

# Analyses of Intergenerational Mobility: An Interdisciplinary Review

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This article reviews the sociological and economic literature on intergenerational mobility. Findings on social class, occupational status, earnings, and income mobility are discussed and discrepancies among them are evaluated. The review also examines nonlinearities in the intergenerational association, variation in mobility across advanced industrial countries, and recent mobility trends in the United States. The literature suggests an association between inequality and economic mobility at the country level, with the United States featuring higher inequality and lower mobility than other advanced industrial countries. However, mobility has not declined in the United States over the recent decades in which inequality has expanded. The inequality-mobility relationship fails to emerge when occupational measures of mobility are used, likely because these measures do not fully capture some mechanisms of economic reproduction.

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## Intergenerational Mobility: Definition and Measures

Social scientists operationalize mobility as the extent and pattern of association between parents' and adult children's socioeconomic

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standing, where higher association means less mobility. Socioeconomic standing is captured by different measures—the most common are social class, occupational status, individual earnings, and family income. The methodological approaches used to measure mobility depend on the measure of socioeconomic attainment used. This article reviews the analysis of mobility based on each one of these four measures, and briefly discusses the factors accounting for discrepancies among them. I also review nonlinearities in the intergenerational association, mobility differences across countries and their potential determinants, and recent trends in mobility in the United States. While this review focuses on the parent-children association, the final section briefly describes sibling correlations as a measure of mobility.

Sociologists favor occupational measures to evaluate intergenerational mobility while economists focus on earnings and income. The distinction is not just disciplinary, nor is it trivial. Empirical research shows that findings about levels of mobility in different countries and trends over time vary depending on the measure used. While the sociological analysis of class and status mobility dates back to the 1960s and may have experienced its golden years in the 1970s to 1990s, economic mobility research has burgeoned in the last two decades. Topics with a long tradition in sociology—for example, mediators of intergenerational reproduction or the distinction between absolute and relative mobility (e.g., Blau and Duncan 1967; Sewell and Hauser 1975)—are being tackled anew by economists (e.g., Eide and Showalter 1999; Bowles and Gintis 2002; Blanden, Gregg, and Macmillan 2007; Chetty, Hendren, Kline, and Saez 2014). Much mobility analysis is descriptive and bivariate—no small feat given the methodological challenges to obtain unbiased estimates—but analysis of “mediating factors” and variation across time and place are interesting extensions. Much has been learned about levels, patterns, and trends of mobility. However, the attribution of causality—to what extent and through which mechanisms family economic standing affects children’s socioeconomic attainment—is a more challenging task that researchers are starting to consider.

## Occupational Status Mobility

Sociological analysis of mobility relies on occupations, collapsed into highly aggregated classes or ranked into a one-dimensional status hierarchy. *Occupational status* is a weighted average of the mean level of earnings and education of detailed occupations. Occupational status has important advantages as a measure of economic standing: collecting information about occupations is relatively easy and faces fewer issues in terms of recall, reliability, refusal, and stability than measures of earnings or income (Hauser and Warren 1997). Furthermore, information about parents can be reported retrospectively by adult children, circumventing the need for long-term panels. Status strongly correlates with other social and economic variables, and it remains relatively stable over the individual occupational career, so a single measure provides adequate information of long-run standing (Hauser et al. 2000; Hauser 2010). Some economists have claimed that

occupational status may even be a better indicator of long-term economic standing than single-year income measures (Goldberger 1989; Zimmerman 1992).

However, status also has some limitations for the analysis of mobility. The occupational education of women tends to exceed men's, while the occupational earnings of men usually surpass women's. This makes the composite status measure problematic to account for differences across genders (Warren, Sheridan, and Hauser 1998). Furthermore, Hauser and Warren (1997) demonstrated that occupational education rather than occupational earnings accounts for the large majority of intergenerational association over time.

A long and rich tradition of sociological research has examined the intergenerational stratification process using occupational status, starting as early as in the 1960s. *Absolute* status mobility has been operationalized as the change in average occupational status over time. In the United States, substantial increase occurred for cohorts born in the first half of the twentieth century, but there has not been further upgrading in mean status after that (Hauser et al. 2000). *Relative* status mobility is measured by a regression model in which child's status is regressed on parental status, and the regression coefficient captures status persistence. Over the last few decades, the occupational status association for white men has ranged between 0.30 and 0.45, with an average value close to 0.40. The occupational status association is much weaker (and imprecisely estimated) for black men (Blau and Duncan 1967; Hauser et al. 2000). There is some indication that the occupational status association has declined from the 1960s to the 1980s, but evidence is weak and formal tests of trends are usually lacking (Grusky and DiPrete 1990; Beller and Hout 2006).

While current studies of economic mobility are rediscovering the mediating role that education and other factors play in the mobility process, the role of education and other mediators in mobility has a long tradition in sociological analyses of occupational status mobility (Blau and Duncan 1967; Sewell and Hauser 1975). Sociologists have modeled the life course, including parents' status and education, adult children's education, cognitive ability, significant other's influences, and status in first and current job, among other variables by means of structural equation models. One important finding was that education is *both* the main vehicle for intergenerational reproduction and the main avenue for mobility (Hout and DiPrete 2006). Education is the main vehicle for reproduction because most of the intergenerational association is mediated by children's educational attainment. The "direct" effect of parental status, once education is accounted for, is nonzero but relatively minor (Blau and Duncan 1967; Sewell, Haller, and Portes 1969; Sewell and Hauser 1975). Education is the main avenue for mobility because the majority of the variance in schooling within populations is not accounted for by parental resources, but rather by other factors, disentangling educational attainment from the advantages of birth.

### *Measurement issues in the analysis of status mobility*

Even if occupational status is a relatively stable measure with limited misreporting, it is still affected by measurement error, resulting from "within occasion

between variable” and “within variable between occasion” variation. Research suggests that measurement error results in a 15 to 20 percent downward bias in the intergenerational association (Bielby, Hauser, and Featherman 1977). Surprisingly (and reassuringly) no substantially higher measurement error was found in retrospective reports of parental occupation than in contemporary reports about one’s own occupation. Some analyses of occupational mobility adjust for measurement error, but many do not.

