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Intergenerational Occupational Mobility in Great Britain and the United States Since 1850: Comment[†]

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Social scientists in general, and sociologists in particular, have long been interested in intergenerational occupational mobility. Indeed, among sociologists the interest is so common that they often refer to intergenerational occupational mobility simply as "social mobility." Most notable among innumerable contributions to the large literature on social mobility are the landmark studies by Blau and Duncan (1967) and Featherman and Hauser (1978) for the United States and by Erikson and Goldthorpe (1992) for Europe. In these studies, social mobility is taken to measure a society's openness. A widely accepted view rooted in neoclassical liberalism is that more social mobility, i.e., more openness, is good for a society, as it encourages placement of individuals in social positions according to competence rather than social origin (Hout 1988).

Adding to this large literature on social mobility is now a well-researched study by economists Long and Ferrie (2013). Using historical census data and survey data, the Long-Ferrie study compares the United States and Britain both around 1880 and around 1973. A key finding of the study is that the United States was much more socially mobile than Britain in the period around 1880, but that the two countries had similar levels of social mobility around 1973. The authors supplemented the core comparison of the four (2x2) datasets with the analysis of four additional datasets for the United States, demonstrating a sharp decline in social mobility in the United States over its history of rapid industrialization and economic expansion from the post-Civil War era to the post-World War II era. Thus, the Long-Ferrie study supports the popular conception of America as an exceptional land of opportunity for all, but only prior to 1900.

The findings of the Long-Ferrie study are bound to shock the community of scholars who have been studying social mobility. Beginning with Lipset and Bendix (1964), if not earlier, the sociological literature on comparative social mobility now dates back more than 50 years (Ganzeboom, Treiman, and Ultee 1991). The dominant view in the literature is that relative social mobility, or social fluidity (to be defined below), is either constant or trendless and patternless in all industrialized nations (Featherman, Jones, and Hauser 1975; Erikson and Goldthorpe 1992; Guest, Landale, and McCann 1989; Grusky and Hauser 1984; Hauser et al. 1975).

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A primary challenge to this dominant view, based on empirical studies, is that social mobility in industrialized nations has increased over time, albeit slowly (e.g., Breen and Jonsson 2007; Featherman and Hauser 1978; Grusky 1986; Hout 1988; Vallet 2001). To our knowledge, Long and Ferrie are some of the first scholars to argue for the significant decline of social mobility in a major modern society.[1] Given this controversial conclusion, whether or not the evidence actually supports their argument is of great interest to the larger scholarly community.

Why are the key findings of the Long-Ferrie study so different from those in a long and well-established literature on comparative social mobility? As Long and Ferrie (2013) themselves document, (with the exception of Guest, Landale, and McCann 1989), they are the first to compare US mobility between the nineteenth and twentieth centuries with nationally representative data. Thus, the Long-Ferrie study makes an important contribution to the existing literature by analyzing trends in American mobility over a much longer period than has previously been possible. While most scholars who study social mobility are sociologists using a widely accepted but confined paradigm, Long and Ferrie are economists who use methods and data that have not been widely used in sociology. Thus, the Long-Ferrie study is valuable in providing both new data on historical social mobility in the United States and Britain and a new challenge to the dominant "trendless" view found in the sociology literature on comparative mobility. However, before we can accept the findings of the Long-Ferrie study, we need to fully understand the study and its limitations and explore alternative interpretations.

In this article, we present our critique of Long-Ferrie (2013). While this study yielded many results, its most surprising finding was that the pre-1900 United States was much more socially mobile than the post-1970 United States. Our critique thus focuses on the long-term trend analysis in the study of the US case. Our article can be summarized in two main points. First, the data quality of the Long-Ferrie study is more limiting than the authors acknowledge. Second, the Long-Ferrie study capitalizes on a particular method—the analysis of odds ratios—that equates statistical independence between fathers' and sons' occupations with perfect social mobility but is ill suited for measuring social mobility of farmers. While this method is standard practice in sociological research on social mobility, we argue that it is inapplicable when the goal is to compare the social mobility of societies with very different levels of industrialization, because it yields misleading results for farmers. Farmers have not only constituted a unique sector in the labor market but also experienced a tremendous decline in the US labor force since 1880. We show that Long and Ferrie's main conclusion of a significant decline in social mobility in the United States is all driven by the misleading results for farmers.

I. Historical Census Data

A major contribution of the Long-Ferrie study is its creative use of historical census data. For simplicity, we focus our discussion on the US data, as these data give rise to the surprising finding we discussed earlier. The basic idea is to link individuals

[1] See also Rytina (2000).

Table 1—Estimated Statistics for Young White Males in 1850 United States

			Percent living with father				
				By farm status		By student status	
Age	Percent on farm	Percent in school	Total	Farm	Nonfarm	In school	Not in school
0–25	54.8	32.5	72.7	80.4	63.5	85.9	66.4
13–19	58.1	43.9	68.6	78.1	55.3	81.3	58.6
13	60.7	66.5	80.7	87.0	71.0	83.8	74.5
14	58.3	62.1	77.5	84.2	68.1	81.5	71.0
15	60.4	54.8	75.3	82.4	64.4	82.1	67.0
16	58.9	43.9	70.5	79.4	57.6	81.3	62.0
17	58.2	34.5	64.6	75.0	50.0	79.3	56.8
18	55.1	23.8	57.5	70.1	42.0	79.1	50.7
19	54.8	18.1	51.7	65.6	34.8	75.8	46.3

Source: IPUMS of the 1850 US census.

(white males) across different censuses by name, state of birth (and parents' states of birth), and year of birth. The linkage procedure capitalizes on the fact that, while only (1 percent) samples of families are available from the 1850, 1860, and 1900 US censuses (http://usa.ipums.org/), the complete enumerations of the 1880 US census are available (http://www.nappdata.org/). Online Appendix 2 of Long and Ferrie (2013) provides detailed documentation for linkages between the 1850 census and the 1880 census for white males ages 25 and under in 1850. We assume that the procedure documented for 1850–1880 linkages is also applicable to those for 1860–1880 and 1880–1900 linkages that were also performed by the authors.

The authors acknowledge certain limitations of the data resulting from this linking procedure, documenting a 22 percent success rate for "white males age 25 and under in 1850" (Long and Ferrie 2013, online Appendix p. 4). However, one data issue that Long and Ferrie do not discuss in their paper is the requirement of coresidence with fathers on the earlier census. For example, in order to construct the intergenerational mobility table by matching data from the 1850 and 1880 US censuses, it is necessary that boys ages 13–19 be reported to coreside with their fathers on the 1850 census form, as we also need the father-son linkage on the 1850 census form to know father's occupation (in 1850). Not all young white males lived with their fathers. Using data from the Integrated Public Use Microdata Series (IPUMS) (Ruggles et al. 2009), we examine the residential status of boys of the ages considered in the Long and Ferrie study. In our reanalysis of the 1850 data, we find the percentages of coresidence to be 73 percent for white males ages 0–25 and 69 percent for white males ages 13–19.[2] As expected, the coresidence rate differs by age, farm status, and student status. We provide full descriptive statistics involving these variables in Table 1.

