

What is the True Rate of Social Mobility in Sweden? A Surname Analysis, 1700-2012

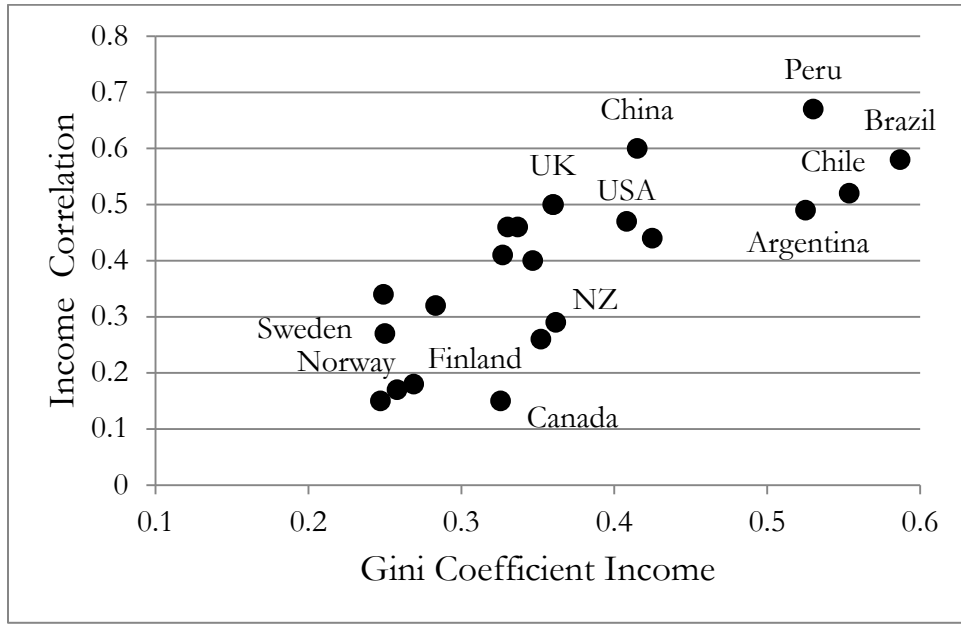
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On conventional measures, modern Sweden has rapid social and economic mobility. Analyzing surname distributions among Swedish elites - attorneys, physicians, university students, and academicians - this paper shows that conventional measures greatly overstate social mobility. The Swedish elite of 1700 is still an elite, and is becoming average only slowly. The b measuring status persistence across generations is 0.7-0.8, compared to the 0.25-0.40 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 Sweden are similar to those of the supposedly more socially immobile economies of the UK and USA. They are little higher than in the pre-industrial era.

Modern Sweden is believed to be a place of great intergenerational social mobility, part of a pattern of high social mobility rates in egalitarian Scandinavia compared to much lower rates in many other societies. 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. 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). In this case there would seemingly be little connection between the income of the current generation and of those before 1914. At these mobility rates after two generations someone whose income was double the average would have grandchildren who had incomes only 1-2% above the average.¹

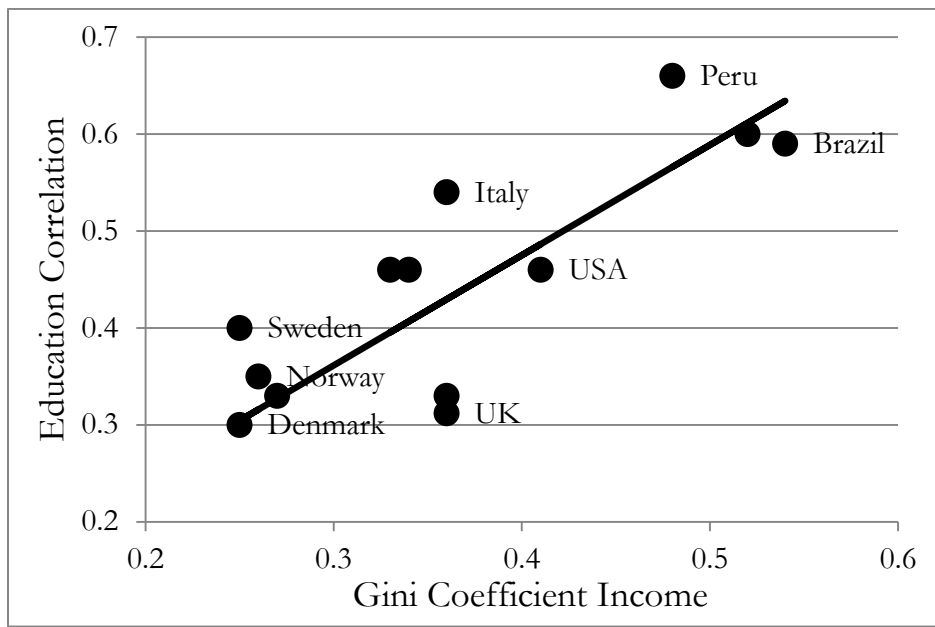
¹ Lindahl et al., 2012, show this is not so, as I will show here for a variety of measures of status. But the question is what explains this.

Figure 1: Intergenerational Earnings Elasticities and Inequality



Source: Corak, 2012, Figure 2. Coefficient for Canada, personal communication.

Figure 2: Intergenerational Education Correlation and Inequality



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

These mobility rates would also imply that only 4-7% of income variance in Sweden in any generation is explained by the ancestry of workers.

Similarly if we look at the intergenerational correlation in education between parents, measured as years of schooling, Sweden and Scandinavia again stand out as having the higher mobility rates. There is similarly an inverse correlation between income inequality and intergenerational educational mobility, as shown in figure 2. The estimate of the correlation in years of schooling for Sweden is 0.25, implying that only 6% of the variation in years of education is explained by the parental background of parents. Again Lindahl et al. show that low intergenerational correlations of years of schooling have existed in Sweden across 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, and in the modern era do not exceed the rates of the eighteenth century. Whatever the short run mobility of income, 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 way I will do 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 17th and 18th 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 no faster than social mobility in pre-industrial eighteenth century Sweden under the monarchic rule.

Swedish Surnames

Sweden has a number of distinctive classes of surnames that we can potentially use to track socio-economic status over many generations.

Noble Surnames

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.

The families enrolled in the *Riddarhuset* come in three 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 Though the Swedish King could create nobles up until 1975, these ennobled had to independently seek enrollment in the *Riddarhuset*. The last person ennobled by the King was in 1902. Thus the Noble surnames of the *Riddarhuset* date from 1902 or earlier.

The great period of expansion of the Swedish mobility was in 1626-1658, 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

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

³ Ridderhuset, 2012.

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.

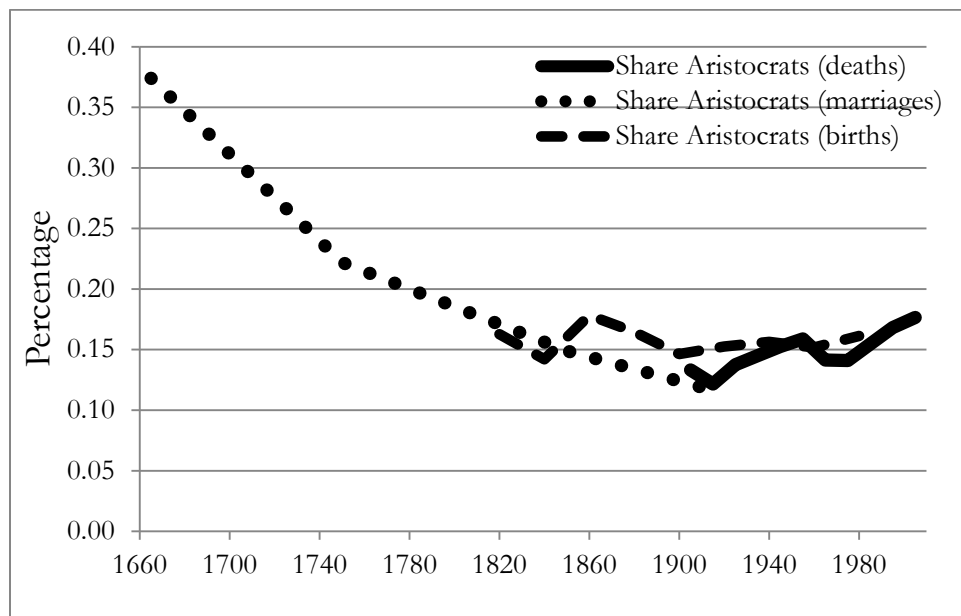
When domestic families were enrolled in the *Riddarhuset* they typically adopted a new surname if they were Swedish, embodying status elements such as *Gyllen* (gold), *Silfver* (silver), *Adler* (eagle), *Leijon* (lion), *Ehren* (honor). Many of the noble surnames in Sweden, however, are German in origin, reflecting the importance of German military commanders in the service of the Swedish crown in the seventeenth century. There are also Scottish, English, Russian and other surnames. Some noble surnames are, however, quite common and held by many people 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 have descended from the noble class.

One privilege that the nobility obtained in the Names Adoption Act of 1901 was a ban on anyone else adopting their surnames.⁴ 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. The modern generation with these surnames are all descended from a privileged class dating typically from 1721 and before. Such surnames constitute a very 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. Figure 3 shows the share of a sample of aristocratic surnames among male deaths 1901-2009, male births 1810-1989, and for marriages 1630-1920. From 1810 to the present there has been little change in the share of these surnames among Swedish surnames, though earlier they constituted a larger fraction of the surnames of those marrying. This, however, may stem from the unrepresentative sources of the earlier marriages, which could have been drawn more heavily from the communities where the aristocrats lived.

⁴ There had been concern that disreputable people had been adopting noble surnames.