The intergenerational status regression coefficient captures the average change in children’s status associated with a one-unit increase in parents’ status, assuming a linear relationship. Research on occupational status does not evaluate (or at least does not report) the distribution of occupational status, tacitly assuming that it is approximately normal or, if not normal, that the intergenerational regression coefficient is not affected by departures from normality. Depending on the population under analysis, this assumption may be problematic, as there may be substantial kinks in the distribution (for example, in less-developed countries a large proportion of fathers are farmers). In addition, analyses do not explicitly attempt to evaluate departures from linearity in the intergenerational status association (for example, by adding higher-order terms or using spline functions), although these strategies are easy to implement.

## Class Mobility

Measures of status subsume all sources of socioeconomic advantage into a single scale. Classes are instead categorical groupings based on specific occupational assets that determine life chances as expressed in outcomes such as income, health, and wealth (Grusky and Weeden 2006), and which are differentially affected by economic and institutional factors such as technological change, and labor market and welfare policy (Breen and Whelan 1996). For this reason it is claimed that classes cannot be ranked into a single hierarchical dimension, and they capture the “causes of inequality and not simply its surface manifestations” (Portes and Hoffman 2003, 43).

The most widely used class classification was devised by Erikson, Goldthorpe, and Portocarero (1979), based on different types of “employment relations.” First, a distinction is made among employees, self-employed, and employers. Among employees, a further distinction is made between a “service relationship”—a longtime exchange entailing a comprehensive compensation package and career prospects, which characterizes highly skilled workers—and a “labor contract relationship,” involving a short-term specific exchange of time or product for pay. Classes are claimed to be defined by the varying amounts of these relationships. In practice they are based on the following attributes of occupations: (1) employer/employee/self-employed; (2) skill level; (3) authority in the workplace (supervisor status and number of supervisees); and (4) sector (urban/agricultural and manual/nonmanual).

In its most detailed formulation, this classification distinguishes twelve classes, but it is usually collapsed into seven or five groups for comparative analysis

(Erikson and Goldthorpe 1992; Breen 2005). In the seven-class formulation, this schema distinguishes among professional and managers, clerical workers, self-employed, farmers, skilled manual workers, unskilled manual workers, and farm workers.

As with status mobility, there is a long tradition of class mobility analysis looking at the mediating role of education and other factors in the intergenerational transmission process. Research indicates that education plays a substantial role in the intergenerational transmission of class position, but in virtually all national contexts, a “net” intergenerational class association remains after schooling has been accounted for (this may be an artifact of highly aggregated measures of schooling and/or absence of educational quality measure, however). Importantly, Ishida, Muller, and Ridge (1995) have demonstrated that the mediating role of education varies widely across classes. For example, reproduction of the professional class is almost entirely mediated by educational credentials, while the reproduction of self-employment largely bypasses the educational system.

### *Measurement issues in the analysis of class mobility*

Given that classes entail occupational assets that vary not only in their amount but also in their type, the analysis of class mobility is not restricted to movements up and down in a socioeconomic ladder. Rather, it considers barriers to mobility emerging from the ownership of different types of assets such as property, sectoral barriers, or authority in the workplace. Analysis of the intergenerational class association treats classes as nominal (although orderable) categories.

At the most basic level, the mobility table cross-classifying parental class with adult children's class provides information on the total observed flows between classes of origins and classes of destination, called “absolute mobility.” Measures of absolute mobility include, for instance, the proportion of individuals that remain in the same class of their parents (“immobile”), and if a ranked order of classes is assumed, the proportion that moves upward or downward, gaining or losing status. It also communicates the origins composition of each class of destination—the column percentages in the mobility table, conventionally called “inflow distribution”—and the destination distribution of each class of origins—the row percentages, called “outflow distribution.” Inflow and outflow distributions provide information about class formation and transformation across generations.

Absolute mobility flows can be meaningfully divided into two dimensions. The first dimension is the transformation of the class structure over time, called *structural mobility*, and expressed in disparity in the mobility table marginals. Structural mobility is interpreted as a consequence of exogenous economic and demographic factors such as technological change, economic policy, foreign trade, fertility and immigration (Hout 1989). The most important of these factors during the twentieth century was the transformation from an agricultural to a service-based economy. This transformation led to a significant upgrade in national class structures, creating “room at the top”—in the professional and nonmanual classes—and reducing positions in agriculture, thereby inducing a large amount of upward class mobility.

The second dimension of mobility, called *relative mobility*, refers to the association between origins and destinations, net of structural change. Relative rates of mobility indicate the level of *social fluidity* or “social openness” or the degree of “equality of opportunity” in a society. Relative mobility is measured through odds ratios in the mobility table. Free from marginal effects, odds ratios express the competition between people with different origins to attain diverse classes of destination. To put it crudely but correctly, the odds ratio between, for instance, the professional and the manual classes expresses the chances that someone with origins in the professional class becomes a professional rather than a manual worker, relative to the chances that someone with origins in the manual class becomes a professional rather than a manual worker. Thus, odds ratios combine the unskilled manual class’s “chances of success” and the professional class’s “chances of failure” in the same measure, providing a margin-free measure of competition for advantaged positions (Goldthorpe 2000, 252).

Odds ratios close to unity (1) reflect relative equality of opportunity. Relative mobility is analyzed using log-linear models, which capture the association between origins and destinations through a relatively small number of parameters that are a function of the odds ratios. Log-linear models are used to account for main sources and types of intergenerational association, interpreted as the main barriers to mobility. Some of these models are topological, that is, they use a single matrix to model different levels of association without assuming a rank-order for social classes. These models include, for example, the quasi-independence model (assuming a higher probability of remaining in the class of origin), the quasi-symmetry model (assuming that flows are symmetrical around the main diagonal), and the “levels” model (postulating zones of the table with different levels of association). The “crossing” model uses multiple matrices to capture the varying difficulty of crossing barriers between classes. Yet other log-linear models treat classes as strictly ordinal and estimate a single parameter similar to a linear regression coefficient to capture the intergenerational association, for example, the linear-by-linear association model and the row-and-column model (Hout 1983; Hauser 1978).

