

# **Levels and Trends in the Income Mobility of U.S. Families, 1977-2012**

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# Levels and Trends in the Income Mobility of U.S. Families, 1977–2012

Katharine Bradbury

**Abstract:**

Much of America’s promise is predicated on economic mobility—the possibility that people can move up and down the economic ladder during their lifetimes. Mobility is of particular consequence when economic disparities are increasing. Using panel data and mobility concepts and measures adapted from the literature, this paper examines 10-year income mobility levels and trends for U.S. working-age families during the time span 1977–2012. According to many measures, mobility, already limited in the 1978–1988 decade, declined over ensuing decades: families’ later-year incomes increasingly depended on their starting place, and the distribution of longer-term family incomes became less equal.

**JEL codes:** D31, D63, I32, J15

**Keywords:** Income mobility, income inequality, income distribution

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Much of America’s promise is predicated on the existence of economic mobility—the idea that people are not limited or defined by their current economic circumstances, but can move up the income ladder based on their effort and accomplishments. Changes in economic mobility are of particular consequence when economic disparity among families is increasing over time, as has been the case in the United States in recent decades. If family income inequality is increasing, changes in the degree to which families move up and down can either offset or amplify longer-term inequality—and loosen or tighten the link between a family’s circumstances in any given year and its later outcomes. Other things being equal, an economy with rising mobility—one in which families move increasingly frequently or traverse increasingly greater distances up and down the income ladder—will result in a more equal distribution of lifetime incomes than an economy with declining mobility.

This paper examines patterns of income mobility of U.S. families with working-age heads and spouses between 1977 and 2012, using data from the Panel Study of Income Dynamics (PSID) and a number of mobility concepts and measures. Calculating these measures for overlapping decades, the paper documents mobility levels and trends based on a post-tax-and-transfer measure of family income adjusted for family size. If one considers mobility only in terms of movement out of an origin income group (a quintile for example), 10-year mobility between 1977 and 2012 was 70 to 80 percent of what would be expected if the end-of-period income group had been independent of the starting group. Moreover, when the distance of moves or changes in detailed rank are accounted for, mobility in these decades was even more limited compared to the same “independent-of-starting-point” standard—as low as one-quarter as great.

By and large, different mobility measures yield similar pictures of mobility time trends over the 1977–2012 time span. Most mobility measures indicate that family income mobility was lower in the more recent decades than in earlier decades. Comparing 1978–1988 with the most recent decade in the study (2001–2011), mobility declined to a statistically significant degree according to many measures, both overall and for families beginning near the bottom of the income distribution. Upward mobility for those starting in the poorest quintile declined especially markedly over the last two decades studied (1999–2009, 2001–2011), both of which

included portions of the Great Recession.

As the opening paragraphs above indicate, a key reason for studying mobility trends is a concern with lifetime income inequality. Although the calculations reported here track families' incomes over 10 years (far less than a lifetime), the results show that the distribution of long-term income (family income averaged over 10 years) has been much more unequal in recent decades than in the 1980s. The trend has been visibly steep, regardless of the measure of inequality or income employed. Thus, whether or not the declines in measured mobility are significantly different from zero, mobility has been insufficient to offset the considerable rise in short-term (cross-sectional) inequality.

The paper proceeds as follows: The first section below provides an overview of the existing literature related to changes over time in family income mobility. The following section discusses concepts of income mobility and defines the measures used in this paper. The next section describes the data and sample used in the analysis, the measure of income and how it is adjusted for family size, and the mobility periods examined. Two sections follow, reporting and discussing results according to various mobility measures and examining their time trends. The final section summarizes and discusses the results.

## **Related Literature**

An extensive literature explores the extent of economic mobility that individuals and families have experienced during their lifetimes in the United States and other nations.<sup>1</sup> Much of that research focuses on earnings mobility, examining how individuals' earnings have changed over time. Another set of papers focuses on family income mobility, measuring the degree to which specific families' incomes change from one point in time to another, and a subset of that research investigates how family income mobility patterns have changed over

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<sup>1</sup> An even larger literature documents *intergenerational* mobility, that is, how individuals' adult income positions compare with the positions of their parents when those individuals were children. One recent paper, Plewis and Bartley (2014), investigates how *intragenerational* mobility (parental income changes) while children are growing up may influence the degree of *intergenerational* mobility via educational attainment; their analysis is in terms of social class rather than income, but the same may be true of income mobility.

time. The current paper contributes to the former and especially the latter literature, measuring intragenerational U.S. family income mobility with a variety of measures and in many overlapping time periods in order to explore the relative levels and time patterns of family mobility according to these measures. It investigates the degree to which the income positions of families in the United States at a point in time reflect their income positions 10 years earlier, and further asks whether U.S. families were more or less likely to move up and down the family income ladder in recent periods than in earlier decades, comparing, for example, mobility during the 2001–2011 period (the most recent available) with mobility during 1978–1988 (the earliest available) or with some other 10-year period in the middle of the 1978–2011 span. And it explores whether the answer to this question depends on the specific measures of mobility or family income considered.

At least a dozen research papers examine U.S. family income mobility in two adjacent “long” periods (mostly decades), focusing largely on relative (quintile- or decile-based) mobility measures.<sup>2</sup> Using data from the PSID, Acs and Zimmerman (2008a) report “no change” in family income mobility between 1984–1994 and 1994–2004, although the reported values of their quintile-based mobility measures decreased somewhat between the two decades. Based on tax returns, Auten and Gee (2009) find the “degree of relative income mobility among income groups” very similar in 1987–1996 and 1996–2005, although mobility out of the top quintile declined somewhat between the two periods. Hungerford (2008, 2011) compares the 1980s with the 1990s and finds that “relative income mobility was lower in the 1990s than in the 1980s” (2008, p. 9) and, more specifically, that “reranking or positional income mobility decreased from the 1980s to the 1990s” (2011, p. 96). Bradbury and Katz (2002) see a slight decline in mobility between the 1980s and the 1990s, following no change between the 1970s and 1980s. Carroll, Joulfaian, and Rider (2006) find that relative mobility declined somewhat between 1979–1986

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<sup>2</sup> Fields and Ok (1999) compare the early part of two decades, but use only absolute measures—income flux and directional income change—based on changes in log income (which they describe as “a particular facet of the multi-faceted notion of income mobility,” p. 467). They say their finding of a statistically significant increase in (family) income flux in the United States between the 1969–1976 and 1979–1986 periods complements “earlier findings of others who demonstrated that relative mobility in the United States has been unchanged or falling over the same period of time” (p. 457).

and 1987–1995. Jenkins and Van Kerm (2006) uncover declines in U.S. six-year mobility (reranking) from 1981–1986 to 1987–1992. Kopczuk, Saez, and Song (2010) document both very low levels and slight decreases in U.S. earnings mobility between the early 1970s and 2004, especially for men, measured either as rank correlations in the very short term (year-to-year) or via comparisons of five-year earnings inequality and average one-year earnings inequality during the same five years.

Looking at even earlier periods, Sawhill and Condon (1992), Hungerford (1993), and Gittleman and Joyce (1999) report little change in overall family income mobility between the 1970s and the 1980s. The latter two studies, however, find “subtle differences” (Hungerford’s term), suggesting that some groups were less upwardly mobile in the later decade. Focusing on young children, Gottschalk and Danziger (2001) also find little difference in family income mobility between the 1970s and the 1980s, although children whose families began with low income (poorest two quintiles) or high income (richest quintile) were somewhat less mobile in the later period.

The results in this paper are broadly consistent with this literature, showing little change in family income mobility from one period to the next. However, because I measure mobility for overlapping decades covering 35 years, I am able to examine trends beyond adjacent periods. In addition, I rescale some common mobility measures to put into practice Anthony Shorrocks’s (1978) approach, which argued for defining perfect or complete mobility (hence, the condition under which the value of the mobility measure is equal to one) as the situation when outcomes are independent of the initial position. Rescaling in this way allows comparisons of mobility levels across measures. In addition, I include transfers and subtract estimated net tax payments from family money income to provide an accurate and comprehensive measure of family wellbeing. Thus, this paper contributes to the literature by examining mobility over a considerably longer time span, with a more accurate measure of family income, and investigating and allowing comparisons of both levels and trends among a broader range of mobility measures than the earlier literature does.

## Mobility Concepts and Measures

In broad terms, mobility is the pace and degree to which individuals' or families' incomes (or other measures of wellbeing) change over time relative to one another or relative to the overall income distribution. Some researchers define mobility even more broadly to encompass movements that have no "relative" aspect, such as the average change in incomes or the average absolute value of income changes. While overall income growth obviously contributes to average wellbeing, this paper treats it as distinct from mobility. Thus, the mobility measures examined in this paper all have a relative aspect, comparing families' contemporaneous income changes with one another, not simply computing average changes in income.<sup>3</sup>

Among concepts and measures with a relative aspect, this paper emphasizes the features that help to address the questions posed at the outset: to what extent is a person or family limited by current circumstances and how do income changes contribute (or not) to the inequality of lifetime incomes? The degree to which end-of-period income (or position) is independent of beginning-of-period income (or position) is related to the idea of equal opportunity. In their "introduction to the literature" on income mobility measurement, Fields and Ok (2001) note that "origin independence seems to capture our intuitions about 'equality of opportunity'... Viewed in this way, income mobility is a desirable notion that helps attenuate the unequal distribution of initial endowments" (p. 561).<sup>4</sup> Mobility as an equalizer of longer-

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<sup>3</sup> Fields (2008) notes that a "difference of view—whether 'income mobility' includes the growth aspect of distributional change or whether 'mobility' is what remains after growth has been taken out—underlies much of the mobility literature, but rarely is made explicit." For this reason, I am stating explicitly that this paper does not include pure, average-growth measures. Van Kerm (2004) explicates the distinction by saying that the Fields and Ok (1999) flux concept of mobility, depending as it does on the absolute change in log income, "differs from most approaches to income mobility measurement in one important respect: income mobility is seen as the juxtaposition of isolated individual experiences and not as an intrinsically social phenomenon where it is individual experiences *relative* to the experiences of others that matter" (p. 232, emphasis added). In these terms, the mobility investigated in this paper, like "most approaches," is a social phenomenon.

