"British, American, and British-American Social Mobility: Intergenerational Occupational Change Among Migrants and Non-Migrants in the Late 19th Century"

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Abstract

The occupational mobility experienced by immigrants in the nineteenth century has been difficult to assess because of a lack of both information on their pre-migration occupations and information on a comparable group of individuals who were observed at the same origin but did not migrate. We take advantage of new samples of Americans linked 1860-1880 & 1880-1900, British linked 1861-81 & 1881-1901, and British-American migrants linked 1861-1880 & 1881-1900 to compare the experience of migrants from Britain to the U.S. to both those who remained in Britain and those who were always located in the U.S. We assess the selectivity of migration and explore several of the mechanisms through which the intergenerational mobility of migrants exceeded that of both those they left behind in Britain and those they joined in the U.S.

Introduction

The experience of migrants to the U.S. over the last 350 years has received considerable attention from both economists and historians (Borjas 1994; Ferrie 1999; Menard 1973). This research generally traces migrants' economic progress (in terms of income or occupational status) beginning with their arrival and attempts to infer migrants' quality based on that trajectory. A complementary literature has examined the effect of out-migration on source countries (Beine et al. 2008; Vidal 1998), particularly the effect of emigration on domestic human capital formation. This literature focuses on the experience of immigrants before their departure from their home country, but says little about their performance at the destination.

Only a handful of studies have examined the experience of migrants from their economic circumstances in their home country through their decision whether to emigrate and their subsequent experience in their chosen destination (if they chose to migrate) or in their home country (if they chose not to migrate). The reason for this gap in the existing literature is not surprising: few sources provide detailed information on both (1) potential migrants at their origin and (2) actual migrants at their destinations and non-migrants back in their home countries. Recent contributions in this area have examined Norwegian emigrants to the U.S. between 1865 and 1900 (Abramitzky et al. 2010) and German emigrants from the principality of Hesse-Cassel between 1852 and 1857 (Wegge 2002).

Our own previous research on intergenerational occupational mobility in Britain and the U.S. from the 1850s through the late twentieth century (Long and Ferrie 2007; Long and Ferrie 2011) has shown that mobility was substantially greater in the nineteenth century U.S. than in nineteenth century Britain. But that conclusion pertains only to the native born in each country and does not examine the experience of migrants from low-mobility Britain to the high-mobility U.S. This project expands on our previous work on intergenerational mobility by examining the occupations of sons compared to their fathers among three groups: father-son pairs that remained in either Britain or the U.S. and father-son pairs in which the sons (and perhaps the father as well) migrated from Britain to the U.S. We examine two cohorts of migrants: those who arrived 1861-1880 (when British migrants still accounted for a substantial fraction of total immigration into the U.S.) and 1881-1900 (when British migration had fallen considerably). Our analysis, like that of

Abramitzky et al. (2010), assesses the selectivity of migrants from an important source country, and does so by examining the experience of both migrants and non-migrants.

British Migration to the U.S., 1861-1900

British migrants have come to the U.S. for more than 400 years, since the arrival of the first colonists at Jamestown and Plymouth. For almost as long, there has been controversy about the relative quality of those migrants.[1] For our purposes, however, there are four salient facts regarding emigration from Britain to the U.S. to keep in mind. The first is that immigration throughout the period we examine (1861-1900) was unimpeded either by the sending country or the receiving country. There were no legal, administrative, or linguistic restrictions whatsoever on the entry into the U.S. of immigrants from Britain, so when we observe their behavior, we are observing the outcome of a process in which the motivations of individual or family interact only with their budget constraints.

The second aspect of this migration to remember is that it is almost exclusively an economic migration, but it is a "normal" economic migration, not the desperate escape from famine and imminent death undertaken by Irish migrants after 1846. The religious persecution that had driven many early British migrants across the Atlantic had substantially subsided by the second half of the nineteenth century. Together, these mean that when we consider their motivation we can limit ourselves to a smaller set of motivating factors, and we can meaningfully engage in marginal analysis, as the large, discrete jumps in the return to migration seen by the Irish were absent for the British.

[1] See Galenson (1978) for a summary of this debate in the context of the migration of British indentured servants in the years prior to the American Revolution.

Third, the relative importance of British migrants among all arrivals in the U.S. changed over the period we are examining (Figure 1). In the mid-1860s, the British accounted for roughly 35 percent of all immigrants to the U.S. By the 1880s, however, their share fell below 20 percent, and it fell below 10 percent in the 1890s. The British share tended to rise when overall immigration was low and fall when overall immigration was high. To a greater extent than other immigrant groups, then, the British were in competition with the U.S. born rather than with other immigrants for jobs. This makes comparisons between British arrivals and the U.S. born cleaner for this group than for other immigrants in the nineteenth century.

Finally, the Britain left by our first cohort (1861-1880) was at the tail end of the First Industrial Revolution (characterized by consolidation in agriculture and the displacement of crafts dominated by artisans as factories and steam power became more prominent); the Britain left by the second cohort (1881-1900) was already well into the Second Industrial Revolution (characterized by greater science-based innovation, particularly advances in chemicals, metallurgy, and electricity). The U.S. that each cohort entered was still a few decades behind Britain at each date, leaving more opportunity for those displaced in Britain (farmers and craft workers in the first cohort, unskilled factory operatives in the second). For example, as Figure 2 shows, emigrants departing Britain in the first (1861-1880) cohort left an economy where the share of the population in farming had already fallen below 5 percent; they entered an economy in which 25 to 30 percent of the population was still employed in farming, and in which new land was still being settled on the western frontier of the U.S.

Data

The linked father-son pairs with a twenty year interval between the observation of the father's occupation and the observation of the son's occupation for Britain (1861-1881 and 1881-

1901) and the U.S. (1860-1880 and 1880-1900) that we have used previously (Long and Ferrie 2007) were created by taking advantage of the fact that the entire British 1881 census and the entire U.S. 1880 census have been completely transcribed.[2] For Britain, the entire 1861 and 1901 censuses have been indexed, so males age 30-39 in 1881 were sought in the 1861 index, where their fathers' occupations were recorded, then males 10-19 in 1881 whose fathers' occupations were reported there were sought in the 1901 index, where their own adult occupations were recorded. For the U.S., there are also public use one-percent samples for 1860 and 1900. This made it possible to identify males in 1860 and link them forward to 1880 and to identify males in 1900 and link them back to 1880. The age range used (30-39 in the terminal year) was chosen so fathers' occupations when the sons were young and the sons' occupations when sons were adults will be observed at roughly the same point in their respective life cycles. This procedure resulted in 2,039 British 1861-1881 father-son pairs, 4,138 U.S. 1860-80 father-son pairs, 4,071 British 1881-1901 father-son pairs, and 3,919 U.S. 1880-1900 father-son pairs.[3]

Generating the samples of linked migrants (with their fathers' occupations observed in the British census and their own adult occupations observed in the U.S. census) was complicated somewhat by the imprecise place of birth information available for immigrants in the U.S. census:

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[2] When we refer to "Britain" we mean specifically England and Wales. Though the 1881 census of Scotland has also been transcribed and the 1861 and 1901 censuses of Scotland have been indexed, they were not available when the original British samples were created.

