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Trends in U.S. Family Income Mobility, 1967–2004

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Abstract:
Much of America's promise is predicated on the existence of economic mobility—the idea that people are not limited or defined by where they start, but can move up the economic ladder based on their efforts and accomplishments. Family income mobility—changes in individual families' real incomes over time—is one indicator of the degree to which the eventual economic wellbeing of any family is tethered to its starting point. In the United States, family income inequality has risen from year to year since the mid-1970s, raising questions about whether long-term income is also increasingly unequally distributed; changes over time in mobility, which can offset or amplify the cross-sectional increase in inequality, determine the degree to which the inequality of longer-term income has risen in parallel.

Using data from the Panel Study of Income Dynamics and a number of mobility concepts and measures drawn from the literature, we examine mobility levels and trends for U.S. working-age families, overall and by race, during the time span 1967–2004. By most measures, we find that mobility is lower in more recent periods (the 1990s into the early 2000s) than in earlier periods (the 1970s). Most notably, mobility of families starting near the bottom has worsened over time. However, in recent years, the down-trend in mobility is more or less pronounced (or even non-existent) depending on the measure, although a decrease in the frequency with which panel data on family incomes are gathered makes it difficult to draw firm conclusions. Measured relative to the overall distribution or in absolute terms, black families exhibit substantially less mobility than whites in all periods; their mobility decreased between the 1970s and the 1990s, but no more than that of white families, although they lost ground in terms of relative income.

Taken together, this evidence suggests that over the 1967-to-2004 time span, a low-income family's probability of moving up decreased, families' later year incomes increasingly depended on their starting place, and the distribution of families' lifetime incomes became less equal.

JEL codes: D31, D63, I32, J15

Keywords: income mobility, income distribution, income inequality

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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 where they start, but can move up the income ladder based on their effort and accomplishments. Can an individual or family move out of poverty and rise into the middle class, or is longer-term economic status limited by where one starts?

Changes in economic mobility are of particular consequence when economic disparities among families are 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.

We examine time patterns of income mobility for U.S. working-age families between 1967 and 2004, using data from the Panel Study of Income Dynamics (PSID) and a number of mobility concepts and measures, including a measure of the degree to which mobility equalizes long-term incomes. Calculating these measures for overlapping 10-year periods, we document mobility levels and trends for all families and for families by race.

We find, by and large, that different measures yield similar pictures of mobility trends. By most measures, family income mobility was lower in more recent periods (the 1990s into the early 2000s) than in earlier periods (the 1970s). Most notably, mobility of families starting near the bottom of the income distribution has decreased over time. However, comparing the most recent periods, the downtrend is more or less pronounced, or even nonexistent, depending on the mobility measure employed. Black families exhibit substantially less mobility than white families in all periods relative to the overall distribution of families and in absolute terms, and while the disparity between the races' mobility rates does not appear to be growing, between-race differences in long-term income have risen.

This suggests that during most of the span from 1967 to 2004, a low-income family's probability of moving up was decreasing while lifetime incomes were becoming less equal—

mobility did not offset rising cross-sectional inequality of family incomes. Not surprisingly, families' later-year incomes increasingly depended on their starting place. Determining whether these patterns abated after 1999 will require additional examination as more years of data become available.

Our findings are consistent with—and extend—the fairly limited existing literature tracking changes in U.S. earnings or income mobility over time. Of the studies looking at this question, "a few have found declines, most have found no changes, and none has found any increase" (Gottschalk 1997). Buchinsky and Hunt (1999) document "significant" declines in quintile-based earnings mobility measures, "especially at the lower end" between 1979 and 1991. Kopczuk, Saez, and Song (2009) report "slight" declines in U.S. earnings mobility since the early 1970s. By contrast, Acs and Zimmerman (2008) report "no change" in intragenerational family income mobility between 1984–1994 and 1994–2004, although the values of their reported quintile-based mobility measures decrease somewhat between the two decades. Both Hungerford (1993) and Gittleman and Joyce (1999) report little change in overall family income mobility between the 1970s and the 1980s, but find "subtle differences" (Hungerford's term), suggesting that some groups were less upwardly mobile in the later decade. Our main contributions are to extend the time span over which mobility changes are reported, shift the focus from earnings to family income mobility, and examine a broader range of measures of mobility.