<sup>4</sup> One strand of the inequality literature (based on Roemer 1998), distinguishes inequality due to differences in circumstances (or initial endowments in the Fields and Ok quotation) from residual inequality (due to differences in what is usually labeled effort), stating that only the former represents inequality of opportunity. While conceptually related to opportunity based on the "circumstance" of beginning-of-period income, in practice the rescaled mobility measures also reflect differences resulting from individual choices and lifecycle factors before and during the period.

term or lifetime incomes, by contrast, associates more-equal long-term outcomes (not weaker ties between outcomes and starting points) with improved mobility.

This paper uses a variety of relative measures in order to understand whether they all tell a consistent story. Reflecting an interest in mobility during a working life, the paper examines mobility over the long term (10-year periods); it does not address shorter-term “volatility”—shocks to incomes from year to year—or longer-term intergenerational mobility—how much a person’s adult family income level (or position) depends on the corresponding level (or position) of his/her parents during his/her childhood.

### *Zero and complete mobility*

This paper selects measures from the literature and rescales others to implement more broadly the approach outlined by Anthony Shorrocks (1978) in defining his *M-hat* measure. Shorrocks explores methods for reconciling four desirable properties of mobility measures, one of which is “perfect mobility.” He notes that mobility “matrices with identical rows, so the probability of moving to any class is independent of that originally occupied, have been usually described as perfectly mobile” (1978, p. 1015) and he wants such “perfect mobility” to be associated with a mobility measure equal to one (just as perfect immobility—in which no one’s position changes—is associated with a mobility value of zero).<sup>5</sup> As typically measured, quantile mobility—the fraction of all individuals (or other income units) who move out of their quantile of origin—would be zero if no one moved, and one if everyone moved out.<sup>6</sup> Shorrocks reconciles the four properties by “restricting attention to transition matrices which stand a reasonable chance of being observed empirically” (1978, p. 1017), and notes that the case of everyone moving out (zeroes along the diagonal) does not. If individuals’ or families’ ending quantile were independent of their starting place, the fraction of those beginning in a particular

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<sup>5</sup> Note that Shorrocks is addressing a *measurement* issue—defining a reasonable maximum for mobility measures—not arguing that perfect mobility is socially desirable. To avoid confusion (since the word “perfect” has such a normative tone), I refer to “complete” mobility in the remainder of this paper.

<sup>6</sup> Shorrocks’s analysis refers to *individual* incomes; the issues he raises and the measures he proposes are nonetheless applicable to any income units—individuals, families, households, or other entities. This paper focuses on family incomes and hence applies the mobility concepts and measures in that context. See the “Data and Sample” section below for a discussion of family income as analyzed in this paper.



quantile who would end a period in each quantile, including the quantile of origin, would be equal to  $1/n$ , where  $n$  is the number of quantiles. Thus, Shorrocks rescales quantile mobility as  $M\text{-hat}$  which is equal to one when the fraction of each origin quantile that moves out is  $(1-1/n)$ ; see the discussion of measures below for details.

Shorrocks's definition of complete mobility as reflecting outcomes that are independent of starting points puts the emphasis squarely upon equality of opportunity rather than on equality of outcomes.<sup>7, 8</sup> This distinction has currency in the public debate, as Gallup (2011) has reported that 70 percent of Americans say it is extremely or very important that the federal government enact policies that attempt to "increase the equality of opportunity for people to get ahead if they want to," while only 46 percent say it is extremely or very important for the federal government to try to "reduce the income and wealth gap between the rich and the poor."

To facilitate comparisons, this paper rescales measures from the literature that do not already have this natural scaling from zero to one, where one represents complete mobility defined in terms of an orthogonal relationship between starting and ending position. One measure often used in the literature is the fraction of those beginning in the poorest quintile who move up, that is, who end the period in a higher quintile. If outcomes were independent of starting position, this value would be 0.8 (equal to  $(1-1/n)$  in the quintile case of  $n=5$ ), not one; hence the simple fraction moving out of the poorest (or richest) quintile is rescaled by dividing by 0.8. As discussed below, an example of an existing measure that is naturally scaled from zero to one is the rank correlation inverse (one minus the rank correlation).

Measures that range from zero (no mobility) to one (complete mobility) have the advantage that their levels can meaningfully be compared across concepts because they are all expressed relative to the "equal opportunity" benchmark. While Jantti and Jenkins (2015) note that independence of outcomes from origins is a more widely used standard in the *intergenerational*

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<sup>7</sup> As noted earlier, this equal-opportunity interpretation depends on accepting beginning-of-period income as a reasonable measure of "circumstances."

<sup>8</sup> Nonetheless, Shorrocks's is not the only choice one could make regarding scaling. Burkhauser and Couch (2009) note that the "conflict in how to norm... the upper value of a mobility index is a recurring theme in this [mobility] literature," which Shorrocks resolves by "restricting his measure to realistic cases" (p. 529).

than in the *intragenerational* context, scaling all measures against a consistent “complete mobility” standard still provides useful comparisons in the intragenerational context. Thus, for example, the discussion of results below compares the extent of “any” and “far” mobility by those who begin in the poorest or the richest quintiles.

The sections that follow discuss two ways of categorizing mobility concepts. One approach distinguishes between movements among purely relative positions in the income distribution (position-relative) and movements among absolute dollar-defined locations in the distribution (dollar-relative). The other approach further subdivides position-relative and dollar-relative measures based on whether mobility is summarized for everyone in the distribution (overall) or for subsets of the population that begin a period in specific parts of the income distribution (origin-specific). This cross-classification yields the two-by-two matrix shown in Table 1, which lists the specific measures from the literature used in this paper.

### ***Position-relative and dollar-relative mobility (horizontal panels in Table 1)***

*Position-relative mobility* refers to families moving among positions in the distribution of family incomes between the beginning and end of a period, where positions are defined in a purely relative way. Position-relative measures are typically based on transition matrices showing position in terms of quintile, decile, or other quantile at the beginning and the end of a period, and they can also be expressed more granularly in terms of rank. What makes them *position-relative* is that they do not reflect the dollar magnitude of incomes or the spread of the income distribution, but only rank.

*Dollar-relative mobility* refers to changes in families’ incomes in dollar terms and associated changes in their relative positions. This concept encompasses income movement both relative to some real standard of wellbeing or purchasing power and relative to the (possibly changing) distribution of dollar incomes across all families. Dollar-relative mobility can reflect changes in the structure of rewards in the economy—the addition, for example, of much higher places at the top of the distribution—as well as changes in specific families’ access to these rewards. In other articles, dollar-relative measures are often called “absolute” measures, but that term is not used here because even in the dollar context, we restrict the analysis to measures that have

some “relative” aspect.

### ***Overall and origin-specific mobility (vertical panels in Table 1)***

Overall mobility summarizes the transition process from the economy-wide set of observations of family wellbeing—whether income or rank—at the start of a period to the corresponding set at the end of that period. Overall mobility measures quantify the extent to which the entire economy is characterized by families with persistent positions versus an economy characterized by widespread movement of families.

Origin-specific mobility summarizes movements of subgroups of families defined by their position (rank or income) in the distribution at the beginning of the period. Origin-specific mobility measures attempt to quantify the extent to which those who start at the bottom/top (or, more generally, in any specific part of the distribution) move up/down either relatively (rank, position) or absolutely (by crossing some real-dollar threshold) by the end of the period.

Origin-specific measures are of interest for several reasons, including concerns about the ability of the poor to escape the bottom rungs of the income ladder and concerns about stability at the top as evidence of unequal opportunity or a lack of meritocracy. In this regard, a 2009 Pew Trusts survey found that “a majority of Americans believe that the lack of upward mobility from the bottom rung of the income ladder is a major problem for this country, while they are relatively unconcerned about how little downward mobility there is from the top” (Economic Mobility Project 2009, p. 4). More recently, however, the advent of “Occupy” protests in 2011 directed at the “top 1 percent” indicates some dissatisfaction with the perceived ability of those at the top to hold onto their positions.

### ***Detailed definitions***

As noted above, Table 1 categorizes the mobility measures reported and analyzed in this paper. The discussion in this section proceeds from the position-relative overall measures in the upper left quadrant of Table 1 to the position-relative origin-specific measures (upper-right quadrant), through the dollar-relative overall and origin-specific measures (lower-left and lower-right quadrants).

Most of the **overall position-relative mobility measures** examined in the paper are based on a transition matrix  $P$  for the family income distribution divided into quintiles or deciles, in which the matrix cells  $p_{ij}$  (indexed by origin row  $i$  and destination column  $j$ ) represent the fraction of all families in the entire distribution who start a period in quintile or decile  $i$  and end the period in quintile or decile  $j$ . Alternatively, they are based on the row mobility matrix  $Q$ , in which the matrix cells  $q_{ij}$  represent the fraction of those families who start a period in quintile or decile  $i$  who end the period in quintile or decile  $j$ . To clarify the distinction, all the  $i \times j$  cells in the *transition* matrix  $P$  sum to one, while the  $j$  elements in each row of the *mobility* matrix  $Q$  sum to one.

Shorrocks (1978) developed his *M-hat* measure as a rescaled version of quantile mobility, which tallies the fraction of families who move up or down at least one quantile, that is, the fraction who move out of their quantile of origin. Quantile mobility is thus equal to one minus the fraction of families along the diagonal of the quantile transition matrix; this measure would be equal to one only if all families moved out of their quantile of origin. Shorrocks noted that if families' ending quantiles were independent of their starting places, the fraction of those beginning in a particular quantile who would end a period in each quantile, including the quantile of origin, would be equal to  $1/k$ , where  $k$  is the number of quantiles. Thus, Shorrocks's *M-hat* measure is equal to one when the fraction of families of each origin quantile who move out is  $(1-1/k)$ ; he defines the measure based on the trace of the mobility matrix  $Q$ :

$$M\text{-hat} = \frac{\sum_{i=1}^k (1 - q_{ii})}{k - 1} = \frac{k - \text{trace } Q}{k - 1}, \quad (1)$$

where  $Q$  is the  $k \times k$  row mobility matrix. In this paper, *M-hat* is calculated for quintiles ( $k=5$ ) to facilitate comparison with the results of other researchers who publish their quintile mobility matrices. Just as *M-hat* equals one when those who start in each quintile have only a one-fifth probability of ending in that origin quintile (which would be the case if they had an equal probability of ending in any quintile—complete mobility), *M-hat* equals zero (complete immobility) when every family's end-of-period quintile is the one where the family began; the only non-zero entries in the matrix are ones on the diagonal.