[3] Linkage was done on the basis of surname (with some tolerance allowed for misspellings and transcription errors), standardized given name, birth year (with a tolerance of $\pm$ 2 years allowed), place of birth (parish in Britain; state in the U.S.). For the U.S. samples, the reported state of birth for each parent was used as well. Individuals with more than one match were discarded. Linkage rates were roughly 25% for all four samples, with the 75% rate of linkage failure entirely accounted for by mortality (for the 1860-1880 U.S. linkage and the 1881-1901 British linkage), under-enumeration in the census, transcription errors, and errors in the reporting of age and birthplace. Though these did not occur randomly (linkage failure was more likely among those lower in socioeconomic status, for example), when we have constructed weights to force the characteristics of the linked samples to mimic those of the general population, analysis of the weighted and unweighted data produced identical results. The analysis that follows uses the unweighted data.

though the native-born reported their state of birth, immigrants reported only their country of birth. This means that an individual named "Enoch Powell" born in Britain in 1845 and appearing in the 1880 U.S. census will potentially have a large number of matches in the 1861 British census among which it will be impossible to distinguish. As a result, larger initial samples of British immigrants present in the U.S. needed to be drawn from the 1880 fully-transcribed U.S. census and from the fully-indexed 1900 U.S. census (though there is a five-percent public use sample for 1900, it yielded too few observations to be useful when the stringent linkage criteria described below were employed).

For the 1861-1880 linkage, half of all British males born 1841-1850 were drawn from the complete 1880 U.S. census file (91,101 individuals). These individuals were then sought in the 1861 British census index. If they were located there exactly once and their father was present in 1861, they were confirmed as correct matches if they met five additional criteria: (1) they were not present in the 1860 U.S. census index; (2) they were not present in the 1881 British census complete count file; (3) their oldest U.S.-born child in 1880 was born after 1860; (4) their youngest Britain-born child in 1880 was born before 1862; (5) if they were present in the 1870 U.S. census index, they were not also present in the 1871 British census index, and if they were present in the 1871 British census index, they were not also present in the 1870 U.S. census index. These restrictions resulted in a linked sample of 2,174 father-son pairs. Of these, fathers' 1861 British occupations have now been retrieved for 1,176 (the sons' 1880 U.S. occupations were present in the 1880 U.S. census 100% file) which is the size of the sample for this cohort used in the following analysis.

For the 1881-1900 linkage, half of all British males born 1861-70 who arrived in the U.S. 1881-1900 were drawn from the 1900 U.S. census index (36,216 individuals). These individuals were then sought in the 1881 British census 100% file. If they were located there exactly once and their father was present in 1881, they were confirmed as correct matches if they met three additional criteria: (1) they were not present in the 1880 U.S. census index; (2) they were not present in the 1901 British census index; (3) if they were present in the 1891 British census index, the year of arrival in the U.S. they reported in 1900 must have been 1891 or later. These restrictions resulted in a linked sample of 1,144 father-son pairs. Sons' 1900 U.S. occupations have now been retrieved for all of these (the fathers' 1881 British occupations were present in the 1881 British census 100% file), so this is the size of the sample for this cohort used in the following analysis.

Intergenerational Occupational Mobility

Intergenerational occupational mobility can be assessed through the analysis of simple two dimensional matrices, with categories for fathers' occupations arrayed across one dimension and categories for sons' occupations arrayed across the other. Comparing mobility across two places or times requires comparison of two matrices. Suppose fathers and sons can be found in either of two jobs.[4] A matrix that summarizes intergenerational mobility in location P has the form $P = \begin{bmatrix} p_{11} & p_{21} \\ p_{12} & p_{22} \end{bmatrix}$ with numbers of fathers in the two occupations (1 or 2) in columns and numbers of sons in these occupations in rows. The entry in the power left (p_{12}) is the number of sons of job 1 fathers who themselves obtained job 2. One simple measure of the overall mobility in P is the fraction of sons who end up in jobs different from those of their fathers: $M_P=(p_{12}+p_{21})/\ (p_{11}+p_{21}+p_{12}+p_{22})$.

[4] It is difficult to impose an unambiguous ordering on the occupations: though they differ in a variety of dimensions that would have been recognized throughout the span of time our analysis embraces (the amount of formal education they required, the amount of physical stamina they demanded, the long-run job security they afforded, the location where the work was performed, the amount of supervision that was exercised or endured, the degree to which production occurred in conjunction with other workers, etc.), there is no single scale along which these categories can be arrayed that would be either accurate or meaningful for both the historical and modern data. With four categories (white collar, farmer, skilled/semi-skilled, and unskilled), it is possible to rank unskilled last unambiguously, but it is not clear how to rank the others relative to unskilled. There are no good sources that would allow us to calculate average incomes by occupation. We thus begin analysis techniques that rely not on the ordering of occupational categories but only on their labeling.

Though this measure has the virtue of simplicity as a benchmark, it also has a shortcoming when mobility is compared across two matrices P and Q: it does not distinguish between differences in mobility (1) arising from differences across the matrices in the distributions of fathers' and sons' occupations (differences in what Hauser, 1980, labels "prevalence") and (2) arising from differences across the matrices in the association between father's and sons' jobs that may occur even if the distributions of fathers' and sons' occupations were identical in P and Q (differences in what Hauser, 1980, calls "interaction"). Consider $P = \begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & 1 \\ 6 & 1 \end{bmatrix}$ for which M_P=3/8 and M_Q=7/10. The marginal frequencies differ, so it is not clear whether the difference in observed mobility M results from this difference or from something more fundamental such as differences between P and Q in the amount of human capital necessary to achieve job 1.

One way to proceed is to adjust one of the matrices so it has the same marginal frequencies as the other. Such a transformation, if achieved by multiplication of rows and columns by arbitrary constants, does not alter the underlying mobility embodied in the matrix. (Mosteller, 1968; Altham and Ferrie, 2007) If we multiply the first row of Q by 2 and then multiply the first column of the resulting matrix by ½, we produce a new matrix $Q' = \begin{bmatrix} 2 & 2 \\ 3 & 1 \end{bmatrix}$ with the same marginal frequencies as in matrix P, with an associated total mobility measure $M_{Q'}$=5/8. We could then calculate the difference M_P - $M_{Q'}$ and be confident that the difference in mobility does not result from differences in the distributions of occupations between the two locations.