The first two columns of Table 1 show that, in 1850, 58 percent of US white boys ages 13–19 lived on farms and 44 percent of them were enrolled as students. Negative age gradients are clear for both variables, although the age pattern for enrollment is much more pronounced. These negative age patterns suggest that young Americans

[2] Our reanalysis of the Long-Ferrie data focuses on linkages between the 1850 and 1880 censuses because this is the matched data that were provided to us by Joseph Ferrie. The Appendix of the Long and Ferrie paper also discusses the 1850–1880 linkages extensively.

at that time were already leaving school as well as home at these young ages. Note that the percentage enrolled in school was only 67 percent for 13-year-old boys.[3] For these reasons, we are not surprised to observe, in the third column, that only 69 percent of young men in this age range still lived with their fathers, with the percentage declining gradually from 81 percent at age 13 to 52 percent at age 19. The last four columns break down the likelihood of coresidence by farm status and school status, living on farms and enrollment in school both being positively associated with coresidence with fathers. Again, there is a negative age pattern within each group.

We have shown that occupational mobility is structurally unknown for a large portion (about one third) of youth in the Long and Ferrie data due to their data construction method, even in the unlikely event of no linkage failures. Moreover, there are systematic patterns of this data omission by age, farm status, and student status. Regardless of whether or not this data limitation caused biases to the social mobility tables in the Long-Ferrie study, we believe that such a large rate of missing data (almost one third) in sample selection is worth documenting in its own right. Hence, our reanalysis of the original 1850 data has revealed that the actual matching rate between the 1850 and 1880 censuses in the Long-Ferrie study is not 22 percent as reported, but only 22 percent of 69 percent, i.e., 15 percent.

Now, let us discuss potential biases caused by matching failures. If the occurrence of matching failures were truly random, as the authors implicitly assume, the low success rate would not have caused any bias to the results. The concern is that the probability of finding a match between the 1850 and the 1880 data may be correlated with intergenerational mobility.[4] In the other extreme scenario of strong sample selection, however, the sample of successfully matched cases would have provided little identifying information about the general population to which the authors wish to generalize (Manski 1995). Ideally, we wish to know whether or not the matching likelihood is associated with intergenerational mobility in 1880, but this missing-at-random assumption cannot be empirically evaluated, as we do not observe a person's occupation in 1880 unless the case is successfully matched.

To help evaluate the missing-at-random assumption, we conducted a supplementary analysis of the Long-Ferrie historical data (Xie and Killewald 2010), capitalizing on the fact that, for a subset of sons who were already employed in occupations in 1850, it is possible to construct an intergenerational occupational mobility table based on 1850 data alone. The main idea is to break the 1850 mobility table by their future matching status (success versus failure). This analysis yields some evidence that the measurement error due to the matching requirement introduced a bias in favor of Long and Ferrie's conclusion that mobility was higher in the nineteenth-century US than in the twentieth-century US. However, the difference between the matched and unmatched samples is not statistically significant, so the results are best interpreted as suggestive.

[3] This low enrollment is not surprising, given that a large fraction of adult Americans (more precisely, 10 percent for whites ages 20–50) were still illiterate in 1850 (calculated from http://usa.ipums.org/usa/sda/).

[4] We conducted an analysis of the likelihood of matching as a function of 1850 characteristics. We found that living in an urban (rather than a rural) place, having fewer siblings, father being literate (rather than illiterate), and being enrolled in school were all positively associated with matching success. Long and Ferrie also conducted a similar analysis and constructed weights to account for differential likelihoods of matching based on observed covariates.

We by no means wish to convey that other data sources for measuring intergenerational social mobility are without flaw. In the 1973 Occupational Changes in a Generation (OCG) study, which Long and Ferrie use as their modern comparison point, individuals were asked to report retrospectively the occupation of their fathers when the individuals were age 16. Although this does not require that the individual coreside with his father at age 16, it does require knowledge of his father's occupation. Furthermore, recall error may be correlated with the respondent's occupation, producing measurement biases in resulting mobility tables.

As empirical social scientists, we do not always have the luxury of collecting ideal data (longitudinal data in this case) and instead have to rely on existing data sources, particularly when the research question is about historical trends. It is not our purpose here to argue for the superiority of one dataset over another, nor does our critique depend on this. For a trend analysis of the kind undertaken by Long and Ferrie, the key question is not whether each individual dataset produces biased estimates of the level of social mobility at a particular time, but whether the biases of the datasets used for the comparison periods are similar so as to be canceled out in the comparison in a trend analysis. We merely note that the data for the earlier period in the Long-Ferrie study are a sample of only about 15 percent of age-eligible sons in 1850. Given that the 1973 OCG data came from an entirely different research design, it is unlikely that data quality issues would produce similar biases between the two data sources, and they can thus be overlooked. Of course, we have no intention of arguing that selectivity on coresidence status accounts for Long and Ferrie's finding of a sharp decline in social mobility in the United States between the nineteenth and twentieth centuries. Our goal in this section has been to highlight a limitation of the historical census data not previously acknowledged and leave it to readers and the original authors to consider the potential impact of this data limitation on Long and Ferrie's study.

II. Measuring Social Mobility

Measurement of social mobility is not a straightforward matter. For the benefit of readers who may not be familiar with the sociological literature on social mobility, we present a brief methodological review in this section. Since an intergenerational mobility table is usually a square matrix, with the same occupational classification for father's and son's occupations, diagonal cells represent immobility, or inheritance. At first glance, it seems that we can simply measure social mobility by the proportion of individuals who fall in off-diagonal cells in a mobility table. Indeed, this simple descriptive measure, called "total mobility rate," "absolute mobility rate," or simply "mobility rate," is commonly used and reported, as in the Long-Ferrie study.[5] However, methodological problems with the mobility rate have been well known for a long time (Ganzeboom, Treiman, and Ultee 1991). The main problem is that the mobility rate is affected by the marginal distributions of a mobility table.

[5] In economics, total mobility is called "gross mobility," and a summary difference between the two marginal distributions is called "net mobility" (Jovanovic and Moffitt 1990). Interestingly, Jovanovic and Moffitt (1990) measure net mobility by the index of dissimilarity for the two marginal distributions, a common practice in sociology (Hout 1983).