Per capita decile movement, *PCDM*, the rescaled average distance (in deciles) that families move during a period, contains considerably more information about off-diagonal elements of the transition matrix than *M-hat*:

$$PCDM = \frac{1}{S} \sum_{i,j=1}^{10} p_{ij} |j - i|, \quad (2)$$

where  $S$  is a rescaling factor equal to the decile movement that would occur if the entries in all rows of the decile mobility matrix were identical (that is, the ending decile is independent of the starting decile). For example, if 10 percent of those who started a period in the poorest decile ended in each decile, the average movement of those starting in the poorest decile would be 4.5 deciles; similarly, if 10 percent of those who started in the fifth decile ended in each decile, their average movement would be 2.5 deciles. For the entire decile matrix, when every  $p_{ij}$  is equal to 0.01, average movement is equal to 3.3.

The *rank correlation (inverse)*, *iRcorr*, is computed as one minus the correlation between families' income ranks at the beginning and end of the period; it shows how strongly the beginning-of-period position (rank) is related to the end-of-period position. This measure is naturally scaled from zero to one: the rank correlation ranges from one, when the beginning- and end-of-period ranks are perfectly matched, to zero, when there is no relationship between the beginning and end-of-period ranks; hence, the rank correlation *inverse* ranges from zero to one.<sup>9</sup>

A final overall position-relative measure is the *(inverse) adjusted contingency coefficient*, *iCstar*, based on the chi-squared test-statistic related to the independence of rows and columns in the decile transition matrix<sup>10</sup> and "adjusted" to range between zero and one. Subtracting the adjusted contingency coefficient from one, just as for the rank correlation, makes measured

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<sup>9</sup> Subtracting from one rescales the measure to be higher when mobility is higher. Note that a negative correlation would cause the rescaled mobility measure to exceed one. Conceptually, treating one as the maximum value for the inverse rank correlation is equivalent to Shorrocks's rescaling in the calculation of *M-hat*, in that it defines complete mobility as the situation in which the end-of-period rank bears no relationship to the beginning-of-period rank. A negative correlation would indicate even greater changes in rank than a zero correlation, but it does not represent what Shorrocks calls a realistic case. And, in fact, negative correlations never occur in the data analyzed here.

<sup>10</sup> The adjusted contingency coefficient is known as  $C^*$ ; it can be computed only for matrices with an equal number of rows and columns.

mobility higher when the association between the starting and the ending decile is lower:

$$iCstar = 1 - decile C^* = 1 - \frac{\sqrt{\frac{\chi^2}{N+\chi^2}}}{\sqrt{\frac{k-1}{k}}}, \quad (3)$$

where  $C^*$  is the adjusted contingency coefficient,  $N$  is the total (weighted) number of families,  $k$  is the number of rows and columns (=10 in the decile case), and  $\chi^2$  is the chi-squared test statistic:

$$\chi^2 = \sum_{i,j=1}^k \frac{(n_{ij} - e_{ij})^2}{e_{ij}}, \quad (4)$$

with  $n_{ij}$  the observed number of families who start in decile  $i$  and move to decile  $j$  during the period and  $e_{ij}$  the number that would be expected based on the product of row and column totals  $N_i$  and  $N_j$ , respectively, (that is, if the beginning- and end-of-period decile positions were completely independent).

The **position-relative origin-specific measures** (upper-right quadrant of Table 1) are based on the quintile row mobility matrix  $Q$ . These include the (rescaled) fraction of families starting in the poorest quintile who move up, *PR-poorup*, and, similarly, the (rescaled) fraction of those starting in the richest quintile who move down, *PR-richdown*. The simple fraction of poorest (richest) moving up (down) is equal to one minus the upper-left (lower-right) corner elements in the quintile row mobility matrix. If outcomes were independent of the starting position, the fraction of the poorest (richest) quintile who moved up (down) would be 0.8 (equal to  $(1-1/k)$  in the quintile case of  $k=5$ ); hence, the simple fraction moving out of the poorest (or richest) quintile is rescaled by dividing by 0.8:

$$PR-poorup = \frac{1 - q_{11}}{0.8} \quad PR-richdown = \frac{1 - q_{55}}{0.8}. \quad (5)$$

The other origin-specific position-relative measures represent the rescaled fraction of families beginning in the poorest (richest) quintile who move beyond the adjacent quintile:

$$PR\text{-}poorfar = \frac{1 - (q_{11} + q_{12})}{0.6} = \frac{\sum_{j=3}^5 q_{1j}}{0.6} \quad (6)$$

$$PR\text{-}richfar = \frac{1 - (q_{55} + q_{54})}{0.6} = \frac{\sum_{j=1}^3 q_{5j}}{0.6} . \quad (7)$$

Without rescaling, these latter measures are used fairly widely in the literature to indicate the fraction of those beginning in the poorest and richest quintiles who move “far.”

As noted earlier, **dollar-relative mobility measures** (lower panel of Table 1) reflect changes in families’ absolute (constant-dollar) incomes and relative positions in the distribution of family income.

*Gini mobility* (Yitzhaki and Wodon 2004), or *Gini-mob*, reflects changes in relative rank and real income. It compares the covariance of families’ changes in income and rank over the period with the covariances of income and rank at the start and the end of the period:

$$Gini\text{-}mob = \frac{\sum_{s=1}^N \left( \frac{y_{sj}}{\mu_j} - \frac{y_{si}}{\mu_i} \right) \left( \frac{R_{sj}}{N} - \frac{R_{si}}{N} \right)}{\sum_{s=1}^N \left( \frac{y_{sj}}{\mu_j} - 1 \right) \frac{R_{sj}}{N} + \sum_{s=1}^N \left( \frac{y_{si}}{\mu_i} - 1 \right) \frac{R_{si}}{N}} , \quad (8)$$

where  $y_{si}$  and  $y_{sj}$  are family incomes of the  $s^{th}$  family in the beginning ( $i$ ) and end ( $j$ ) years of a period,  $N$  is the number of families whose incomes are observed at both the beginning and end of a period,  $\mu_i$  and  $\mu_j$  are mean incomes at the beginning and end of the period, and  $R_{si}$  and  $R_{sj}$  are the ranks of family  $s$  in the beginning- and end-of-period distributions, from poorest (lowest rank) to richest (highest rank).

Yitzhaki and Wodon call this the Gini index of mobility because the Gini index of inequality is proportional to the covariance of income and rank. Note from the numerator expression that if either a family’s relative income or rank does not change, the contribution to Gini mobility is zero. Yitzhaki and Wodon point out that the Gini mobility measure will equal zero when rankings of families do not change between the two distributions—consistent with complete immobility. The measure will equal two if there is a total reversal of ranks and will equal one if the two income distributions are statistically independent. As with the rank

correlation (above) or the correlation of log income (below), Gini mobility measures greater than one (involving some reversal of positions beyond independence) may be regarded as irrelevant, since they do not “stand a reasonable chance of being observed empirically” (Shorrocks 1978, p. 1017).

The *correlation of log income (inverse)*,  $iYcorr$ , shows how strongly the beginning-of-period logarithm of income is related to the end-of-period log income. It is computed as one minus the correlation between families’ log income at the beginning and end of the period, in order to be closer to one when the relationship is weaker, hence mobility is greater. Like the rank correlation (inverse), this measure is naturally scaled from zero to one, where one indicates that there is no relationship between the beginning and the end-of-period income.

*Dollar-relative group mobility*,  $DRGM$ , can be characterized via dollar-relative transition and mobility matrices like their position-relative counterparts  $P$  and  $Q$  above, where  $B$  is a  $k \times k$  transition matrix consisting of elements  $b_{ij}$ , indicating the fraction of all families who begin in group  $i$  and end in group  $j$ , and where the  $k$  groups are defined by real-income ranges, held steady from the beginning to the end of the period. Similarly, dollar-relative mobility matrix  $D$  consists of elements  $d_{ij}$ , indicating the fraction of families starting in group  $i$  who end in group  $j$ . As with the (rank-based) matrices  $P$  and  $Q$ , the sum of all  $k \times k$  elements of  $B$  is one and the sum of the  $k$  elements in each row of  $D$  is one.

To facilitate comparisons with earlier research, I use quintiles to define the beginning-of-period groups in this paper ( $k=5$ ), maintaining the real-dollar boundaries of the quintiles to define the end-of-period group boundaries. The “absolute quintile mobility” measure widely used in the literature tallies the percentage of all families who move out of their beginning-of-period absolute (constant-dollar-defined) quintile; its rescaled counterpart used here, like  $M\text{-hat}$ , accounts for the fraction who would move if the outcomes were independent of the starting points. An orthogonal relationship between the starting and the ending group would be represented by all the rows in  $D$  being identical. The only way this can occur is if all the row entries are equal to the column totals in the matrix  $B$ , the distribution of all families among the  $k$  groups at the end of the period. In this case, the rescaled fraction moving out of their origin group can be expressed as follows:



$$DRGM = \sum_{i=1}^k \frac{1 - d_{ii}}{k(1 - c_i)} , \quad (9)$$

$$\text{where } c_i = \sum_{j=1}^k b_{ji} , \text{ the column totals in the transition matrix } B. \quad (10)$$

Note that if the end-of-period groups were equal in magnitude, that is, if they (like the beginning-of-period groups) were quantiles, this expression would be equal to *M-hat*, because each of the transition matrix column totals  $c_i$  would be equal to  $1/k$  and the row absolute mobility matrix  $D$  would be equivalent to the row mobility matrix  $Q$ .