After documenting mobility trends, we briefly explore a number of potential policy questions raised by our findings. Is more mobility always better from a social welfare point of view? What is the appropriate policy response to declining mobility, and to what extent does it depend on whether the cause of the decrease is increased barriers and labor market impediments or changes in talent, effort, and preferences?

Mobility Concepts and Measures

In the very broadest terms, mobility is the pace and degree to which individuals' or families' incomes (or other measures of wellbeing) change over time. Measures of mobility summarize the transition process from the set of incomes in the economy at one point in time to

the incomes of those same individuals or families at a later point.

Beyond this broad definition, however, one quickly discovers that "the term 'income mobility' connotes precise but *different* ideas to different researchers" (Fields 2008a). There is no single concept or yardstick of income mobility: Fields counts at least 20 different mobility measures used in the literature. In some cases, the measures address different underlying questions; in at least one instance, the same term has been used to express two different ideas. Perhaps, not surprisingly, "mobility analysts often have trouble communicating with each other, with other social scientists, and with the general public" (Fields 2008a).

We focus on concepts and measures that most closely address questions related to mobility as an equalizer of long-term incomes and the degree to which end-of-period income (or position) is independent of beginning-of-period income or position. We are particularly interested in investigating whether different concepts and measures tell a consistent story and whether findings from previous studies are artifacts of particular measures. In line with our interest in mobility during a working life, we examine mobility over the medium term (10-year periods), although we also calculate measures for shorter (4-year) and longer (16-year) periods and occasionally report the results where they differ. We do not address shorter-term "volatility"—shocks to family incomes from year to year—or longer-term "intergenerational mobility"—how much a person's adult family income level (or position) depends on the level (position) of his/her parents during childhood.[1]

In the sections that follow, we first discuss some basic mobility concepts and then define the specific measures from the literature used in this paper. Table 1 shows the measures classified by concept.

Relative, absolute, and interaction mobility

Relative mobility refers to individuals or families trading relative positions in the distribution of outcomes between the beginning and end of a period. Relative measures are typically based on transition matrices showing position (in terms of quintile, decile, or other

[1] Medium-term mobility may reflect, among other things, the cumulative effects of short-run shocks and/or the processes that lead to intergenerational patterns.

quantile) at the beginning and the end of period, but they also can also be expressed more continuously in terms of rank. We examine several measures of relative mobility (top panel of Table 1) because considerable evidence suggests that relative position is an important determinant of wellbeing (Luttmer 2005; Clark, Frijters, and Shields 2008). Furthermore, the persistence of families' relative positions provides direct information about time-dependence and tells us something about whether longer-term relative income positions are being equalized.

Absolute mobility is movement relative to some real standard of wellbeing or purchasing power, such as the poverty line or median income at the start of the period. The absolute measures we report in this paper are all calculated for families who start in a particular segment of the income distribution[2] (see the middle panel of Table 1)[3] and thus inform us about real income gains or losses of those families and the extent of the movement away from the starting point. Although relative and absolute measures may move together, rising absolute mobility can occur during a period of declining relative mobility, and vice versa.

Interaction mobility (our term) refers to the interaction of changes in families' relative ranks and the changes in incomes associated with those ranks (changes in the level and spread of the income distribution); see the lower panel of Table 1. Thus, interaction mobility reflects 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 individual families' access to these rewards over time. Interaction measures are useful for summarizing how much movement the average family experiences—both relative to other families and in terms of absolute income change—taking account of contemporaneous changes in average income levels and the inequality of the income distribution.

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[2] We call such measures "origin specific"; see below.

[3] The literature also discusses absolute mobility measures that do not focus on families starting in specific parts of the distribution (these are called "overall" absolute measures below), such as directional income movement, share movement, and flux (see Fields 2008a). We regard these as indicators of overall income growth, not mobility. Fields (2008a) notes "This 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."

Overall and origin-specific mobility

Overall mobility is the translation of an entire vector of individual observations of wellbeing—for example, family income or rank in the distribution—at the start of a period into the corresponding vector at the end of that period. (See left-hand column of Table 1.) Overall mobility measures attempt to quantify the extent to which the economy is characterized by individuals or families with persistent positions as opposed to widespread and extensive movement. Overall mobility measures can be either relative or absolute, although we do not investigate the latter.