There still may be differences in mobility between P and Q, even after adjusting the marginal frequencies and finding that $M_P - M_{Q'} = 0$, however. The fundamental measure of association between rows and columns in a mobility table is the cross-product ratio, which for P is $p_{11}p_{22}/p_{12}p_{21}$ and can be rearranged to give $(p_{11}/p_{12})/(p_{21}/p_{22})$, the ratio of (1) the odds that sons of job 1 fathers get job 1 rather than job 2 to (2) the odds that sons of job 2 fathers get job 1 rather than job 2. If there is perfect mobility, the cross-product ratio would be one: sons of job 1 fathers would have no advantage in getting job1 relative to sons of job 2 fathers. The more the cross-product ratio exceeds one, the greater the relative advantage of having a job 1 father in getting job 1. The cross-product ratio for P is 3 and for Q is 1/3 (as it is for Q′), so there is more underlying mobility in Q than in P.

For a table with more than two rows or columns, there are several cross-products ratios, so a summary measure of association should take account of the full set of them. One such measure has been suggested by Altham (1970): the sum of the squares of the differences between the logs of the cross-product ratios in tables P and Q. For two tables which each have r rows and s columns, it measures how far the association between rows and columns in table P departs from the association between rows and columns in table Q:

$$d(P,Q)=\left[\sum_{i=1}^{r}\sum_{j=1}^{s}\sum_{l=1}^{r}\sum_{m=1}^{s}\left|\ln\left(\frac{p_{ij}p_{lm}q_{im}q_{lj}}{p_{im}p_{lj}q_{ij}q_{lm}}\right)\right|^{2}\right]^{1/2}$$

The metric d(P,Q) tells us the distance between the row-column associations in tables P and Q.[5] A simple likelihood-ratio χ^2 statistic G^2 (Agresti, 2002, p. 140) with (r-1)(s-1) degrees of freedom can then be used to test whether the matrix Θ with elements $\theta_{ij}=\log(p_{ij}/q_{ij})$ is independent; if we can

[5] See Altham and Ferrie (2007) for a discussion of the distance measure and test statistic. As it obeys the triangle inequality, so d(P,Q) + d(Q,J) ≥ d(P,J), the metric d(P,Q) can be thought of as the distance between the row-column association in table P and the row-column association in table Q, while d(P,J) and d(Q,J) are the distances, respectively, between the row-column associations in tables P and Q and the row-column association in a table in which rows and columns are independent (all the elements are 1s). This property of the Altham statistic – its interpretation as a *distance* measure – makes it possible to visualize how the row-column associations differ across various tables. For a set of N tables, the pair-wise distances among all the tables and the distance from each to a table with independent rows and columns are sufficient to allow us to display the positions of these tables relative to independence in a multidimensional space. The idea is the same as generating a map of cities in the U.S. knowing only the distances between each pair of cities and selecting an arbitrary point of reference.

reject the null hypothesis that Θ is independent, we essentially accept the hypothesis that $d(P,Q)\neq 0$ so the degree of association between rows and columns differs between table P and table Q.

The statistic does not tell us which table has the stronger association, but that can be determined by calculating d(P,J) and d(Q,J), which use the same formula as d(P,Q) but replace one table with a matrix of ones. If $d(P,Q)>0$ and $d(P,J)>d(Q,J)$, we conclude that mobility is greater in table Q (i.e. mobility is closer in Q than in P to what we would observe under independence of rows and columns, in which the occupation of a father provides no information in predicting the occupation of his son). It is, of course, possible that in some circumstances $d(P,Q) > 0$ but $d(P,J)\approx d(Q,J)$, in which case we will say that tables P and Q have row-column associations that are equally distant from the row-column association observed under independence, but that tables P and Q differ in how they differ from independence (i.e. the odds ratios in table P that depart the most from independence are different from those that depart the most from independence in table Q).

Contingency tables are often dominated by elements along the main diagonal (which in the case of mobility captures immobility or occupational inheritance). It will prove useful to calculate an additional version of d(P,Q) that examines only the off-diagonal cells to see whether, conditional on occupational mobility occurring between fathers and sons, the resulting patterns of mobility are similar in P and Q. This new statistic will then test whether P and Q differ in their proximity to "quasi-independence." (Agresti, 2002, p. 426) For square contingency tables with r rows and columns, this additional statistic $d^{i}(P,Q)$ will have the same properties as d(P,Q), but the likelihood ratio χ^2 statistic G^2 will have $[(r-1)^2-r]$ degrees of freedom.

Because it is a pure function of the odds ratios in tables P and Q, d(P,Q) is invariant to the multiplication of rows or columns in either table by arbitrary constants. As a result, d(P,Q) provides a measure of the difference in row-column association between two tables that abstracts from differences in marginal frequencies. Because $[d(P,Q)]^2$ is a simple sum of the squares of log odds ratio contrasts, it can be conveniently decomposed into its constituent elements: for an $r \times s$ table, there will be $[r(r-1)/2][s(s-1)/2]$ odds ratios in $d(P,Q)$ and it will be possible to calculate how much each contributes to $[d(P,Q)]^2$, in the process identifying the locations in P and Q where the differences between them are greatest.

In analyzing how mobility differs between two tables, we will then proceed in three steps:

1. calculate total mobility for each table as the ratio of the sum of the off-diagonal elements to the total number of observations in the table, and find the difference in total mobility between P and Q;

2. adjust one of the tables to have the same marginal frequencies as the other and re-calculate the difference in total mobility to eliminate the influence of differences in the distribution of occupations;

3. calculate $d(P,Q)$, $d^i(P,Q)$, $d(P,J)$, and $d(Q,J)$ and the likelihood ratio χ^2 statistics G^2; if $d(P,Q) \neq 0$, calculate the full set of log odds ratio contrasts and identify those making the greatest contribution to $[d(P,Q)]^2$.

This differs from common practice in sociology, where the estimation of log-linear models has dominated the empirical analysis of mobility since the 1960s.[6] Log-linear analysis decomposes the influences on the log of each entry in a contingency table into a sum of effects for its row and column and an interaction between the row and column. Controlling for row and column effects eliminates the effect of the distribution of fathers' and sons' occupations on mobility. The remaining interaction between rows and columns captures the strength of the association between rows and columns which in turn measures mobility, though the coefficient on the interaction term has no meaning in itself as it is a component of a highly non-linear system.[7] In comparing mobility in two

[6] See Hauser (1980) and Hout (1983).

[7] Goodman (1970) suggests using the standard deviations of the log-linear model parameters in additive form as a measure of the strength of the row-column association in each layer. The approach

tables, the underlying question addressed is how well a particular pattern of mobility fits the different layers of the table, through comparisons of likelihood ratios. Attention is generally focused on the statistical significance of the difference in the fit of particular models across layers rather than on the magnitude of differences in row-column association. Simple comparisons of differences in the strength of the row-column association are not generally performed without the imposition of additional structure. For example, an analysis may have as its maintained hypothesis that all of the odds ratios in P differ in exactly the same degree from all of the odds ratios in Q, or that the odds ratios can be partitioned into sets that differ uniformly across the tables.