Figure 3: The Population Share of Aristocratic surnames, 1630-2009



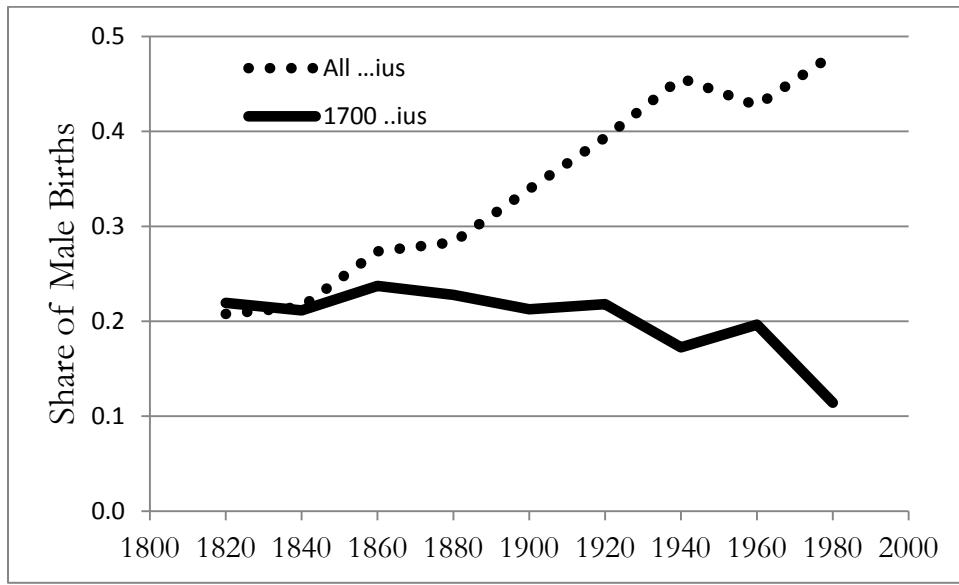
Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011, Parish Records of Birth, Death, and Marriage, 1630-1920.

Latinized Surnames

The second class of surnames of interest are Latinized surnames. In the pre-industrial era, when most Swedes had impermanent patronyms, the educated class – clerics, academics, and some merchants - adopted such 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), Olaus Rudbeckius (1630-1702).

Only a small fraction of the modern population bears such Latinized surnames. Of those dying 2000-9, for example, only 0.47% bore a surname ending in either *ius* or *æus*. However, as Figure 4 shows, for men dying 1901-2009 the share bearing a Latinized surname nearly doubled between those born in 1820 and 1980. This was because in the late nineteenth and early twentieth century significant numbers of people switched to Latinized surnames.

Figure 4: The Share of Latinized Surnames at Death, Births, 1800-2009



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

However, as figure 4 shows, if we take only Latinized surnames that existed before 1800 then the population share is close to stable 1820-1980.⁵ 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 Latinized surnames that existed before 1800, 0.18-22% of the current stock of surnames in Sweden, inherited from the eighteenth century elite.⁶

⁵ 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).

⁶ 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.

Patronyms

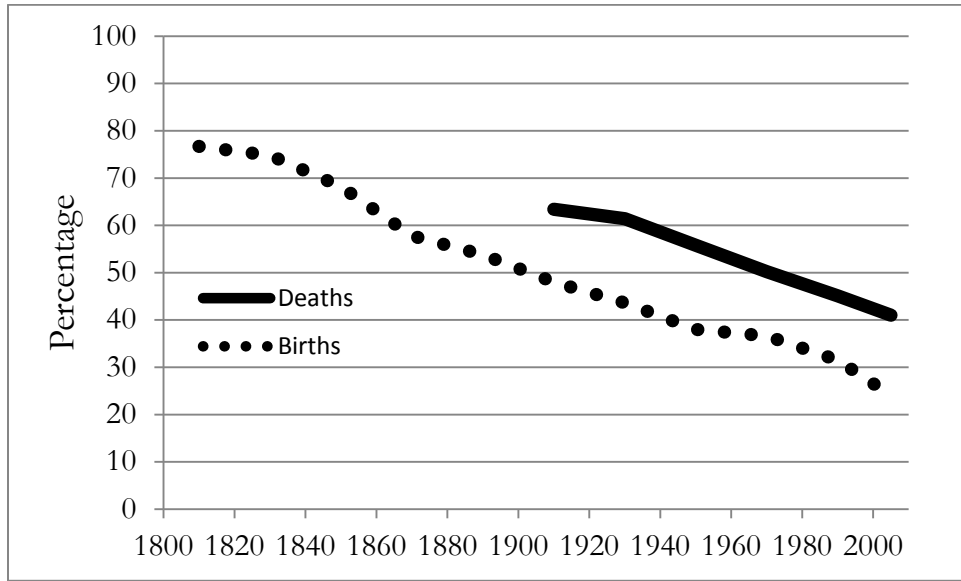
The most common Swedish surnames are patronyms – surnames ending in *son* (and before 1901 also *dotter* for women), and starting with the first name of the father. These were the predominant surname in Sweden in the pre-industrial era. A sample of 17th century parish marriage records, for example, shows 93% 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 5 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.⁷

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 6. Of men born in 1950-1, 48% of those dying aged 0-9 had a patronym. But only 35% 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.

There are other Swedish names, however, where the proportion of men at birth with the surname is the same as the proportion at older ages. Consider surnames ending in *berg* (mountain). As figure 7 also shows, for men born 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 to measure social mobility rates.

⁷ 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: Percentage of Men Named ..son, by Date of Death and Birth



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

Figure 6: ..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. I can thus 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.

The measure I will derive of social mobility is the b in the equation

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

where y is some measure of socio-economic status such as income, wealth, or education.

To extract implied b s from information on the distribution of surnames among elites I proceed as follows. Assume that 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 elite groups. The situation looks as in figure 7, 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

$$\bar{y}_{zt} = \bar{y}_{z0}b^t$$

Also since $\text{var}(y_{zt}) = b^2\text{var}(y_{zt-1}) + (1 - b^2)\sigma^2$,

Figure 7: Initial Position of an Elite

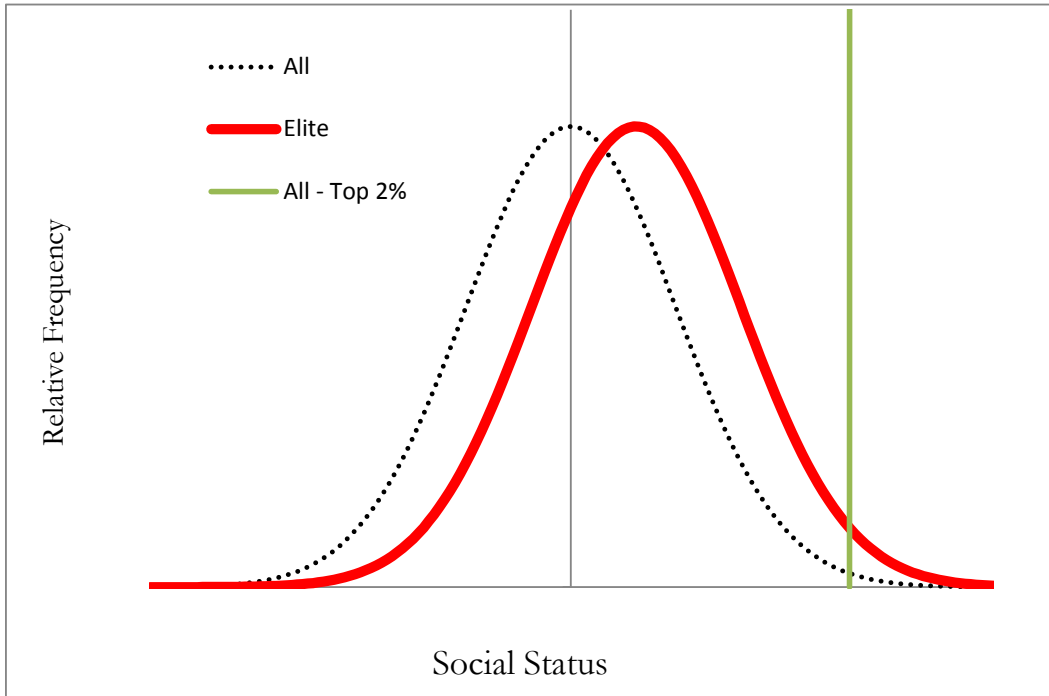
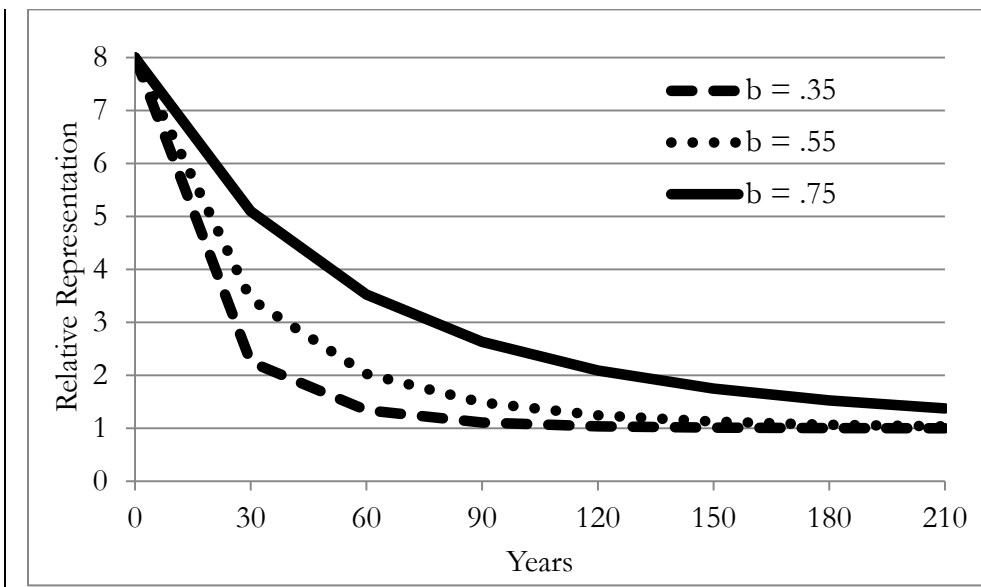


Figure 8: Relative Representation by Generation with Different bs



$$\text{var}(y_{zt}) = b^{2t}\sigma_{z0}^2 + (1 - b^{2t})\sigma^2$$

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 $\sigma_{z0}^2 < \sigma^2$). Its relative representation in the elite will decline in a particular pattern.