An important, theoretically derived model of class mobility is the *core model*, claimed to represent basic similarity in mobility across industrialized countries (Erikson and Goldthorpe 1987a, 1987b, 1992). The core model is topological, but instead of emerging from a single allocation of cells it uses several matrices intended to capture different factors driving the intergenerational association: hierarchy (status differences between classes), inheritance (class-specific propensity to remain in the class of origins), sector (barrier between agricultural and nonagricultural classes), and affinity/disaffinities between specific pairs of classes. Log-linear analysis of class mobility provides a very flexible tool to capture the intergenerational association between classes, not constrained by linearity or even ordinality assumptions, although these possibilities can be empirically tested by means of goodness-of-fit statistic comparisons.

Specific methods have been devised to compare mobility across units, such as countries, cohorts, or time points. A parsimonious comparative approach is the

log-multiplicative layer effect model also known as uniform difference model (Xie 1992; Erikson and Goldthorpe 1992). This model formulates the origin-destination association across tables as a function of two components: one describes the pattern of association for all units being compared, and the other captures the layer-specific deviation from the overall association. This model captures departures in strength of the association while assuming a common pattern across units, which can be restrictive in some empirical instances. Goodman and Hout (1998) offer an extension of this formulation, a “modified regression-type approach,” which can accommodate differences in pattern as well as strength of the intergenerational association. This model is, however, more challenging to implement and interpret and has not yet been widely used in the comparative analysis of class mobility.

It is important to mention that relative class mobility is a construct without empirical correlate and that it accounts for a small portion of the total mobility experienced by individuals across generations, while structural mobility accounts for most of it, or, put in other words, “people live in the margins (of the mobility table)” (Breen 1987; Hout and Hauser 1992; Hauser, Koffel, et al. 1975; Hauser, Dickinson, et al. 1975; Featherman and Hauser 1978, 217). However, class mobility analyses focus on the relative dimension of mobility because, by controlling for changes in the class structure across generations, the study of relative mobility uncovers the underlying social mechanism that allocates people of different origins to different destinations, identifying the *causes* and *patterns* of transmission of advantage across generations. Depending on the contextual features, changes in the relative and structural dimensions of mobility could offset each other. For example Hout (1988) demonstrated that absolute mobility remained relatively constant between 1972 and 1985 in the United States as a result of two offsetting forces: increased social fluidity and decline in structural mobility.

### *Unit of analysis for the study of class mobility*

Even though proponents of class analysis maintain that the family, rather than the individual worker, is the “unit of class fate” (Erikson and Goldthorpe 1992, 233), it is not self-evident how class status should be measured at the family level (Sørensen 1994). Several alternatives have been offered by the literature, including measuring the class position of the father/husband (“conventional approach”), the class position of the spouse with a stronger labor market involvement or higher class position (“dominance approach”), or a combination of both spouses if both are employed (“joint approach”).

This issue is not trivial because the assessment of mobility may depend on how class is measured. Beller (2009) shows that when the social class of mothers is included, models fit better than those including only fathers’. Furthermore, the assessment of mobility trends in the United States changes when mothers’ class origins are incorporated; while stability over time is found using only fathers’ class, declining mobility is found after including mothers’ class position.

## Earnings Mobility

The study of earnings mobility evaluates the intergenerational association by means of a linear regression of the log-transformed version of parents' and children's earnings, or the percentile rank of these respective earnings. The double-log transformation addresses the right-skew of earnings distributions. If the double-log formulation is used, the regression coefficient is an elasticity that captures, approximately, the average percent change in children's earnings associated with a 1 percent change in parental earnings. With this formulation, a regression coefficient of, say, 0.4, indicates that a 10 percent difference in parents' earnings will lead, on average, to a 4 percent difference in the children's generation. In other words, this indicates that if two fathers' earnings differ by 10 percent, their children's earnings will differ, on average, by 4 percent. An alternative to the log-log formulation is to run a regression of the percentile rank of children's earnings on the percentile rank of parents' earnings. This formulation permits including observations with zero earnings (omitted by the double-log formulation) and may be closer to linearity in some instances (Chetty, Hendren, Kline, and Saez 2014). In this case a regression coefficient of 0.4 indicates that a 10 percentile point increase in parents' rank results in a 4 percentile point increase in children's rank.

The elasticity and rank coefficient are not affected by the change in mean income across generations. By measuring the association in terms of percent or rank change, these measures adjust for economic growth or contraction over time. Thus, these measures capture relative, not absolute, mobility. The rank coefficient is not sensitive to the variance of the dependent and independent variables, that is, to the extent of earnings inequality in each generation and its change across generations. However, the intergenerational elasticity is. While empirical values of elasticities usually range between 0 and 1, it is possible for an elasticity to take values larger than 1 if earnings dispersion increases substantially across generations (something seldom seen, but see Grawe 2004).

The intergenerational correlation adjusts the elasticity by the ratio of the standard deviation of father's earnings and children's earnings ( $\sigma_{FE}/\sigma_{CE}$ ). As a result, the correlation is not mechanically affected by changes in inequality across generations, and it ranges between 0 and 1, with 0 indicating independence between origins and destination and 1 indicating perfect association. The distinction between the elasticity and the correlation coefficient is important if there is substantial change in earnings inequality across generations, such as experienced in the recent past in the United States. In a context of rising inequality, the elasticity will be higher than the correlation because  $(\sigma_{FE}/\sigma_{CE})$  will be less than 1.

### *Measurement issues in the analysis of earnings mobility*

Initial assessments of intergenerational earnings mobility in the 1980s considered single-year measures of earnings for either (the parent or children) generation. These analyses yielded father-son intergenerational elasticities of about



0.15–0.20 (Becker and Tomes 1986; Behrman and Taubman 1985), leading to the conclusion that earnings were not strongly transmitted across generations. As concluded by Becker and Tomes (1986, S32), “aside from families victimized by discrimination . . . almost all earnings advantages and disadvantages of ancestors are wiped out in three generations.” But the consensual figure of intergenerational elasticity was raised to about 0.40 in the 1990s (Solon 1999), and had an even higher value of around 0.50 in the 2000s (Mazumder 2005a). These updates were due to better measurement of earnings in either generation, and to the use of larger, nationally representative datasets. Most recently, however, Chetty, Hendren, Kline, and Saez (2014) find a surprisingly low intergenerational elasticity of 0.34 using high-quality tax data.