The measure of underlying mobility adopted here has several advantages over the more commonly employed measures of mobility derived from log-linear analysis: the measure used here (1) generates a simple, meaningful measure of the *distance* between the row and column association in P and the row and column association in Q that is conceptually straightforward and easy to visualize (see Figure 3 below);[8] (2) can be easily decomposed, allowing us to isolate the specific odds ratios that account for the largest part of difference between the association in P and the association in Q; (3) has a simple associated one-parameter test statistic that allows us to say whether the difference between the row-column association in P and the row-column association in Q is non-zero; and (4) answers a question ("does the row-column association in P differ from that in Q, and if so by how much and in which odds ratios?") that should be methodologically prior to the question addressed by more commonly employed measures of differences in row-column association based

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adopted here instead has some advantages, described below, over this approach.

[8] Goodman and Hout (1998) provide a method to visualize differences in row-column association across tables for each log-odds ratio, but do not offer a summary measure for the entire table.

on log-linear analysis ("can we find a particular pattern of row-column association that is common to tables P and Q?").

Tables 1 and 2 present the raw cross-tabulations of son's occupation by father's occupation in Panel A. In Panel B, the cross-tabulations have been standardized so they have the same marginal frequencies. Even in the absence of an unambiguous ordering of the occupations, several conclusions can be drawn. Of the three groups in the first cohort (Table 1), the migrants exhibit more mobility both upward from unskilled and downward from white collar than either the non-migrants in Britain or the native-born U.S. males. This is true whether the raw frequencies (Panel A) or the standardized frequencies (Panel B) are used. Among the immigrant sons of unskilled workers, most of the movement out of unskilled is entry into skilled and semiskilled work (48%); this is more like the pattern for the British non-migrants than it is for the U.S. native-born. Among the native-born U.S. sons of unskilled workers, roughly equal fractions entered farming and skilled and semiskilled work. When the marginal frequencies are adjusted, however, this pattern is reversed: the immigrants actually look more like the U.S. native-born than the British non-migrants – in fact the fraction entering farming among the immigrants (30%) actually exceeds that among the U.S. native-born (22%). This means that the mobility shown by the immigrants is shaped significantly by the overall distribution of occupations that they pursue after arrival, rather than primarily by patterns of movement that are specific to the occupations in which their fathers worked.

By the second cohort, the immigrants have begun to look considerably less distinctive. In both the raw and standardized cross-tabulations, their movement down from white collar and up from unskilled, though still greater than among the British non-migrants, looks much more like that among the U.S. native-born. Farming has become a less likely route out of the unskilled group among the immigrants than it was earlier, and its prominence as a route out of unskilled has fallen even more for the immigrants than it has for the U.S. native born. Finally, the differences between the raw and standardized tables are less pronounced in the second cohort, indicating that there are impediments to mobility that are more specific to particular origin categories than was true earlier.

Table 3 presents more comprehensive measures of mobility. The comparison between columns (1) and (2) reveals how much mobility would have differed between two groups in a cohort if they had the other group's marginal frequencies. For example, in the first cohort, in comparing the British non-migrants to the immigrants (Comparison 1), two thirds of immigrant sons would have ended up in occupations different from those of their fathers if the immigrants faced the same distribution of origin and destination occupations as the British non-migrants. The differences between immigrants and the U.S. native-born are less pronounced by this simple measure of total mobility regardless of which group's marginal frequencies are used (Comparisons 2 and 4). By the second cohort, even the British non-migrants do not look substantially different from the immigrants, using either group's marginal frequencies (Comparison 3).

The remaining columns in Table 3 present the Altham statistics for each group and each comparison. In the first comparison, the immigrants have a lower Altham statistic (7.8) than the British non-migrants (29.2), so the immigrants are more mobile (i.e. closer to a table in which fathers' and sons' occupations are independent). Further, the difference in mobility between their tables is large (23.8) and we can reject at any conventional significance level the null hypothesis that this difference is actually zero. When we ignore those who remain in their fathers' occupations in column (9), the difference between the two groups is eliminated, meaning that the disparity in mobility is driven primarily by differences in direct occupational inheritance, rather than by wide differences in mobility patterns among those who move out of their father's occupation class. Even in comparison to the U.S. native-born, the immigrants in the first cohort are more mobile, a difference which is again statistically significant and again driven by differences in direct occupational inheritance ($d^i(P,Q)$ is again neither large nor statistically significant).

By the second cohort, however, differences between the immigrants and both the British they left behind and the U.S. native-born they joined have diminished. Though the post-1881 immigrants are still more mobile than the British non-migrants, the difference between their mobilities has fallen by more than half (from 23.8 to 11.5), though this difference remains statistically significant. Compared to the U.S. native-born, however, the immigrants are now indistinguishable: it is not possible to reject the null hypothesis that there is no difference between their mobilities.

Figure 3 provides a visual summary of these results. It was generated by taking all of the pairwise comparisons between the 6 mobility tables in Panel A of Tables 1 and 2, as well as a seventh table containing only ones representing independence, generating the Altham statistics to measure the distance between mobility in each of these comparisons, and taking advantage of the interpretation of the Altham statistic as a Euclidean distance. With the full set of pairwise comparisons in hand, it is straightforward to use multidimensional scaling to locate every table's mobility relative to every other table in an *N*-dimensional space. Two dimensions are used here (adding additional dimensions adds little new information but complicates the visual presentation considerably); the scaling in each dimension is arbitrary as is the location of "Independence."

In Figure 3, tables that are equally far from independence (i.e. that display equal amounts of mobility) will lie along an arc with the point labeled "Independence" at its vertex. The chord connecting two points on such an arc measures how far the mobility in one tables differs from that in another. Two tables can be equally far from independence and yet differ from each other in their amount of mobility (e.g. $d(P,J)=d(Q,J)$ but $d(P,Q)>0$) if specific sets of odds ratios in the tables are different. For example, one table may have more mobility in the upper-left corner, so its odds ratio (WC_FWC_S x F_FF_S) / (WC_FF_S x F_FWC_S) exceeds its odds ratio (SS_FSS_S x U_FU_S) / (SS_FU_S x U_FSS_S), while the opposite is true in the other table where the magnitudes of these odds ratios are reversed. As Figure 3 shows, the first cohort of immigrants were more mobile than any of the other groups; the other immigrant cohort and the two U.S. native-born cohorts constituted a second distinct grouping with similar levels of mobility and slight differences between them in mobility, while the two cohorts of British non-migrants represented the lowest mobility groups.

Selection and Migration

In our analysis of differences in mobility between immigrants and non-migrants (both those who were always in Britain and those who were always in the U.S.), we have been descriptive and have not attributed a causal role to migration. The extent to which migrants are a selected portion of the home country population is a function of a variety of home and destination country characteristics (Borjas 1994). In order to examine the role of migration in causing differences in intergenerational mobility, we need to take account of this selectivity explicitly. Long (2005) develops an ordered probit switching regression model that is appropriate for the present situation, in which we do not have a continuous economic outcome. If we are willing to impose an ordering on the four categories we are using, implementation of that framework is straightforward.

