

What is the True Rate of Social Mobility in Sweden? A Surname Analysis, 1700-2012¹

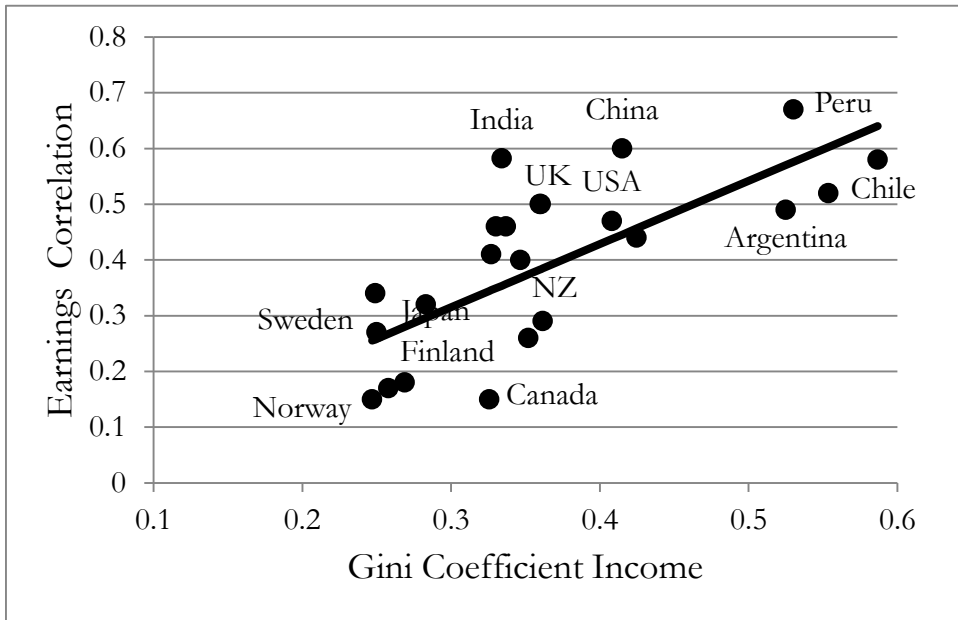
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On conventional measures, modern Sweden has rapid social and economic mobility. Analyzing surname distributions among Swedish elites - attorneys, physicians, university students, and academicians - this paper shows that conventional measures greatly overstate underlying social mobility rates. The Swedish elite of 1700 is still an elite, and is becoming average only slowly. The b measuring status persistence across surname generations is 0.7-0.8, compared to the 0.2-0.4 found in conventional studies. This illustrates a general feature that conventional studies overstate generalized or long-term social mobility rates. True rates of mobility in modern Sweden are similar to those of the supposedly more socially immobile economies of the UK and USA. They are perhaps no higher than in pre-industrial Sweden.

As standardly measured, modern Sweden has rapid social and economic mobility, more rapid than in either the UK or USA. And Sweden is a representative of a group of Nordic Countries – Denmark, Finland, Iceland, Norway, and Sweden – believed to have achieved a similar configuration of low inequality, promotion of widespread educational attainment, and rapid social mobility. In recent years these societies have been cited as a reproach to the Anglo-Saxon economic model of the UK and USA, where there is greater inequality in outcomes, and lower rates of social mobility.

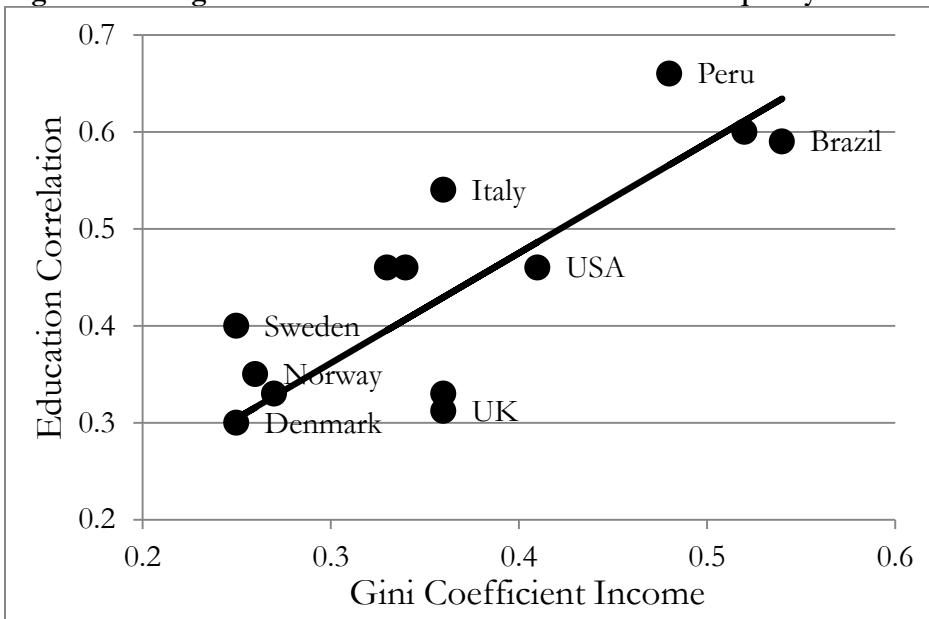
¹ I thank my former colleague, Pontus Rendahl, for his assistance in helping me locate the Swedish data. Anna Dreben Almenberg and Johan Almenberg kindly supplied the underlying data to redraw figure 3 from their article.

Figure 1: Intergenerational Earnings Elasticities and Inequality



Source: Corak, 2012, Figure 2. Canada, person communication from Miles Corak. Hnatkovska et al., 2012 (India).

Figure 2: Intergenerational Education Correlation and Inequality



Sources: Hertz et al., 2011, table 2. Gini for Income, World Bank.

Figure 1, for example, shows a recent estimate of intergeneration earnings elasticities, compared to the degree of overall income inequality, across a range of countries. These mobility rates would also imply that only 4-7% of earnings variance in Sweden in any generation is explained by the observed earnings of parents. In terms of educational mobility the Nordic countries are less distinct, as figure 2 shows. But the intergenerational correlation of years of education is still modest both in absolute terms, and compared to most other countries.

A recent study by Mikael Lindahl et al. also suggests that intergeneration earnings correlations in Sweden have been at the modern level for at least three generations, back as far as those born 1925-30 compared to their fathers (Lindahl et al., 2012, table 5). Intergenerational correlations in years of education are low over four generations, from an initial cohort born 1865-1912 (Lindahl et al., 2012, table 2).

Such enhanced mobility in a country like Sweden would suggest that institutional arrangements – the support for public education, for example, or the progressive taxation of wealth - play a vital role in determining rates of social mobility. The implication is that the lower rates of social mobility observed in countries such as England or the USA represent a social failure. The life chances of the descendants of high and low status ancestors can be equalized at low social cost. Sweden is, after all, one of the richest economies in the world.

Here I show, however, that in Sweden true intergenerational mobility rates for measures of status such as occupation or education are much lower. Also the rates of social mobility in recent decades exceed by little the rates of the eighteenth century. Whatever the short run mobility of earnings, or years of education, there is considerable persistence of status – measured through wealth, education and occupation - over as many as 10 generations in Sweden. The true intergenerational correlation of social status between parents and children measured in a more general sense, in Sweden is in the region of 0.7-0.8, as is summarized in table 1.

Table 1: Summary Surname b Estimates by Period from Surnames, Sweden

Group	1700-1900	1890-1979	1950-2012
Attorneys	-	-	0.72
Physicians	-	0.71	0.80
University Students	0.78	-	0.66
Academics	0.89	0.75	0.84

The way I show this is by following the relative frequency of two elite sets of surnames, those of the Swedish nobility, and those of the educated elite of the seventeenth and eighteenth centuries, among modern social elites compared to their shares of the population. These elite surnames from several hundred years ago are still overrepresented among modern Swedish elites - physicians, attorneys, and university students – showing that social mobility rates in Sweden have been low. But by looking at the rate with which their overrepresentation has declined over the last two or three generations, we can measure mobility rates up to 2012. The answer is that current social mobility in Sweden is very slow, and no higher than in countries such as the UK or USA. But further it is little faster than social mobility in pre-industrial eighteenth century Sweden under monarchic rule.

Why are these results in table 1 so different from the conventional studies for Sweden? One suggestion is that by looking at surname groupings we are implicitly controlling for errors in the measurement of current status that will reduce the estimated intergenerational correlation β , so estimating higher values for b . But the correlation estimates in figure 1 are those corrected for measurement error. And in the case of education in figure 2 measurement errors are believed to be relatively insignificant. The different b s estimated in these ways are not about different degrees of control for measurement errors.

The resolution proposed here is that individuals and families have some underlying general level of social status in generation t , x_t , where x_t is always

regressing toward the mean across generations to that

$$x_{t+1} = bx_t + e_t \quad (1)$$

where x_t and x_{t+1} are assumed to have a mean of 0, and a constant variance σ^2 , and x is normally distributed.

However, x is a latent variable, not directly observed. Instead observe various partial measures of status, y_t , where such measures would be earnings, wealth, years of education, educational status, or occupational status. For each generation t

$$y_t = x_t + u_t \quad (2)$$

where u_t is a random component linking the underlying status of the family to the particular observed measure of status.

The random component linking aspects of social status to underlying social status exists for two reasons. First there is an element of luck in the status attained by individuals given their underlying competence. If we look at earnings, people happen to choose a successful field to work in, or a successful firm to work for. They just succeed in being admitted to Lund University, as opposed to just failing. They marry a supportive spouse, or end up instead shackled to a needy partner. But, second, people trade off income and wealth for other aspects of status. They choose a career as a philosophy professor as opposed to a lower occupational status, but more lucrative career, as a plumbing hardware salesman.

The above implies that the conventional studies of social mobility, based on estimating the β in the relationship

$$y_{t+1} = \beta y_t + v_t \quad (3)$$

will underestimate the true b linking underlying social status across generations. In particular the expected value of β will be not be b , but instead θb , where $\theta < 1$. The greater the random components linking underlying status and any measured aspect of status, the smaller will be θ . For

$$E(\hat{\beta}) = b \frac{1}{1 + \left(\frac{\sigma_y^2}{\sigma_x^2}\right)} \quad (4)$$

Thus conventional estimates of social mobility, based as they are on one generation studies, and on partial measures of overall social status, will systematically tend to overestimate social mobility rates. However, the surname measures that we use here over multiple generations, even when they are based on partial measures of social mobility such as educational or occupational status, will closely approximate to the true underlying b . This is because by aggregating over groups of individuals with the same surname we can make the error component linking observed status y and underlying status x go to zero.