Let f_{ij} be the observed frequency in the ith row $(i = 1, \ldots, I)$ and jth column $(j = 1, \ldots, I)$ in a mobility table with I rows and I columns. We follow Long and Ferrie in representing son's occupation in rows and father's occupation in columns, although the convention in the standard mobility literature is the reverse. We further denote $f_{i+} = \sum_{j=1}^{I} f_{ij}$, $f_{+j} = \sum_{i=1}^{I} f_{ij}$, and $f_{++} = \sum_{i=1}^{I}\sum_{j=1}^{I} f_{ij}$, respectively, to be the row-specific total, the column-specific total, and the grand total. The marginal distributions of the row and the column variables $(f_{i+}/f_{++}$ and f_{+j}/f_{++}, when $i = j)$ are almost always dissimilar, representing differences in occupational structure between subjects and their fathers. For example, we often see lower proportions of workers in farming and in unskilled manual jobs among sons than among fathers.[6] We define the mobility rate to be

$$M = 1 - \left(\sum_{i=1}^{I} f_{ii}\right)\Bigg/ f_{++}. \tag{1}$$

Of course, the amount of mobility measured this way as the proportion of cases that fall in off-diagonal cells is heavily dependent on occupational classification (Duncan 1966). The cruder the classification, the lower the measured mobility by M. For this reason, the mobility rates from different studies cited by Long and Ferrie (2013) are not directly comparable, as they were based on different occupational classification systems.

The earlier statement that M is affected by marginal distributions can be understood in two ways. First, when $f_{i+} \neq f_{+j}$, $i = j$, or occupational structure is dissimilar between sons and fathers, it is simply not possible to have perfect immobility (i.e., $M = 0$). The amount of social mobility that is forced by an asymmetry in marginal distributions is sometimes called "structural mobility" (Sobel, Hout, and Duncan 1985). Second, even when father's occupation and son's occupation are independent of each other (to be discussed below), not only is M not 1, but its magnitude is dependent on marginal distributions. In comparative social mobility research, this is even more complicated because at least four marginal distributions (say, for two tables) are involved.

To avoid the confounding of marginal distributions, scholars studying social mobility tables have relied on the use of odds ratios as measures of "relative social mobility" or simply "social fluidity." This is true in both the large standard literature in sociology as well as in the Long-Ferrie study. To appreciate odds-ratio measures, let us first define the "independence model" by the null hypothesis that there is no statistical association between father's occupation and son's occupation. The independence model is usually taken as the natural reference point for perfect mobility, deviation from which is then taken to indicate social closure, or social immobility. If the row and the column variables are independent of each other, it is easy to estimate the expected frequency (Powers and Xie 2008) as

$$\hat{f}_{ij} = \frac{f_{i+}}{f_{++}} \cdot \frac{f_{+j}}{f_{++}} \cdot f_{++} = \frac{f_{i+}\, f_{+j}}{f_{++}}. \tag{2}$$

[6] However, the differences in the marginal distributions should not be entirely equated with secular changes in occupational structure between a given generation and its parents' generation at any given historical time, due to such demographic factors as differential fertility and differential timing of fertility (Duncan 1966).

That is, the expected frequency under the null is proportional both to the row-marginal total and the column-marginal total. With this insight, much of the effort in the early years of mobility analysis resorted to the proportional-adjustment method to account for differences in marginal distributions (Duncan 1966; Hauser 1978), as is also true in the Long-Ferrie study. An odds ratio between a pair of rows (i,i') and a pair of columns (j, j') can be expressed as

$$\omega_{i,i';j,j'} = \frac{f_{ij} f_{i'j'}}{f_{i'j} f_{ij'}}. \tag{3}$$

Of many possible odds ratios, only $(I-1)(I-1)$ of them are uniquely identified (Powers and Xie 2008).

An attractive property of odds ratios is that they are invariant to *proportional* changes (of the nature as in equation (2) under the independence model) in marginal distributions (Powers and Xie 2008). Invariance to multiplicative changes in marginal distributions is sometimes taken to mean the purging of the confounding influences on social mobility "from the interplay of supply and demand in the labor market or from long-term processes of societal development and transformation" (Hauser 1978, p. 920). Another attractive property of odds ratios is that, under the independence model, they are all 1s for all possible pairs of the row and column variables in a mobility table. Thus, measuring relative social immobility is tantamount to measuring deviations of odds ratios from 1.

Another way to understand odds ratios in a mobility table is to first calculate either row proportions (f_{ij}/f_{i+}) or column proportions (f_{ij}/f_{+j}) and compare a pair of row proportions (by taking the ratio) across two rows or a pair of column proportions (by taking the ratio) across two columns. This "ratio-of-ratio" measure is analogous to the difference-in-differences method now commonly used in quasi-experimental designs in economics (Angrist and Krueger 1999). When independence holds true, all row proportions, or column proportions, are exactly the same. For this reason, the independence model is also called the "homogeneous proportions" model (Powers and Xie 2008, p. 72).

Yet we will offer another interpretation of odds ratios that should be familiar to all of our readers. A mobility table can be analyzed by a multinomial logit model, with son's occupation as the dependent variable and father's occupation as the only independent variable that is categorical (Powers and Xie 2008). In this setup, only $(I-1)$ $(I-1)$ logit coefficients are identified. Odds ratios are exponentiated forms of these logit coefficients. Because in this case we have only a single categorical independent variable, and logit coefficients are symmetric between the dependent variable and the independent variable, we can obtain the same logit coefficients—hence, the same odds ratios—by regressing father's occupation (as the dependent variable) on son's occupation. The first logit regression is an analysis of outflows, whereas the second logit regression is an analysis of inflows. The two approaches are statistically equivalent, as far as the relevant logit parameters are concerned.

Also focusing on odds ratios, the Long-Ferrie study relies on Altham's (1970) index as the main method of yielding findings. While it has not been widely used in previous research on social mobility, Altham's index, denoted as d, is a sensible summary measure comparing two tables, involving comparisons of all possible odds ratios. Let f_{ijk} denote the observed frequency for the *i*th $(i = 1, \ldots, I)$ row, *j*th column $(j = 1, \ldots, J)$, and *k*th layer $(k = 1, 2)$.[7] We rewrite Altham's index as

$$(4) \qquad d(k = 1, 2) = \left| \sum_{i=1}^{I} \sum_{i'=1}^{I} \sum_{j=1}^{J} \sum_{j'=1}^{J} \left(\log \frac{f_{ij1} f_{i'j'1}}{f_{i'j1} f_{ij'1}} - \log \frac{f_{ij2} f_{i'j'2}}{f_{i'j2} f_{ij'2}} \right)^2 \right|^{1/2}.$$

That is, Altham's index is the square root of the sum of squared differences in corresponding logged odds ratios between the two tables being compared across all possible permutations by row and column. For this reason, Long and Ferrie (2013 p. 1116) recommend that we can interpret it as "the distance between the row-column associations in Tables **P** and **Q**." In a typical setup for comparing two mobility tables (***Q*** and ***P***), Long and Ferrie first compare them separately to a table generated under the independence model (denoted as ***J***) to see which table is closer to independence and, thus, shows more mobility and then compare them directly to assess the overall difference between the two tables. Along with these indices, the authors also report log-likelihood ratio chi-squared statistics for the comparisons.