Assume there is an outcome (socioeconomic status) which is y_{1i} for individual i in location 1 and y_{0i} for individual i in location 0. This is a function of a vector of characteristics X_i and parameters β_1 and β_0. The individual moves from location 0 to location 1 (M_i=1) if the net gain is positive and remains in location 0 (M_i=0) otherwise, where the net gain is a function of the gain in y and a set of other characteristics Z_i and parameters γ. Equations (1) - (3) describe this setting:

$$y_{1i} = \beta_1' X_{1i} + \varepsilon_{1i} \quad \text{if } M_i = 1 \tag{1}$$

$$y_{0i} = \beta_0' X_{0i} + \varepsilon_{0i} \quad \text{if } M_i = 0 \tag{2}$$

$$M_i = \begin{cases} 1 & \text{if } \gamma_1' Z_i + \gamma_2 (y_{1i} - y_{0i}) + u_i \geq 0 \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

With this notation, the selection of migrants (s_1) and non-migrants (s_0) can be defined as

$$\begin{aligned} s_1 &= \mathrm{E}\left(y_1^* \mid M = 1\right) - \mathrm{E}\left(y_1^* \mid M = 0\right) = \tilde{X}_1 \hat{\beta}_1 - \tilde{X}_0 \hat{\beta}_1 \\ s_0 &= \mathrm{E}\left(y_0^* \mid M = 0\right) - \mathrm{E}\left(y_0^* \mid M = 1\right) = \tilde{X}_0 \hat{\beta}_0 - \tilde{X}_1 \hat{\beta}_0 \end{aligned} \tag{4}$$

Finally, we define the effect of treatment on the treated (τ_1) and the effect of treatment on the untreated (τ_0) as

$$\tau_1 = \mathrm{E}\left(y_1^* - y_0^* \mid M = 1\right) = \tilde{\tilde{X}}_1 \hat{\beta}_1 - \tilde{\tilde{X}}_1 \hat{\beta}_0 \tag{5}$$

$$\tau_0 = \mathrm{E}\left(y_1^* - y_0^* \mid M = 0\right) = \tilde{\tilde{X}}_0 \hat{\beta}_1 - \tilde{\tilde{X}}_0 \hat{\beta}_0 \tag{6}$$

The parameters β can be obtained by estimating Eqautions (1) - (3) by Full Information Maximum Likelihood (FIML), while the parameters γ can be obtained once estimates of $\hat{y}$ for migrants and non-migrants have been obtained. The model is identified by construction due to the non-linearities, but additional exclusion restrictions are imposed as well: a set of characteristics related to household composition, mother's employment, and previous migration are included in Equation (3), the migration decision, but not in Equations (1) and (2). Table 4 presents the parameters of the ordered probit switching regression and the structural probit estimation of the migration decision. Table 5 presents the selection and treatment parameters.[9] The analysis is limited at this time to the second cohort (1881 British-born observed either in Britain in 1901 or in the U.S. in 1900) because we still need to retrieve additional information manually from the 1861 British census population schedules for the first cohort.

Not surprisingly, father's occupational class has a large impact on occupational attainment for sons, as does one of the few available measures of household affluence apart from occupation, the presence of servants. In the migration decision, several parameters are imprecisely estimated, but both the age discrepancy (the gap between reported age in 1881 and reported age in 1900 or 1901, a rough measure of numeracy and perhaps human capital) and the mother's employment had a non-zero effect on migration. The last non-zero migration determinant is the anticipated gain in occupational status $\hat{y}_M$ - $\hat{y}_S$ which is actually negative: individuals were less likely to migrate the larger were the anticipated benefits of migration. The migrants were positively selected: they did better in the U.S. than non-migrants would have done in the U.S. (row (5) in Table 5). The non-migrants were negatively selected: they did worse in Britain than the migrants would have done in Britain. Finally, it is not possible to reject the null hypothesis that the treatment effect for either the migrants or the non-migrants, or the average treatment effect, is zero.

The puzzling. negative coefficient on the anticipated gain from migration $\hat{y}_M$ - $\hat{y}_S$ – though the treatment effect of migration is impossible to distinguish from zero (row (7) in Table 5), migration was more likely among those who anticipated the largest declines in occupational status – points to several potential shortcomings of the analysis. The first potential is simply the bluntness of the outcome measure: we only capture improvement if it occurs through movement across

[9] The ranking of occupations used is (from highest to lowest): white collar, farmer, skilled and semiskilled, and unskilled. In additional analyses (not shown), we reversed farmer and skilled and semiskilled. This produced no change to any of the substantive conclusions that follow.

occupational category boundaries. A migrant whose father was a clerk does not “improve” if he becomes a surgeon, as both are “white collar” occupations. Even when no occupational changes occur, real improvements in the economic circumstances faced by individuals (the actual maximand of the model underlying the econometric exercise) may occur: throughout the period 1870-1910, real wages were at least 50% higher in the U.S. than in Britain. (O’Rourke et al. 1994, Table 10.3) The son of an unskilled worker could thus experience a substantial rise in his living standard even without moving to another occupational category, simply by migrating to the U.S. These problems can potentially be addressed by using measures of income-by-occupation with scales that are appropriate to Britain and the U.S., rather than simple occupational categories. An additional complication is that sons may have been “tied movers” – the decision to migrate was made by parents who were concerned with maximizing their own welfare or that of the entire family. In future work, we will isolate individuals who migrated alone to minimize this possibility.
Finally, some historians have even questioned whether material improvement was the primary rational for some nineteenth century British migrants.[10]

Conclusions

Migrants from Britain to the U.S. in the last four decades of the nineteenth century experienced substantially greater intergenerational occupational mobility than individuals who remained in Britain. These migrants were actually somewhat more occupationally mobile than even the U.S. native-born if they arrived before 1880; post-1880 arrivals were as mobile as the U.S.

[10] In a large survey of letters written home by British immigrants to the U.S., Erickson (1972, p. 29) claims that

> All of these attitudes – distaste for commercial life, desire for independence, love of leisure, resistance to family dispersal, and faith in subsistence farming – were to be found among craftsmen, domestic workers such as handloom weavers, and also among some farmers and professional people and even manufacturers and merchants....

native-born. When we impose an ordering on occupational categories, we find that although we cannot detect a positive return to migration in intergenerational occupational mobility, migrants were positively selected (they did better in the U.S. than British non-migrants would have done in the U.S. if the latter had actually moved), which suggests that the high intergenerational mobility among migrants is not simply a consequence of the experience of migration: the selectivity of the migration process generated a stream of migrants who were more likely to move up from their fathers' occupations whether they migrated or not. This contrasts with the findings of Abramtizky et al. (2010), who found – using somewhat different techniques – that Norwegian immigrants to the U.S. over the same 40 years experienced a positive return to migration (though smaller in magnitude than more recent immigrants to the U.S.) and were negatively selected from the source country population. Substantial differences between the British and Norwegian economies in the second half of the nineteenth century can help explain these different outcomes.