Swedish Surnames

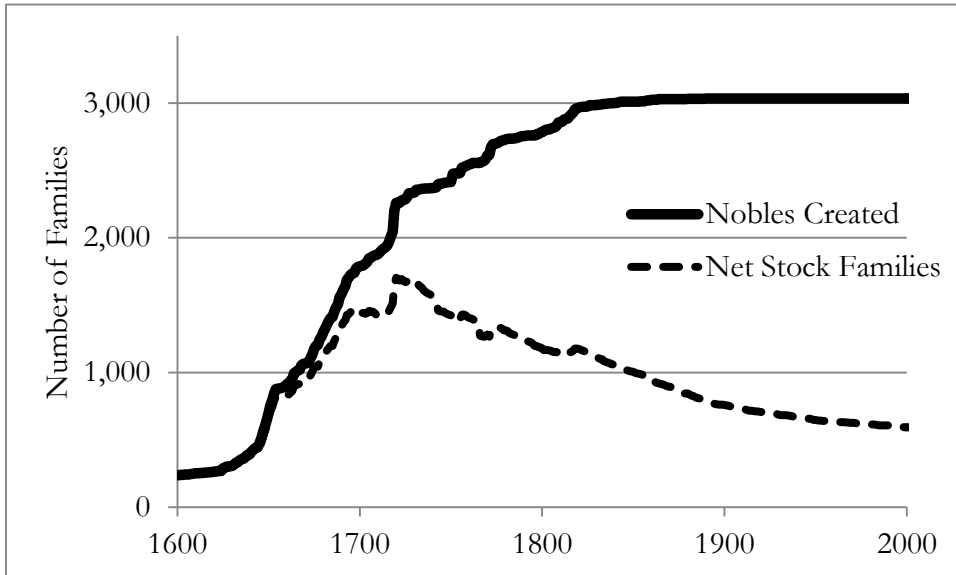
Sweden has a number of distinctive classes of surnames that we can potentially use to track socio-economic status over many generations. The first of these are the surnames of nobles. Surprisingly a class of nobles is very much alive and functioning in Swedish society, despite its reputation as a model social democracy. Sweden has a formal guild of noble families, the *Riddarhuset* (House of Nobility). Though noble families existed since medieval times, the modern *Riddarhuset* was created in 1626. During the Diet of the Four Estates, 1668-1865, the *Riddarhuset* functioned as one of the four governing estates of the kingdom (analogous to the House of Lords in England).² Since 2003 the *Riddarhuset* has been a purely private institution, which maintains the records of the Swedish noble families, and lobbies on their behalf. Despite its location in a world of Scandinavian gender equality, only men get to vote in the *Riddarhuset*, and only sons can transmit titles to their offspring.

The families enrolled in the *Riddarhuset* come in three descending status ranks: counts, barons, and “untitled” nobility. Each family has a number corresponding to their order of enrollment. In total 2,330 families have been enrolled, though only about 700 have living representatives.³ The timing of these ennoblements are all recorded, and are summarized in figure 3. The important thing revealed by the figure is that almost all noble families in the current stock were enrolled before 1815.

² The organization has an elaborate building in Stockholm, also called the *Riddarhuset*, erected in the seventeenth century.

³ Ridderhuset, 2012.

Figure 3: The History of Ennoblement in Sweden



Source: Almenberg and Dreber, 2009, 178.

And indeed a large fraction of all noble families were created before 1721, when Sweden enjoyed conquests that brought its territories to their maximum extent of 1658-1721. At this point Sweden had possession also of Finland, Estonia, and some north German states. In this period the crown rewarded many military commanders with ennoblement. This is reflected in the foreign (particularly German) names of many of the nobility, who served the crown as military commanders.

From 1680 the nobility gradually lost its privileges, starting with the reclamation by the crown in 1680 of much of the land granted to nobles in previous years. By 1866 the nobles had no privileges of economic significance.

When domestic families were enrolled in the *Riddarhuset* they typically adopted a new surname if they were Swedish, embodying status elements such as *Gyllen* (gold), *Silver* (silver), *Adler* (eagle), *Leijon* (lion), *Stjerna* (star), *Creutz* (cross), and *Ehren* (honor): thus *Leijonhufvud*, *Gyllenstjerna*, *Ehrensward*, *Adlercreutz*. Such heraldic surnames can be of great antiquity. Thus in Shakespeare's *Hamlet*, written around 1600, the two unfortunate Danish nobles are *Rosencrantz* and *Guildestern*.

Rosencrantz and *Gyllenstjerna* (*Guildestern*) were such common Danish and Swedish noble surnames in these years that one tenth of the aristocrats participating in the Danish royal coronation of 1596 bore one or other name.⁴

Many of the noble surnames in Sweden, however, are German in origin, reflecting the importance of German military commanders in the service of the Swedish crown in the seventeenth century: thus *von Buddenbrock*, *von Köningsmarck*. There are also Scottish, English, Russian, French and other surnames: *Douglas*, *Maclean*, *Bennet*, *de la Gardie*. Some noble surnames are, however, quite common and held by many people probably not descended from these noble families, such as *Björnberg* held by 925 people in 2011, or *Hamilton*, held by 586 people. In the analysis below I thus restrict the sample to noble surnames held by 400 or fewer people in 2011, where a large fraction will likely be related to the name holder who was ennobled.

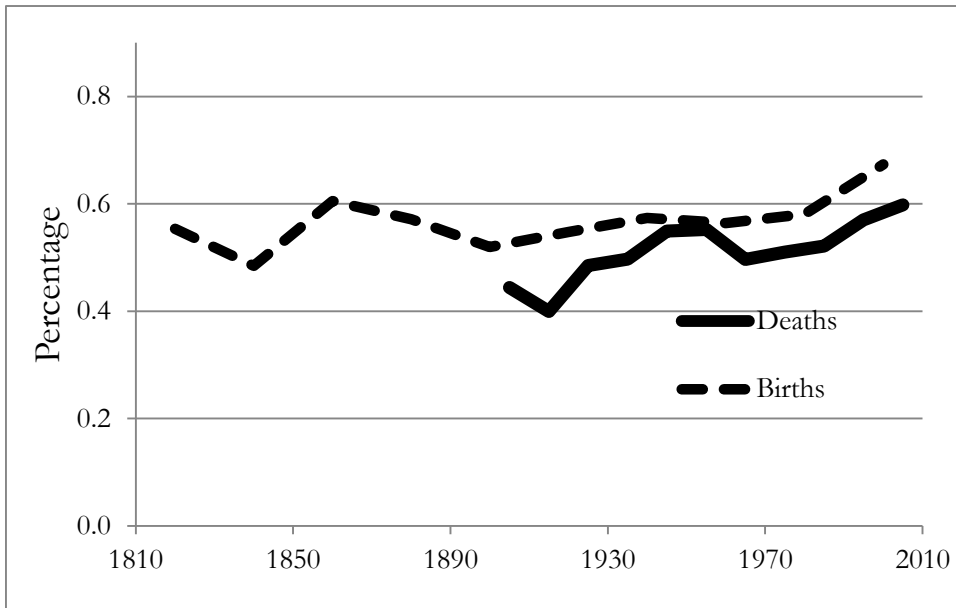
One privilege that the nobility obtained in the Names Adoption Act of 1901 was a ban on anyone else adopting their surnames.⁵ Thus apart from foreign imports, and name changing before 1901, the surnames of the enrolled nobles in the *Ridderhuset* identify uniquely the lineage of these noble families. Such surnames constitute a small Swedish elite. Thus, of the Count and Baronial family surnames, there are only 16,000 current holders of such surnames, for those surnames held by fewer than 400 people now. The untitled nobility add a further 40,000 people holding the rarer surnames.

Sign that these surnames are mostly derived by descent from those ennobled many years ago comes from the stock of these names as a share of the population over time. Figure 4 shows the share of a sample of aristocratic surnames among male deaths 1901-2009, and male births 1810-1999. From 1901 to the present there has been little change in the share of noble surnames among all Swedish surnames.

⁴ Boyce, 2005, 154.

⁵ There had been concern that disreputable people had been adopting noble surnames.

Figure 4: The Population Share of Aristocratic surnames, 1810-2009



Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011.

The second class of surnames of interest are Latinized surnames. In the pre-industrial era, most Swedes had impermanent patronyms, changing each generation. But in these years the educated class – clerics, academics, and some merchants - adopted such permanent Latinized surnames (typically ending “ius” or “æus”), which became characteristic of them as a class. This is reflected in the names of a number of famous Swedish scientists of the seventeenth and eighteenth centuries: *Carolus Linnaeus*, 1707-78, *Anders Celsius*, 1701-44, *Jöns Jakob Berzelius*, 1779-1848, and *Olaus Rudbeckius*, 1630-1702. Typical examples of these surnames now are *Aquilonius*, *Arrhenius*, *Berzelius*, *Boethius*, and *Cnattingius*.

Only a small fraction of the modern population bears such Latinized surnames. Of those dying 2000-9, for example, only 0.47 percent bore a surname ending in either *ius* or *æus*. However, as Figure 5 shows, for men dying 1901-2009 the share bearing a Latinized surname nearly doubled between those born in 1860 and 1980. This was because in the late nineteenth and early twentieth century significant numbers of people switched to such Latinized surnames.

However, as figure 5 also shows, if we take only Latinized surnames where 40 or more people held the surname in 2010, which are mainly the Latinized surnames created first in the eighteenth century or earlier, the population share was stable for men born 1860-1979.⁶ These old established Latinized surnames, deriving from the eighteenth century or earlier, are overwhelmingly held by those who inherited them from their parents. This may stem in part from restrictions on surname changing in the Names Adoption Act of 1901, and the Surname Law of 1982. In the analysis below I thus use these more common Latinized surnames that existed before 1800, 0.18-0.22 percent of the current stock of surnames in Sweden, inherited from the eighteenth century elite.⁷

The most common Swedish surnames are patronyms – surnames ending in *son* (and before 1901 also *dotter* for women), and starting with the first name of the father. These were the predominant surname in Sweden in the pre-industrial era. A sample of 17th century parish marriage records, for example, shows 93 percent of those marrying carrying such patronyms.