Thus even though we cannot initially fix \bar{y}_{z0} and σ_{z0}^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 the case of Sweden where the elite surnames were established mainly before 1800 we can safely assume that the variance of status among the elite is by the modern period as great as that for the general population (it turns out to matter little to the estimated size of b what specific initial variance is assumed). We shall see below that we can confirm this assumption.

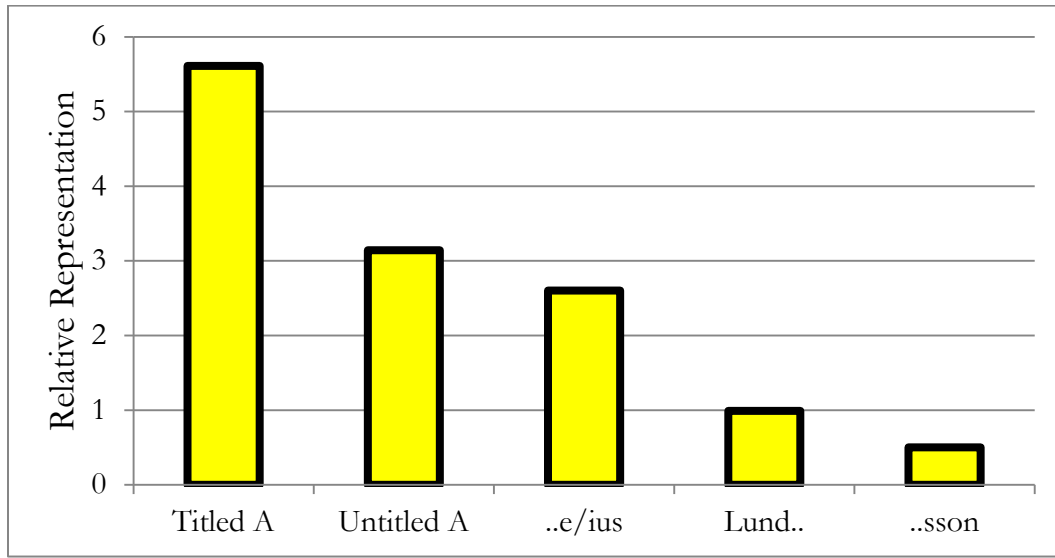
Figure 8 thus shows what we would expect the relative representation of a surname, which had a relative representation of 8 times its share in the population in the first year, to have in each subsequent 30 year interval with different assumptions about b . If $b = .35$, the kind of b we expect from 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 7,111 member attorneys with the date of birth of each member, and date of entry to the bar up to 2012.⁸ 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 9 shows the surnames held by titled aristocrats – Counts and Barons – appear at a frequency nearly 6 times greater than

⁸ 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*.

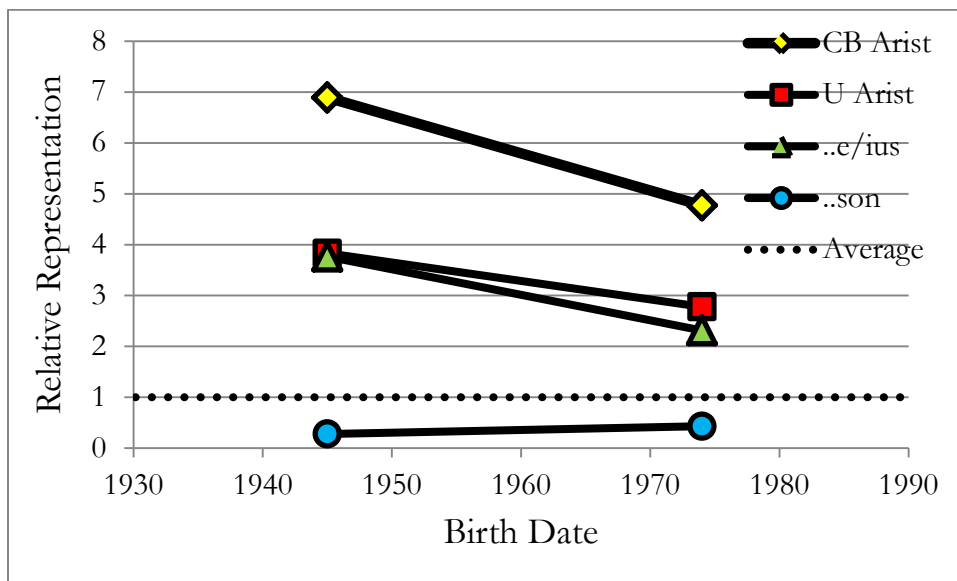
Figure 9: Relative Representation of Surnames, Attorneys, Sweden, 2012



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

Notes: Since some noble surnames were common, for nobles only surnames with a frequency in 2011 or 400 or less were used.

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



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

the frequency of these surnames in the population at large.⁹ Other overrepresented surnames include those shared with untitled aristocrats, and Latinized surnames, both about 3 times the expected rate. Surnames beginning with *Lund.* appear at just the expected rate. In contrast surnames ending in *..son* appear at half the expected rate.¹⁰

This implies that the distant past 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. Also the aristocratic names 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 Aristocrats.

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 surnames among attorneys.

Table 1 shows the data required to calculate the implied persistence coefficient, b , for each surname group, normalized to a 30 year generation gap. The average of these b s is 0.70, much higher than the conventionally estimated b 's for income and education in Sweden. Note, however, that for the patronyms we have to be cautious about interpreting the b , since significant numbers of people switching 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 estimated b s do differ by surname group, but since for the high status surnames we are dealing with, there samples of attorneys in each cohort are only 18-54, these variations in estimated b 's could easily stem largely from chance.

⁹ This is excluding 88 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.

¹⁰ The relative frequency of the *..son* surnames was measured using the four most frequent: Andersson, Johansson, Karlsson and Nilsson.

Table 1: b estimates for attorney cohorts born 1930-59 and 1960-88

	Count and Baron Surnames	Untitled Nobility	Latinized	Patronyms
Births 1930-59				
Share attorneys %	1.19	1.65	0.76	4.41
Share population %	0.17	0.43	0.20	15.60
Relative Representation	6.89	3.83	3.77	0.28
Births 1960-88				
Share attorneys %	0.82	1.20	0.42	4.93
Share population %	0.17	0.43	0.18	11.30
Relative Representation	4.77	2.78	2.31	0.43
Implied b	0.78	0.74	0.61	0.67

Sources: Swedish Death Index, 1901-2009 (version 5.00), 2011 (population shares of surnames). Swedish Bar Association, Membership Registry.

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 4 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.

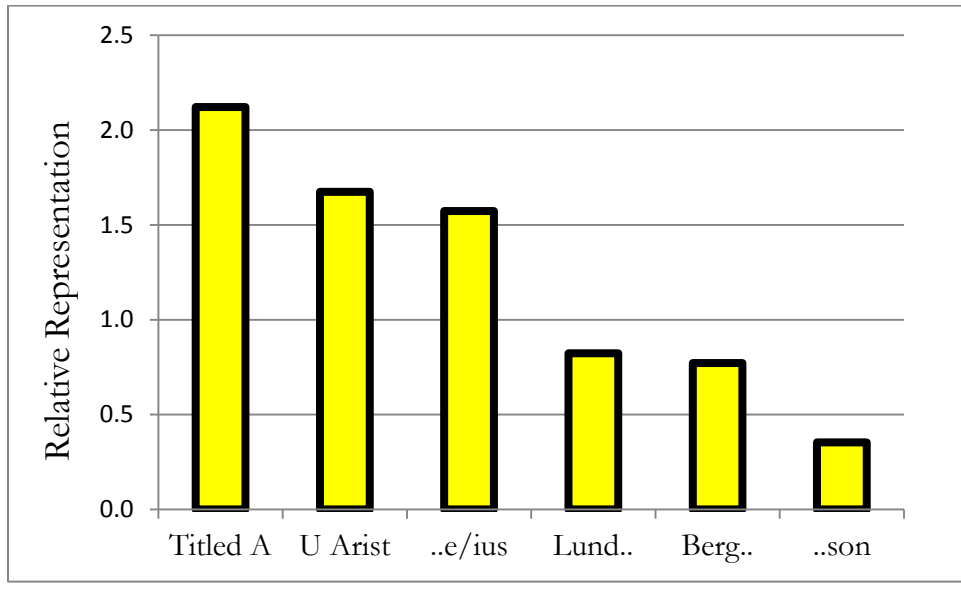
Here even surnames such as *Lund.* which had an average representation among attorneys are underrepresented. The reason for this is that a substantial fraction of the current stock of doctors in Sweden is of foreign origin. Doctors with a medical license from any other EU country can register as a doctor 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.¹¹

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 *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.