In future work, we will improve on our outcome measure by examining incomes-by-occupation with scales specific to each country, isolate individuals who migrated in the absence of a family tie, and consider the possibility that motives other than pure material gain (e.g. independence, land ownership) were driving migrants from Britain at the time. After we have retrieved the information on 1861 Britsin to 1880 U.S. migrants from the 1861 British census manuscripts, we will be able to compare the selectivity of migrants across both of our cohorts.

The British were nearly 40 percent of the immigrants to the U.S. in some years 1861-1900. They arrived at a time when there were no impediments to their departure from Britain or their entry into the U.S., and came with advantages not enjoyed by most other nineteenth century immigrants to the U.S: the ability to speak English, the lack of characteristics (e.g. religion) against which some discrimination still occurred, and familiarity with day to day life in a modern, industrializing economy. These advantages suggest that the intergenerational mobility this group exhibited is likely an upper bound on the intergenerational mobility experienced by all nineteenth century immigrants to the U.S.

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	Father's Occupation														
	Britain 1861-1881					Britain 1861-U.S. 1880					U.S. 1860-1880				
Son's Occup.	White Collar	Farmer	Skilled & Semi-Skilled	Un-Skilled	Row Sum	White Collar	Farmer	Skilled & Semi-Skilled	Un-Skilled	Row Sum	White Collar	Farmer	Skilled & Semi-Skilled	Un-Skilled	Row Sum
A. Raw Frequencies (Column Percent)															
WC	117	18	153	54	342	35	12	113	42	202	164	336	164	56	720
	(41.9)	(11.6)	(15.8)	(8.5)		(24.0)	(13.2)	(16.5)	(16.5)		(46.2)	(12.9)	(21.2)	(13.6)	
F	3	67	4	10	84	15	22	64	49	150	65	1409	168	118	1,760
	(1.1)	(43.2)	(0.4)	(1.6)		(10.3)	(24.2)	(9.3)	(19.3)		(18.3)	(54.2)	(21.8)	(28.6)	
SS	115	46	641	288	1,090	78	41	439	123	681	88	466	330	127	1,011
	(41.2)	(29.7)	(66.4)	(45.1)		(53.4)	(45.1)	(64.1)	(48.4)		(24.8)	(17.9)	(42.7)	(30.8)	
U	44	24	168	287	523	18	16	69	40	143	38	388	110	111	647
	(15.8)	(15.5)	(17.4)	(44.9)		(12.3)	(17.6)	(10.1)	(15.7)		(10.7)	(14.9)	(14.2)	(26.9)	
Col. Sum	279	155	966	639	2,039	146	91	685	254	1,176	355	2599	772	412	4,138
B. Standardized Frequencies (Column Percent)															
WC	55	6	27	12	100	35	17	27	22	100	49	14	23	14	100
	(55.3)	(5.6)	(27.0)	(12.1)		(34.5)	(16.7)	(26.8)	(22.0)		(48.6)	(14.5)	(23.0)	(13.9)	
F	6	83	3	9	100	17	36	18	30	100	14	46	18	22	100
	(5.7)	(82.7)	(2.8)	(9.0)		(17.1)	(35.5)	(17.6)	(29.7)		(14.5)	(45.7)	(17.8)	(22.0)	
SS	22	6	46	26	100	25	19	34	21	100	21	16	37	25	100
	(22.0)	(5.8)	(45.9)	(26.2)		(25.4)	(18.9)	(34.4)	(21.3)		(21.0)	(16.2)	(37.4)	(25.4)	
U	17	6	24	53	100	23	29	21	27	100	16	24	22	39	100
	(17.0)	(6.1)	(24.2)	(52.7)		(22.9)	(28.8)	(21.2)	(27.1)		(15.9)	(23.6)	(21.8)	(38.8)	
Col. Sum	100	100	100	100	400	100	100	100	100	400	100	100	100	100	400

Note: Panel B was obtained by iterative proportional fitting. Males age 30-39 in terminal year.

Table **1**. Intergenerational Occupation Mobility, Britain 1861-1881, Migrants 1861-1880, and U.S. 1860-1880.

Son's Occup.	Britain 1881-1901 White Collar	Britain 1881-1901 Farmer	Britain 1881-1901 Skilled & Semi-Skilled	Britain 1881-1901 Un-Skilled	Britain 1881-1901 Row Sum	Britain 1881-U.S. 1900 White Collar	Britain 1881-U.S. 1900 Farmer	Britain 1881-U.S. 1900 Skilled & Semi-Skilled	Britain 1881-U.S. 1900 Un-Skilled	Britain 1881-U.S. 1900 Row Sum	U.S. 1800-1900 White Collar	U.S. 1800-1900 Farmer	U.S. 1800-1900 Skilled & Semi-Skilled	U.S. 1800-1900 Un-Skilled	U.S. 1800-1900 Row Sum
A. Raw Frequencies (Column Percent)															
WC	199	28	355	75	657	89	11	89	33	222	219	339	227	62	847
	(43.1)	(12.3)	(15.2)	(7.1)		(36.6)	(16.9)	(15.1)	(13.4)		(52.8)	(15.5)	(25.0)	(15.1)	
F	5	66	32	21	124	19	19	31	14	83	40	1,015	96	62	1,213
	(1.1)	(29.1)	(1.4)	(2.0)		(7.8)	(29.2)	(5.3)	(5.7)		(9.6)	(46.4)	(10.6)	(15.1)	
SS	204	97	1,620	558	2,479	101	27	378	127	633	113	460	458	166	1,197
	(44.2)	(42.7)	(69.6)	(53.0)		(41.6)	(41.5)	(64.2)	(51.4)		(27.2)	(21.0)	(50.4)	(40.5)	
U	54	36	322	399	811	34	8	91	73	206	43	372	127	120	662
	(11.7)	(15.9)	(13.8)	(37.9)		(14.0)	(12.3)	(15.4)	(29.6)		(10.4)	(17.0)	(14.0)	(29.3)	
Col. Sum	462	227	2,329	1,053	4,071	243	65	589	247	1,144	415	2,186	908	410	3,919
B. Standardized Frequencies (Column Percent)															
WC	57	8	25	10	100	44	17	22	17	100	50	12	24	13	100
	(57.2)	(7.5)	(25.4)	(9.8)		(43.9)	(16.6)	(22.3)	(17.3)		(50.3)	(12.3)	(24.4)	(13.0)	
F	6	73	9	11	100	18	54	15	14	100	13	53	15	19	100
	(5.9)	(73.3)	(9.4)	(11.4)		(17.7)	(53.9)	(14.6)	(13.8)		(13.3)	(53.0)	(14.9)	(18.8)	
SS	21	10	42	27	100	20	16	38	26	100	21	13	39	28	100
	(21.4)	(9.5)	(42.3)	(26.7)		(19.8)	(16.1)	(37.7)	(26.4)		(20.5)	(13.1)	(38.8)	(27.6)	
U	15	10	23	52	100	19	13	25	43	100	16	22	22	41	100
	(15.4)	(9.6)	(22.9)	(52.0)		(18.7)	(13.4)	(25.4)	(42.5)		(15.9)	(21.6)	(21.9)	(40.6)	
Col. Sum	100	100	100	100	400	100	100	100	100	400	100	100	100	100	400

Note: Panel B was obtained by iterative proportional fitting. Males age 30-39 in terminal year.