It should be noted that the mobility rate, the odds ratio, and Altham's index do not take into account the potential ordering of occupational categories. While many sociologists believe in distinct and discontinuous social positions (sometimes called "classes") as represented by occupational categories, they are still interested in the social hierarchy, or vertical dimension, of occupations (Grusky and Sørensen 1998; Hauser 1978). One should not simply assume that "social mobility" is something desirable or positive. For one thing, social mobility can be upward or downward. For another, social mobility *per se* tells us very little about the behavioral mechanisms for allocating workers to positions and the consequences of such allocations for the overall welfare of a population. For these reasons, we may wish to use mobility tables merely as *empirical descriptions* of concrete movements from father's to son's occupation. Comparing it to linear regression analysis with a continuous measure of socioeconomic status, Hauser (1978, p. 921) made the following justification of mobility table analysis:[8]

> *In short, mobility tables are useful because they encourage a direct and detailed examination of movements in the stratification system. Within a given classification they tell us where in the social structure opportunities for movement or barriers to movement are greater or less, and in so doing provide clues about stratification processes which are no less important, if different in kind, from those uncovered by multivariate causal models.*

In the standard literature on social mobility, the loglinear model has been the dominant method of choice. Similar to Altham's index, the loglinear model enables

[7] In Altham's notation, tables ***Q*** and ***P*** are referred to so as to suppress the third subscript *k*. We use the third subscript *k* to be consistent with the general literature on comparative social mobility. We allow for $I \neq J$ in general, although in mobility analysis, $I = J$.

[8] Note that this approach departs sharply from the standard practice in the economics literature on intergenerational income mobility, where the focus is on intergenerational income elasticity (Chadwick and Solon 2002; Solon 1992; Zimmerman 1992), including trend analyses (Aaronson and Mazumder 2008; Lee and Solon 2009; Mayer and Lopoo 2005).

the researcher to focus attention on odds ratios. The advantages of the Altham statistic are discussed by Long and Ferrie (2013). However, the loglinear approach has three distinct advantages. First, it is a statistical model that smooths sampling error by borrowing information across cells. Second, it affords the researcher flexibility in modeling subtables or blocking out certain cells and thus finding out local structures in social mobility nonparametrically (Goodman 1972; Hauser 1978). Third, the loglinear model can be extended to capitalize on, or to extract information about, rank-order information in mobility tables, especially via Goodman's (1979) influential work. One particular hypothesis that has received a lot of attention in the loglinear tradition is called the "quasi-independence" model, which specifies that the independence assumption as stated in equation (2) holds true for all other cells after excluding diagonal cells representing direct inheritance. The Long-Ferrie study also considers this hypothesis.

In the loglinear analysis of a mobility table, the researcher is interested in understanding how the two-way association between the row variable (abbreviated as R, son's occupation in our case) and the column variable (abbreviated as C, father's occupation in our case) depends on the third dimension-layer (abbreviated as L, time period in our case). Let F_{ijk} denote the expected frequency in the ith row, the jth column, and the kth layer. The saturated loglinear model can be written as

$$\text{(5)} \qquad \log(F_{ijk}) = \mu + \mu_i^R + \mu_j^C + \mu_k^L + \mu_{ij}^{RC} + \mu_{ik}^{RL} + \mu_{jk}^{CL} + \mu_{ijk}^{RCL}.$$

In a typical research setting, interest centers on the variation of the RC association across layers. That is to say, the researcher needs to specify and estimate μ^{RC} and μ^{RCL} in order to understand the layer-specific mobility. As Long and Ferrie (2013, p. 1133) recognize in their Appendix, "Xie (1992) is the standard reference for differences in mobility across tables calculated using conventional log-linear analysis." Xie's log-multiplicative layer effect model, also called the "unidiff" model, is to give a flexible specification for μ^{RC} but constrain μ^{RCL} so that equation (5) becomes

$$\text{(6)} \qquad \log(F_{ijk}) = \mu + \mu_i^R + \mu_j^C + \mu_k^L + \mu_{ik}^{RL} + \mu_{jk}^{CL} + \phi_k \psi_{ij}.$$

In this setup, ψ_{ij} is assumed to be the same across different tables, and the interest in comparing odds ratios across tables is captured by the ϕ_k parameter (Xie 2003). This model can be estimated via an iterative log-likelihood estimation method (Goodman 1979; Xie 1992).[9]

Long and Ferrie's (2013) key finding did not come from their comparison of the mobility tables using the total mobility rate M in equation (1). In their Table 2 and the associated text, they clearly document that the mobility rate is actually *lower* in the 1860–1880 data than in the 1973 data (50.6 percent versus 56.7 percent). It is only after adjusting for differences in marginal distributions using the proportional method that the authors are able to report a higher mobility rate in the 1880 data than in the 1973 data (57.7 percent versus 43.7 percent). Hence, whether we accept Long and

[9] A Stata program, "unidiff," is available for estimating this class of models.

Ferrie's principal finding hinges on whether or not we accept the proportional adjustment method that has been well understood and commonly accepted in the literature.

The Long-Ferrie study reports its main findings using Altham's (1970) index equation (4). Although the method is little known and has not been used in the prior literature on comparative social mobility, we do not think that Long and Ferrie's preferred method is responsible for their surprising conclusion. Indeed, they report a sensitivity analysis using a more conventional loglinear model of Xie (1992) in their Appendix, which shows similar, but less pronounced, findings. This is not surprising, because Altham's (1970) index measures, as does the loglinear model, differences or similarity in odds ratios across mobility tables.

III. The Unique Case of Farmers

While the literature on social mobility has long been focused almost exclusively on odds ratios, this practice has not gone unchallenged. In particular, Logan (1996) and Hellevik (2007) have argued that the invariance property of odds ratios to multiplicative changes in marginal distributions does not mean in general that they appropriately account for changes in supply and demand, i.e., overall changes in the marginal distribution of occupations. We acknowledge that by focusing on odds ratios, Long and Ferrie are indeed following a long tradition in the sociological literature on social mobility. Why, then, would we criticize a method that has been so routinely used, including in some of our own past work (i.e., Xie 1992)? The answer is that the very long span of the historical period over which Long and Ferrie compare mobility has heightened a weakness of the standard interpretation of odds-ratio measures of social mobility, as we will show below. Earlier research that examines trends across much smaller time horizons (and thus with smaller changes in the occupational structure) and blocks diagonal cells tends to hide the weaknesses associated with the use and interpretation of odds-ratio measures.