The recent literature has shown at least three sources of bias in early measures of the intergenerational earnings elasticity/rank coefficient: (1) transitory (and autocorrelated) fluctuation around long-run income, (2) age-related errors in variables bias, and (3) life cycle bias (Jenkins 1987; Mazumder 2005a, 2005b; Black and Devereux 2011).

### *Transitory fluctuation*

The analysis of intergenerational mobility has its conceptual basis in the notion of “permanent income” (Friedman 1957), which states that it is the permanent expectation of income that determines consumption and ultimate economic welfare. So the relationship of interest is between parents’ and children’s permanent standing. However, data on mobility are usually taken from surveys that contain measures for a single or a few years, with only Scandinavian countries, Canada, and, most recently, the United States having—to date—exploited administrative records that contain information over extended periods of time for both generations.

From a permanent income perspective, transitory fluctuation and error from one year to the next is a form of measurement error. Under classical measurement error assumptions, error in the dependent variable (children’s earnings) is not a source of bias. But measurement error in the explanatory variable (fathers’ earnings) results in biased and inconsistent coefficients, usually downward (Zimmerman 1992; Solon 1992; Peters 1992).

To reduce measurement error, researchers resort to averaging fathers’ earnings over several years to better approximate permanent income. Research has shown that attenuation bias declines as the number of averaged years increases. Using high-quality social security data on earnings, Mazumder (2005a, 2005b) found intergenerational earnings elasticities of about 0.25 when fathers’ earnings are averaged over two years. But the estimate increased to about 0.6 when fathers’ earnings are averaged over 16 years. Mazumder (2005a) shows that five-year averages are not enough because observations are usually too close together to be representative of life cycle earnings, and that the remaining bias crucially depends on the extent of temporal autocorrelation in fathers’ earnings. In a useful empirical exercise, Mazumder assumed that transitory variance is half of total income variance and that there was no autocorrelation, and found that the

attenuation factor goes from 0.51 with a single-year measure of income to 0.91 with 10 years' worth of data. However, with autocorrelation of 0.7 (not an unreasonable figure), the figures are 0.50 and 0.71, respectively. Even with as many as 30 years' worth of data, the downward bias of the elasticity remains 0.85 if the autocorrelation coefficient is 0.7. Measurement error in earnings (but not "real" year-to-year fluctuation) is significantly reduced when administrative data are used (Chetty, Hendren, Kline, and Saez 2014).

### *Age-related errors-in-variables*

If the variance of the transitory component of earnings changes considerably over the life cycle, averages taken at a time when earnings are noisy may lead to further bias. Baker and Solon (2003) find that innovations to the transitory component of earnings follow a U-shaped pattern across age, with vertex around age 40. This suggests that earnings measured at that age minimizes attenuation bias.

### *Life cycle bias*

Furthermore, the association between current and lifetime earnings is not constant over the life cycle because of heterogeneous age-earnings profiles. Individuals who will have high lifetime earnings typically have steeper earnings growth than those with low lifetime earnings. As a result, the early career earnings gap between low and high lifetime earners tends to underestimate the gap in lifetime earnings. One important implication of this source of bias is that the age in which earnings are measured for both parents and children matters for producing an unbiased estimate of the elasticity (Jenkins 1987; Haider and Solon 2006; Mazumder 2008; Grawe 2006). In other words, the standard errors-in-variables assumption that measurement error in the dependent variable (children's earnings) is innocuous is wrong. Estimations of the relationship between current and permanent income reveal that income should be measured between the early thirties and the mid-forties in the United States (Haider and Solon 2006). Chetty, Hendren, Kline, and Saez (2014) suggest, again surprisingly, that estimates of mobility stabilize when children reach their late twenties, much earlier than previously thought.

### *Methodological alternatives to address measurement error*

In addition to using administrative data, an alternative to address measurement error in fathers' earnings is to use an instrumental variable approach. For this approach, a variable related to parents' earnings but unrelated to measurement error (and, of course, to children's earnings except through parents' earnings) is needed. Such a variable is very difficult to find. Usually, variables selected as instruments—father's education or occupation—are related to children's earnings via factors other than parents' earnings, violating the exclusion restriction. This usually induces upward bias in the estimated elasticity, resulting in

instrumental variable estimates usually providing an upper bound for the intergenerational elasticity.

If parental earnings are not available in the main dataset that contains information on adult children's earnings but other parental characteristics predicting parental earnings (such as schooling, experience, and occupation) are, a two-sample instrumental variable (TSIV) approach can be used (Arellano and Meghir 1992; Angrist and Krueger 1992). The strategy requires information from two surveys. In a first step, earnings equations can be estimated on an older sample of men (which will represent the parental generation) to obtain coefficients of some earnings determinants such as schooling, experience, and occupation. Then, these coefficients can be used to predict the earnings of the fathers in the main dataset of adult children, using the same earnings predictors as those used in the older sample. This strategy will produce estimators of intergenerational persistence that will be upward biased in the same way as other instrumental variable estimators, as they will convey not only the association between children's and parental earnings, but also the net influence of the instrumental variables used to predict parental earnings. They can, therefore, be used as an upper bound of intergenerational persistence. This approach has been used for mobility analysis in several national cases and in international comparisons (Björklund and Jäntti 1997; Mocetti 2007; Piraino 2007; LeFranc and Trannoy 2005).

## Total Family Income Mobility and the Mobility of Women

Early economic analysis of mobility focused on father-son pairs and on individual earnings. Over the last two decades, the study of economic mobility has expanded in three related directions: to consider total family income, including daughters, and to consider the role of assortative mating in the mobility process.

Like class and status, earnings provide a measure of well-being strictly based on the labor market. As a result, it does not include those who are not working or extra-occupational resources, such as financial assets and public and private transfers. These extra-occupational resources are central at either extreme of the economic distribution—among the “underclass” poorly attached to the labor market (Grusky and Weeden 2008) and among the “overclass,” whose income largely depends on returns to capital. By focusing on the family rather than the individual or the occupational group as the unit of analysis, measures of total family income capture the economic position of those not in the labor force and include occupational and extra-occupational pecuniary sources. Furthermore, this measure is a result of family-level dynamics, such as spousal selection (assortative mating) and intrahousehold division of labor (Torche 2011). Given that women's labor market engagement is still weaker than men's, the examination of income mobility may provide a more comprehensive account for women. Furthermore, when the analysis is extended from individual earnings to family income, the question about the contribution of assortative mating becomes central.