Figure 13 shows for the four surname types – Titled Nobles, Untitled Nobles, Latizined, and Patronyms – their relative representation by estimated year of entry

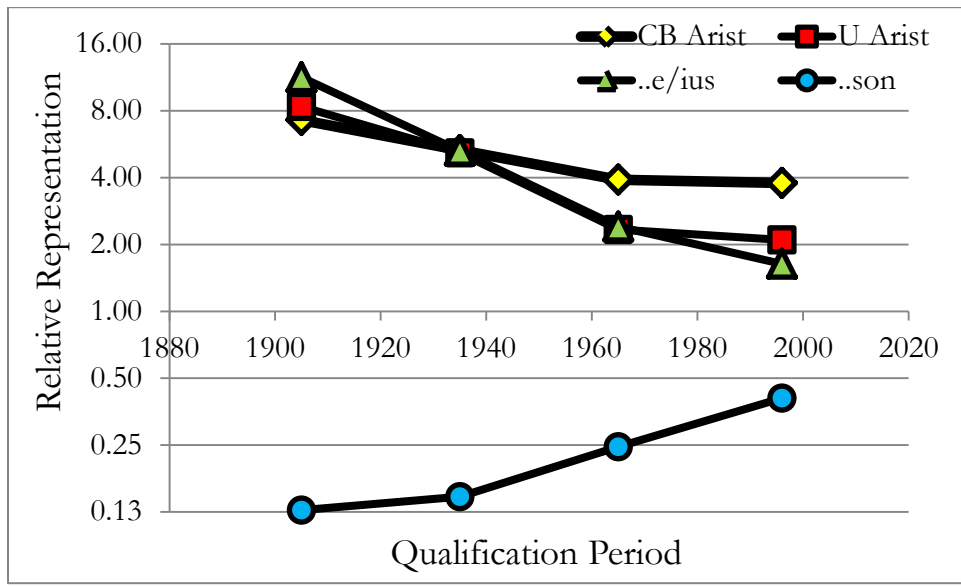
¹¹ “Every other doctor in Sweden from abroad”, *The Local*, 30 August 2009 (<http://www.thelocal.se/21768/20090830/>)

Figure 12: Relative Representation of Surnames among Swedish Physicians



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

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.

into practice, for the cohorts entering 1890-1919, 1920-49, 1950-79, and 1980-2011.¹²

To make clearer what is happening with the Patronyms a logarithmic scale is used. All three 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 0.70, and the fit is good. The rate of regression to the mean was no faster in the last period, the people entering medical practice within the last 30 years, than in the earlier ones. Indeed the data suggests it was slower. The estimated b for 1950-79 to 1980-2011 is 0.88, compared to 0.67 across the three previous generations. The estimated b s for the three subgroups of the elite surnames vary substantially - Titled Nobles, 0.83, Untitled Nobles, 0.67, Latinized, 0.55. But there were only 13, 34, and 13 surnames of these types among doctors in the years 1890-1919, so this could easily be the result of sampling error.

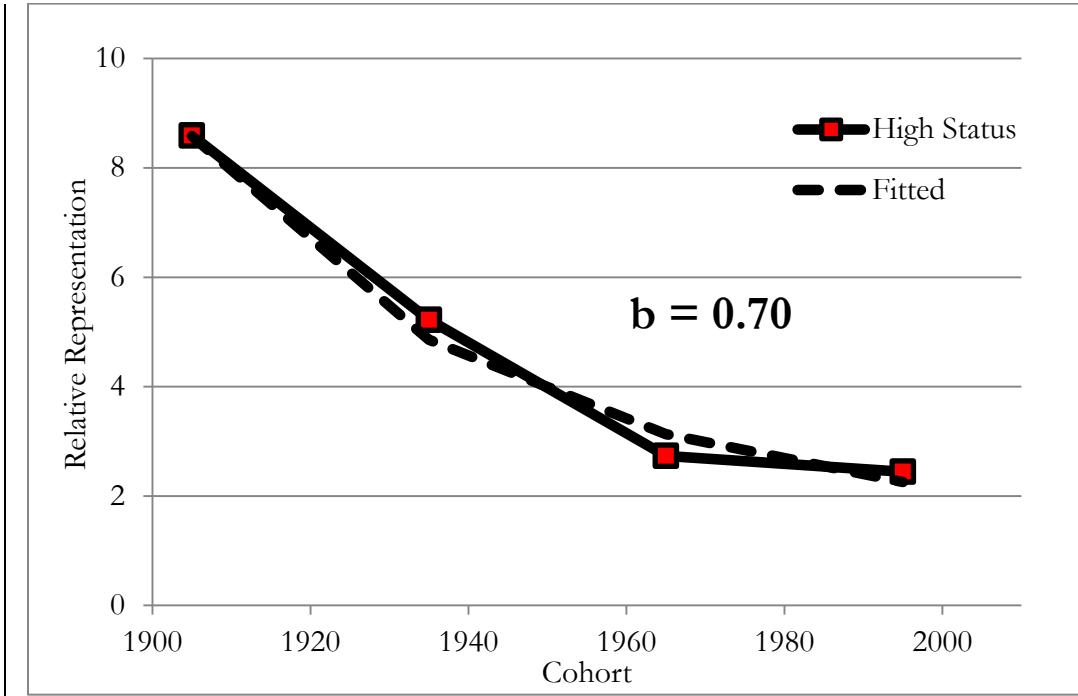
The corresponding b for the Patronyms is similarly high at 0.75. We have to again be cautious about the estimate for patronyms, however. People were switching from these surnames in all generations, and this switching may have been selective by the upwardly mobile. This implies the b estimated here overestimates the persistence of status among the patronym surnames. However, the b estimated for this group is only modestly above the average for the three elite types of surname.

Thus the surnames of attorneys and doctors in Sweden suggest a similar pattern. Social mobility in Sweden is much slower than the conventional estimates suggest, even for very recent generations. The congruence of the evidence from attorney and doctor surnames is highlighted graphing in figure 15 the relative representation of surnames among attorneys and doctors (measured relative to the surnames Berg. and Lund.). The correlation between the status of surname types across these professions suggests this reflects a general difference in status across surname types.

A second surprising suggestion from the surname distribution of Swedish doctors is that not only are true social mobility rates very slow, they are also no faster now than they were in the early twentieth century. The enlargement of the political

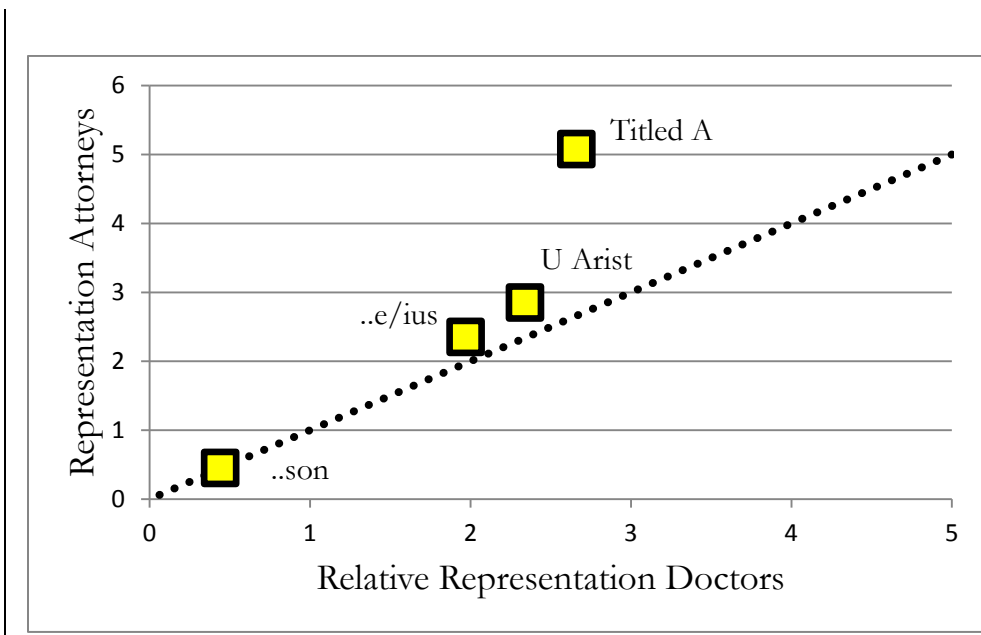
¹² The Latinized surnames here are a sample of 383 surnames that appear at Lund and Uppsala universities before 1820.

franchise, and the adoption of the extensive welfare state of modern Sweden, that
Figure 14: Estimated b for Elite Surnames, Doctors



Sources: As for figure 13.

Figure 15: The Correlation of Surname Status between Attorneys and Doctors



Sources: As for figure 9 and 12.

includes free university education, and maintenance subsidies to students, have done nothing to increase rates of social mobility.

Education

Looking at those achieving university education in Sweden, we also see evidence of very low rates of social mobility, even in the most recent decades. Figure 16, 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 derived before 1800, still have a 50-80% overrepresentation.¹³ The most common patronyms are at half their expected representation.¹⁴

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 elite 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.¹⁵ If a surname type, such as *..(e)ius* 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 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

¹³ Using just *..ius*

¹⁴ The surname frequencies for this age group are estimated from the distribution of surnames in the death register for males born 1985-1994.

¹⁵ 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.

surnames will not end soon.