Origin-specific mobility characterizes income movements of individuals or families defined by their position in the distribution at the beginning of the period (middle column of Table 1). 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 threshold such as the poverty line) by the end of the period. Origin-specific measures are of interest for several reasons, including concerns about the ability of the poorest families 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. For example, a recent 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).

Mobility concepts for subgroups

In some instances, one might be interested in the mobility of specific subgroups of the overall population, defined by race, age, education, family type, or the like. Two aspects of subgroup mobility have been examined in the literature: between-group and within-group. We focus on between-group mobility to understand how each subgroup's income movements compare with overall family mobility and the degree to which members of one subgroup move relative to members of another subgroup (right-hand column of Table 1). In this paper, we examine how black families move relative to white families. Alternatively, within-group

mobility sheds light on how much members of a subgroup move relative to one another (for example, the degree to which black families move up and down in the black family income distribution), a set of issues we do not address in this paper.

Specific measures (discussed in the order of Table 1 entries, moving across and then down)

To examine overall relative mobility, the measures we examine are mostly based on a transition matrix for the income distribution divided into deciles, in which the matrix cells (indexed by row *i* and column *j*) represent the fraction of all families that start a period in decile *i* and end the period in decile *j*. Decile mobility is the fraction of families who move up or down at least one decile (equal to one minus the fraction of families along the diagonal of the transition matrix). Per family decile movement, the average distance (in deciles) that families move during the period, contains somewhat more information about off-diagonal elements of the transition matrix:

$$\frac{1}{n}\sum_i \left| decile(y_{ie}) - decile(y_{ib}) \right|$$

where y_{ib} and y_{ie} are family income (or another measure of wellbeing such as income/needs) of the i^{th} family in the beginning (*b*) and end (*e*) years of a period, and *n* is the number of families whose incomes are observed at both the beginning and end of a period.

Minus chi-squared indicates, given the starting decile, the difference between the observed mobility matrix entries and the hypothetical probabilities under an expectation based on equal probability of ending in each decile.[4] The measure is computed as the sum over all cells in the matrix of the squared difference between actual row percentages and 10 percent:

$$-\sum_{ij} \frac{(p_{ij} - 0.1)^2}{0.1}$$

where p_{ij} is the observed fraction of families starting in decile *i* who move to decile *j* during the period, and the minus sign makes the measure higher when mobility is higher.

We also calculate one overall relative measure based on rank, not deciles. The rank

[4] Buchinsky et al. (2003) use minus chi-squared as their measure of mobility as time independence.

correlation (inverse)—the simplest indicator of time independence—shows how strongly beginning-of-period position is related to end-of-period position. It is computed as one minus the correlation between families' income ranks at the beginning and end of the period.[5]

We report several decile-based measures that are origin-specific: the fraction of families starting in the poorest (richest) decile who move up (down);[6] the fraction of families beginning in the poorest (richest) three deciles who move beyond the median or into the richest (poorest) three deciles.

For all these relative measures, we look at subgroup mobility in the context of decile or rank in the all-families income distribution, that is, between-group relative mobility. For example, we compute the fraction of black (or white) families who are in the off-diagonal cells of the all-families transition matrix (that is, the fraction of black families who move up or down at least one decile in the overall distribution) and the average number of deciles that black (white) families move. Similarly, it is straightforward to compute the fraction of black (white) families starting in the poorest three deciles who move above the poorest three.

For absolute measures, we report average real income growth for families starting in selected deciles. We also report moves into and out of "extreme poverty,"—which we define as having income below needs—that is, the fraction of families who begin the period in extreme poverty and move beyond the threshold at the end of the period, and the fraction of families not in extreme poverty at the beginning who fall below the threshold at the end of the period.

For absolute mobility of subgroups, we look at the absolute income growth of each subgroup, on average, as well as the fraction of families in each subgroup starting in extreme poverty who move beyond the threshold and, similarly, the fraction who start above the threshold and fall into extreme poverty. Note that for absolute measures, there need be no distinction between within-and between-group measures, since the choice of group (all families versus specific subgroups) does not define the yardstick for the measurements.