Increasingly, mobility research has considered family income as a measure of economic standing in the parental or in both generations. The intergenerational

income association tends to be higher than the earnings association (Solon 1992; Harding et al. 2005; Mayer and Lopoo 2004, 2005; Lee and Solon 2009), suggesting avenues for the transmission of advantage beyond labor market resources and rewards. To date, research has examined assortative mating as one of these mechanisms, but there are plausible others such as direct transmission of income-producing assets.

Much research links analysis of women's mobility with the question of assortative mating. Chadwick and Solon (2002) examine total family income mobility for sons and daughters and include the contribution of assortative mating to intergenerational persistence using a model introduced by Lam and Schoeni (1993). They find an income elasticity of around 0.4 for daughters and around 0.5 for sons. They also find that assortative mating based on social origins plays a crucial role for both genders, but a stronger one for women because a spouse's contribution to household income tends to be larger for women than for men. Ermisch, Francesconi, and Siedler (2006) use the same model and extend the analysis to a U.S.-Germany comparison. Like Chadwick and Solon, they find that assortative mating plays an important role—about 40 to 50 percent of the covariance between parents' and own permanent income can be attributed to one's spouse, for both sons and daughters. Hirvonen (2008) finds both a similarly strong role of assortative mating and a similar level of family income elasticity across gender in Sweden as in the United States.

Consistently across countries, it is found that women display lower earnings elasticities than men (e.g., Jäntti et al. 2006), but income elasticities are similar across genders (Mayer and Lopoo 2005; Torche 2011). A weaker earnings elasticity among women than men may be related to assortative mating and labor supply among women, at least in some national contexts. Raaum et al. (2007), using a comparative analysis of the United States, UK, and Scandinavian countries, show that married women with children and husbands with affluent backgrounds tend to reduce their labor supply in the United States and UK but not in Scandinavia. This weakens the intergenerational association between married women's own earnings and their parents' earnings in the Anglo countries.

Less work exists that explicitly distinguishes mothers from fathers in the parental generation. Although mothers' economic contributions are implicitly included in measures of parental family income, analysts have not examined a potentially different contribution by mothers' economic resources. One exception is Fertig (2003), who examines mother-children as well as father-children pairs and finds impressively low individual earnings elasticities for mother-children pairs (this finding considers cohorts born around 1960 and may be historically specific).

In summary, research shows that the persistence of total family income is stronger than the persistence of individual earnings, and that assortative mating substantially contributes to intergenerational persistence for both men and women. This suggests that the family, rather than the individual, is a relevant unit of intergenerational stratification for both genders.

## Divergences in Findings between Sociological and Economic Measures of Mobility

The analysis of occupational status, class, earnings, and income mobility does not necessarily yield the same results, as these variables capture different dimensions of socioeconomic advantage (Beller and Hout 2006). However, to the extent that they capture the same latent concept—socioeconomic standing or well-being—we should expect a close correlation. This is not the case: empirical analysis shows widely different results for class/occupational status mobility when compared with earnings/income mobility in cross-country and over-time comparisons.

While the United States consistently ranks as the least mobile of the advanced industrial countries in terms of earnings or income mobility, it emerges as relatively fluid when class mobility is analyzed (Erikson and Goldthorpe 1992; Björklund and Jäntti 2000; Blanden 2013). Furthermore, a strong correlation exists between income/earnings mobility and economic inequality across countries (Corak 2013; Blanden 2013), so much so that these two measures have even been used as substitutes for each other (Kearney and Levine 2014). In contrast, no correlation exists between economic inequality and class mobility. Erikson and Goldthorpe (1992) correlated class mobility with cross-sectional inequality across thirteen industrialized countries and found a very weak relationship; a more recent analysis of eleven European countries found no association between these variables (Breen and Luijkx 2004). Other discrepancies between occupational status and income/earnings mobility also exist. For example, while educational attainment accounts for most—about 85 percent—of the intergenerational occupational status association, it accounts for only about half of the intergenerational association of total family income in the United States (Torche 2013; for an earlier related finding, see Sewell and Hauser 1975). This again suggests that family income may be a more comprehensive measure of socioeconomic standing, insofar as it includes extra-occupational assets.

What can explain such divergent results from economic and occupational mobility? Different measures of economic standing will provide a dissimilar evaluation of intergenerational mobility to the extent that the distributions of these measures are not perfectly correlated and, crucially, to the extent that deviations across distributions are strongly correlated across generations (Björklund and Jäntti 2000). A recent controversy about the British case shows this point empirically. Findings indicate stability in class mobility over time but a decline in income mobility between the 1958 and 1970 birth cohorts (Goldthorpe and Mills 2008; Erikson and Goldthorpe 2010; Goldthorpe 2013; Blanden et al. 2004; Blanden, Gregg, and Macmillan 2007, 2013). In theory, these discrepancies could be accounted for by several factors, including a change in the association between class and income in the parental generation, decline in measurement error or transitory component of income across cohorts, or growing relevance of within-class family income for children's outcomes. Blanden, Gregg, and Macmillan (2013) suggest that the most important factor explaining declining income but not class mobility in Britain is that dimensions of income not

explained by social class (i.e., income variation within class) have become more important for children's outcomes. While social class mobility analysis has major advantages—class is a relatively stable measure over the adult life cycle such that transitory variation and measurement error are much less of a concern than with income measures—one important limitation is that classes are highly aggregated groupings, which miss important variation in socioeconomic advantage. One solution would be to use more detailed occupations or “micro-classes” (Weeden and Grusky 2005; Jonsson et al. 2009), but the problem may still persist if deviations across distributions are strongly correlated across generations. The discrepancies are relevant because they force researchers to evaluate which dimensions of socioeconomic well-being each measure captures and why the differences matter for theoretical and policy considerations.