Our examination of the Long-Ferrie data has led us to question the use of odds ratios as valid measures of social mobility when social mobility is compared across regimes at very different levels of industrialization, such as the pre-1900 United States and the post-1970 United States. In particular, the fraction of the labor force that is composed of farmers changed dramatically over this period, and this change has substantial implications for the conclusions about social mobility drawn by Long and Ferrie.

Let us now recall Long and Ferrie's main conclusions in their study: (i) social mobility was higher in the 1880 United States than in 1881 Britain; and (ii) social mobility was higher in the 1880 United States than in the 1973 United States. These two patterns reported by Long and Ferrie mirror what we know about the level of industrialization of the two countries at the two time points: the agricultural sector of the US labor force was still large (around 50 percent) in 1880 but became very small (under 3 percent) in 1973, whereas the British labor force was overwhelmingly nonagricultural by 1881. Long and Ferrie entertained the rapid reduction in the farming sector in the United States as an explanation for their observed decline in social mobility in the United States but rejected the hypothesis. Their discussion mostly focuses on selectivity of farmers. We also consider this hypothesis, and our reanalysis of Long and Ferrie's data has led us to a different conclusion.

Table 2—Ratios of Observed to Predicted Counts in Two US Mobility Tables

	Father's occupation			
Son's occupation	White collar	Farmer	Skilled/ semiskilled	Unskilled
Panel A. 1860–1880 census				
White collar	2.41	0.72	1.32	0.86
Farmer	0.39	1.28	0.51	0.58
Skilled/Semiskilled	1.05	0.75	1.68	1.40
Unskilled	0.91	0.90	1.00	1.83
Panel B. 1973 OCG				
White collar	1.48	0.66	0.90	0.73
Farmer	**0.14**	**5.32**	**0.22**	0.42
Skilled/Semiskilled	0.56	1.07	1.17	1.27
Unskilled	0.63	1.26	1.00	1.42

Note: Predicted counts are based on the independence model.

Source: Data are from Tables 1 and 5 of Long and Ferrie (2013).

As we discussed before, Long and Ferrie follow the larger literature in defining social mobility in terms of how close odds ratios in an observed mobility table are to 1. The case of perfect mobility is the independence model, in which all observed frequencies are determined multiplicatively by marginal distributions, shown in equation (2). Lack of mobility, or social closure, means a deviation from the independence model. To observe concretely how an observed table departs from the ideal case of perfect mobility, we may take the ratio, cell by cell, between an observed table and the corresponding table using the same marginal distributions but satisfying independence (i.e., equation 2). In Table 2, we present such ratios for two key US tables in the Long-Ferrie study: one based on the 1860–1880 censuses and one based on the 1973 survey data.

We are immediately drawn to three large outliers (appearing in bold) in panel B, all pertaining to the social origins of farmers. As ratios of frequencies, all entries in Table 2 are positive, with 1 as the reference. A number much larger than 1 or much smaller than 1 is thus an outlier. For panel B (1973 data), the number of farmers with farmer fathers is far greater than expected under the independence model (the ratio being 5.3); the numbers of farmers with fathers who are white-collar workers and those with skilled and semiskilled workers for fathers are much smaller than expected (the ratios being 0.14 and 0.22, respectively). While there are clearly discrepancies between observed and predicted frequencies for panel A (1860–1880 data), we do not see any discrepancy of a similar magnitude.

We now conduct a few auxiliary analyses to understand how Long and Ferrie's main finding of a declining trend in mobility is caused by unusually large discrepancies for farmers between observed data and predicted data under independence in the modern era. First, Long and Ferrie's own result shows that the trend is no longer significant when the diagonal cells are removed from the analysis. In their comparison of the 1860–1880 and 1973 tables, the log-likelihood chi-squared statistic ($G2$) drops from 46.7 with nine degrees of freedom to 3.2 with five degrees of freedom.[10] This result

[10] This result was reported in an earlier version of the Long and Ferrie paper that was given to us.

suggests the very large role played by diagonal cells in producing Long and Ferrie's finding, but it does not in itself tell us whether or not their finding is valid.[11] Instead, it merely points the way to further investigation of the source of their surprising finding. Upon further investigation, we find that, while blocking the diagonals suffices to eliminate any statistical difference between the mobility of the 1860–1880 and 1973 periods, it is not necessary: most of this change is driven by a single cell—farmers with farmer fathers. If we block this cell from the analysis, the G^2 statistic declines to 11.8 with eight degrees of freedom.

Second, when we examine particular odds ratios that Long and Ferrie identified as components that contribute the most to the overall d statistic, we immediately notice the prominence of this diagonal cell of farmers with farmer fathers. As reported by Long and Ferrie, this cell is involved in all the top seven component odds ratios that contribute to the d statistic comparing the 1880 United States and the 1973 United States (their Table 6).[12] Finally, we carry out an exercise in which we force the distribution of farmers' social origin to be the same as the marginal distribution of all fathers, thus satisfying the independence condition. This alternation of data involving just one row of data wipes out completely the discrepancy between the 1880 United States and the 1973 United States using Long and Ferrie's own method:

$$d(\text{altered 1973 table}, \boldsymbol{J}) = 8.3,$$
$$d(\text{altered 1880 table}, \boldsymbol{J}) = 8.6,$$
$$d(\text{altered 1973 table, altered 1880 table}) = 4.8.$$

From these analyses, we conclude that indeed farming was the main source of Long and Ferrie's finding of high mobility in the 1880 United States as compared to the 1973 United States. These results are very similar to Long and Ferrie's own finding that, after removing cells of inflows to farming from the analysis, $d(\boldsymbol{P}, \boldsymbol{J}) = 8.00$ and $d(\boldsymbol{Q}, \boldsymbol{J}) = 8.15$, where $\boldsymbol{P}$ is the US 1860–1880 mobility table and $\boldsymbol{Q}$ is the US 1953–1973 table. Thus, the deviations from independence for the two tables are of very similar magnitude once farmers are removed. After excluding farmers, Long and Ferrie find that $d(\boldsymbol{P}, \boldsymbol{Q}) = 3.35$, a difference that is only marginally significant (p-value $= 0.08$) (Long and Ferrie 2013).[13]

However, Long and Ferrie still explicitly dismiss farming as the only source for the higher level of observed mobility in the 1880 United States. Given the above results, we are surprised by their summary statement that "the importance of farming by no means exhausts the sources of higher mobility in the US" (Long and Ferrie 2013, p. 1123). There is overwhelming evidence in their own data and analyses that it is due to farmers that social mobility measures based on odds ratios appear extraordinarily high in the nineteenth-century United States.