In early Sweden such surnames also were not fixed, but changed from generation to generation. Such patronyms gradually declined as a proportion of all surnames, as families adopted more permanent surnames in the eighteenth and nineteenth centuries. The 1901 *Naming Law* called for each family to have a family surname passed unchanged across generations, thus freezing in place these previously changing patronyms.

But the decline of the patronyms as a share of the population has continued to this day. Figure 6 thus shows an estimate for Swedish men by 20 year periods of the number dying with a patronym as surname, and the number born. By 2000-9 only 40 percent of males dying in Sweden bore a patronym. But for those ages less than 10 at death the share was even lower at 25 percent.⁸

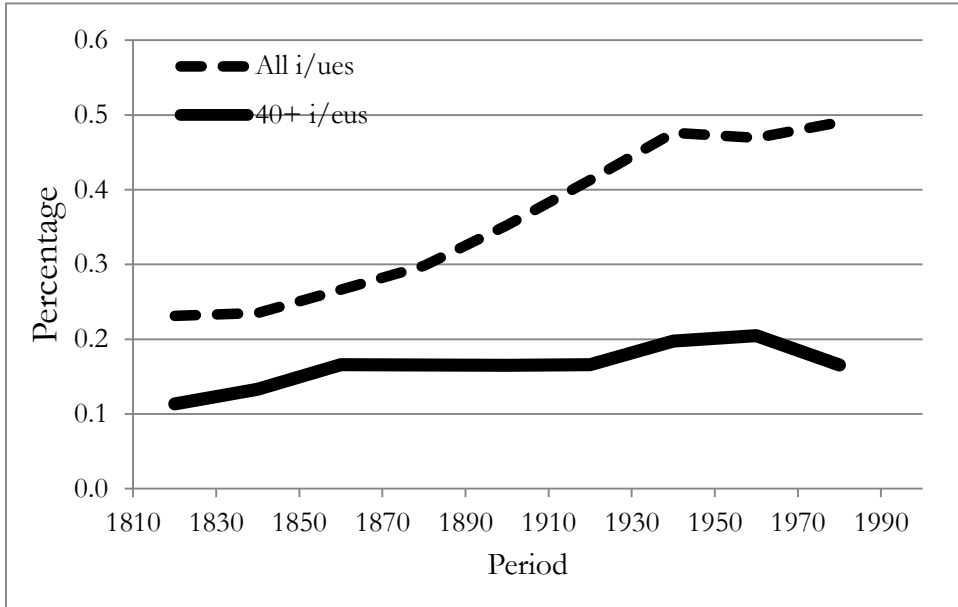
⁶ The names were checked against the register of Lund and Uppsala universities, and the International Genealogical Index of the Church of Jesus Christ of Latter-Day Saints, which has a sample of parish records in Sweden 1630-1920

(http://www.familysearch.org/eng/search/frameset_search.asp).

⁷ As Walton and Galton famously demonstrated, rare surnames over many generations will tend to either die out, or survive at relatively higher frequency. Walton and Galton, 1875.

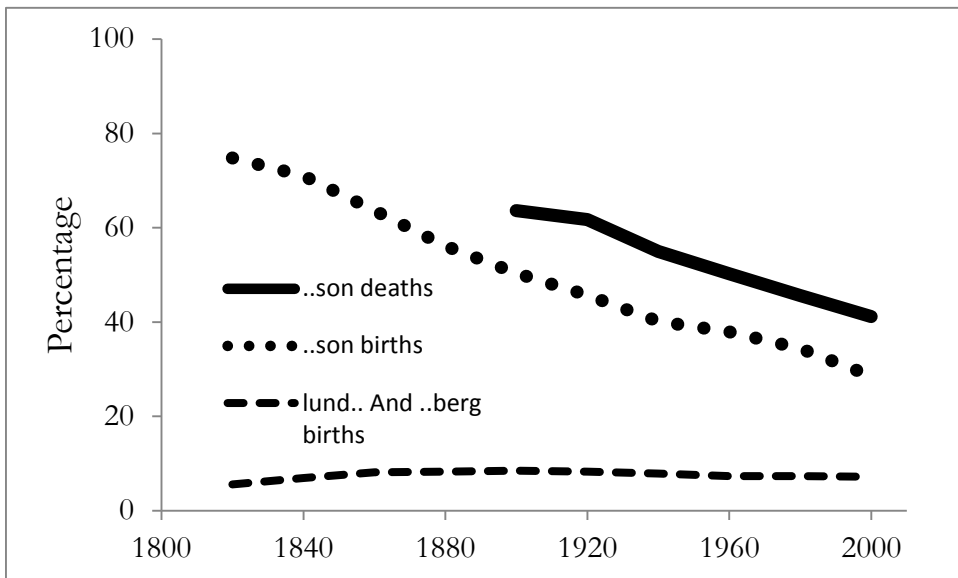
⁸ Though this reflects in part a substantial increase in children in this period born from immigrants. Of males born in 2000, and dying 2000-9, about 10 percent had Muslim names, and another 10 percent names that indicated an immigrant parent.

Figure 5: The Share of Latinized Surnames at Death, Births, 1810-1979



Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011.

Figure 6: Percentage of Men Named ..son, Lund.. and ..berg by Date of Death, and Date of Birth



Source: Swedish Death Index, 1901-2009 (version 5.00), 2011.

We can observe the sources of this decline if we take all births for 1950-1, and measure the percentage of patronyms by date of death. This is shown in figure 7. Of men born in 1950-1, 48 percent of those dying aged 0-9 had a patronym. But only 35 percent of those dying ages 50-59 had a patronym. Assuming the same death rates by age, nearly one third of men born with patronyms changed their surname, with most of the changes occurring by age 30. This means that while we will see below that patronyms in Sweden are associated with low social status, we have to be careful in using them to measure social mobility, since such patronyms are selectively retained by the modern population.

Nina Benner, a reporter for Sverige Radio, has a nice story from her own family of how such surname changes took place. Her grandfather and his four brothers changed their surname from Andersson to Benner in 1916, when her grandfather was 16. His oldest brother was studying to become a doctor, and his professor made it clear that Andersson wasn't a suitable name in that profession. The name Benner stems from the small village of Bennebo, where her great-grandfather grew up.

There are other Swedish names, however, where the proportion of men at birth has stayed constant over the last hundred years, as in the surnames *Lund.* and *..berg* whose proportion of births is shown also in figure 6. This proportion has been stable since births from 1860. As figure 7 shows this is because those born as surnames like *..berg* are not changing from these names. For men born *..berg* in 1950-1 the same fraction held the name for those dying aged 0-9 as for those dying in 50-9. These are the surnames we can use as a standard against which to measure social mobility rates.

Figure 7: ..son and ..berg Surnames, Men Born 1950-1



Source: Swedish Death Index, 1901-2009 (version 5.00), 2011.

Measuring Social Mobility through Surnames

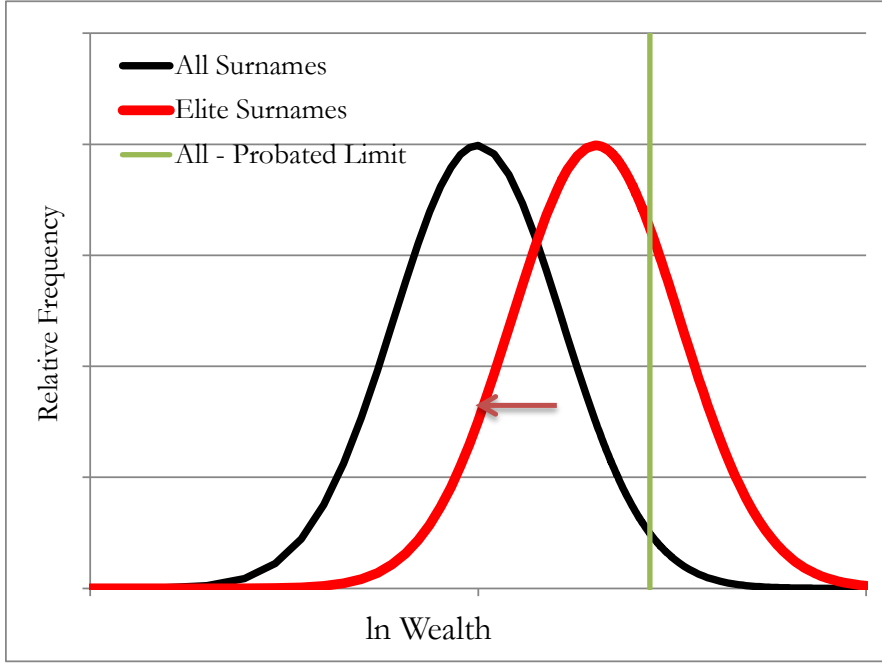
The measures I have of status at any time for various surname groups in Sweden is their share in an elite occupation or educational status compared to their population share. To extract implied bs for these cases we can proceed as follows. Define the *relative representation* of each surname or surname type, z, in an elite group as

$$\text{relative representation of } z = \frac{\text{Share of } z \text{ in elite group}}{\text{Share of } z \text{ in general population}}$$

With social mobility any surname which in an initial period has a relative representation differing from 1 should tend towards 1, and the rate at which it tends to 1 is determined by the rate of social mobility.

To extract implied bs from information on the distribution of surnames among elites compared to the general population we proceed as follows. Assume that any measure of social status, y, follows a normal distribution, with mean 0 and variance σ^2 . Suppose that a surname, z, has a relative representation greater than 1 among

Figure 8: Regression to the Mean of Elite Surnames



elite groups. The situation looks as in figure 8, which shows the general probability distribution function for status (assumed normally distributed) as well as the pdf for the elite group.

The overrepresentation of the surname in this elite could be produced by a range of values for the mean status, \bar{y}_{z0} , and the variance of status, σ_{z0}^2 , for this surname. But for any assumption about $(\bar{y}_{z0}, \sigma_{z0}^2)$ there will be an implied path of relative representation of the surname over generations for each possible b . This is because

$$\bar{y}_{zt} = \bar{y}_{z0} b^t \quad (5)$$

$$\sigma_{zt}^2 = b^{2t} \sigma_{z0}^2 + (1 - b^{2t}) \sigma^2 \quad (6)$$

With each generation, depending on b , the mean status of the elite surname will regress towards the population mean, and its variance increase to the population

variance (assuming that $\sigma_{z_0}^2 < \sigma^2$). Its relative representation in the elite will decline in a particular pattern.