## Nonlinearities in the Intergenerational Economic Association

Intergenerational elasticities and correlations are useful summary measures, but they may conceal interesting detail about intergenerational mobility at different points of the joint distribution. Researchers have used different techniques to relax the linearity assumption, including spline or locally weighted regressions, adding higher-order polynomial terms of the predictor, transition matrices across quintiles or other percentiles of the earnings distribution, kernel density, and quantile regression approaches (Corak and Heisz 1999; Couch and Lillard 2004; Peters 1992; Eide and Showalter 1999). Spline or locally weighted regressions provide a flexible account of the conditional son's earnings mean across the distribution of parental earnings. For example, Corak and Heisz (1999) find that the intergenerational mobility in Canada is greater at the lower end than at the upper end of the earnings distribution by using locally weighted regression.

Examination of nonlinearities by means of these approaches has been used to address substantive questions of interest, for example, the impact of credit constraints on mobility. As suggested by Becker and Tomes (1986), credit constraints are a severe deterrent to mobility, and they may be particularly severe for low-income parents. This pattern would result in a concave intergenerational association curve (strong association among poor families, weaker association among better-off families). However, some empirical research in the United States has found the opposite—a convex relationship (Behrman and Taubman 1990; Solon 1992).

Han and Mulligan (2001) account for such convexity by suggesting that higher-earning families are more likely to have high-ability children and so may be more credit constrained if returns to human capital rise with ability (and if education is costly, of course). To the extent that the optimal level of investment is higher for high-ability parents, then the intergenerational association may be convex. Also, strongly egalitarian public educational systems could result in a convex intergenerational association. For example, Bratsberg et al. (2007) found that the intergenerational elasticity is close to linear in the United States and UK (this

contradicts recent findings by Chetty, Hendren, Kline, and Saez [2014] who find substantial nonlinearities in the United States), but the pattern is convex in Denmark, Finland, and Norway, suggesting that the convexity in the Nordic countries is related to the egalitarian public education systems and redistributive welfare states that foster access to education among disadvantaged families.

Grawe (2004) adds a necessary note of caution by showing that nonlinearities in the intergenerational association do not provide a conclusive test of the effect of credit constraints on mobility. He shows that earnings-ability correlations could lead to varying types of non-linearities depending on different assumptions and that, in the absence of credit constraints, other factors may explain a nonlinear association.

A more direct approach to test the credit constraints hypothesis is to define groups that are more likely to be constrained explicitly. Mazumder (2005a) finds less mobility among families with low wealth (but not low income), which supports the hypothesis of credit constraints among the asset-poor. Mulligan (1997) split the sample by those who expect to receive an inheritance. He finds no significant difference in intergenerational mobility between the two groups and concludes that borrowing constraints do not appear to be an important determinant of intergenerational mobility. Gaviria (2002) defines the nonconstrained as those who have actually reported receiving large financial transfers or whose parents have a high net worth. He finds some evidence that intergenerational mobility is in fact lower among borrowing-constrained families. Grawe (2004) tests the hypothesis that constraints depend on children's ability and proxies ability by means of children's earnings level conditional on parents' earnings using quantile regression. Constrained sons should be those whose earnings are high conditional on their father's earnings. Credit constraints should result in a stronger association among sons at higher conditional quartiles, particularly of low-earning fathers, but Grawe fails to find evidence supporting this hypothesis (a disadvantage of this approach is that earnings depend on investments as well as abilities and so are endogenous to the presence of credit constraints).

*Transition matrices* collapse parents' and children's income into percentiles (usually quintiles or deciles) and examine the bivariate cross-classification. Transition matrices account for any change in dispersion across generations by dividing it into equally sized groups in both generations, so they are unaffected by changes in inequality. A standard (and trivial) finding of transition matrix analysis is that there is much more persistence in the extremes ("corners") than in the middle percentiles—an artifact of ceiling and floor effects. Differences in corner persistence across countries or time can however be usefully examined for comparative purposes. For example, Jäntti et al. (2006) used transition matrices to examine differences in the pattern of mobility among the United States, UK, and Scandinavian countries, and found much lower upward mobility out of the poorest quintile group in the United States than in Scandinavia. As rudimentary as they are, transition matrices provide useful information about the symmetry in the mobility flows: is the reproduction of poverty or rags-to-riches mobility more prevalent than reproduction of wealth or riches-to-rags movement?

Bhattacharya and Mazumder (2011) criticize the standard transition matrix approach for relying on arbitrary discretizations of the distribution, which is strongly affected by measurement error (O'Neill, Sweetman, and Van de Gaer 2007). They propose a new measure of upward mobility—the probability that a son's percentile rank in the earnings distribution of sons exceeds the father's percentile rank in the earnings distribution of fathers. In effect, this implies more weight is placed on small moves, as mobility is noted even if it does not involve the son's quintile (or other discrete measure) being different from the quintile of the father. They show that the distinction can matter in practice as the degree of upward mobility of blacks is found to be more similar to that of whites when the new measure is used.

*Quantile regression* extends the traditional mobility analysis from prediction of a conditional mean to prediction of different percentiles of the adult children's conditional earnings. When diverse predicted percentiles are obtained, quantile regression provides an assessment of the dispersion of son's income around the central tendency at different levels of parents' income. This is an important measure, which adds information to the average level of reproduction obtained from the elasticity. For example, several studies have found that the association is greater at the bottom of the son's conditional earnings distribution (e.g., the 10th percentile), but it declines monotonically as children's conditional earnings percentile increases (Eide and Showalter 1999; Fertig 2003; Torche 2013). This amounts to a varying dispersion of son's earnings at different levels of parental earnings—specifically, a “fanning in” pattern of association, indicating that the dispersion in son's earnings is wider at lower than at higher levels of father's earnings. In other words, children of wealthy parents are more likely to be homogeneously wealthy than children of poor parents are likely to be homogeneously poor. As put by Jäntti, “perhaps the variation of the elasticity should be considered an index of mobility (in addition to the elasticity).”<sup>1</sup>

## Variation in Mobility across Countries

Becker and Tomes's (1986) framework suggests that parents make optimal financial investments in their children. If access to credit markets is perfect, then there will not be a direct relationship between parents' income and investments—any intergenerational relationship will only emerge from the inheritance of endowments such as cognitive ability and household socialization. In this context, public policy could foster mobility in two ways: investing in the human capital development of disadvantaged children—weakening heritability—and financing higher education to ameliorate the effect of credit constraints. (Naturally, this would be valid if public and private investments are substitutes, rather than complements, in the production of human capital.) Under this model, then, investment in public education, particularly at the lower levels of schooling, should promote mobility.