[11] We reiterate that there is nothing inherently superior about excluding diagonal cells.

[12] The same is true for their comparison between the 1880 United States and 1881 Britain (their Table 4). Odds ratios involving the diagonal cell of farmers with farmer fathers are often unusually large. For example, the odds ratio that involves the first two rows and first two columns of the 1973 US table is 84 (top row of their Table 6).

[13] Of course, even a significant difference here tells us only that the two mobility tables are different in odds ratios, not necessarily that mobility in the nineteenth-century United States is higher than that in the twentieth-century United States. As discussed earlier, mobility can be either upward or downward.

TABLE 3—FARMERS' SHARE IN LABOR FORCE AND RELATIVE FAMILY ORIGIN IN THE UNITED STATES, BY DATA SOURCE

	Share of labor force (percent)	By father's occupation (percent)			
		White collar	Farmer	Skilled/ semiskilled	Unskilled
Census 1850–1880					
Marginal		7.1	68.3	18.1	6.4
Farmers	50.9	4.3	83.3	9.0	3.4
Census 1860–1880					
Marginal		9.5	64.1	17.4	9.0
Farmers	43.9	3.7	82.2	8.9	5.2
Census 1880–1900					
Marginal		11.3	56.5	21.5	10.7
Farmers	31.5	3.4	83.7	7.4	5.5
OCG 1973					
Marginal		27.9	15.1	41.4	15.6
Farmers	2.5	3.9	80.3	9.2	6.6
GSS 1977–1990					
Marginal		38.6	9.1	41.9	10.4
Farmers	1.7	0.0	86.7	6.7	6.7
NSLY 1979					
Marginal		43.5	3.5	43.3	9.8
Farmers	1.3	7.7	61.5	15.4	15.4

Source: Data were provided by Joseph Ferrie. See Long and Ferrie (2013).

Should we conclude from this that farmers in the nineteenth century experienced higher rates of social mobility than those in the twentieth century? That is, should Long and Ferrie's general conclusion be modified as applicable only to farmers? Recall that an odds ratio necessarily involves the comparison of two rows and two origins, as shown in equation (3). Thus, by definition, there cannot be a measure of relative mobility *just* for farmers. However, it is possible to measure farmers' absolute mobility, with two possible rates. First, we can calculate the percentage of farmers' sons who no longer worked as farmers and call it "absolute outflow mobility." Alternatively, we can also calculate the percentage of farmers' fathers who were nonfarmers and call it "absolute inflow mobility." In the Long and Ferrie data, farmers' mobility for the 1880 census data was 53.4 percent by the outflow measure and 16.3 percent by the inflow measure, compared to, respectively, 86.5 percent and 19.7 percent for the 1973 data. In other words, according to absolute mobility measures, farmers in the nineteenth-century United States were *less*, rather than more, mobile than those in the twentieth-century United States. This is consistent with our earlier observation that, contradicting Long and Ferrie's overall conclusion, society-wide total mobility actually increased between the two time points being compared.

To examine relative social mobility of farmers, we compare social origins of farmers to those of nonfarmers across the six US datasets (ranked in chronological order), shown in Table 3. We observe a steady and rapid reduction of the share of farmers in the labor force, from 51 percent in the 1850–1880 census data to just over 1 percent in the 1979 NLSY data.[14] This societal change in the reduction of the farming labor force means that, structurally, many sons of fathers who were farmers had to leave the farm (Blau and Duncan 1967). This structural force is further exacerbated by the fact that farmers tend to have more children than nonfarmers (Duncan 1966).

As America became more and more industrialized, the proportion of sons with farmer fathers necessarily became smaller and smaller. This is apparent in Long and Ferrie's data, shown in the rows labeled "marginal" for each dataset in Table 3: the percentage of farmer fathers among all workers declines rapidly from 68 percent in the 1850–1880 data to 15 percent in the 1973 data, and further to under 4 percent in the 1979 NLSY data. According to the conventional operationalization of relative mobility based on odds ratios, perfect mobility means homogeneous proportions in social origin between farmers and nonfarmers (thus all workers). That is, under the independence model, we would expect the inflow distribution of farmers to mirror that of the "marginal." However, the independence assumption is strongly violated: the steady and rapid decline in the proportion of farmer fathers in general did not translate into a parallel decline in the proportion of farmer fathers *among farmers*, shown in the rows labeled "farmers" in Table 3. In fact, the distribution of father's occupation among farmers remains stable across all the American datasets in the Long and Ferrie study.[15] It does not matter how fathers' occupation is distributed overall; the majority of fathers among farmers (around 80 percent for almost all datasets) have always remained farmers.[16]

The unchanging pattern of father's occupation among farmers, despite the overall rapidly declining trend of farmer fathers, points to a unique feature of farming that challenges the independence model (or homogeneous proportions) as a general operationalization of social mobility applicable to all occupations. While it may be sensible in general to expect a cell in a mobility table to rise or fall as a function of marginal distributions, as shown in equation (2), under perfect mobility, it is however inappropriate to apply the proportionality principle to the case of farmers. The uniqueness of farmers was observed long ago by Duncan (1966, p. 68), who remarked that "[farming] is probably an extreme example of an occupation recruited from sons of men pursuing the same occupation."[17]

Why is farming unique? Because farming is one of the few occupations where direct inheritance from father to son was normative in the past and is still widely practiced today. Furthermore, even if direct inheritance is also strong for certain other occupations, such as shop-keeping, farming remains distinct because it has been treated not only as an occupation, but also as a broad occupational category (or a class). By contrast, shopkeepers represent a relatively small fraction of skilled workers, so even substantial direct inheritance by this small subgroup would not

[14] Note that the NLSY study *began* in 1979 when the subjects were young (14–22 years old). Long and Ferrie's mobility table from the NLSY pertains to jobs held by the subjects in years later than 1979.

[15] Indeed, it is roughly the same across many other datasets we have examined for this article. However, to ensure comparability across datasets and to save space, we present only the results for the US datasets used in the Long-Ferrie study.

[16] This is a unique feature pertaining only to farmers. For example, we repeated the same analysis for unskilled workers and did not find the dominance of fathers in the same occupation to be true throughout the datasets.

[17] Hout (1989) made a similar comment on the social origins of farmers in Ireland around the 1970s.

increase the overall direct inheritance of the class by much.[18] This uniqueness of farmers was noted in Blau and Duncan's (1967, p. 60) classic study, as they drew "a boundary between the industrial and the agricultural sectors of the labor force, which is manifest in the finding that both intergenerational and intragenerational movements from any nonfarm occupation to either of the two farm groups fall short of what would be expected under conditions of statistical independence." Building on Blau and Duncan's observation, economists Laband and Lentz (1983) provided an explanation using human capital theory: a son accumulates valuable human capital, both about farming in general and about particular soil farmed by his father while growing up on the farm. To prove their theoretical explanation, Laband and Lentz showed empirical evidence that farmers who had farmer fathers "earned a premium for the added experience they have over [their counterparts who did not have farmer fathers]" (p. 314).