Figure 16: Surname Representation among Uppsala Master's Theses, 2000-12

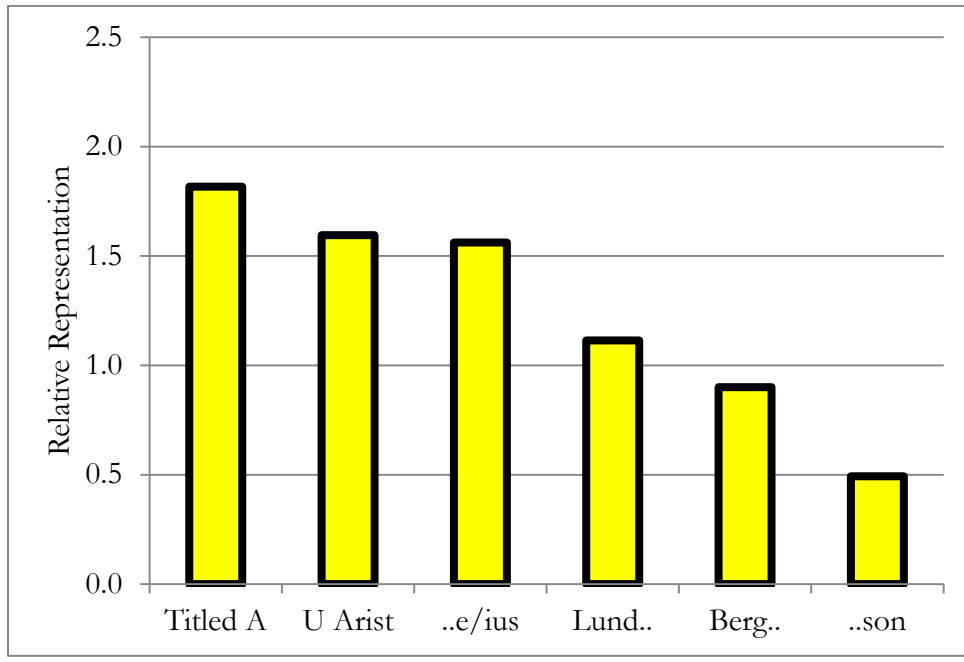
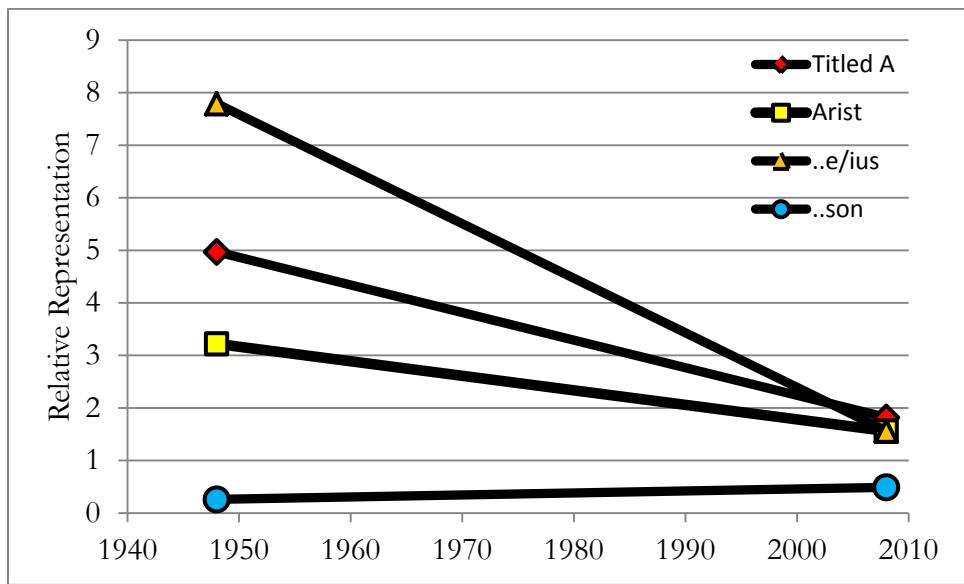


Figure 17: Relative Representation at Uppsala, 1948-2008



Sources:

There are extensive records of those enrolled at the only two Swedish universities established before 1954, Uppsala (1477) and Lund (1666). Thus there are volumes recording the surnames of 1,894 students attending two of the student nations at Uppsala 1942-1954. Using these we get the picture in figure 17 of the relative representation of different surnames 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 17 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 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 the major reforms of 1977 which greatly expanded access to universities. Tuition is 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.

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.¹⁶ For Uppsala there is complete registry data 1477-1817, but data from only one student nation 1817-1902 (Östgota).

¹⁶ These nations are Blekingska, Göteborgs, Kalmar, Skånska (to 1882), Smålands, Vermlands.

Table 2: b Estimate for Education in Sweden, 1948-2008.

Surname Type	Uppsala Sample 1942-1954	Relative Representation 1942-54	Relative Representation 2000-12	Implied b
Titled Aristocrats	16	4.97	1.82	0.72
Untitled Aristocrats	26	3.22	1.59	0.75
Latinized (pre 1800)	31	7.79	1.56	0.53
Combined Elite	73	4.78	1.64	0.66
Patronyms	79	0.26	0.49	0.87

Note: the relative representation is estimated based on the number of births of each name type recorded 15-25 years earlier in the Swedish Death Index, 1901-2009.

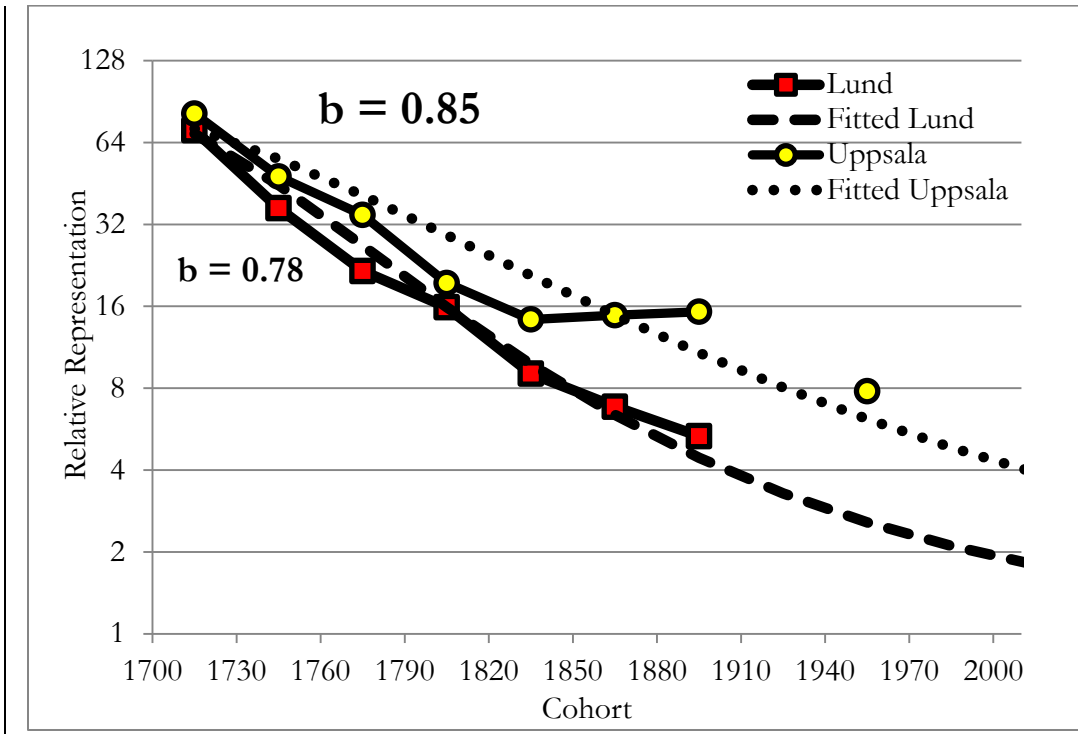
Sources: Elvin, 1956, Uppsala Universitet, 1954. Uppsala Masters Theses Database, 2012.

Figure 19 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, while being only an estimated 0.21% of the population.¹⁷ They were thus 71 times more common among students as in the population. The share of Latinized surnames 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 be wary of in this calculation of persistence is surname changing. If people going to the university born with the surname *Anderson* were changing this to *Wigonius*, then there would appear more persistence than there really was. The biographical sources for some of the student nations at Lund and Uppsala,

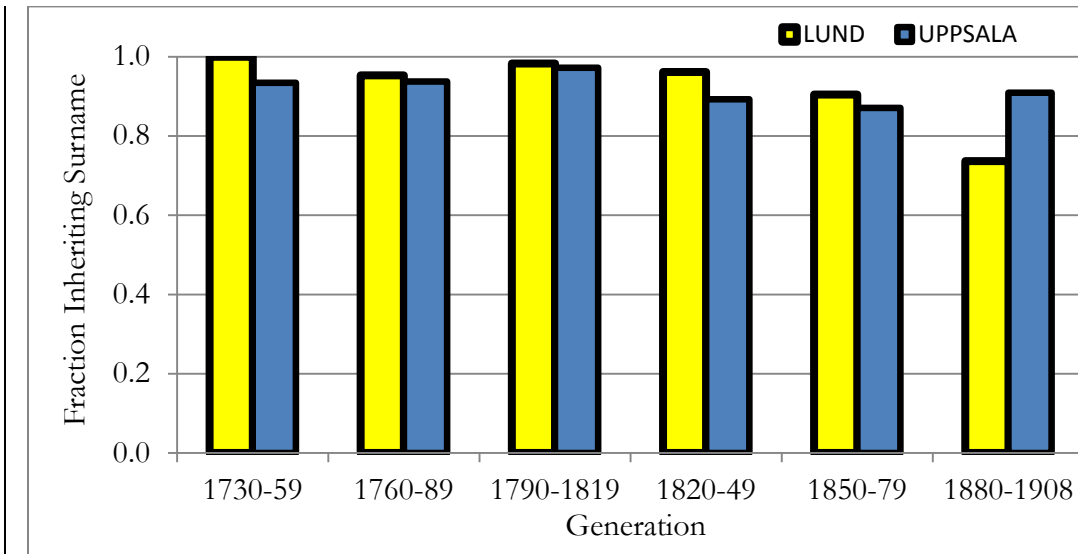
¹⁷ Based on the share of male births 1800-1829 in the 1901-2009 death register.

Figure 18: Latinized Surnames among Lund and Uppsala students, 1700-2012



Sources: See university section in references.