Thus even though we cannot initially fix \bar{y}_{z_0} and $\sigma_{z_0}^2$ for the elite surname just by observing its overrepresentation among an elite in the first period, we can fix these by choosing them along with b to best fit the relative representation of the elite surname z in the social elite in each subsequent generation. In practice it turns out to matter little to the estimated size of b in later generations what specific initial variance is assumed. Below we assume that the initial variance of the elite surname status is the same as the overall variance, since this assumption fits the observed time path of relative representation well in for elites in Sweden.

Figure 9 thus shows what we would expect the relative representation of a surname, which had a relative representation of 8 times its share in the population in the first year, to have in each subsequent 30 year interval with different assumptions about b . If $b = .35$, the kind of b we expect from standard studies of Sweden, then within two generations surnames heavily overrepresented among the elite should have close to a proportional representation among the elite.

Attorneys

The Swedish Bar Association maintains a register of member attorneys with the date of birth of each member, and date of entry to the bar.⁹ As of June 20, 2012 there were 7,022 such members. If we compare the frequency of surname types in this register with the frequency of surname types in the population 2011 then we find great variations in the relative representation of surname types. As figure 10 shows the surnames held by titled nobles – Counts and Barons – appear at nearly 6 times the rate these surnames appear in the general population.¹⁰ Other overrepresented surnames include those shared with untitled nobles, and Latinized surnames, both about 3 times the expected rate. Surnames beginning with *Land..* appear at just the expected rate. In contrast surnames ending in *..son* appear at half the expected rate.¹¹

⁹ As of June 20, 2012. Swedish attorneys are not required to qualify for the Bar Association, but only those who qualify can use the title *advokat*.

¹⁰ This is excluding 89 attorneys employed at the foreign offices of one large firm with offices in Russia, Germany, Brussels, New York, Hong Kong, and China who seem mainly to be foreign nationals.

¹¹ The relative frequency of the *..son* surnames was measured using the four most frequent: Andersson, Johansson, Karlsson and Nilsson.

Figure 9: Relative Representation by Generation with Different bs

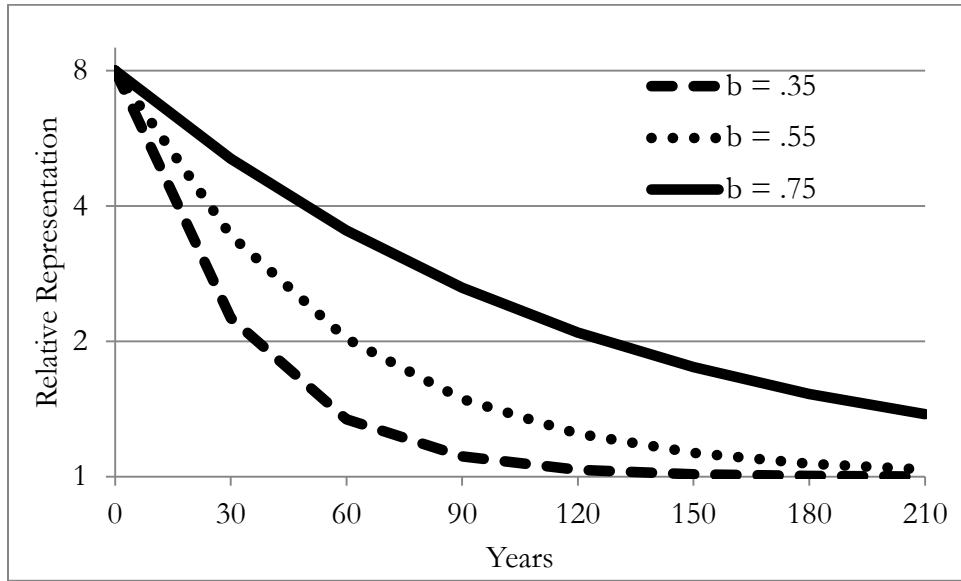
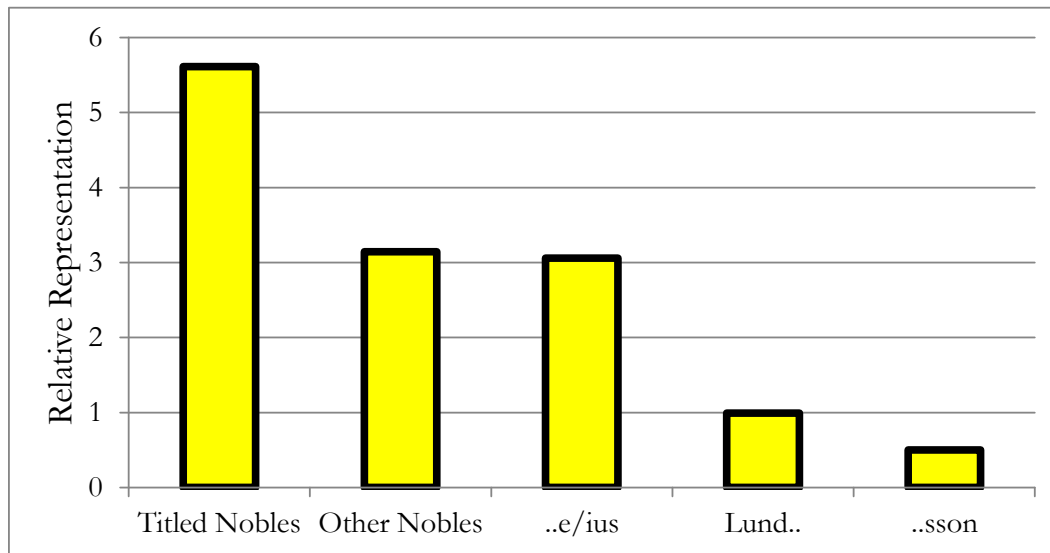


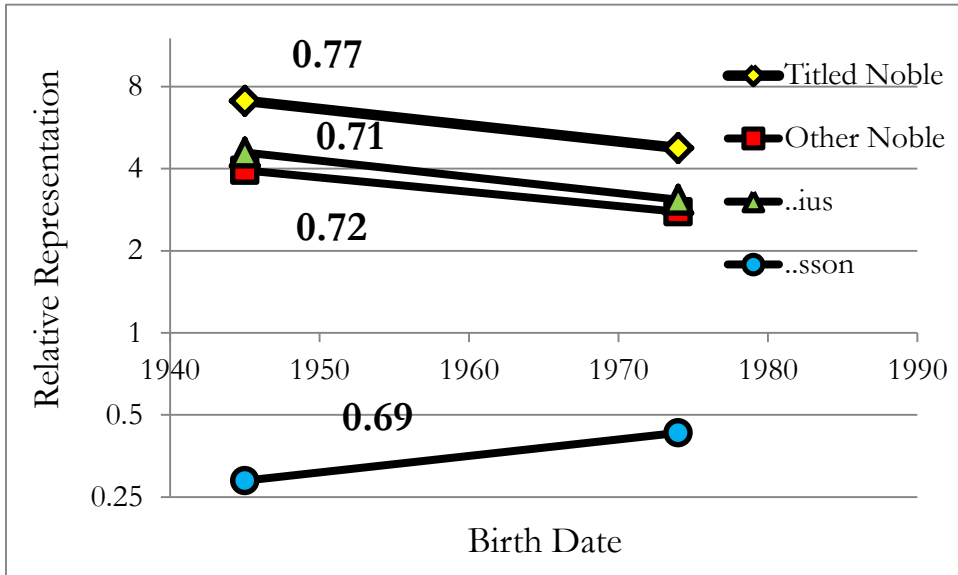
Figure 10: Relative Representation of Surnames, Attorneys, Sweden, 2012



Source: Swedish Bar Association, Membership Registry, June 20, 2012. Statistics Sweden, Surname Frequency, December 2011.

Notes: “Titled Nobles” are surnames of Counts and Barons. “Other Nobles” are surnames of Untitled Nobility. “..e/ius” are Latinized surnames with frequency greater than 40 in 2011. “Lund” are all surnames beginning with these letters. “..sson” are four common surnames ending with sson.

Figure 11: Relative Representation of Surnames, Attorneys, by Cohort



Source: Swedish Bar Association, Membership Registry, June 20, 2012. Statistics Sweden, Surname Frequency, December 2011.

Note: The vertical axis is on a logarithmic scale.

This implies that the distant past again has a surprising impact on the present even in Sweden. Surnames that were differentiated socially in 1700 have remained differentiated even to the present time, 10 generations later. Also the noble surnames have retained their relative ranking in the social hierarchy, even to today, with the surnames of Counts and Barons more elite than those of the Untitled Nobles.

Bar members have birth dates varying from the 1910s to 1988. Using these birth dates I divide the members into two generations, those born 1930-59, and those born 1960-88. Figure 11 shows the relative representation of each surname type across these two cohorts. Two things appear. First is that each of the surname types has been regressing towards the expected mean representation of 1, for the average surname in the population. The second, however, is that the rate of regression to the mean is slow. Even for attorneys born 1960-88, those qualifying in the last 30 years, there are substantial differences in the relative representation of

different types of surnames.

The implied intergenerational correlation of occupational status from the attorney data is as follows by surname group: high aristocrats, 0.77, lower aristocrats, 0.72, Latinized surnames, 0.71, and Patronyms, 0.69. Note, however, that for the patronyms we have to be cautious about interpreting the b , since significant numbers of people switched from the patronyms of their birth to other types of surnames. If this switching was mainly by the socially more successful, the b estimated could be significantly higher than the true b . The average b reported for attorneys in table 1 above is thus the 0.73 for the three elite surname groups. The estimated b s do differ by surname group, but since for the high status surnames we are dealing with, the samples of attorneys in each cohort are only 18-54, these variations in estimated b 's could easily stem from chance alone.