Table **2**. Intergenerational Occupation Mobility, Britain 1881-1901, Migrants 1881-1900, and U.S. 1880-1900.

Comparison and Terminal Year	M (1)	M′ (2)	d(P,J) (3)	G^2 (4)	d(Q,J) (5)	G^2 (6)	d(P,Q) (7)	G^2 (8)	d^i(P,Q) (9)	G^2 (10)
1. Britain 1861-1881 (P)	45.5	41.4	29.2	567.64***						
vs.							23.8	139.66***	7.2	7.71
Migrants 1861-1880 (Q)	54.4	67.5			7.8	45.88***				
2. U.S. 1860-1880 (P)	51.3	50.1	12.7	592.23***						
vs.							7.5	24.63***	3.0	3.95
Migrants 1861-1880 (Q)	54.4	57.4			7.8	45.88***				
3. Britain 1881-1901 (P)	43.9	45.3	23.5	710.97***						
vs.							11.5	34.35***	5.8	7.68
Migrants 1881-1900 (Q)	51.1	48.4			13.7	111.27***				
4. U.S. 1880-1900 (P)	53.8	50.0	15.1	854.43***						
vs.							6.4	10.60	5.5	9.20
Migrants 1881-1900 (Q)	51.1	54.8			13.7	111.27***				

Note: M is total mobility (percent off the main diagonal), M′ is total mobility using the marginal frequencies from the other table, G^2 is the likelihood ratio χ^2 statistic with significance levels *** < 0.01 ** < 0.05 * < 0.10. Degrees of freedom: 9 for columns (4), (6), and (8); 5 for column (10).

Table **3**. Summary Measures of Intergenerational Mobility.

1881 Characteristic	Ordered Probit Switching Regression: Movers β	Movers *t*-stat.	Stayers β	Stayers *t*-stat.	Structural Probit (Move) β	S.E.	[90% C.I.]	
Father's Class: 1. WC	0.56	4.39***	0.97	13.35***				
Father's Class: 2. F	0.48	2.30**	0.88	10.02***				
Father's Class: 3. SS	0.25	2.40**	0.37	6.35***				
Age	0.13	0.93	0.10	1.47	0.16	0.15	[-0.10	0.41]
Age^2	0.00	0.85	0.00	1.44	-0.01	0.01	[-0.01	0.00]
Father's Age	0.00	0.23	0.01	3.60***	0.00	0.01	[-0.01	0.01]
Father in Agric.	-0.06	0.33	-0.43	6.19***				
One Servant in HH	0.34	2.40**	0.34	4.07***	0.11	0.17	[-0.17	0.40]
2+ Servants in HH	0.42	2.48**	0.55	4.96***	0.02	0.23	[-0.35	0.40]
Age Discrepancy	-0.02	0.30	-0.06	2.80***	0.16	0.06	[0.06	0.26]
Eldest Child	-0.06	0.74	-0.04	0.91	-0.12	0.09	[-0.28	0.04]
Oldest Brother in HH					-0.07	0.06	[-0.17	0.02]
Children in HH					0.04	0.01	[0.02	0.06]
Mother Employed					-0.19	0.07	[-0.31	-0.07]
Parish ≠ Birth Parish					-0.04	0.04	[-0.10	0.03]
$\hat{y}_M - \hat{y}_S$					-0.90	0.37	[-1.51	-0.29]
Constant	-0.22	0.21	-0.37	0.74	-2.18	1.08	[-3.95	-0.39]

Note: Observations: 5,025. Omitted categories are "Father's Class: 4. U," "No Servants in HH," "<2 Servants in HH," "Not Eldest Child," "Not Oldest Brother in HH," "Mother Not Employed," and "Parish=Birth Parish." Structural Probit SEs and CIs calculated by bootstrapping via data resampling with 500 repetitions.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table **4**. Ordered Probit Switching Regression (FIML).

Parameter	Estimate	S.E.	[90% C.I.]	
(1) $\hat{y}_M$, Movers	1.093	0.127	[0.883	1.302]
(2) $\hat{y}_M$, Stayers	1.028	0.138	[0.801	1.254]
(3) $\hat{y}_S$, Movers	1.128	0.153	[0.876	1.380]
(4) $\hat{y}_S$, Stayers	1.002	0.130	[0.787	1.216]
(5) s_M, Selection of migrants=(1)-(2)	0.065	0.027	[0.021	0.109]
(6) s_S, Selection of stayers=(4)-(3)	-0.127	0.029	[-0.174	-0.080]
(7) τ_M, Treatment Effect: Treated=(1)-(3)	-0.036	0.196	[-0.359	0.288]
(8) τ_S, Treatment Effect: Not Treated=(2)-(4)	0.026	0.186	[-0.281	0.333]
Average Treatment Effect	0.013	0.188	[-0.297	0.322]

Note: SEs and CIs are calculated by bootstrapping via data resampling with 500 repetitions.

Table **5**. Selection and Treatment Parameters Based On Ordered Probit Switching Regression.

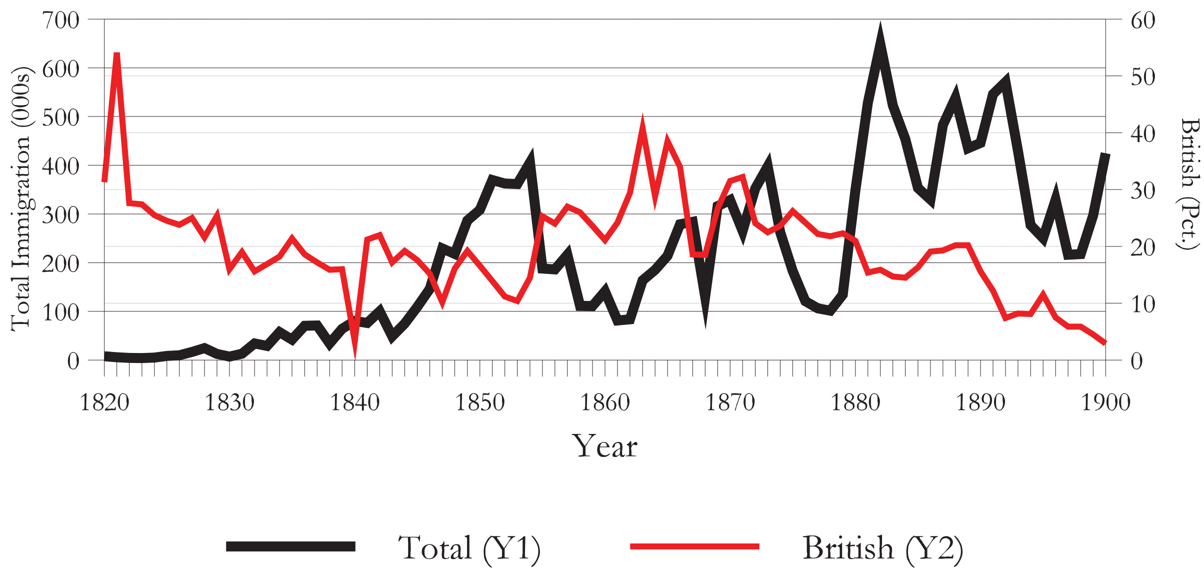

Figure 1. Total (000s) & British (Pct.) Immigration into the U.S., 1820-1900. Source: *Historical Statistics of the U.S. (Millennial Edition)*, Series Ad106-120.