The **origin-specific dollar-relative measures** tally moves out of specific dollar-relative groups. For each origin group  $i$ , the rescaled measure of the fraction moving out would be the following:

$$\frac{1 - d_{ii}}{1 - c_i} , \quad (11)$$

or, equivalently, the sum of the off-diagonal elements of each row of the mobility matrix rescaled in terms of those groups' end-of-period shares of the population. As is the case for the position-relative origin-specific mobility measures, the figures of interest are the (rescaled) percentage of families starting in the poorest group ( $i=1$ ) whose incomes rise enough to move up past their group's initial real-dollar upper bound of income, and, similarly, the (rescaled) percentage of those beginning in the richest group ( $i=5$ ) whose incomes fall enough to end below their group's initial real-dollar lower bound of income:

$$DR-poorup = \frac{1 - d_{11}}{1 - c_1} = \frac{\sum_{j=2}^5 d_{1j}}{\sum_{j=2}^5 c_j} \quad DR-richdown = \frac{1 - d_{55}}{1 - c_5} = \frac{\sum_{j=1}^4 d_{5j}}{\sum_{j=1}^4 c_j} . \quad (12)$$

As for the position-relative quintile measures, "far" moves by those beginning in the poorest and richest groups—beyond the constant-dollar boundaries on the far side of the adjacent groups—are also examined:

$$DR\text{-}poorfar = \frac{1 - (d_{11} + d_{12})}{1 - (c_1 + c_2)} = \frac{\sum_{j=3}^5 d_{1j}}{\sum_{j=3}^5 c_j} \quad (13)$$

$$DR\text{-}richfar = \frac{1 - (d_{55} + d_{54})}{1 - (c_5 + c_4)} = \frac{\sum_{j=1}^3 d_{5j}}{\sum_{j=1}^3 c_j} \quad (14)$$

## Data and Sample

The mobility measures analyzed here are calculated using data from the Panel Study of Income Dynamics (PSID), which has collected information on the incomes and characteristics of individuals and their families since 1968. The survey was conducted every year from 1968 through 1997 and every other year thereafter; the most recent survey used in this paper, conducted in 2013, provides data on incomes in 2012.

Each period's measures include all individuals who meet the following criteria at both the beginning and the end of the period:

- The individual is a family head or spouse.
- The head of the individual's family and the spouse, if present, are between 16 and 62 years old.<sup>11</sup>
- The individual's family income data are not missing.

In addition, at the beginning of a period, the individual's family is excluded if it is a "split-off"; this exclusion implies that the family must have been separate from the head's parents' family

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<sup>11</sup> Age is reported in the survey year, while income is observed for the prior year. Thus, for mobility measures based on two-year-average endpoints, heads and spouses are between 16 and 62 years old in both years used in computing both endpoints. For example, the measures shown in Figure 1 for the 2001–2011 period are based on heads and spouses who are 16 to 62 years of age in 2001, 2003, 2011, and 2013 (with incomes reported for 2000, 2002, 2010, and 2012). As a result, they are 16 to 50 years of age in 2001 and 28 to 62 years old in 2013.

for at least a year.<sup>12</sup>

Applying these criteria leads to changes in the sample (2,500 to 3,500 observations) for each period. The observations are weighted using individual weights, to correct for the PSID's over-sampling of the bottom of the income distribution.<sup>13</sup>

The analysis focuses on a measure of post-tax, post-transfer family income in order to represent as accurately as possible the monetary resources available to a family.<sup>14</sup> This post-tax, post-transfer income measure comprises the money income reported by PSID families (family head and spouse combined)<sup>15</sup> plus the cash value of food stamps and minus net federal and state income taxes estimated using the NBER's TAXSIM model ("net" meaning that it also reflects the potentially positive addition of the earned income tax credit for low-income families with at least one worker).<sup>16</sup> Because NBER's TAXSIM model does not include state income taxes consistently until 1977, the analysis focuses on the years after 1977. Dollar income is expressed in 2012 dollars, adjusting for inflation using the CPI-U-RS.

The observations in the highest and lowest (weighted) percentile of each year's head-and-spouse post-tax, post-transfer income distribution are trimmed out. This eliminates any top-coded and bottom-coded observations as well as the most extreme measurement errors.

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<sup>12</sup> Since income is reported for the calendar year prior to the survey, split-off families' reported income includes the full- or part-year income of the parental family. The exclusion of split-off families thus insures that measured mobility reflects changes in independent family income, not the income movements that result when children move out and shift from parental family income to their own family income.

<sup>13</sup> After exclusion of observations with zero weight in either year, the individual weight is averaged over all the years included in each period's measure. Using these weights for head and spouse observations yields family income estimates as consistent as possible with the income distribution of U.S. households. (Note: one-person households are considered families in the PSID and households (but not families) in U.S. Census definitions.)

<sup>14</sup> Overall, one would expect the tax and transfer system to reduce measured mobility during every period; transfers are intended to cushion large income drops, and taxes are intended to somewhat mute large income gains.

<sup>15</sup> Money income includes wages, salaries, rent, interest, dividends, farm and business income, pensions, alimony, child support, help from relatives and others, and government transfers, including social security.

<sup>16</sup> Because we lack family-specific information that would allow us to do otherwise, we assume that all taxpaying units take the standard deduction and that all eligible families file for the earned income tax credit.

Family income is adjusted for family composition to yield a more accurate indicator of wellbeing; for example, \$45,000 represents a very different standard of living for a family of five than for a two-person family. The adjustment divides family income by the square root of family size, an equivalence scale used in a number of research papers.<sup>17</sup> While the unit of observation is an individual head or spouse, it is the individual's family income that is tracked, and movements up and down the family income distribution are measured.<sup>18</sup> For this reason, I refer to family income mobility throughout the analysis.

The period for measuring mobility is 10 years. Family-size-adjusted income is averaged for two years at both the start and the end of each 10-year period. Averaging two years of adjusted income at the period endpoints is intended to smooth some of the transitory income changes that occur on a year-to-year basis and to reduce the effects of measurement error in single-year income. Because the data are collected only every other year after the 1996 income year (1997 survey), the two-year endpoints are calculated by averaging non-adjacent years ( $t-1$  and  $t+1$ ); for consistency, this approach is used both before and after 1996. Labels refer to year  $t$ ; thus, for example, "2005" is the average of 2004 and 2006 income data, so the period 1995–2005 reflects income changes between the average of 1994 and 1996 and the average of 2004 and 2006.<sup>19</sup>

## Mobility Levels: Comparing the Measures

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<sup>17</sup> Burkhauser, Smeeding, and Merz (1996) explore the implications of using several possible equivalence scales in measuring inequality, including the poverty line and some based on expenditures; they label the square root of family size the "International Experts" scale. Karoly and Burtless (1995) adopt the square root of family size in their exploration of Gini inequality and report (in their Appendix Table 1) only modest differences in the trend from using an exponent of 0 (no adjustment of total family income) vs. 0.5 (square root). Burkhauser, Larrimore, and Simon (2011) say that dividing by the square root of the income-sharing-unit's size is "the customary procedure in the income inequality literature" (p. 13). The most widely used alternatives are to adjust family income by dividing by the census poverty line, which varies with family size (and, over time, with inflation), or by dividing by the PSID "needs" measure, a similar scale based on the USDA "low cost" food standard.

<sup>18</sup> Note that the use of an equivalence scale may increase measured mobility compared with an income measure that has not been adjusted for family size during a period in which income is unchanged in real-dollar terms and a formerly dependent child becomes independent and leaves the family. But such a change represents upward mobility in family wellbeing, since the given dollar income has fewer demands upon it at the end of the period.

<sup>19</sup> Because TAXSIM includes state income taxes only in 1977 and later years, the first two-year average beginning point for the analysis periods is 1978, equal to the average of 1977 and 1979.

Position-relative mobility measures consider families' movements in relative position from the beginning to the end of a period, where relative position is indicated by quintile, decile, or some other rank-based indicator. As noted earlier (and as categorized in Table 1), position-relative mobility can be measured for all families combined (overall) or for subsets defined by the place in the distribution where they begin the period (origin-specific).

### ***Overall position-relative mobility***

Figure 1 displays four position-relative overall mobility measures, and Table 2 reports the values. Noticeable differences in mobility *levels* can be seen across the measures.

Based on the fraction of families moving out of their origin quintile within a decade (*M-hat*), mobility totals are about three-quarters of what they would be if families' end-of-period quintiles were independent of their beginning-of-period quintiles. Based on how many deciles the average family moves, the rescaled per capita decile movement (*PCDM*), mobility is lower, but still more than half as large as the moves that would be observed if the spread across end-of-period deciles were the same for those starting in all 10 initial deciles. But the inverse rank correlation (*iRcorr*) and the inverse adjusted contingency coefficient (*iCstar*) show much lower mobility levels, only 30 to 40 percent of complete mobility. These differences reflect the completeness of the different measures' consideration of both numbers and distance of positional moves: *M-hat* counts only whether or not families move out of an origin quintile, *PCDM* looks at the average distance of moves, and *iCstar* and *iRcorr* consider the full decile transition matrix and changes in every family's rank, respectively.

### ***Origin-specific position-relative mobility***

Origin-specific mobility measures focus on the movement of those who begin in a specific segment of the initial distribution. Figure 2 shows the rescaled shares falling out of the top quintile (*PR-richdown*) and rising from the bottom quintile (*PR-poorup*) and also the shares of those who start in the richest or poorest quintile and move "far" relative to the distribution, defined as beyond the adjacent quintile (*PR-richfar* and *PR-poorfar*, respectively); the right-hand panel of Table 2 reports the measures.