Based on the insights of Duncan (1966), Blau and Duncan (1967), and Laband and Lentz (1983), as well as the empirical pattern shown in Table 3, we thus propose that farmers are unique in that they overwhelmingly come from farmer families, regardless of secular changes in the overall occupational structure. Of course this uniqueness can be sustained only when the agricultural sector is shrinking or at least not growing. If our proposition is taken to be true, then the declining trend of mobility from the nineteenth century to contemporary America that is reported by Long and Ferrie is simply an artifact of their statistical method of relying on the independence model as the reference and the proportional adjustment for differences in marginal distributions. That is, their measure of mobility merely captures the discrepancy of the conditional distribution of farmers' fathers from the marginal distribution of all fathers. Over time, the two distributions grow more and more dissimilar. This trend of growing dissimilarity over time is due to two separate social forces: on the one hand, industrialization diminishes the demand for farmers, but on the other hand, farming is such a unique occupation that the dominant inflow of farmers has remained of farmer origin. Long and Ferrie misidentified this trend of growing dissimilarity as a declining trend in social mobility. In fact, Long and Ferrie's main conclusion disappears once the farmer-farmer cell is removed from the analysis, and we also find no evidence that absolute mobility rates for farmers declined over the period.

Why has the literature on social mobility largely overlooked the uniqueness of farmers in the past four decades?[19] After all, they have almost all been concerned with odds ratios as measures of relative social mobility, just as Long and Ferrie were. In addition to the much larger time scale of the Long and Ferrie study, the loglinear approach, as commonly practiced, differs in one important respect: diagonal cells are often blocked out in loglinear models of mobility tables so that attention is focused only on independence for off-diagonal cells (called "quasi-independence"), whereas Long and Ferrie's main analysis includes diagonal cells. Although the method of blocking diagonal cells in loglinear analysis was not designed specifically to handle the unique case of farmers, who seem to defy the independence

[18] Using microclasses, Jonsson et al. (2009) indeed show that farmerlike inheritance exists for certain occupations, but the inheritance pattern is lost when such occupations are grouped in broader occupational categories.

[19] Exceptions include Blau and Duncan (1967), Duncan (1966), Guest (2005), and Hout (1989).

hypothesis in terms of being proportional to marginal distributions, it is fortuitous that this practice effectively removes the confounding influence of the uniqueness of farmers in comparative studies of social mobility in past research. Sociologists should be grateful that Long and Ferrie's work has brought to our attention again the uniqueness of farmers, which, in turn, challenges a conventional operationalization widely accepted in sociology for relative social mobility, or fluidity. The sociological literature, which has focused on shorter time spans and blocked diagonals, has obscured a severe limitation of odds-ratio measures.

IV. Conclusion

We congratulate Long and Ferrie on their significant contribution to an already large literature on comparative social mobility. Using data from linked historical censuses, the Long-Ferrie study has provided, for the first time, nationally representative data on social mobility in the nineteenth-century United States and Britain. The valuable historical data allow them, as well as other scholars in the future, to examine long-term trends in social mobility and to compare mobility regimes across countries in a distant past. Long and Ferrie's main claim is that, compared to either today's United States or Britain at the same time, the pre-1900 United States exhibited an unusually high level of social mobility.

Has social mobility in America declined? The answer is no. In this paper, we have discussed two sets of issues in the Long-Ferrie study. First, the data quality of the Long-Ferrie study is more limiting than the authors acknowledge. Second, Long and Ferrie's key finding hinges on an operationalization of the concept of "social mobility" in terms of odds ratios, manifested in results using Altham's index for whole tables. We have shown that odds ratios–based measures equating statistical independence to perfect mobility are inappropriate for farmers. Long and Ferrie's reliance on such measures in comparing mobility tables with vastly different proportions of farmers led them to an incorrect conclusion that social mobility was much higher in the nineteenth-century United States than in the twentieth-century United States.

If Long and Ferrie's key finding is no more than a methodological artifact, why have so many other researchers in the loglinear tradition missed it? Along with the lack of long-term trend data in the past, another important reason is that the loglinear model is both too powerful and at the same time too complicated. The power of the loglinear model lies in its ability to fit any observed data with flexible parameterization. In particular, researchers are often quick in fitting diagonal cells to block out immobility when their models do not fit observed data. That is to say, the temptation to fit empirical data well, even at the risk of masking interesting patterns begging explanations, has unfortunately led sociologists astray in the past. As we showed earlier, and as Long and Ferrie explained, diagonal cells do carry useful information and do matter. We would not have learned as much as we did from Tables 2 and 3, if we had excluded diagonal cells early on. Much of the uniqueness of farmers has to do with a diagonal cell: farmers from farmer origins. To make the loglinear model powerful in explaining observed data well, sociologists often fit many parameters but do not always exercise care in interpreting them. Only through applying Long and Ferrie's simple and descriptive approach did we arrive at the conjecture that farmers may be qualitatively distinct from other workers in keeping their social origin distribution constant over time. We invite other researchers to debate and evaluate our conjecture in future studies.

REFERENCES

Aaronson, Daniel, and Bhashkar Mazumder. 2008. "Intergenerational Economic Mobility in the United States, 1940 to 2000." *Journal of Human Resources* 43 (1):139–72.

Altham, Patricia M. 1970. "The Measurement of Association of Rows and Columns for an r × s Contingency Table." *Journal of the Royal Statistical Society, Series B* 32: 63–73.

Angrist, Joshua D., and Alan B. Krueger. 1999. "Empirical Strategies in Labor Economics." In *Handbook of Labor Economics Volume 3A*, edited by Orley Ashenfelter and David Card, 1277–366. Amsterdam: Elsevier Science, North-Holland.

Blau, Peter M., and Otis Dudley Duncan. 1967. *The American Occupational Structure*. New York: Wiley.

Breen, Richard, and Jan O. Jonsson. 2007. "Explaining Change in Social Fluidity: Educational Equalization and Educational Expansion in Twentieth-Century Sweden." *American Journal of Sociology* 112 (6):1775–1810.

Chadwick, Laura, and Gary Solon. 2002. "Intergenerational Income Mobility among Daughters." *American Economic Review* 92 (1): 335–44.

Duncan, Otis Dudley. 1966. "Methodological Issues in the Analysis of Social Mobility." In *Social Structure and Mobility in Economic Development*, edited by N.J. Smelser and S.M. Lipset, 51–97. Chicago: Aldine.