Solon (2004) offers a stylized version of the Becker-Tomes model, derived under the simplifying assumptions of steady state and equal variance in both generations. The intergenerational association coefficient is explained in terms of



public and private investments in children. Intergenerational persistence is postulated to be a function of automatic heritability of human capital endowments such as cognitive ability (which increases the intergenerational association), productivity of investments in human capital (increases association), returns to education (increases the association), and progressivity of public investments in human capital (reduces the association). Based on this model, then, countries with lower returns to schooling and more progressive educational investments should feature higher levels of mobility.

Many studies have undertaken international comparisons of economic mobility and have provided some empirical evidence for these relationships. Several reviews exist that compare estimates of elasticity across advanced industrial countries using (relatively) similar methods and assumptions (Solon 2002; Jäntti et al. 2006; Corak 2013; Björklund and Jäntti 2009; Blanden 2013). These studies consistently indicate that Scandinavian countries feature the highest levels of mobility, while the United States, the UK, and Italy have stronger intergenerational association. These studies also explored the association between the intergenerational earnings elasticity and several macro-level factors. Consistent with Solon's (2004) model—and with common sense—they found a negative correlation between elasticity and cross-sectional inequality, as popularized in the “Great Gatsby” curve (Corak 2013), a negative correlation with returns to schooling, and a positive correlation with educational spending, particularly in primary education (Ichino, Karabarbounis, and Moretti 2011).

Particularly interesting analyses are offered by Mayer and Lopoo (2008) and Rauscher (2014), who attempt to capture determinants of mobility variation across time and place using causal inference techniques. Mayer and Lopoo (2008) use fixed effects and find weaker elasticities in U.S. states with larger per child spending. Rauscher (2014) combined instrumental variable and regression discontinuity approaches to find a causal effect of educational equalization on mobility using historical census data. Chetty, Hendren, Kline, and Saez (2014) also found substantial variation in mobility across regions in the United States. Such variation correlates with several local factors in the parental generation, including economic inequality, test scores (net of income), lower dropout rates, smaller class size, higher local taxes, social capital indices, and, probably the strongest predictor, family structure. These correlations do not, naturally, prove a causal relationship, but given the high-quality data used, they provide suggestive evidence.

## Trends in Intergenerational Mobility in the United States

The increase in economic and educational inequality over the last three decades in the United States suggests that the intergenerational elasticity should have declined. However, the evidence is mixed and inconclusive, with findings from diverse datasets differing widely. Findings based on the Panel Study of Income Dynamics (PSID) show an increase in mobility among men born in the 1950s and 1970s, although this trend usually fails to reach statistical significance, due to the small sample sizes (Fertig 2003; Mayer and Lopoo 2004; Hertz 2007; Lee and

Solon 2009). In sharp contrast, analysis based on the National Longitudinal Surveys (NLS) show a decline in mobility between cohorts born in the late 1940s to early 1950s and those born in the early 1960s (Levine and Mazumder 2002; Bloome and Western 2011).

Analysts have also used census data to address trends. Because the census does not permit matching parents with adult children, analysts create a “synthetic cohort” of parents, which is less than ideal. This analysis finds that the intergenerational income elasticity declined between 1950 and 1980 but then increased over the 1980s and 1990s (Aaronson and Mazumder 2008). Interestingly, they find that the increase in elasticity mirrors the recent surge in income inequality in the United States but that there is less similarity with trends in the intergenerational correlation. A similar finding is obtained by Harding et al. (2005), who report a decline in the intergenerational correlation during the 1960s and stability from the 1970s to 1990s. In contrast, recent analysis using tax records finds virtually no change in the intergenerational association across the cohorts born between the early 1970s and the early 1990s (Chetty, Hendren, Kline, Saez, et al. 2014). In sum, no clear answer emerges in terms of mobility trends in a context of growing inequality and a cautious answer would be one that suggests no substantial change over time. Before the Chetty, Hendren, Kline, Saez, et al. (2014) analysis, this inconclusiveness could have been attributed to data limitations. But the analysis using a large administrative dataset with little measurement error suggests stability over time may be an accurate finding.

## Sibling Associations

Parent-children associations are not the only way to describe the extent of family influences. Sibling (usually brothers) correlations of socioeconomic attainment provide what has been claimed to be a broader measure of family persistence insofar as they include the myriad of family, community, and neighborhood factors shared by siblings when they are growing up. As a result, brother's earnings provide a better fit for own income than father's earnings does and brothers correlations are usually higher than parent-children correlations.

A good approach to estimating sibling correlations when more than one single measure of income for each sibling exists is a variance component model (Björklund and Jäntti 2009). Under this formulation, the correlation becomes the ratio of the variance of the family effect to the sum of the individual and family effect variances, that is, the share of long-run income that is attributable to family background. Sibling correlation in earnings can be shown as  $\rho = b^2 + s$  where  $b$  is the intergenerational earnings elasticity and  $s$  is a measure of all variables shared by siblings that are unrelated to parents' earnings (Solon 1999).

The consensus value of the correlation of log earnings between brothers in the United States of about 0.4 does not seem to have changed much since Solon (1999). For example, Mazumder (2008) reports brother correlations of almost 0.5 in the National Longitudinal Survey of Youth-79 (NLSY-79) and about 0.4 in the

PSID. Björklund et al. (2002) compare sibling correlations across several countries and find estimates of just over 0.4 for the United States and, consistent with the findings for intergenerational elasticities, much lower estimates for Nordic countries (see also Raaum, Salvanes, and Sørensen 2006). These figures suggest that almost half of economic inequality in the United States can be attributed to family and community influences. If we assume an intergenerational earnings elasticity of about 0.5 for the United States and a sibling correlation of 0.4, the formula presented above implies that about five-eighths of the sibling correlation can be attributed to father's earnings, leaving a substantial role for other shared variables (Black and Devereux 2011).