The first thing to note in Figure 2 is that those who begin in the poorest quintile are

generally less likely to move up than those who begin in the richest quintile are to move down; this lower mobility of the poor applies both to any movement out of the origin quintile and to moves beyond the adjacent quintile. The second thing to note is that for both rich and poor, there are fewer moves beyond the adjacent quintile (*far moves*) than there are moves into or beyond the adjacent quintile (*any moves*). With outcomes independent of the starting point, one would naturally expect there to be more *any moves* than *far moves*; that is, “complete” mobility would involve 80 percent of the rich and 80 percent of the poor moving so as to be evenly distributed among the four available quintiles and similarly 60 percent of the rich and of the poor making *far moves* so as to be evenly distributed among the three available non-adjacent quintiles. But the data indicate an even greater shortfall for far moves than this expectation. Thus, far moves are generally 25 to 50 percent of “complete” mobility, while the any-moves measures are in the vicinity of 50 to 65 percent of “complete” mobility. Finally, a comparison with *M-hat* indicates that moves out of the middle quintiles are more prevalent than moves out of the poorest and richest quintiles, since *M-hat* summarizes moves out of all five quintiles and is larger than either *PR-poorup* or *PR-richdown*. This reflects the familiar result that the two corner elements of the quintile transition matrix tend to be larger than the other three diagonal elements.

### ***Overall dollar-relative mobility***

Figure 3 displays measures of dollar-relative overall mobility (also see Table 3). The upper line in Figure 3 (measured against the right-axis scale) is overall dollar-relative group movement (*DRGM*), reflecting the percentage of all families moving out of (up or down from) their quintile of origin defined in real-dollar terms, and rescaled relative to the ending distribution across the five real-dollar-defined groups.

As is the case for its position-relative counterpart, *M-hat*, *DRGM* tallies considerable mobility, running in the vicinity of three-quarters to four-fifths of what would occur if the ending group were independent of the starting quintile. The mobility levels registered by *Gini-mob* and *ilYcorr*, by contrast, are only 30 to 40 percent as large as what would occur with origin independence, reflecting the fact that they are based on a much finer-grained income measure

(and, in the case of *Gini-mob*, rank as well). Moving out of one's origin dollar-defined group is apparently more likely (or more prevalent) than more-substantial loosening of income (and rank) correlations.

### *Origin-specific dollar-relative mobility*

Figure 4 displays measures of real-dollar movements by those beginning the period in the poorest or richest groups (also, see the right panel of Table 3). Like their position-relative counterparts in Figure 2, these dollar-relative, origin-specific measures are rescaled to equal one when the distribution of families over the end-of-period groups is independent of the beginning-of-period group. Because incomes rose faster than prices, on average, in all these periods (real income growth, also plotted in Figure 4, is positive throughout)<sup>20</sup> and the group thresholds are set in constant-dollar terms, movement among groups is upward, on average. The rescaling measures movement by those starting in the poorest or richest groups against the overall net shrinkage of the poorest group and the overall expansion of the richest group in each period.

Notwithstanding this rescaling adjustment, the *rescaled* shares of the poor climbing above the real-dollar ceiling of their origin group (*DR-poorup*) in Figure 4 generally tracks within-period real income growth: the correlation between the two series across the 1978–1988 to 2001–2011 periods is 0.93. The corresponding rescaled shares of the richest group falling below their origin-group, real-dollar floor has a negative correlation of -0.63 with real income growth across periods.<sup>21</sup> Furthermore, because of general growth in real income, these dollar-relative mobility

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<sup>20</sup> The dotted black line plots the average change (across all families) in the log of family income between the beginning and endpoint of the period, that is, average real income growth during the period. This is the “directional income movement” measure as defined by Fields and Ok (1999), which this paper does not report as a mobility measure because it has no relative aspect.

<sup>21</sup> The end-of-period distribution of families among income groups reflects the average degree to which real income growth moves families from lower quintiles to higher ones. Over all the decades studied, an average of 14 percent of families ended in the poorest of the five groups, and about 35 percent of families ended in the richest group. Rescaling compares actual group retention with these overall end-of-period distributions; for those starting poor, an average of 58 percent moved out of the poorest group (had end-of-period income above the constant-dollar-defined ceiling), while 28 percent of those who began a period in the richest group, on average, had incomes below that group's real-dollar floor at the end of the period. These simple mobility fractions are rescaled to indicate the fraction of “complete” mobility they

measures for the poor are larger (closer to complete mobility) than are the dollar-relative measures for the rich. They are also larger than the position-relative ones shown in Figure 2 (67 percent for *DR-poorup*, on average, vs. 54 percent for *PR-poorup*); by contrast, rescaled mobility for the rich is higher in position-relative mobility terms than in dollar-relative mobility terms (62 for *PR-richdown* vs. 44 percent for *DR-richdown*). Even with the help of real income growth, however, those starting in the poorest group were less likely to escape it than those starting in other groups: *DRGM*, which summarizes moves out of all five groups, exceeds *DR-poorup* in all periods; real income growth augments the upward moves of all the groups (except the richest, who, by definition, cannot move *up* from their origin group).

As was the case with their position-relative counterparts in Figure 2, the rescaled shares of families starting in the poorest/richest groups who move far—beyond the real-dollar ceiling/floor of the adjacent group—come in well below their “any-movement” counterparts: That is, as with position-relative moves, many of the families who begin poor and succeed in moving above the constant-dollar ceiling of that group do not succeed in moving much beyond that ceiling, even when adjusting for the degree to which real income growth shrinks the size of the poor group and increases the number of families in the upper-income groups. Similarly, the rich who fall below the dollar-defined top income group are much less than proportionally likely to fall even into the middle group.

## Mobility Trends

Figures 1–4 show patterns of mobility over time as well as mobility levels. This section describes those patterns and also tests whether each measure changed to a significant degree between the earliest (1978–1988) period and the most recent (2001–2011) period.

Based on family observations, many types of mobility can be expressed in terms of zero-one values (for example, moved out of the origin quintile or did not); if we pool family observations from two periods, we can estimate a regression with that mobility expression as the dependent variable. Clustering for overlap and estimating the coefficient on a period-

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represent, as reported in the text.



interaction term generates a test statistic for the significance of the difference between the mobility rates in the two periods. To test for statistical significance in the rescaled measures, we first rescale the “zero-one” family observations to reflect the rescaling. For the position-relative measures, this is a simple linear transformation (for example, dividing by 0.8, so that the observations take on values of 1.25 or 0, rather than 1 and 0, and the constant term estimates the mean of the measure). For the dollar-relative measures, the rescaling reflects the outcome distributions across constant-dollar-defined groups and is therefore period-specific. The rank correlation and log-income correlation are estimated across family observations, which allows for inclusion of a period-interaction term.

Alternatively, bootstrap standard errors can be used to test the significance of differences between periods. Bootstrap methods are used for the (inverse) adjusted contingency coefficient *iCstar* and Gini mobility measures.

### ***Overall position-relative mobility***

The time patterns of the mobility measures displayed in Figure 1 suggest general and gradual declines in mobility over time; most of them decline, albeit non-monotonically, from the first period, 1978–1988 through 1991–2001, rise in 1993–2003, and then decline further through the final period, 2001–2011. They all register lower family income mobility in the (most recent), 2001–2011, period than in the 1980s: *M-hat* decreased from around 0.77 to 0.71; rescaled average decile movement (*PCDM*) declined from 0.60 to 0.51. The correlation of a family’s beginning-of-period and end-of-period income rank rose from 0.59 to 0.68, indicating that mobility (as measured by the inverse rank correlation, *iRcorr*) declined from 0.41 to 0.32. The inverse adjusted contingency coefficient *iCstar* fell from 0.38 to 0.33. While these are modest-to-moderate changes, they are consistently negative across the position-relative overall measures.<sup>22</sup>

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<sup>22</sup> The trends for *M-hat* shown in Figure 1 and Table 2 are similar to those found in the literature. Acs and Zimmerman (2008a, Table 2) show modest declines in *M-hat* between 1984–1994 and 1994–2004 (equivalent to this paper’s 1983–1993 and 1993–2003 periods). Hungerford (2011) reports statistically significant declines in decile mobility between the 1980s and 1990s. Auten and Gee’s (2009) tax-return-based mobility matrices indicate a slight decline in *M-hat* between 1987–1996 and 1996–2005. (Their *National Tax Journal* paper does not include mobility matrices defined over the panel population for both periods, but their working paper (2007, Appendix Table A.5) does). The quintile mobility matrices

The declines in mobility between the 1978–1988 period and the (most recent) 2001–2011 period are also statistically significantly different from zero for all four of the position-relative, overall measures shown in Figure 1 ( $p < 0.01$ ). See Table 4 for these significance tests.

### *Origin-specific position-relative mobility*

In Figure 2, all four origin-specific measures visibly move down between the 1978–1988 and 2001–2011 periods. While the measures bounce around somewhat from period to period, the overall downtrends in origin-specific mobility are steeper for those starting in the poorest quintile than for the rich, in part because the mobility of the poor drops off particularly sharply during the periods that include the Great Recession (1999–2009 and 2001–2011).<sup>23</sup> The right-hand panel of Table 2 shows *PR-poorup* declining from 0.56 in 1978–1988 to 0.48 in 2001–2011 and *PR-poorfar* declining from 0.37 in 1978–1988 to 0.23 in 2001–2011. The changes in these measures of upward moves by those starting in the poorest quintile—both simple moves out and “far” moves—declined to a statistically significant degree between 1978–1988 and 2001–

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reported in Tables 7–9 of Carroll, Joulfaian, and Rider (2006) indicate that *M-hat* fell slightly between the 1979–1986 and 1987–1995 periods. For even earlier periods, Gittleman and Joyce (1999) document a gradual increase in mobility between 1967–1977 and 1981–1991 and between 1967–1979 and 1979–1991. Data from Gottschalk and Danziger (2001, Table 5.1) and from Sawhill and Condon (1992, Table 1) show no change in *M-hat* between the 1970s and the 1980s. Similarly, Hungerford (1993) reports no change in mobility between the 1970s and 1980s, although his decile mobility ratio declines from 77.0 in 1969–1976 to 75.6 in 1979–1986.