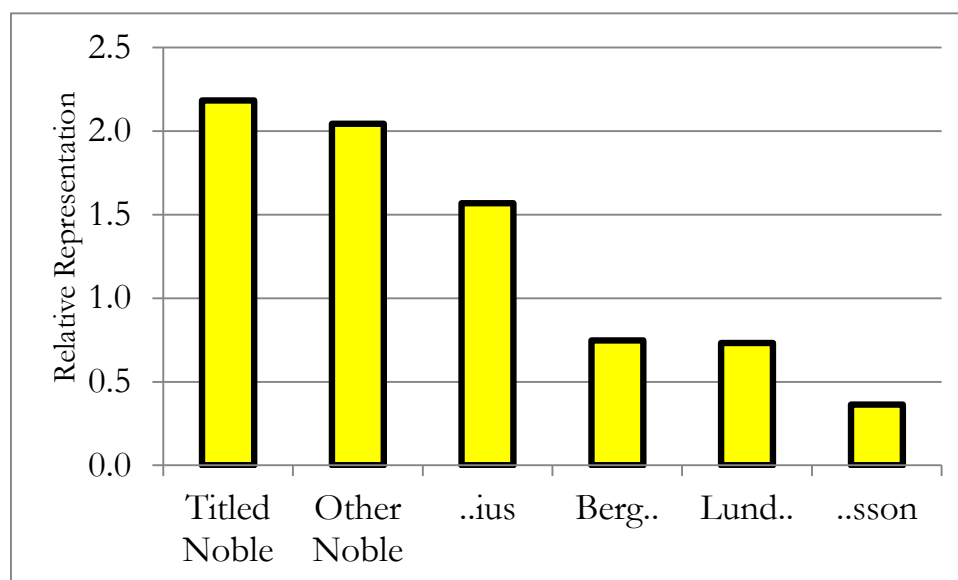
If we combine the three elite groups we can estimate an overall persistence rate, and also calculate the confidence interval from sampling error. The estimated b is 0.72, with a 95% confidence interval of (0.56, 0.91). Thus the estimate of b is imprecise, because of the small number of attorneys, but certainly much higher than conventionally estimated social mobility rates for Sweden.

Physicians

A second source that measures social mobility rates back to the 1890s is the list of registered physicians in Sweden. I can get estimates of the relative frequency of surnames among physicians for those first registering between 1890 and 2011, which covers four generations of physicians in Sweden. Starting with currently registered physicians we see the same differences in relative representation that we saw among attorneys.

Thus figure 12 shows the relative representation of each surname type among currently registered physicians. The same pattern as with the attorneys appears here. The surnames of the three elite groups of the eighteenth century are still overrepresented relative to their share of the population, and the Patronyms are greatly underrepresented. Here even surnames such as *Lund.* which had an average representation among attorneys are underrepresented.

Figure 12: Relative Representation of Surname Types among Swedish Physicians



Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011. [Sverige, Socialstyrelsen](#). 2011.

The reason for this is that a substantial fraction of the current stock of doctors in Sweden is of foreign origin. Doctors with a medical license from any other EU country can register as a doctor in Sweden without any further required training. Thus in 2007 18.4% of all doctors registered in Sweden were trained abroad, though this includes Swedes who attended foreign medical schools. But of those registered first in 2007, excluding Swedes training in foreign medical schools, 40% of new doctors were foreign.¹²

To correct for this, and calculate the relative representation of Swedish surname types among Swedish born doctors in Sweden, I assume all foreign doctors were registered post 1979, and that the relative representation of the surnames *Lund..* and

¹² “Every other doctor in Sweden from abroad”, *The Local*, 30 August 2009 (<http://www.thelocal.se/21768/20090830/>)

Berg. both averaged one in 1980-2011. This implies that in this cohort Swedish born doctors now constitute only 70% of all doctors, reasonable in light of the statistics in the paragraph above. I adjust the overall doctor population for these years accordingly. For the years 1890-1979 I assume all registered doctors in Sweden were of Swedish birth.

Table 2 shows the data needed to calculate social mobility rates. The second column shows for each group the number of doctors with the surname recorded in each period from that surname group. Also shown is the share of this group among doctors of domestic origin. The share of the surname group in the population is estimated from the share of the surname in deaths of men born in the years 30 years before the registration period. By dividing the first share by the second I get the relative representation of each surname group among doctors by period. Notice that a small share of doctors in Sweden registering first after 1980 comes from these three elites, 2% only. But what is interesting is that this is still much greater than the share of such surname holders in the domestic population, 0.8%.

Figure 13 shows for the four surname types – Titled Nobles, Untitled Nobles, Latinized, and Patronyms – their relative representation by estimated year of entry into practice, for the cohorts entering 1890-1919, 1920-49, 1950-79, and 1980-2011.¹³ All four groups regress towards the mean, but their rate of regression is again very slow across all the cohorts. Figure 14, for example, shows the fitted relative representation for all those in the three high status groups across the four generations. The estimated b in this case is 0.72, and the fit is good and similar for all three elite groups and all periods 1890-2011. The rate of regression to the mean was no faster in the last period, with a persistence parameter of 0.80, for people entering medical practice within the last 30 years, than in the earlier ones. For 1920-49 the estimated persistence parameter is 0.79, and for 1950-79 0.63. However, these parameter estimates are not statistically different. The empirically estimated 95% confidence interval in each of the three periods is: 1920-49, 0.66-0.95, 1950-1979, 0.55-0.72, 1980-2011, 0.70-0.91. So there is no clear improvement in mobility rates across time. But also the estimated mobility rates are always much lower than those conventionally estimated, even at the bottom of the confidence intervals.

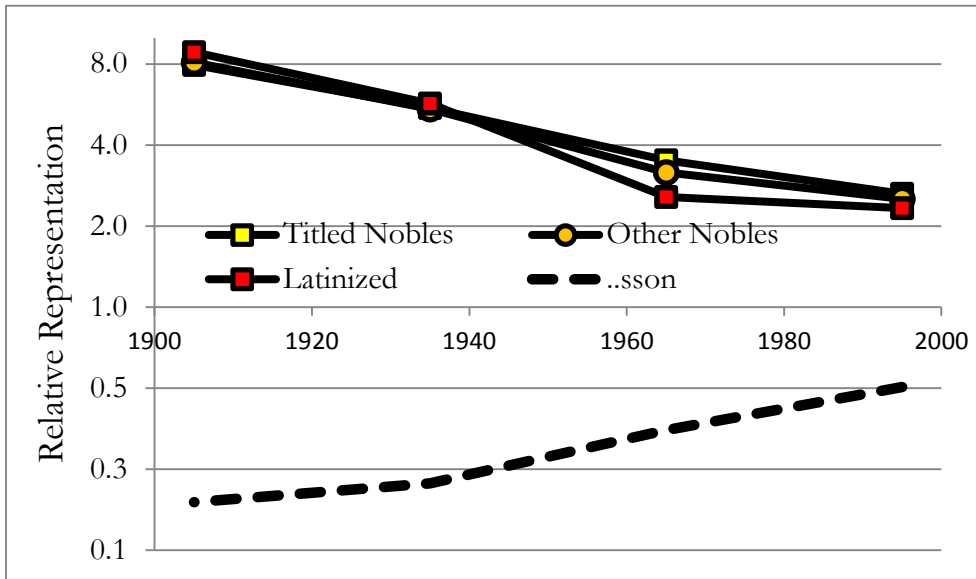
¹³ The Latinized surnames here are all such surnames held by 40 or more people in Sweden in 2010. The Patronyms are the 9 most common: Andersson, Eric(k)sson, Johansson, C(K)arlsson, Larsson, Nilsson, O(h)lsson, Persson, Svensson.

Table 2: Surname Types among Doctors and in the Population

Period of Qualification	Doctors	Share of Domestic Doctors	Share of Cohort Population	Relative Representation
Titled Nobles				
1980-2011	125	0.45	0.17	2.64
1950-79	122	0.60	0.17	3.51
1920-49	37	0.94	0.17	5.50
1890-1919	13	1.36	0.17	7.93
Untitled Nobles				
1980-2011	296	1.07	0.43	2.52
1950-79	273	1.35	0.43	3.17
1920-49	91	2.32	0.43	5.46
1890-1919	33	3.46	0.43	8.12
Latinized (40+)				
1980-2011	123	0.45	0.19	2.33
1950-79	97	0.48	0.19	2.57
1920-49	37	0.94	0.17	5.71
1890-1919	14	1.47	0.17	8.87
..son (top 9)				
1980-2011	2,282	8.28	16.4	0.50
1950-79	1,308	6.47	18.5	0.35
1920-49	192	4.90	22.1	0.22
1890-1919	45	4.72	25.0	0.19

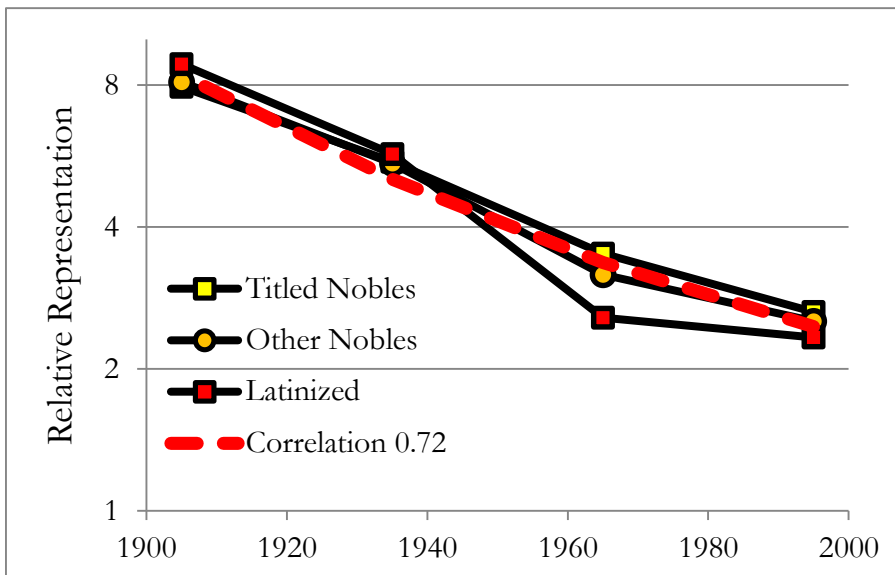
Notes: The share of each surname group in the total numbers of doctors before 1950 is determined from the total stock of doctors. After 1950 it is measured relative to the surnames Berg. and Lund..

Figure 13: Representation of Surname Types Among Doctors, 1890-2011



Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011. [Sverige, Socialstyrelsen](#). 2011, 1972, 1939.