Figure 19: Fraction of Latinized Surnames Inherited, 1730-1908



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

Blekingska, Göteborgs, Skånska, Smålands, and Vermlands at Lund, and Östgöta at Uppsala, allow us to estimate the fraction of Latinized surnames which were newly adopted in each generation at the universities, since it gives fathers' and mothers' surnames for most students also. Figure 19 shows what fraction of students in each generation inherited rather than adopted a Latinized surname.¹⁸ For the earlier generations, 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 1730.¹⁹ This will bias upwards my estimate of b , but can be corrected for by calculating for each period a b based just on the relative representation of the surname among the inheritors in that period.

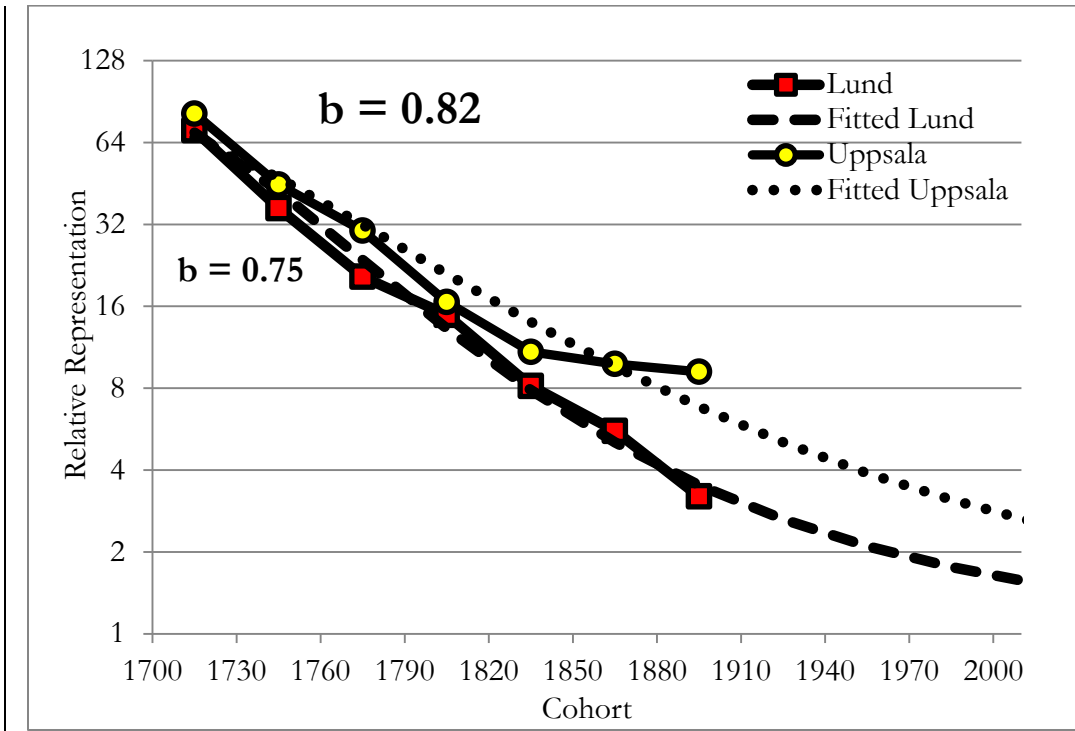
However, we can construct a corrected path of relative represent as in figure 20, which looks just at the implied relative representation of the surname as derived from inheritance from fathers. These paths produce an estimated b for Lund 1700-1909 of 0.75, only modestly lower than the uncorrected estimate, with a very constant rate of regression to the mean throughout the 210 years of this this period. For Uppsala the trends are very similar to Lund from 1700-1849, but in the last two periods the regression to the mean is much slower. However, this again may just be sampling error, since there is only one third as much data for Uppsala as Lund, and for Uppsala 1880-1909 there are only 22 people observed with Latinized surnames.

Thus the gradual tendency of Swedes 1700-2012 to switch from patronyms, even if carried out only by those of higher status, will bias upwards the estimates of b , but only by very modest amounts. The extraordinary persistence in the status of Latinized surnames, and of aristocratic surnames, is largely the product of the great persistence in status of those who inherit these surname types across generations. But this persistence seems to be little greater on average in the eighteenth and nineteenth centuries than it has been in recent years, despite the enormous institutional changes in Sweden between these dates.

¹⁸ 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.

¹⁹ Some acquired the name by inheriting it from their mother.

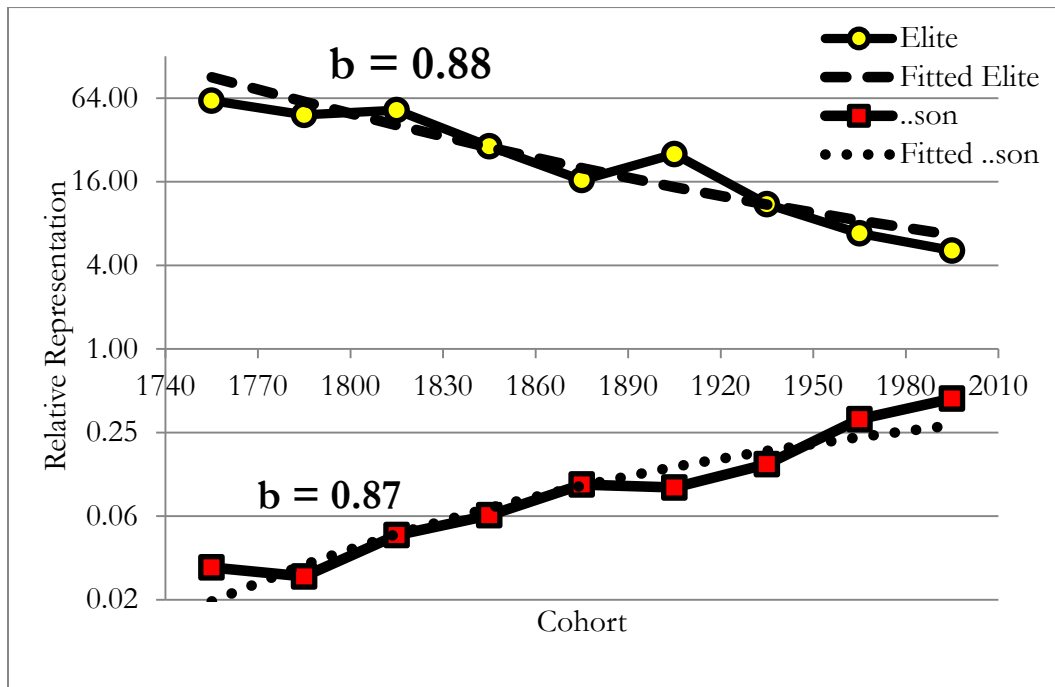
Figure 20: Inherited Latinized Surnames, Lund and Uppsala, 1700-1909



Sources: As for figures 18 and 19.

An even more elite group than Lund and Uppsala students are members of the various Royal Academies of Sweden. 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 21 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.

Figure 21: Elite Surnames in the Swedish Royal Academies



Sources: See reference list on 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 0.88. 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.

Figure 21 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 implies b is 0.87, close to that for the elite surnames. However, as always there is a caveat that many people in Sweden whose father had a patronym did not take their father's name as an adult, and this switching was likely selective.

Interpretation

Table 3 gives a summary of the various estimated persistence bs for Sweden. As noted name changing will bias these estimates upwards modestly. But the implied b for modern Sweden would still be of the order of 0.75-.80, little higher than for Sweden in earlier generations. Despite the material presented in the introduction Sweden appears to be a society with a very modest rates of intergenerational mobility for occupation and education. Why do the results presented here differ so much from those of conventional mobility studies?

Current one generation studies suffer a key limitation. Suppose in particular we assume that the various aspects of social status in generation t, y_t – income, wealth, education, occupation – are all linked to some fundamental social competence or status of families, x_t , such that $y_t = \theta x_t + e_t$, where e_t is some random component. We see evidence above, for example, that surnames show the same relative status across different occupational and educational groups. The random component exists for two reasons. First there is an element of luck in the status attained by individuals given their underlying aptitudes. People happen to choose a successful field to work in, or firm to work for. They just succeed in being admitted to Lund, as opposed to just failing. But second people make tradeoffs between income and other aspects of status. They choose to be philosophy professors as opposed to finance executives.

The one generation studies, as long as y is correctly measured, will indeed report what the b is across one generation for that particular aspects of status. However the regression to the mean exhibited by each partial measure of underlying status, y, will overestimate the regression to the mean of the underlying status x. For the \hat{b} estimated from the partial measures will be related to the b for the underlying status through

$$\hat{b} = b \frac{1}{1 + \left(\frac{\sigma_e^2}{\theta^2 \sigma_x^2} \right)}$$

where σ_x^2 is the variance of the underlying social status, and σ_e^2 is the variance of the random components linking the underlying status to the measured aspect. But it is this underlying b that governs long run social mobility, and that also governs mobility on more comprehensive measures of status. Suppose the b across

Table 3: Summary b Estimates by Period, Sweden

Group	1700-1900	1890-1979	1950-2012
Attorneys	-	-	0.71
Physicians	-	0.67	0.88
University Students	0.78	0.85	0.66
Academicians	0.89	0.75	0.84

generations for income, education, occupational status, and wealth were all 0.3. It does not follow that the regression to the mean across two generations will be b^2 , so that initial differences in social status quickly disappear. It also does not follow that the b for a more general measure of status that averages income, wealth, education and occupational status would be 0.3, or even anywhere close to 0.3.