<sup>23</sup> As with the overall measures, the time patterns in earlier periods in Figure 2 and Table 2 for moves by rich and poor quintiles are similar to those in the literature. Hungerford (2008) finds no change in the fraction of the poorest quintile moving up in the 1980s and the 1990s, while the fraction of the richest quintile moving down decreased from 50 percent to 46 percent and fewer of the rich (22 vs. 26 percent) moved far in the 1990s than in the 1980s. (Note that these measures in the literature are not rescaled.) Acs and Zimmerman (2008a) report the percentage of heads and partners who move up from the bottom quintile as 44.4 in 1984–1994 and 39.0 in 1994–2004, and the fraction who move far from the bottom quintile (beyond the second quintile) as 20.3 percent and 15.7 percent, respectively, in the two periods, with none of these changes statistically significant. Auten and Gee’s (2007) tax-return-based mobility matrices show decreases in the percentage of the richest quintile who move down and who move far between 1987–1996 and 1996–2005. For earlier periods, Gottschalk and Danziger (2001) report slight declines in the fraction of children starting in the poorest or richest quintiles who move out between the 1971–1981 and 1981–1991 periods, and more noticeable declines for “far” moves by initially poorest-quintile children (falling from 14.8 to 12.4 percent) and for children starting in the richest quintile (from 18.5 to 11.3 percent).

2011.<sup>24</sup> Mobility declined somewhat for the rich—they were more able to hold onto their top positions in the most recent period—but not statistically significantly so.

Much of the earlier literature on mobility over time compares measures in two adjacent 10-year periods; for example, Acs and Zimmerman (2008a) show modest declines in mobility between 1984–1994 and 1994–2004 (equivalent to this paper’s 1983–1993 and 1993–2003 periods), which are generally not statistically significant. Table 2’s results for overall quintile mobility (*M-hat*) and far moves by the poor, like those of Acs and Zimmerman, fail to show statistically significant declines between 1983–1993 and 1993–2003, notwithstanding the fact that these measures (and others) show statistically significant declines when compared over the longer span, 1978–1988 to 2001–2011.<sup>25</sup>

### ***Overall dollar-relative mobility***

The three measures in Figure 3 show lower mobility in 2001–2011 than in 1978–1988; they have local peaks during 1993–2003, so most of the decline occurs after that. Both the *Gini mobility* measure, which reflects the association of changes in rank and income during a period, and *ilYcorr*, the (inverse) correlation between beginning- and end-of-period log-incomes, moved downward from about two-fifths in 1978–1988 to about one-third in 2001–2011, while *DRGM* declined from 0.8 in the 1980s to 0.72 recently.<sup>26</sup> All three measures declined by a statistically

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<sup>24</sup> The statistical significance of the falloff in *far* moves from the poorest quintile was greater ( $p=0.002$ ) than the statistical significance of the decline in *any* moves out of the poorest quintile ( $p=0.06$ ).

<sup>25</sup> Kopczuk, Saez, and Song (2010) report that “the surge in top earnings is not due to increased mobility at the top” (p. 115); like the results above for the top quintile of family income, their results indicate that the probability of staying in the top 1 percent earnings group after one, three, or five years was relatively stable between the late 1970s and early 2000s. As noted earlier in the text, most of the other studies that examine changes in mobility over adjacent long periods, including Gittleman and Joyce (1999), Hungerford (1993), Sawhill and Condon (1992), and Gottschalk and Danziger (2001), compare the 1970s and 1980s; in this paper, the position-relative and dollar-relative mobility measures are not measured in the 1970s because of TAXSIM’s omission of state taxes until 1977.

<sup>26</sup> Hungerford (2011) reports that the Gini mobility measure declined by a statistically significant amount (from 0.36 to 0.34) between the 1980s and 1990s. Earlier research investigating absolute quintile mobility measures is mixed: Acs and Zimmerman (2008b) report a drop in overall absolute quintile mobility (the same concept as *DRGM*, but not rescaled) from 0.627 to 0.598 between 1984–1994 and 1994–2004 (not significantly different from zero), a near-zero increase in mobility out of the bottom quintile, and a statistically significant increase in mobility out of the top quintile (their Table 4). Hungerford (1993, combining his data for deciles into quintiles) shows overall absolute quintile mobility falling slightly

significant amount ( $p < .05$ ) between 1978–1988 and 2001–2011 (Table 4).

### ***Origin-specific dollar-relative mobility***

Figure 4 shows declines in dollar-relative mobility concentrated mostly among those who began periods in the poorest quintile; the richest have low mobility (as noted in the previous section) but show no general downtrend in mobility over this time span. Dollar-relative mobility out of the poorest group (*DR-poorup*) was fairly flat from 1978–1988 through the 1989–1999 period, declined gradually across ensuing periods, and then dropped more steeply over the periods that include the Great Recession (1999–2009 and 2001–2011); the same was true for far moves for those starting in the poorest quintile (*DR-poorfar*), except that the decline was more pronounced even before periods affected by the Great Recession.

The fraction of the poorest quintile group who moved above that group's constant-dollar ceiling by the end of the period declined to a statistically significant degree between 1978–1988 and 2001–2011, as did the fraction of the poor who moved far (beyond the adjacent real-dollar-defined group). By contrast, as Figure 4 suggests, the fraction of the richest quintile falling below the absolute floor of their origin group or falling beyond the adjacent group's constant-dollar floor did not decline significantly between 1978–1988 and 2001–2011. Thus, the rich had a fairly steady grip on their top status while the poor became increasingly likely to be stuck at the bottom.

### ***Another indicator of mobility trends: Long-term income inequality***

In summary, many of the position-relative and dollar-relative mobility measures show statistically significant declines in mobility between the 1980s and the most recent, 2001–2011, period. Returning to one of the themes mentioned at the start of the paper, as other researchers have noted repeatedly, even unchanged mobility leads to widening inequality of long-term incomes when short-term inequality increases. An examination of changes in long-term inequality provides another window on mobility time trends.

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(from 60.5 to 59.5, not rescaled) between the 1970s and the 1980s, with absolute upward mobility from the poorest group falling and absolute downward mobility from the richest group increasing.

Any degree of relative mobility (families changing places in the family income distribution) makes the distribution of long-term income (income averaged over several years) more equal than the distribution of single-year income across the same set of families. One way to evaluate changing degrees of *mobility*, therefore, is to examine the time trend of long-term income *inequality*. Figure 5 plots three alternative inequality measures (Gini coefficient, Theil's entropy, and the mean log deviation (MLD)) of long-term income, where long-term income is defined as the average of all the observations on each family's income within a 10-year period.<sup>27</sup> (See also Table 5.)

According to all three measures, the inequality of 10-year-average, post-tax, post-transfer income rose fairly steeply between 1977–1987 and 1983–1993, moved sideways until 1992–2002, and then rose again through the most recent period, 2002–2012.<sup>28</sup> The roughly 4 percentage point rise in all the measures of long-term inequality from the 1980s to the 2000s indicates directly that mobility across the 1977–2012 time span was insufficient to offset the widely documented rise in cross-sectional (one-year) inequality.<sup>29</sup> This mobility shortfall left a larger gap between poor and rich families, even considering 10 years of post-tax, post-transfer income.<sup>30</sup>

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<sup>27</sup> Available data limit the computation to income averaged over the six years comprising every other year within each 10-year period. However, for the periods from 1977–1987 through 1986–1996, data are available for every year, making possible a robustness check: Averaging 11, rather than six, years of income yields a measure of inequality (not shown) that is smoother than the every-other-year measure, but almost identical in level and time pattern.

<sup>28</sup> Because these measures are averaging six annual observations on family income (adjusted for family size) within each 10-year period (for example, 2002–2012 is averaging each family's income in 2002, 2004, 2006, 2008, 2010, and 2012), these measures are not based on the two-year average incomes ( $t-1$  and  $t+1$ ) used as the mobility-measure endpoints.

<sup>29</sup> See, for example, Burkhauser, Feng, and Jenkins (2009) and Gottschalk and Danziger (2005), who report steep increases in family income inequality in the 1980s, with further increases, but at a slower pace, in the 1990s. The single-year data underlying the long-term inequality measures shown in Figure 5 and Table 5 indicate that the MLD, Gini, and Theil single-year measures were 3 to 6 points higher than the long-term measures, and that they rose by 7 percentage points between 1978 and 2012. A study of German earnings data by Bönke, Corneo, and Luthen (2015) finds “rather stable” earnings mobility across cohorts, but “striking evidence of a dramatic secular rise in intragenerational inequality in lifetime earnings” (p. 173).

<sup>30</sup> Hungerford (2011) also reports a higher long-term Gini coefficient in the 1990s than in the 1980s. Kopczuk, Saez, and Song (2010) report steeply rising Gini coefficients for 11-year earnings averages

## Summary and Discussion

A variety of measures indicate that U.S. family income mobility is limited and has decreased since the 1980s. Most overall mobility measures fell, on net, with mobility significantly lower in the 2001–2011 period than in the 1978–1988 period. Origin-specific measures also declined, with families starting in the poorest quintile unlikely to move far (to the middle or higher quintiles) during the 1978–1988 period, and significantly less likely to do so during the decade from 2001 to 2011. Similarly, dollar-relative mobility declined overall and for poor families, especially in the recent periods including the Great Recession. Thus, families have become increasingly less likely to change rank or move out of their (position-relative or dollar-relative) quintile of origin, and when they move, tend to move less far; this appears to be the case overall and especially for those who start poor.

Between the earliest and the latest periods, many of the measures move up over several periods, and then down, or vice versa: the downward trend is not monotonic. This is undoubtedly part of the reason that most earlier research, which generally compares two adjacent periods, fails to document a significant downward trend; that earlier research nonetheless notes that even steady levels of mobility imply increasing long-term inequality during the last quarter of the 20<sup>th</sup> century and into the 21<sup>st</sup> when cross-sectional inequality in the United States was rising.

Increasing economic mobility is a widely shared goal, especially if mobility equalizes opportunity and lifetime incomes or takes the form of families at the bottom moving up (Economic Mobility Project 2009); against this goal, this paper's findings are discouraging. All the mobility measures except origin-specific measures for the rich show a decline in mobility in the most recent period, 2001–2011, compared with the next-most-recent period, 1999–2009, and furthermore indicate lower mobility during these two decades (which include the Great Recession) than in 1997–2007, before the recession began. It appears that the Great Recession further depressed economic mobility for those with low incomes. These recent data have

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centered in the 1970s and 1980s, with shallower increases in the 1990s (similar to Figure 5 above), especially for men.

become available since previous intragenerational mobility research was published, providing additional cause for concern.