Figure 14: Estimated b for Elite Surnames, Doctors



Sources: As for figure 13.

The corresponding b for the Patronyms is similarly high at 0.74. We have to again be cautious about the estimate for Patronyms, however. People were switching from these surnames in all generations, and this switching likely was selective by the upwardly mobile. This implies the b estimated here overestimates the persistence of status among the Patronym surnames. However, the b estimated for this group is very similar to the three elite types of surname.

Educational Mobility, 1948-2012

Looking at college graduates in Sweden, we also see evidence of very low rates of social mobility, even in the most recent decades. Figure 15, for example, shows for Uppsala University the relative representation of our surname groups among those completing Master's Theses in the last 12 years, 2000-12. Taking surnames of the form *Lund.* or *Berg.* as having an average representation, we see that the Noble and Latinized surnames, largely originating before 1800, still have a 50-80% overrepresentation.¹⁴ The most common patronyms are at half their expected representation.¹⁵

The differences here between the elite surnames and patronyms are less sharp than for attorneys and doctors. But those completing Master's theses, even at elite universities such as Uppsala, are a less exclusive share of the population than those qualifying as attorneys or doctors. Indeed based on the numbers of master's theses per year at the Gothenburg, Lund, Stockholm and Uppsala, the most exclusive Swedish universities, 8% of the cohort of Swedes born 1990 will complete a master's thesis at one of these universities.¹⁶

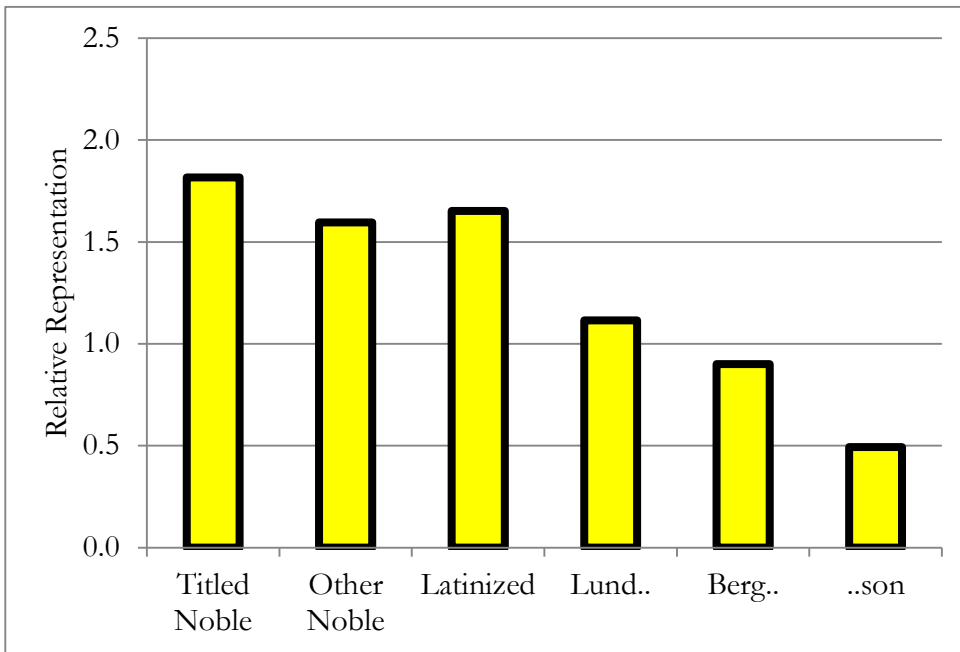
If a surname type, such as *..(e)ins* is at a relative representation of 2 for the top 8% of the population, then its relative representation at the top 1%, more characteristic of attorneys or doctors, would be 2.8. Thus the information here is very consistent with the evidence for doctors and attorneys in the most recent generations, and suggests again that there is currently very slow regression to the mean for elite and underrepresented surnames. These data imply that if 8% of the general population of 22 year olds in Sweden now get a masters degree from

¹⁴ Only Latinized surnames originating before 1820 were employed here.

¹⁵ The surname frequencies for this age group are estimated from the distribution of surnames in the death register for males born 1985-1994.

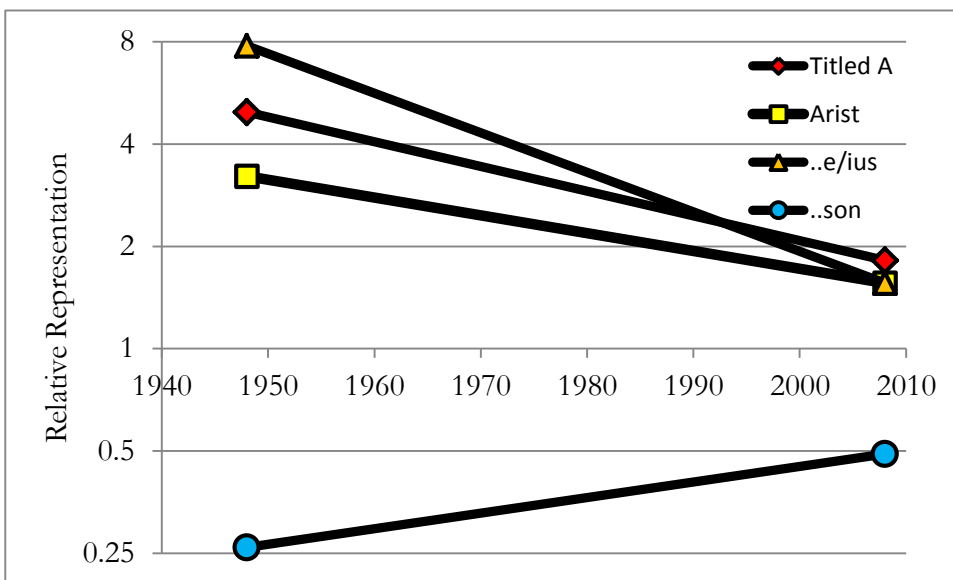
¹⁶ The numbers of theses from domestic students were estimated from the numbers of Berg, and Lund. authors in 2011, taking them based on the birth data as 2.7% of the population. Students have the option of completing one or two theses for a masters degree. A sample of 100 Berg. surnames from Uppsala suggested that the average masters student completes 1.26 theses. This gave an estimate of 8.4% of the 1989 birth cohort completing an MA at one of these universities.

Figure 15: Surnames among Uppsala Master's Theses, 2000-12



Sources: Uppsala University, 1975-2011 <http://uu.diva-portal.org/smash/searchadthe.jsf>

Figure 16: Relative Representation at Uppsala, 1948-2008



Sources: As figure 15.

one of these four elite universities, the rate for those sharing the surnames of the 18th century elite is 12-14%. The differential status of Swedish surnames will not end soon.

There are extensive records of those enrolled at the only two Swedish universities established before 1954, Uppsala, founded in 1477 and Lund, founded in 1666. Thus there are volumes recording the surnames of 1,894 students attending two of the student nations at Uppsala 1942-1954.¹⁷ Using these we get the picture in figure 16 of the relative representation of different surname types at Uppsala circa 1948 and circa 2008, two generations later. Once again there is a clear convergence of all four groups towards the mean across these two generations.

To calculate the b for education implied by the data in figure 16 I need to take account that Uppsala and Lund were much more elite institutions in the 1940s than in 2000-12. The fraction of Swedes attending Uppsala and Lund in the late 1940s can be roughly estimated as still only 1% of the population, compared to an estimate for master's theses now of 8% of the population. The estimated b s for the three elite groups individually, allowing for this shift in the upper proportion of the population being observed, are 0.72 for the Titled Noble surnames, 0.75 for the Untitled Noble surnames, and 0.53 for the old established Latinized surnames.

However, the sample size for these surnames at Uppsala in 1942-54 is small, meaning there will be significant sampling error in these estimates. Combining these groups into one elite implies an overall b in these two generations of 0.65. Yet the two subsequent generations entered university after major reforms in 1977 which greatly expanded access to universities. Tuition is now free, and there are grants and loans available to students to cover living costs.

For the Patronym surname group, here estimated on the basis of the surnames Andersson, Johansson, Karlson, and Nilsson, the implied b , 0.87, is even lower. The shift of people away from these surnames probably biases this implied b upwards, however.

¹⁷ These student nations were dining and residence associations.

Educational Mobility, 1700-1948

There is good data available on the surnames of Lund attendees 1666-1908 from publication of a register of all students 1732-1830, and detailed biographies of students in a number of the student nations that all students had to enroll in 1666-1908.¹⁸ For Uppsala there is complete registry data 1477-1817, but data from only one student nation 1817-1902.

Figure 17 shows the relative representation of Latinized surnames at Lund by 30 year generations starting in 1700-29. In the first generation observed Latinized surnames were 14.3% of Lund students, but only an estimated 0.21% of the population.¹⁹ They were thus 71 times more common among students as in the population. The share of Latinized surnames at the university fell to 1.1% by 1880-1909. They were still 5.3 times as frequent among Lund students as in the general population. The pace of this decline in representation implies a high persistence of this group however. The b estimated for 1700-1909 is 0.78, assuming the university represented an upper 1% of the socio-economic distribution.

One thing we have to beware in calculating persistence is surname changing. If students born with the surname *Anderson* were changing this to *Wigonius*, then persistence would be exaggerated. The biographical sources for some of the student nations at Lund and Uppsala allow me to estimate the fraction of Latinized surnames newly adopted in each generation, since they give the parents' surnames for most students also. Figure 18 shows what fraction of students in each generation inherited rather than adopted a Latinized surname.²⁰ 1730-1819, 96% of students acquired the name by inheritance from their father. However, 1820-1909 that proportion fell to 88%, even though by design these are all surnames that first existed before 1730.²¹ This implies that the estimated b for the years before 1909 is upward biased by successful families newly adopting these surnames. Thus the fact that these estimated persistence rates are now higher than for doctors 1980-2011 then in the eighteenth century is even more surprising.