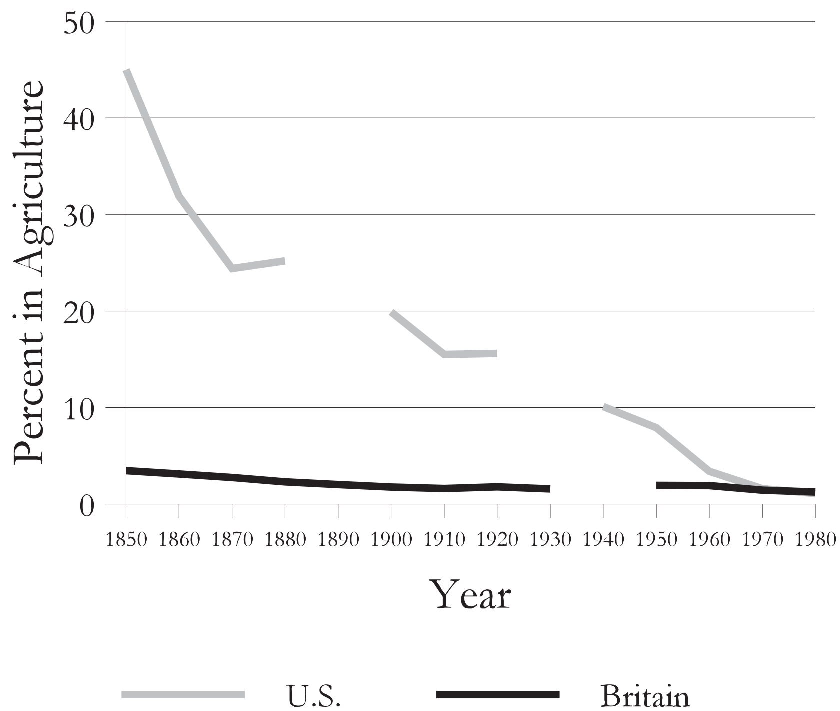

Figure 2. Population Employed in Agriculture in the U.S. and Britain, 1850-1980.

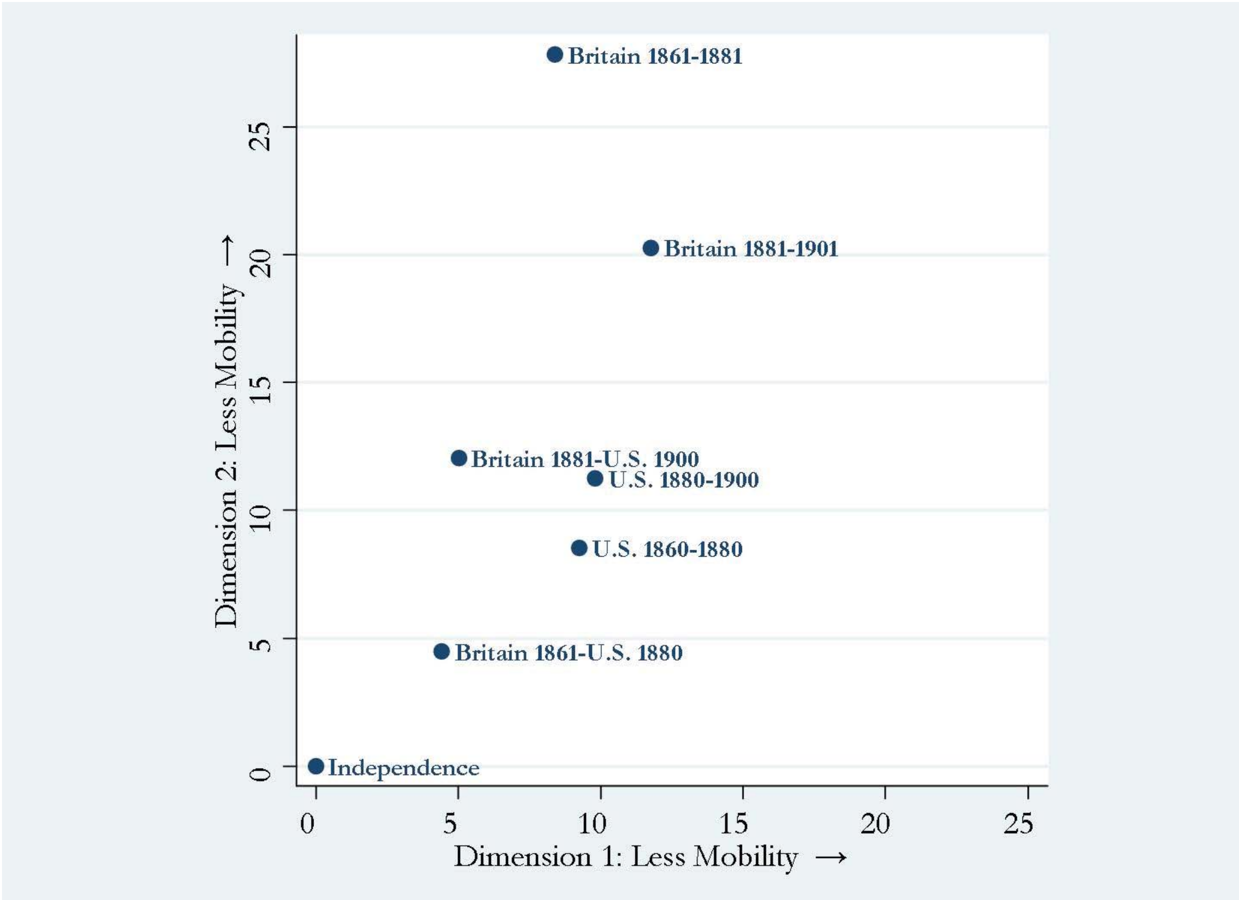

Figure 3. Intergenerational Occupational Mobility in the U.S., Britain, and in British-to-U.S. Migrants (Multidimensional Scaling Scores)