The conventional studies have been often misinterpreted as speaking more generally about the mobility of society than they can, as we see in figure 1 above. When we classify families as high or low status based on partial measures such as income, wealth, education or occupation there will appear to be substantial regression to the mean. But if we took a more aggregate measure of status, which averaged the various partial y measures the regression will be substantially lower. These partial measures are correlated, so that with such an aggregate measure the variance of the error term will decline relative the variance of x .²⁰ So the measured intergenerational correlation will be greater.

With conventional measures, the intergenerational correlation of status, even for broad measures of status, will not predict long run social mobility across many generations. And its relationship to long run mobility will depend on the relative importance of the error components in the first generation. This is because when we classify families as high or low status originally based on their status in an original generation, the measures incorporate random errors of measurement and luck. The

²⁰ Indeed, if people are trading off aspects of status the individual error elements will be negatively correlated, so reducing even further the aggregate error.

regression to the mean observed in the first generation incorporates this error correction, and that component will not occur across subsequent generations. So even the regression of an aggregate status for a first generation t to $t+1$ will be greater than that for the same families from generation $t+1$ to $t+2$, and so on.

The greater are the random components in determining measures of status such as income, relative to the systematic elements stemming from underlying status, the greater will be the degree of mismatch between such partial one generation estimates of regression to the mean and the underlying regression of fundamental social status. In a society such as Sweden, where there is less inequality in such measures of status as income or wealth, the measured persistence of income will be lower relative to the persistence of underlying status.

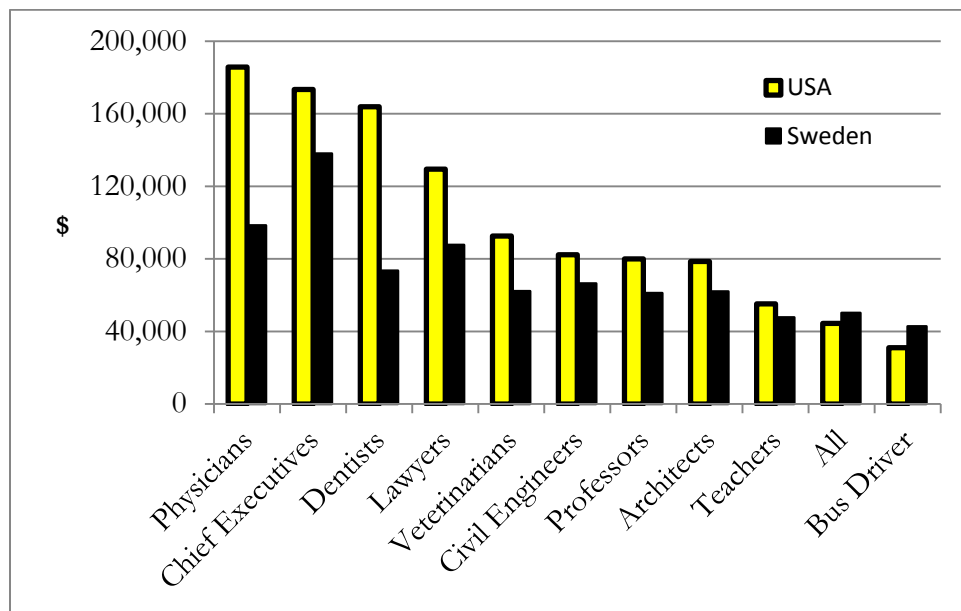
As is well known, incomes are much more evenly distributed in Sweden than in the USA. Figure 22 shows, for example, the salaries in \$2010 for some comparable high and low status occupations in Sweden and the USA. A US doctor earns 6 times the wage of a bus driver, while in Sweden the ratio is only 2.3 times. A US professor earns 60% more than a bus driver, in Sweden it is only 40% more.

These modest income differences show up in differences in income across surname types in Sweden. Above we see that Noble Surnames are about 6 times more likely to be doctors or attorneys, and about 4 times more likely to be graduating an elite university in 1998-2012, than are patronyms like *Andersson*. Yet as table 3 shows a sample of those bearing the rare surnames of Counts and Barons in six Swedish *kommuns* around Stockholm in 2008 had average earned incomes, as reported to the Swedish Tax Agency, only about 21% greater than those with the surname *Andersson*.²¹ Interestingly the reported capital incomes of the noble surnames did exceed that of the *Anderssons* by about 174%, much more than would be suggested by the earned income differences. This makes the total income of Noble surname taxpayers exceed those of the *Anderssons* by 44%.

Even though the earned income differences between the *Anderssons* and the Noble surnames are modest, there is clear sign in the tax returns of a substantial difference in living standards between these two surname types. Thus figure 23 shows the frequency of Noble and Andersson surnames among taxpayers in each of the six *kommuns* relative to their expected frequency based on the surname

²¹ Averaging across men and women.

Figure 22: Average Earnings by Occupation, Sweden and the USA, 2008



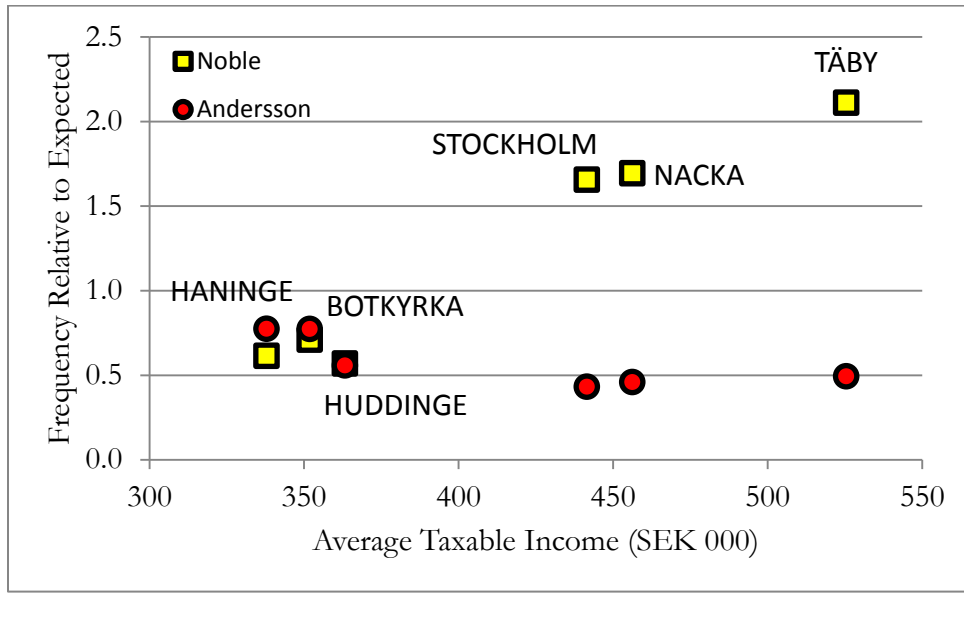
Sources: USA – Bureau of Labor Statistics, National Occupational Employment and Wage Estimates, May 2010. Sweden – Statistics Sweden, Wage and salary structures, private sector (SLP), 2011.

Table 4: Income by Surname Type, Sweden, 2008 (1,000 SEK)

	Andersson	Noble (Counts/Barons)
Number	6,667	1,232
Average Earned Income	399	482
Average Capital Income	70	191
Average Total Income	468	672

Source: All 2008 tax returns for the kommuns of Botkyrka, Huddinge, Haninge, Nacka, Täby, and Stockholm.

Figure 23: Surname Types Relative to Expected, by kommun Average Income



populations in 2011.²² Noble surname taxpayers are at half the expected frequency in poorer Kommuns such as Botkyrka, and at twice the expected frequency in such rich kommun as Täby. Thus the noble surname types appear relatively four times as frequent in the highest income kommun as in the lowest income. Along with the occupational segregation of surname types in Sweden there is a social segregation. The figure also shows, however that Andersson taxpayers are not just underrepresented in rich areas such as Täby, they are also underrepresented even in poorer kommun. There are only about half as many Anderssons filing tax returns as we would expect from their population share, and 50% more of the Noble surnames in returns than would be expected from the population share. The differences in reported taxable incomes will understate average income differences between these surname groups.

The compression of earned incomes in Sweden means the random error components contribute a much greater share of earnings variance than in a more

²² To control for non-indigenous surnames this was estimated as the frequency relative to *Berg.* surnames.

unequal country like the USA.²³ This will make the b estimated for income in Sweden correspondingly more greatly downward biased than in the US. But the fact that we see much greater differences between surname groups in wealth holding than in earned income implies that studies of wealth mobility across generations using standard methods would find a b closer to the underlying rate of persistence.

Studies of surname distributions in a variety of countries, using the methods employed above thus suggest the results in table 5. There we see that the implied b for the last few generations is very similar to the high numbers estimated for Sweden above. Sweden no longer looks like a society with unusually high rates of social mobility. Scandinavia is no longer an exception to the rule, but is instead an exemplar of the existence of high rates of persistence in underlying status in all societies. Nearly 100 years of Swedish social democracy has perhaps created a more economically equal society, but it has been unable to change the underlying rate of social mobility.

A prediction of the model outlined above, where the \hat{b}_1 measured between adjacent generations is just the underlying b pushed down by the presence of measurement error is that if we estimate

$$y_{t+n} = b y_t + e_{t+n}$$

then $\hat{b}_n = b^{n-1} \hat{b}_1 = \varphi b^n$

where φ is the attenuation factor caused by the random components linking observed status on any one dimension with underlying status. In Sweden, using the nice data set assembled by Lindahl et al. (2012) on four generations of Swedish families we can test this prediction. The Lindahl et al. data, for example, has years of education for a first generation born 1865-1912, and then years of education for the three succeeding generations. The upper panel of table 6 shows their estimates of \hat{b}_n for years of education, standardizing the variance in each generation to be the same. They find much more persistence across generations than would be predicted

²³ Assuming that the log of earnings or income, y_t , in each county is given by $y_t = \theta x_t + e_t$, with x_t some underlying talent, where θ is larger in the US, but the error variance is the same.