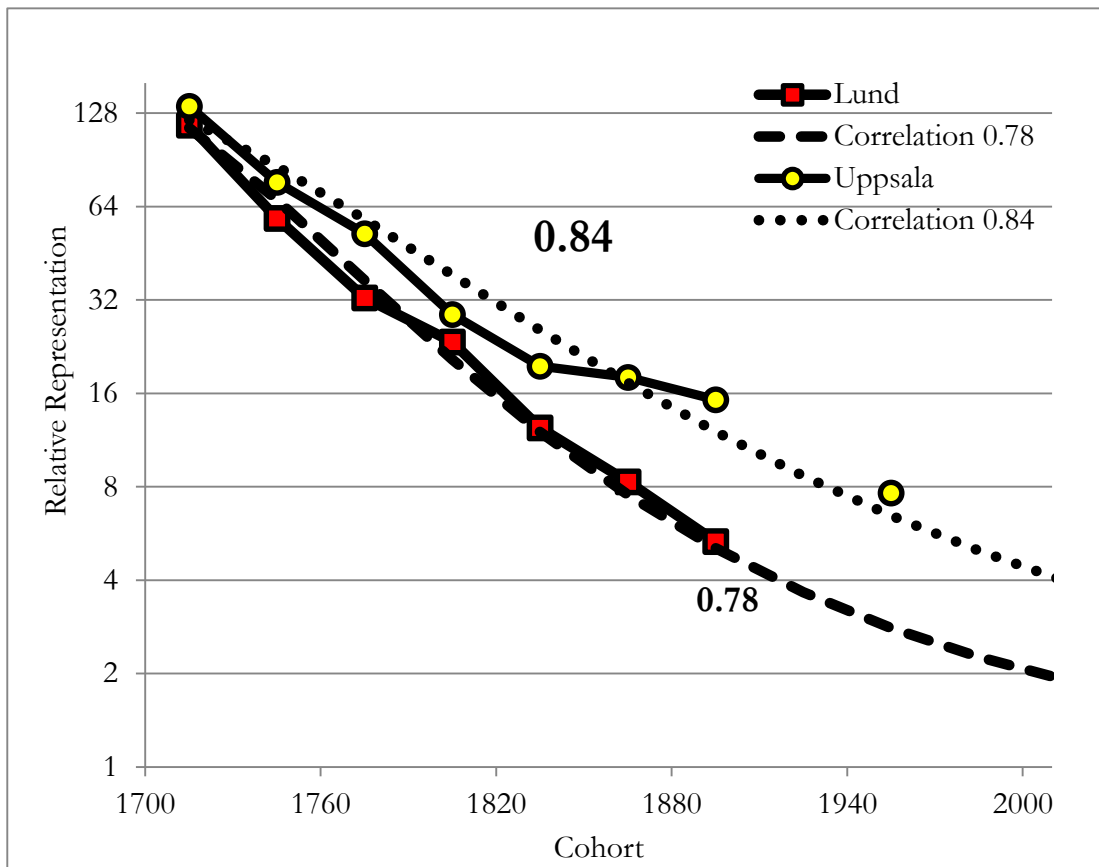
¹⁸ These nations are Blekingska, Göteborgs, Kalmar, Skånska (to 1882), Smålands, Vermlands.

¹⁹ Based on the share of male births 1800-1829 in the 1901-2009 death register.

²⁰ In the first period, 1700-29 a larger fraction of students were freshly adopting Latinized surnames, but this does not affect the calculated b , only the fraction of students post 1730 who changed their surname.

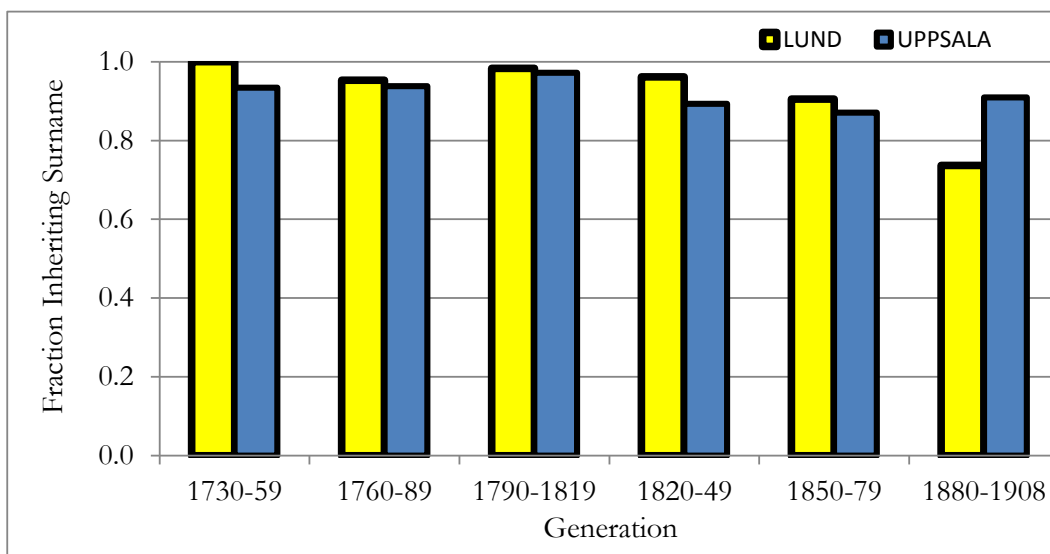
²¹ Some acquired the name by inheriting it from their mother.

Figure 17: Latinized Surnames, Lund and Uppsala students, 1700-2012



Sources: See university section in references.

Figure 18: Fraction of Latinized Surnames Inherited, 1730-1908



Sources: Lund, Lundin, 1882, Sjöström, 1897, 1901, 1904, 1907, 1908. Uppsala, Odén, 1902.

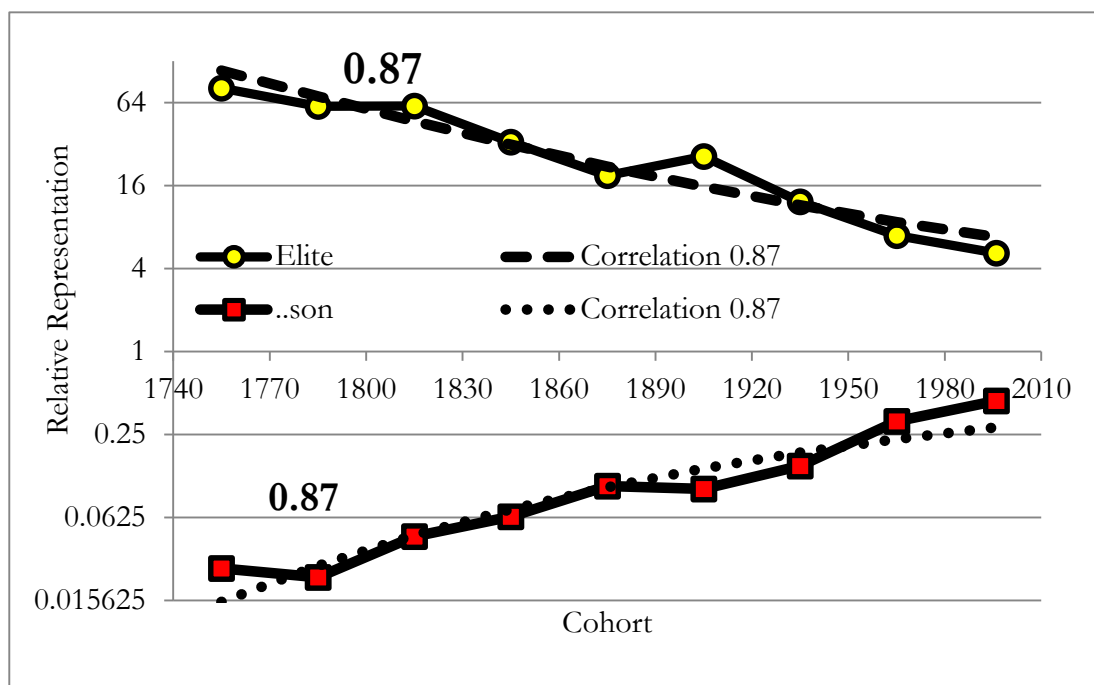
An even more elite group than Lund and Uppsala students are members of the various Royal Academies of Sweden. There are nine such Academies. Comprehensive membership lists are available for the Swedish Academy of Sciences (founded 1739), the Swedish Academy of Music (1771), and the Royal Academy (1786). Together these three academies have had 2,834 domestic members.

Figure 19 shows the relative representation of the surnames of the eighteenth century elite – Latinized surname and the surnames of nobles - in these three academies by 30 year generations starting in 1739-1769, and ending in 1980-2012. In the earliest period such surnames made up half of the members of the academy. By 1980-2012 this had declined 4.1% of the Academies. But these surnames in 2011 were only 0.71% of the Swedish population, so they were still strongly overrepresented in the Academies.

The small number of members compared to other groups we have looked at means that in the latter years there is a lot of sampling error in terms of the frequency of elite surnames. Taking these academies to represent the top 0.1% of Swedish society the implied persistence b over these 273 years is 0.87. There is also little sign of an increased rate of regression to the mean for the entrants to the academies 1980-2012 compared to 1950-79. The estimated b for elite surnames is still 0.84 for this last generation.

Figure 19 also shows the relative representation of Patronyms in the Academies. Such surnames are of course still strongly underrepresented, but they have shown a slow but steady convergence towards proportional representation. However, the implied b is 0.87, the same as that for the elite surnames. However, as always there is a caveat that many people in Sweden whose father had a patronym switched to another name as an adult, and this switching was likely selective.

Figure 19: Elite Surnames in the Swedish Royal Academies



Sources: See reference list on Academies.

Interpretation

Despite the conventional estimates, Sweden appears to be a society with very modest rates of intergenerational mobility for occupation and education. Also rates of social mobility seem no higher now in the modern inclusive, social democrat state than in the pre-industrial past. Why do the results presented here differ so much from those of conventional mobility studies?

One objection that has been raised is that the surname evidence above relates to the top 0.1% to 8% of the status distribution, while conventional studies look at mobility across the entire distribution. Could there be high persistence of status at the upper extreme of the distribution, but for 99% or more of families in Sweden the high rate of social mobility traditionally found? Björklund, Roine, and Waldenström (2012), for example, find an expected overall income mobility b for Swedish men of only 0.26, but for the top 0.1% of the income distribution the b is 0.9.