Only a few studies have investigated the factors accounting for sibling correlations in socioeconomic outcomes. Hauser, Sheridan, and Warren (1999) and Warren, Sheridan, and Hauser (2002) show that the effects of family background on occupational status operate entirely through their effects on education and cognitive ability. Altonji and Dunn (2000) find evidence of linkages between siblings in unobserved preferences for work hours. Björklund, Jäntti, and Solon (2005) use administrative registry data from Sweden to examine earnings correlations among a variety of sibling types and decompose the correlation into genetic and environmental components. Results vary across specification, but they suggest that there is a large genetic component—even the smallest estimates of the genetic component of earnings variation suggests that it accounts for about 20 percent of earnings inequality among men and more than 10 percent among women. As to the influence of neighborhood, research consistently shows a very small role. Solon, Page, and Duncan (2000) find that neighborhood accounts for at most one-fifth of the factors family share. Using a large sample from Norwegian registry data, Raaum, Salvanes, and Sørensen (2006) reach a similar conclusion: neighborhood correlations in log earnings are low, and they play a small role in brother correlations in earnings. By the same token, Oreopoulos (2003) finds neighborhood correlations that are very close to zero in Canada.

## Conclusion

The study of intergenerational mobility has seen both substantive and methodological advances over the last two decades. We know with some certainty that there is a substantial correlation between cross-sectional inequality and intergenerational economic mobility across countries, with Scandinavian countries demonstrating low-inequality and high-mobility, and the United States, the UK, and, to a lesser extent, France and Italy showing high-inequality with low-mobility (Smeeding, Erikson, and Jäntti 2011, 8). At the same time, mobility has not changed much in the United States over the last few decades, despite growing inequality. These dual findings pose a conundrum and challenge us to further understand the relationship between inequality and mobility. While it is intuitively plausible that inequality in one generation shapes the extent of association between that generation and the next (Goldthorpe 2000, 254), many matters

need further elucidation. These include: What are the appropriate time lags to describe the association between inequality and mobility? What are the first-order effects versus externalities? Are there potential tipping points? And, perhaps more importantly, is the relationship spurious, driven by factors such as welfare state arrangements, political systems and cultural values; or does economic inequality directly cause a reduction in mobility? While some scholarship has started to use causal inference techniques to examine factors determining mobility (e.g. Mayer and Lopoo 2008; Rauscher 2014), more research exploiting exogenous variation in these putative causal factors is needed. This is, naturally, a major challenge that may be addressed by merging natural experiments with datasets with information on parents and adult children.

Another controversial topic in the study of mobility is the discrepancy in findings when using occupational versus economic measures of socioeconomic well-being. As suggested by the sociological tradition, it may very well be that earnings, social class, and occupational status measure different domains of well-being. If that is the case, it would be beneficial to explore exactly what these domains are and why they matter for both theoretical and policy reasons. Empirical examination of the causes of such discrepancies (e.g., Goldthorpe 2013; Blanden, Gregg, and Macmillan 2013) helps us to understand the mechanisms for transmission of advantage that each of these concepts capture, and invites more research in this area in different national contexts.

More generally, despite the substantial measurement advances, the evaluation of intergenerational mobility is still plagued with inconsistent findings. In the United States, for example, recent high-quality estimates of the intergenerational elasticity vary from approximately 0.3 (Chetty, Hendren, Kline, and Saez 2014) to 0.6 (Mazumder 2005a). This is a very wide difference that suggests qualitatively different mobility regimes. The inconsistencies are not restricted to magnitude of the intergenerational association. They extend to existence and type of nonlinearities, and to trends over time. My suspicion is that this is to a large extent still a corollary of data limitations. To the extent that most mobility analysis to date has been based on survey data with small sample sizes, capturing different cohorts, and relying on limited measures of parents' and children's income, inconsistencies are expected. In this sense, the recent access to high-quality administrative data offers an enormous advantage. It is too early to say that studies using administrative data will provide a conclusive answer, but researchers should do everything possible to ascertain whether findings are stable and consistent using different subsamples or sources of administrative data.

Another recent development is the study of mechanisms for intergenerational mobility. A rich sociological tradition in status attainment research starting in the 1960s examined these mechanisms, focusing on education and on the early occupational career, and then extending the analysis to include cognitive ability, aspirations, significant other's influences, and other social-psychological factors (Blau and Duncan 1967; Sewell, Haller, and Portes 1969; Sewell and Hauser 1975). As discussed, a crucial finding in the status attainment tradition is that education is at the same time the main vehicle for reproduction and the main source of mobility. More recent research shows that education plays not only a mediating but

also a moderating role. The net intergenerational association substantially varies across levels of schooling and is particularly weak among the highly educated (Hout 1988; Torche 2011). This finding is important because it suggests that as educational expansion across cohorts “pushes” a larger number of people to levels of schooling where the intergenerational association is weaker, social mobility will increase over time (this conclusion holds to the extent that this finding is not driven by unobserved selectivity of the highly educated).

Recent work by economists has reinvigorated the search for mediators of mobility and has included cognitive skills, personality traits, education, and occupational experiences (Bowles, Gintis, and Groves 2005; Blanden, Gregg, and Macmillan 2007; Smeeding, Erikson, and Jäntti 2011; Ermisch, Jäntti, and Smeeding 2012). An important discovery in the search for mechanisms is that early circumstances—starting in utero and through early childhood—are crucial for the transmission of advantage (Case and Paxson 2006; Palloni 2006). Childhood poverty and resources are seen as particularly relevant for long-term outcomes (Duncan, Ziol-Guest, and Kalil 2010). Researchers suggest that socioeconomic differences in cognitive and noncognitive factors emerge early in the life course and seem to widen little over time (Ermisch, Jäntti, and Smeeding 2012) such that “a child who falls behind may never catch up” (Heckman 2006, 1900). Even without such a deterministic emphasis, early circumstances are now known to play an important role in the intergenerational reproduction of advantage. The revival of studies about mobility mechanisms is, however, challenged by methodological concerns: controlling for mediators in a structural equation model does not necessarily capture causal associations, which are ultimately the relationships of interest (Imai et al. 2011). In sum, the study of mobility has made substantial progress but more descriptive and causal analysis is needed to arrive at conclusive findings. The growing availability of high-quality data combined with creative analytical strategies offers the opportunity to move the understanding of mobility forward.

## Note

1. Personal communication.

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