Erikson, Robert, and John H. Goldthorpe. 1992. *The Constant Flux: A Study of Class Mobility in Industrial Societies.* New York: Oxford University Press.

Featherman, David L., and Robert M. Hauser. 1978. *Opportunity and Change*. New York: Academic Press.

Featherman, David L., F. Lancaster Jones, and Robert M. Hauser. 1975. "Assumptions of Social Mobility Research in the US: The Case of Occupational Status." *Social Science Research* 4 (4): 329–60.

Ganzeboom, Harry B.G., Donald J. Treiman, and Wout C. Ultee. 1991. "Comparative Intergenerational Stratification Research: Three Generations and Beyond." *Annual Review of Sociology* 17: 277–302.

Goodman, Leo A. 1972. "Some Multiplicative Models for the Analysis of Cross-Classified Data." In *Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability*, vol. 1, edited by Lucien Le Cam, Jerzy Neyman, and Elizabeth L. Scott, 649–96. Berkeley, CA: University of California Press.

Goodman, Leo A. 1979. "Simple Models for the Analysis of Association in Cross-Classifications Having Ordered Categories." *Journal of the American Statistical Association* 74 (367): 537–52.

Grusky, David. 1986. "American Social Mobility in the Nineteenth and Twentieth Centuries." University of Wisconsin Center for Demography and Ecology, Working Paper 86–28.

Grusky, David B., and Robert M. Hauser. 1984. "Comparative Social Mobility Revisited: Models of Convergence and Divergence in 16 Countries." *American Sociological Review* 49 (1): 19–38.

Grusky, David B., and Jesper B. Sørensen. 1998. "Can Class Analysis Be Salvaged?" *American Journal of Sociology* 103 (5): 1187–1234.

Guest, Avery M. 2005. "Frontier and Urban-Industrial Explanations of US Occupational Mobility in the Late 1800s." *Social Science Research* 34 (1): 140–64.

Guest, Avery M., Nancy S. Landale, and James C. McCann. 1989. "Intergenerational Mobility in the Late Nineteenth Century United States." *Social Forces* 68 (2): 351–78.

Hauser, Robert M. 1978. "A Structural Model of the Mobility Table." *Social Forces* 56 (3): 919–53.

Hauser, Robert M., John N. Koffel, Harry P. Travis, and Peter J. Dickinson. 1975. "Temporal Change in Occupational Mobility: Evidence for Men in the United States." *American Sociological Review* 40 (3): 279–97.

Hellevik, Ottar. 2007. "'Margin Insensitivity' and the Analysis of Educational Inequality." *Czech Sociological Review* 43 (6): 1095 –1119.

Hout, Michael. 1983. *Mobility Tables*. Beverly Hills, CA: Sage Publications.

Hout, Michael. 1988. "More Universalism, Less Structural Mobility: The American Occupational Structure in the 1980s." *American Journal of Sociology* 93 (6): 1358–1400.

Hout, Michael. 1989. *Following in Father's Footsteps: Social Mobility in Ireland*. Cambridge, MA: Harvard University Press.

Jovanovic, Boyan, and Robert Moffitt. 1990. "An Estimate of a Sectoral Model of Labor Mobility." *Journal of Political Economy* 98 (4): 827–52.

Jonsson, Jan O., David B. Grusky, Matthew Di Carlo, Reinhard Pollak, and Mary C. Brinton. 2009. "Microclass Mobility: Social Reproduction in Four Countries." *American Journal of Sociology* 114 (4): 977–1036.

Laband, David N., and Bernard F. Lentz. 1983. "Occupational Inheritance in Agriculture." *American Journal of Agricultural Economics* 65 (2): 311–14.

Lee, Chul-In, and Gary Solon. 2009. "Trends in Intergenerational Income Mobility." *Review of Economics and Statistics* 91 (4): 766–72.

Lipset, Seymour Martin, and Reinhard Bendix. 1964. *Social Mobility in Industrial Society*. Berkeley: University of California Press.

Logan, John Allen. 1996. "Rules of Access and Shifts in Demand: A Comparison of Log-Linear and Two-Sided Logit Models." *Social Science Research* 25 (2): 174–99.

Long, Jason, and Joseph Ferrie. 2013. "Intergenerational Occupational Mobility in Great Britain and the United States Since 1850." *American Economic Review* (103) 4: 1109–137.

Long, Jason, and Joseph Ferrie. 2013. "Intergenerational Occupational Mobility in Great Britain and the United States Since 1850: Dataset." *American Economic Review.* http://dx.doi.org/10.1257/aer.103.4.1109.

Manski, Charles F. 1995. *Identification Problems in the Social Sciences*. Cambridge, MA: Harvard University Press.

Mayer, Susan E., and Leonard M. Lopoo. 2005. "Has the Intergenerational Transmission of Economic Status Changed?" *Journal of Human Resources* 40 (1): 169–85.

Powers, Daniel A., and Yu Xie. 2008. *Statistical Methods for Categorical Data Analysis*. second ed. Howard House, England: Emerald Group Publishing.

Ruggles, Steven, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. 2009. *Integrated Public Use Microdata Series: Version* 4.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor] Retrieved June 1, 2009, http://usa.ipums.org/usa/.

Rytina, Steven. 2000. "Is Occupational Mobility Declining in the US?" *Social Forces* 78 (4): 1227–76.

Sobel, Michael E., Michael Hout, and Otis Dudley Duncan. 1985. "Exchange, Structure, and Symmetry in Occupational Mobility." *American Journal of Sociology* 91 (2): 359–72.

Solon, Gary. 1992. "Intergenerational Income Mobility in the United States." *American Economic Review* 82 (3): 393–408.

Vallet, Louis-André. 2001. "Forty Years of Social Mobility in France." *Revue française de sociologie* 42: 5–64.

Xie, Yu. 1992. "The Log-Multiplicative Layer Effect Model for Comparing Mobility Tables." *American Sociological Review* 57 (3): 380–95.

Xie, Yu. 2003. "Association Model." In *Encyclopedia of Social Science Research Methods*, edited by M. Lewis-Beck, A. Bryman and T. Futing Liao, 30–33. Thousand Oaks, CA: Sage Publications.

Xie, Yu, and Alexandra Achen Killewald. 2010. "Historical Trends in Social Mobility: Data, Methods, and Farming." Paper presented at the annual meeting of International Sociological Association Research Committee 28 on Stratification, Haifa, Israel.

Xie, Yu, and Alexandra Killewald. 2013. "Intergenerational Occupational Mobility in Great Britain and the United States Since 1850: Comment: Dataset." *American Economic Review*. http://dx.doi.org/10.1257/aer.103.5.2003.

Zimmerman, David J. 1992. "Regression toward Mediocrity in Economic Stature." *American Economic Review* 82 (3): 409–29.

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