Suppose this argument of much lower mobility at the top is correct. Then one thing we would learn is that for social elites – doctors, university professors, lawyers, business leaders – the standard estimates of social mobility rates would be too high. Persistence at the top of society, which is perhaps the persistence people care most about, is much greater. But also consider what would happen in this case to families with the surnames of the eighteenth century elite, the nobles and the Latinized surnames. Once such families fell out of the top 1% of status, with rapid social mobility in the bottom 99% of the distribution, their status would quickly fall to the social mean. Status distribution among the surname elite would no longer be normal, and might even be bi-modal, with a cluster at the top and then a near normal distribution around the social mean, as in figure 20. In particular there should be no marked deficiency of elite surnames now at the bottom of the distribution, if mobility rates are rapid for all below the top 1%.

We can observe the overall distribution of income by surname from the tax returns from modern Sweden. Figure 21 shows this calculated for six *kommuns* in the Stockholm region for 2008 for three groups – titled Noble surnames, *Andersson*, and a sample of all surnames. With the tax data the noble surnames are as underrepresented at the bottom of the income distribution as they are overrepresented at the top. Even when they fall out of the top 1% in various measures of status they are still experiencing markedly slower rates of downwards mobility than we would expect.

The underlying rates of social mobility revealed by surnames turn out to be as low as those discovered here for Sweden in all societies where we can observe this. These various estimates are given in Clark et al., 2014. If the underlying rate of social mobility varies little across societies, why is the measured rate for particular aspects of status lower for societies like Sweden, and why is that measured rate correlated with income inequality? The hypothesis I would suggest here is that in societies where inequality in aspects of status such as income, wealth or years of education is lower, the bias in estimating the underlying rate of social mobility from conventional methods will be greater. For the relationship of the observed β to the underlying b is given by

$$E(\hat{\beta}) = b \frac{1}{1 + \left(\frac{\sigma_u^2}{\sigma_x^2}\right)} \quad (4)$$

where $y = x + u$ is the observed status, x is the underlying social competence of families, assumed to have a similar distribution across societies, and u is the random component. When we look at earnings or income in a society such as Sweden, the compression of the variation in

Figure 20: A Bimodal Status Distribution among the Surname Elite

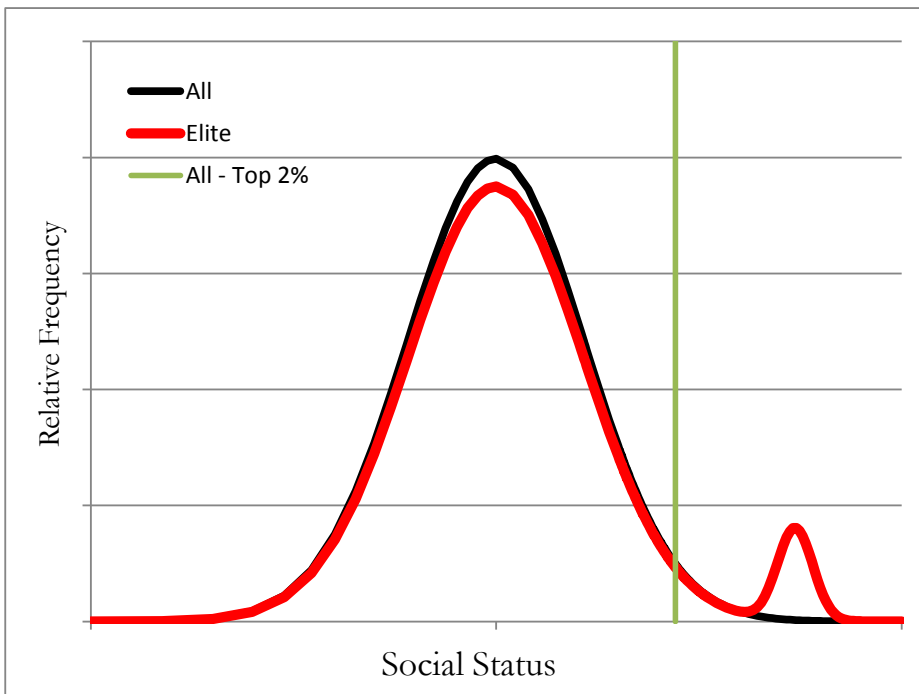
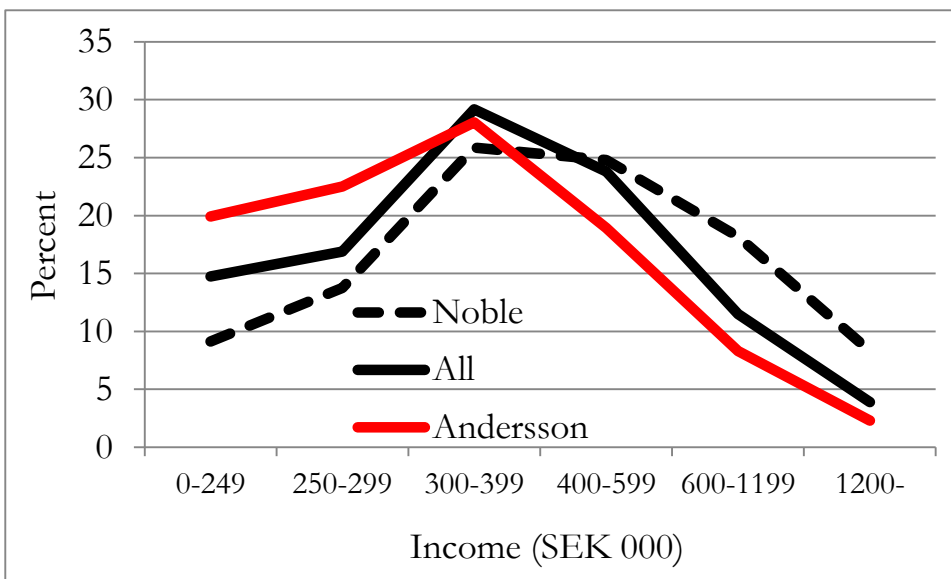


Figure 21: Income Distribution, All Surnames, *Andersson*, and Noble Surnames, 2008.



Notes: The distribution of taxable income overall was estimated from a random sample of all reported returns in these *kommuns*.

Source: 2008 tax returns for the *kommuns* of Botkyrka, Huddinge, Haninge, Nacka, Stockholm, and Täby (884,000 potential tax payers) (Kalenderförlaget 2008a,b,c).

these means that they function less well as a signal of underlying social competence. σ_u^2 is large σ_x^2 for earnings or income. The noise component in relating earnings to underlying social competence in a society such as Sweden compared to the USA is relatively more important. Thus the downwards bias of the conventional β as a measure of b is greater.

This simple model of slowly evolving latent status, with the process first order Markov, the same in every generation and dependent only on the underlying status of parents, will also predict another feature of recent studies of social mobility across multiple generations in England, Sweden and Denmark, which is the stronger than expected connection between grandparents and grandchildren, and even great-grandparents and great-grandchildren.²² For this Markov model for the latent variable contains the prediction that after the second generation, measured social mobility rates will slow down to the underlying mobility rate of social competence. Measured downwards mobility for a high income family will be fast in the generation of the children, but then much slower for the generation of the grandchildren, the great-grandchildren and so on measured relative to the first generation.

If we now indicate the correlation measured between members of families n generations apart as β_n , then the one generation correlation normally estimated will relate to the underlying persistence of status in the form

$$E(\hat{\beta}_1) = \theta b \quad (5)$$

where θ is the attenuation factor caused by the random components linking observed status on any one dimension with underlying status.²³ When we look, however, at the correlation between n generations, and estimate now $\hat{\beta}_n$, the correlation across n generations, we will predict that

$$E(\hat{\beta}_n) = \theta b^n \quad (6)$$

The downward bias caused by the error component in the measure of status is the same across all generations.

²² See, for example, Clark and Cummins, 2013, Lindahl, et al., 2012, Boserup et al., 2013.

²³ $\theta = \frac{1}{1 + \left(\frac{\sigma_u^2}{\sigma_x^2}\right)}$

Table 3: Underlying b Implied by Multi-Generation Status Correlations

Source	Measure	β_1	β_2	β_3	Implied b
England, 1858-2012	Wealth	0.467	0.368	0.315	0.81
Sweden, 1865-2005	Education Gen 1-4	0.353	0.216	0.123	0.60
Sweden, 1925-2005	Earnings, Gen 2-4	0.288	0.141	-	0.49
Denmark, 1983-2011	Wealth	0.168	0.094	-	0.56

Sources: Clark and Cummins, 2013, Lindahl, et al., 2012, Boserup, Kopczuk, and Kreiner, 2013.

Table 3 shows some estimates for recent years of the correlations between parents and children in wealth, education, and earnings compared to the correlation between parents and grandchildren, and parents and great-grandchildren. In each case the data is consistent with a much more highly correlated underlying social status for families. The value implied for the correlation of the underlying status is 0.49-0.81, two to three times as high as the measured one generation correlation. However, the implied values for this underlying correlation are not as high in the Nordic countries as would be predicted from the surname evidence above in Sweden. The degree of error attenuation by generation may not be constant, however. If more of the variance in earnings, for example, at the grandparent level was from the error component for the Swedish earnings study, since the grandparent earnings were imputed from occupations, it will reduce the two generation correlations more than the one generation correlations in earnings.

So my conclusion is the recent multigenerational Nordic evidence on mobility is consistent with a much slower change of underlying social status between generations, as observed above. The persistence coefficient implied, 0.5-0.6, is not, however, as great as would be predicted from surname persistence, which implies 0.7-0.8. But it is still a great deal higher than the normal estimates of intergenerational correlation of education, income and wealth for Nordic countries.

Conclusions

Generalized and long-term social mobility in Sweden in recent years is much lower than the rates reported in standard two generation studies of the intergenerational correlation of income or education. Rates of long run social mobility are indeed so low that the 18th century elite in Sweden have persisted to the present as a relatively advantaged group. There is little evidence that intergenerational mobility rates have increased within the last 2-3 generations, compared to rates in the pre-industrial era. The β for underlying social status may indeed be as high as 0.70-0.80. Such mobility rates are the same as we observe for underlying social status in a variety of other countries such as the UK, USA, and even India and Chile.

The strong intergenerational persistence of status in a country with many years of generous public provision of opportunities and funding for education, at rates similar to other countries without such equalizing expenditures, suggests that the forces that determine intergenerational mobility must be fundamental to the formation and functioning of families. These may be forces that are impossible to change with public policy.

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