Table 5: Estimates of b from Surnames

Country	Measure	Period	B
USA	Attorneys	1950-2011	0.67-0.77
USA	Doctors	1950-2011	0.73-0.74
England	Attorneys, Doctors	1950-2012	0.69-1.00
England	Wealth	1950-2012	0.70
England	Education	1950-2012	0.77
Chile	Occupations	1940-2010	0.74
China	Education	1905-2011	0.71
Japan	Education	1940-2012	0.84
India	Doctors	1900-2010	0.89

Sources: England, Clark and Cummins, 2012, China, Hua and Clark, 2012, India, Clark and Landes, 2012, Japan, Clark and Tatsuya, 2012, USA, Clark et al., 2012. Chile communication from Daniel Diaz.

Table 6: Persistence in Education Across Multiple Generations in Sweden

Last Generation	Great- Granparents	Grandparents	Parents
OBSERVED			
Grandparents	0.334		
Parents	0.229	0.312	
Children	0.123	0.202	0.412
PREDICTED, $b = 0.7$			
Grandparents	0.334		
Parents	0.226	0.312	
Children	0.173	0.253	0.412

Source: Lindahl et al., 2012, table 2.

generation b estimates. Table 5 also shows what the estimated \hat{b}_n s would be if the underlying rate of persistence for status is 0.7 as indicated by my results above. This estimates slightly too high correlations for the link to grandchildren and great-grandchildren, but the difference is not statistically significant. The underlying b that would best fit this pattern of intergenerational correlations would be $b = 0.61$. Note that Lindahl et al. also see no decline in the one generation b for education in Sweden over the last 3 generations.

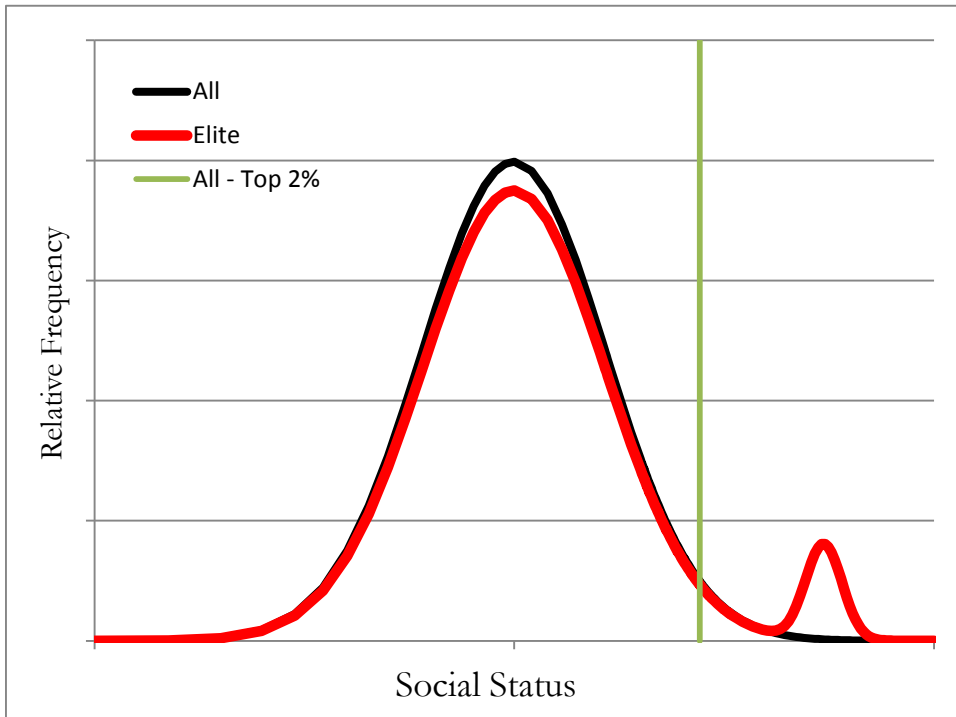
For earnings Lindahl et al. have results only for 3 generations. Their correlation between grandparents and grandchildren, compared to grandparents and parents, and parents and children, would imply an underlying b of 0.49 (Lindahl et al., 2012, table 5). But the standard error on their estimated grandparent/grandchild earnings correlation is large enough that an underlying b of even 0.7 would not be rejected at the 5% level of confidence. Thus the Lindahl et al. study is consistent with the existence of an underlying persistence coefficient b for status that is much greater in magnitude than the persistence observed in conventional one generation studies.

How General are the Surname Results?

The objection has been raised that it may well be that at the extreme of the distribution there is high persistence of status, but for 99% or more of families in Sweden there is the high rate of social mobility traditionally found. Thus Björklund, Roine, and Waldenström (2012) 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.

If this objection is correct then what we would observe with the 18th century elite is that once they fell out of the top 1%, with rapid social mobility, their status distribution would quickly fall to the social mean. Status distribution among this 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 24. In particular there should be no marked deficiency of elite surnames at the bottom of the distribution.

Figure 24: A Bimodal Status Distribution among the Surname Elite



However, there is no evidence of such a bimodal distribution of the status of those in modern Sweden with the surnames of the 18th century elite. Figure 25, for example shows the distribution of income of those with the surnames of counts and barons, and with the surname *Andersson*, in the 2008 tax returns for Stockholm and 5 adjacent municipalities. The Noble surname distribution looks just as though it is uniformly right shifted, as in figure 2. It definitely does not conform to figure 24. Thus those with annual incomes below 250,000 SEK constitute 20% of the Andersson surname population, but only 9% of the noble surnames. There is thus no sign that social mobility rates are indeed much higher outside a small elite of .1-2% of the population.

Figure 25 shows income distributions, which include asset incomes. Figure 26 shows the distribution just of earned income. The same conclusion holds. There is a deficit of noble surnames at the bottom of the distribution (except for the very lowest earnings, including some of 0, where the household may only be subject to income tax because of asset earnings).

Figure 25: Distribution of Taxable Income, Andersson versus Noble surnames, 2008

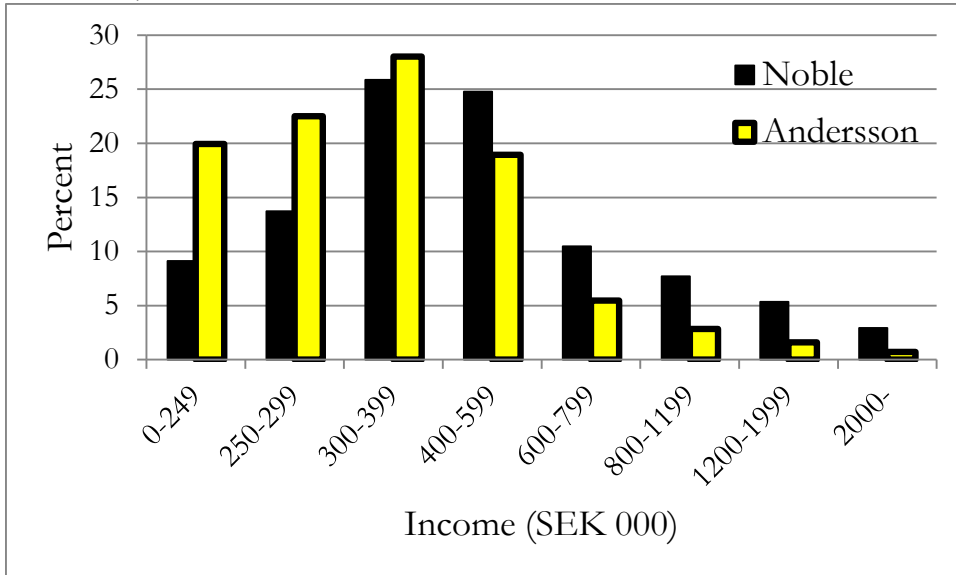
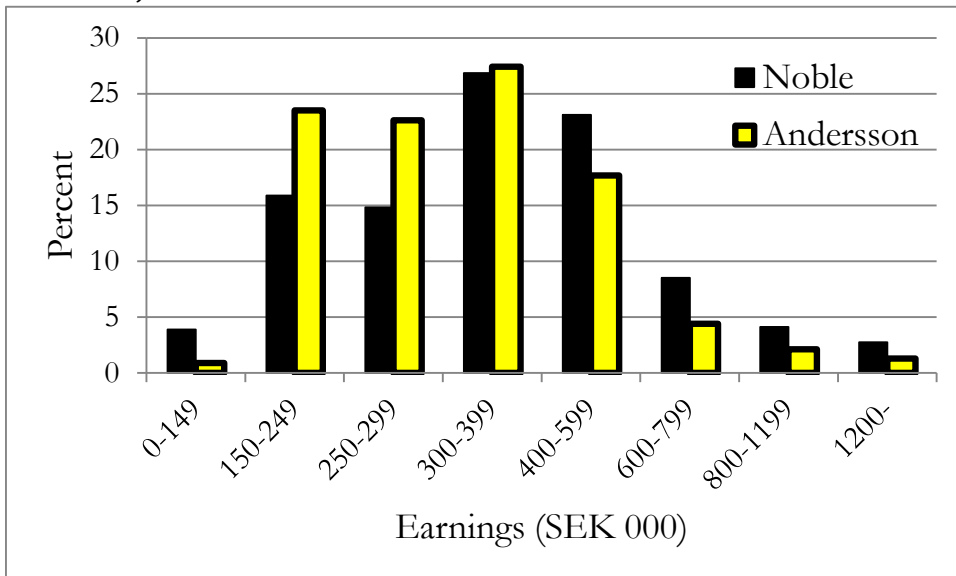


Figure 26: Distribution of Taxable Earnings, Andersson versus Noble surnames, 2008



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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