Long-term income adjusted for family size is considerably more unequally distributed among families for periods ending in the 2000s than for periods ending in the 1980s. That is, when judging mobility by its outcome—the inequality of long-term incomes—the verdict is that mobility has been insufficient to prevent poor and rich families from growing increasingly far apart, even considering average income over 10 years. The increase in long-term inequality documented here is further evidence reinforcing the conclusion that year-to-year changes in families' incomes have become less effective in altering families' long-term prospects: their position in the distribution in any one year is an increasingly good predictor of their position during the ensuing 10 years or at the end of that period. Furthermore, other mobility measures indicate that a family's position at end of a period in the 2000s was less likely to have been produced by a random process and more correlated with its starting position than was the case some 20 years earlier.

What are the implications for policy? Neither worker protections (for example, minimum wage, union support), education policy, nor tax and transfer policies in the United States have produced increases in family income mobility from the 1980s to the present, in some cases because those policies have shifted in disequalizing directions. Beyond overall patterns, the data indicate that the typical family in the poorest one-fifth of the family income distribution is less likely to move up beyond that group's real-dollar ceiling within a decade or move up to or beyond the middle quintile than a family in the poorest one-fifth was 20 years earlier, with the Great Recession apparently a factor in this marked deterioration of prospects. These facts suggest that policy remedies for those at the bottom should aim beyond short-term help, as those who are poor at any point in time are now more likely than earlier to have low long-term incomes. Beyond this, the choice of policy presumably hinges, at least in part, on the reasons for the decline in mobility, for example, whether it reflects rising barriers to opportunity, other shifts in the economy that have altered the distribution of market incomes, or changes in the U.S. tax and transfer system that increasingly reinforce rather than offset market disparities over time. This question represents a potentially fruitful avenue for future research.

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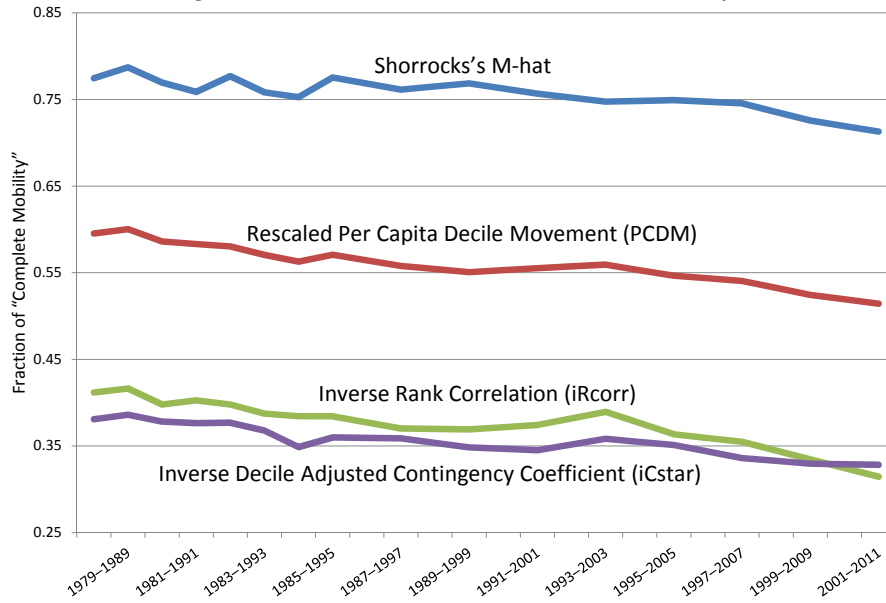
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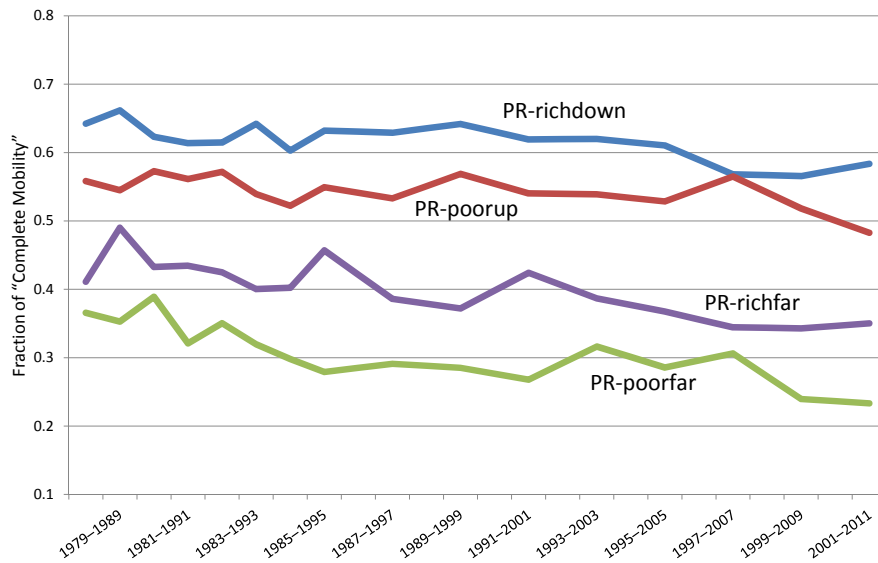
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**Figure 1. Measures of Overall Position-Relative Mobility**



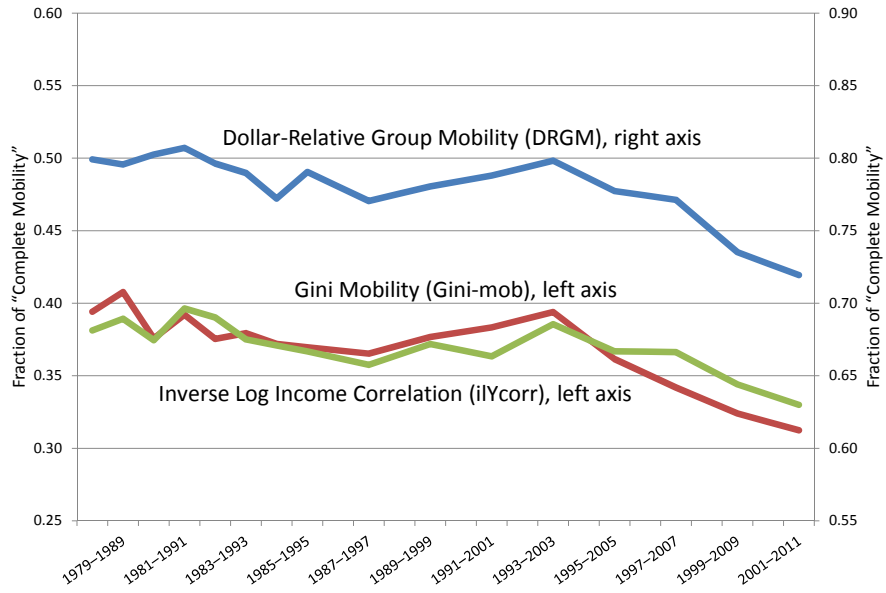
Source: Author's calculations based on data from PSID and NBER TAXSIM program

**Figure 2. Origin-Specific Position-Relative Income Mobility of the Richest and the Poorest**



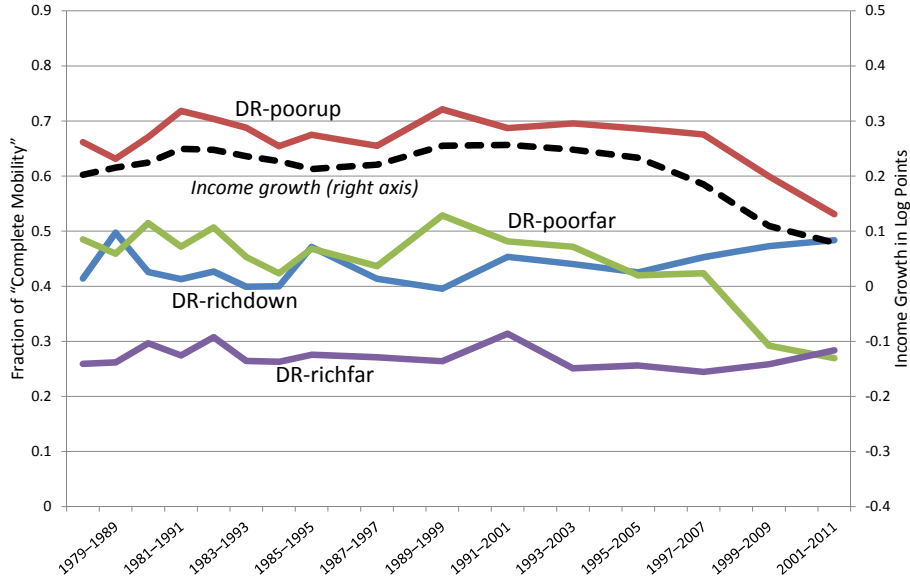
Source: Author's calculations based on data from PSID and NBER TAXSIM program

