	1887
	Birth month	20,177	6.86	3.49	1	12
	Age at death	15,165	55.70	15.15	16	96

Daughters

	Variable	Obs	Mean	Std. dev.	Min	Max
Demographics						
	Birth order	11,150	1.81	1.09	1	10
	Birth year	2,443	1857.55	24.22	1615	1903
	Birth month	2,443	6.46	3.42	1	12
	Death year	1,418	1850.85	23.63	1654	1908
	Death month	1,420	7.06	3.31	1	12
Their fathers						
	Birth year	11,151	1770.63	66.09	1365	1866
	Birth month	11,151	6.99	3.53	1	12
	Age at death	8,541	55.37	13.42	15	90
Their mothers						
	Birth year	11,151	1774.78	66.55	1369	1870
	Birth month	11,151	6.86	3.50	1	12
	Age at death	7,784	55.87	15.44	11	96

Table C. Lineage variation

		Son Status 23	Father Status 23	No. Brothers	No. Siblings	Share of Siblings	Son Educ.	Father Longevity	Mother Longevity
Lineage Name						Female			
Chen	N	291	291	291	291	291	291	275	249
	mean	0.357	0.430	3.703	5.488	0.267	0.003	59.115	61.357
	sd	1.317	1.652	1.821	2.728	0.207	0.059	13.413	13.655
Ma	N	627	627	627	627	627	627	627	621
	mean	6.085	6.952	2.691	4.396	0.302	0.327	58.140	60.359
	sd	6.201	6.350	1.389	2.177	0.221	0.469	14.209	17.188
Wang	N	4681	4681	4681	4681	4681	4681	4543	4339
	mean	0.912	1.496	3.435	4.998	0.267	0.034	56.768	57.702
	sd	2.272	3.096	1.639	2.183	0.200	0.181	12.381	14.118
Ye	N	1606	1607	1607	1607	1606	1607	1557	1480
	mean	3.122	4.000	3.102	4.711	0.274	0.101	58.298	58.910
	sd	5.054	5.442	1.617	2.121	0.216	0.302	13.662	15.908
Yin	N	604	604	604	604	604	604	585	567
	mean	0.892	1.154	3.194	4.796	0.271	0.026	58.581	59.087
	sd	2.446	3.036	1.523	2.234	0.229	0.161	12.808	13.824
Zhao	N	769	769	769	769	769	769	756	693
	mean	0.732	0.914	3.330	4.828	0.264	0.017	56.816	58.254
	sd	1.815	2.312	1.495	2.152	0.193	0.129	13.203	14.169
Zhou	N	314	314	314	313	313	314	313	304
	mean	0.659	0.717	2.834	3.738	0.174	0.022	59.265	58.270
	sd	2.239	2.247	1.568	2.100	0.220	0.148	13.146	12.883
Total	N	8892	8893	8893	8892	8891	8893	8656	8253
	mean	1.632	2.197	3.284	4.847	0.268	0.063	57.434	58.391
	sd	3.636	4.174	1.620	2.209	0.208	0.244	12.944	14.658
Notes: Statistics for sample of adult married men linked over three generations.									