**Figure 3. Measures of Overall Dollar-Relative Income Mobility**



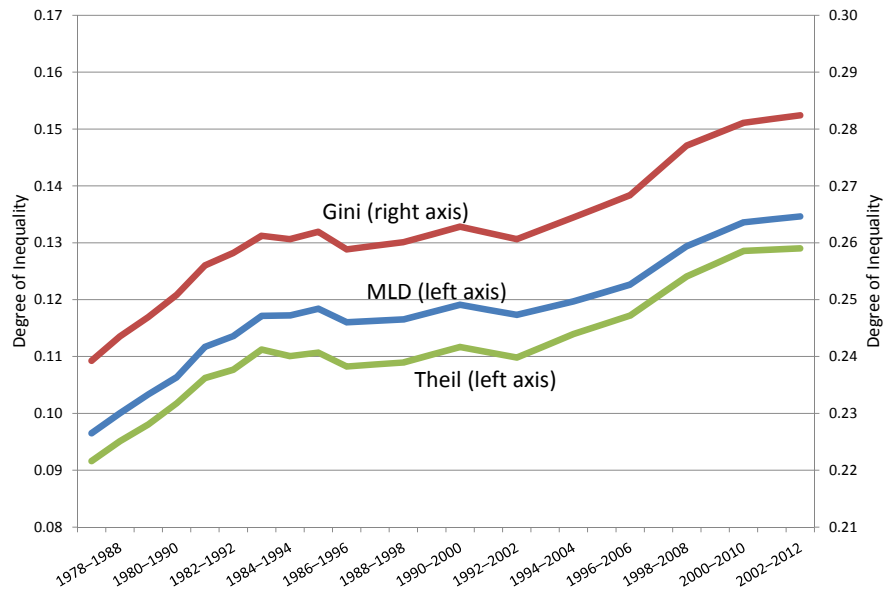
Source: Author's calculations based on data from PSID and NBER TAXSIM program

**Figure 4. Origin-Specific Dollar-Relative Income Mobility of the Richest and the Poorest**



Source: Author's calculations based on data from PSID and NBER TAXSIM program

Figure 5. Inequality of 10-Year-Average Post-Tax, Post-Transfer Income



Source: Author's calculations based on data from PSID and NBER TAXSIM program

**Table 1. Measures of Mobility Analyzed in this Paper**

	OVERALL	Short Name	ORIGIN-SPECIFIC	Short Name
	• Shorrocks's M-hat for quintiles	• M-hat	• Rescaled fraction of bottom (top) quintile	• PR-poorup
POSITION-	• Per capita decile movement - rescaled	• PCDM	who move up (down)	• PR-richdown
RELATIVE	• Rank correlation (inverse)	• iRcorr	• Rescaled fraction of bottom (top) quintile	• PR-poorfar
	• Decile adjusted contingency coefficient (inverse)	• iCstar	who move beyond adjacent quintile	• PR-richfar
	• Gini mobility	• Gini-mob	• Rescaled fraction of bottom (top) group	• DR-poorup
	• (Log) income correlation (inverse)	• iLYcorr	who move above (below) own group's constant-dollar threshold	• DR-richdown
DOLLAR-				
RELATIVE	• Dollar-relative group mobility - rescaled	• DRGM	• Rescaled fraction of bottom (top) group	• DR-poorfar
			who move above (below) the constant-	• DR-richfar
			-dollar threshold on far side of adjacent	
			group	

Note: See text for definitions and sources.

<b>Table 2. Position-Relative Mobility Measures Based on Post-Tax, Post-Transfer Family Income</b>									
	Position-Relative Overall					Position-Relative Origin-Specific			
Period:	M-hat	PCDM	iRcorr	iCstar		PR-poorup	PR-richdown	PR-poorfar	PR-richfar
1978–1988	0.774	0.595	0.412	0.381		0.558	0.642	0.366	0.411
1979–1989	0.787	0.600	0.416	0.386		0.545	0.662	0.353	0.490
1980–1990	0.770	0.586	0.398	0.378		0.573	0.623	0.389	0.433
1981–1991	0.759	0.583	0.403	0.376		0.561	0.614	0.321	0.435
1982–1992	0.777	0.580	0.398	0.377		0.572	0.615	0.350	0.425
1983–1993	0.758	0.571	0.387	0.368		0.539	0.642	0.320	0.400
1984–1994	0.753	0.563	0.384	0.349		0.522	0.603	0.298	0.402
1985–1995	0.775	0.571	0.384	0.360		0.549	0.632	0.279	0.457
1987–1997	0.761	0.558	0.370	0.359		0.533	0.629	0.291	0.386
1989–1999	0.769	0.551	0.369	0.348		0.569	0.642	0.285	0.372
1991–2001	0.757	0.555	0.374	0.345		0.540	0.619	0.268	0.424
1993–2003	0.747	0.559	0.389	0.358		0.539	0.620	0.316	0.387
1995–2005	0.749	0.547	0.363	0.351		0.528	0.610	0.286	0.368
1997–2007	0.746	0.541	0.355	0.336		0.565	0.568	0.306	0.344
1999–2009	0.726	0.524	0.335	0.330		0.518	0.566	0.240	0.343
2001–2011	0.713	0.514	0.315	0.328		0.483	0.584	0.233	0.350

Notes: See upper panels of Table 1 for definitions and text for derivation; these data are displayed in Figures 1 and 2. Measures are based on post-tax, post-transfer family income divided by the square root of family size.

Source: Author's calculations based on Panel Study of Income Dynamics and NBER TAXSIM program.

**Table 3. Dollar-Relative Mobility Measures Based on Post-Tax, Post-Transfer Family Income**

Period:	Dollar-Relative Overall			Dollar-Relative Origin-Specific			
	Gini-mob	iYcorr	DRGM	DR-poorup	DR-richdown	DR-poorfar	DR-richfar
1978–1988	0.394	0.381	0.799	0.662	0.414	0.485	0.259
1979–1989	0.408	0.389	0.796	0.631	0.497	0.459	0.262
1980–1990	0.376	0.375	0.802	0.671	0.426	0.515	0.296
1981–1991	0.392	0.396	0.807	0.718	0.413	0.472	0.274
1982–1992	0.375	0.390	0.796	0.704	0.427	0.507	0.307
1983–1993	0.379	0.375	0.790	0.688	0.399	0.453	0.264
1984–1994	0.372	0.371	0.772	0.654	0.400	0.424	0.263
1985–1995	0.370	0.367	0.790	0.675	0.471	0.468	0.275
1987–1997	0.365	0.358	0.770	0.655	0.414	0.436	0.271
1989–1999	0.377	0.372	0.781	0.721	0.396	0.528	0.264
1991–2001	0.383	0.363	0.788	0.687	0.453	0.481	0.314
1993–2003	0.394	0.386	0.798	0.696	0.440	0.472	0.251
1995–2005	0.362	0.367	0.777	0.686	0.425	0.420	0.256
1997–2007	0.342	0.366	0.771	0.676	0.453	0.424	0.245
1999–2009	0.324	0.344	0.735	0.599	0.473	0.292	0.258
2001–2011	0.312	0.330	0.719	0.531	0.484	0.270	0.284

Notes: See lower panels of Table 1 for definitions and text for derivation; these data are displayed in Figures 3 and 4. Measures are based on post-tax, post-transfer family income divided by the square root of family size.

Source: Author's calculations based on Panel Study of Income Dynamics and NBER TAXSIM program.



**Table 4. Significance Tests for Changes over Time**

Measure	Short Name	Type of Estimate	Periods & Levels		Difference		S.E.
			1978-1988	2001-2011			
<b>Position-Relative, Overall Mobility</b>							
Rescaled per capita decile movement	PCDM	OLS	0.595	0.514	-0.081	***	0.016
Shorrocks's M-hat for quintiles	M-hat	OLS	0.774	0.713	-0.061	***	0.019
Rank correlation (inverse)	iRcorr	OLS	0.412	0.315	-0.097	***	0.023
Decile adjusted contingency coefficient (inverse)	iCstar	Bootstrap	0.381	0.328	-0.053	***	0.016
<b>Position-Relative, Origin-Specific Mobility</b>							
Rescaled % poorest quintile move up	PR-poorup	OLS	0.558	0.483	-0.076	*	0.041
Rescaled % richest quintile move down	PR-richdown	OLS	0.642	0.584	-0.059		0.046
Rescaled % poorest quintile move far	PR-poorfar	OLS	0.366	0.233	-0.132	***	0.043
Rescaled % richest quintile move far	PR-richfar	OLS	0.411	0.350	-0.061		0.050
<b>Dollar-Relative, Overall Mobility</b>							
Log-income correlation (inverse)	ilYcorr	OLS	0.381	0.330	-0.051	**	0.025
Gini mobility	Gini-mob	Bootstrap	0.394	0.312	-0.082	***	0.031
Rescaled dollar-relative group mobility	DRGM	OLS	0.799	0.719	-0.080	***	0.019
<b>Dollar-Relative, Origin-Specific Mobility</b>							
Rescaled % poorest quintile rise past real ceiling	DR-poorup	OLS	0.662	0.531	-0.131	***	0.039
Rescaled % richest quintile fall past real floor	DR-richdown	OLS	0.414	0.484	0.069		0.050
Rescaled % poorest quintile rise far in real terms	DR-poorfar	OLS	0.485	0.270	-0.215	***	0.042
Rescaled % richest quintile fall far in real terms	DR-richfar	OLS	0.259	0.284	0.025		0.050

Notes:

S.E. = Clustered standard error (see text for details).

Asterisks denote significance as follows: \* p&lt;0.10, \*\* p&lt;0.05, \*\*\* p&lt;0.01.

Sources: Author's calculations based on data from Panel Study of Income Dynamics and TAXSIM.

<b>Table 5. Inequality of Long-Term Income</b>			
	Inequality Measure		
Period:	MLD	Theil	Gini
1977–1987	0.096	0.092	0.239
1978–1988	0.100	0.095	0.244
1979–1989	0.103	0.098	0.247
1980–1990	0.106	0.102	0.251
1981–1991	0.112	0.106	0.256
1982–1992	0.114	0.108	0.258
1983–1993	0.117	0.111	0.261
1984–1994	0.117	0.110	0.261
1985–1995	0.118	0.111	0.262
1986–1996	0.116	0.108	0.259
1988–1998	0.117	0.109	0.260
1990–2000	0.119	0.112	0.263
1992–2002	0.117	0.110	0.261
1994–2004	0.120	0.114	0.264
1996–2006	0.123	0.117	0.268
1998–2008	0.129	0.124	0.277
2000–2010	0.134	0.129	0.281
2002–2012	0.135	0.129	0.282
Notes:			
Long-term = average of six alternate years in decade.			
Income = post-tax, post-transfer family income.			
Source: Author's calculations based on data from Panel Study of Income Dynamics and NBER TAXSIM program			