We report two interaction mobility measures—Gini mobility and mobility-as-

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[5] We subtract from one to rescale so that the measure is higher when mobility is higher.

[6] These represent one minus the upper left or lower right corner elements ($p_{1,1}$ and $p_{10,10}$) in the row-percentage mobility matrix—the fractions who stay in the top or bottom decile.

equalizer—and also the direct measure of long-term inequality that is an ingredient in the mobility-as-equalizer measure. Gini mobility (Yitzhaki and Wodon 2004) reflects changes in relative rank and real income. It compares the covariance of individual 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:[7]

$$\frac{\sum_i \left(\frac{y_{ie}}{\mu_e} - \frac{y_{ib}}{\mu_b} \right) \left(\frac{R_{ie}}{n} - \frac{R_{ib}}{n} \right)}{\sum_i \left(\frac{y_{ie}}{\mu_e} - 1 \right) \frac{R_{ie}}{n} + \sum_i \left(\frac{y_{ib}}{\mu_b} - 1 \right) \frac{R_{ib}}{n}}$$

where μ_b and μ_e are mean family incomes at the beginning and end of the period, and R_{ib} and R_{ie} are the rank of family i in the beginning- and end-of-period income distributions, from poorest (lowest rank) to richest (highest rank). Yitzhaki and Wodon developed their measure to provide (with the Gini index of inequality) "an overall consistent framework for the analysis of mobility [and] inequality";[8] they cite examples of job rotations and the distribution of income over the life cycle, in which snapshot measures of inequality may give misleading indications of longer-term inequality that their Gini mobility measure will correct.

We do not compute Gini mobility for subgroups since our subgroup analysis focuses on between-group comparisons. Calculating this measure separately by subgroup produces a within-group measure (using each family's rank compared only with other members of its own subgroup), and a between-group version has little meaning because rank in our two-subgroup context takes on only two values.

Shorrocks (1978) proposes a measure known as mobility-as-equalizer, which compares the inequality of long-term income (over t years) with the (weighted average) inequality of single-year income and scales it to increase with mobility by subtracting the ratio from one:[9]

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[7] It is called the Gini index of mobility because the Gini index of inequality is proportional to the covariance of income and rank.

[8] They note that their measure also provides a consistent framework for analyzing horizontal equity.

[9] In Shorrocks' view, "Mobility is regarded as the degree to which equalization occurs as the observation period is extended" (p. 386). We do not analyze the Fields (2008b) mobility-as-equalizer measure, which

$$1-\frac{I\{y_{i1}+y_{i2}+\ldots+y_{it}\}}{\sum_j\left(\mu_j \bullet I\{y_{ij}\}\right)/\sum_j \mu_j}$$

where $I\{\cdot\}$ is an index of inequality (such as Gini, Theil's entropy measure, mean log deviation (MLD), the ratio of 80th to 50th percentile income, or the ratio of 50th to 20th); y_{i1}, y_{i2}, …, y_{it} is the income of family i in year 1 through year t (year 1 can be seen as year b, and year t as year e). In the denominator, the index j runs from 1 to t. Note that this is the only measure we present in this paper that uses income data on the intervening years between beginning and end of period. Mobility-as-equalizer and its "ingredient" measure of long-term inequality (the numerator in the expression above) are the most direct measures of the degree to which mobility equalizes long-term incomes.

We apply the mobility-as-equalizer concept to subgroups by calculating the between-group inequality of both single-year and long-term incomes of the two groups. A considerable literature examines between-group measures of inequality.[10] With only two subgroups (blacks and whites), between-group inequality is quite small, but its change over the 1967–2004 time span does shed additional light on the shifting relative mobility of the two groups. In addition, we look at 10-year and 1-year between-group inequality relative to its possible maximum (based on the sizes of the groups and the overall income distribution) and the mobility-as-equalizer measure based on these between-group inequality measures relative to maximum.

Data and Sample

The mobility measures defined above are calculated using data from the Panel Study of

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is conceptually different from Shorrocks'. Fields' measure uses income information only for the beginning and end of the period and incorporates a directional aspect. It measures whether the average or sum of beginning and ending income is more/less equal than the beginning-of-period income. The OECD adopted Shorrocks' measure to quantify "the extent to which earnings mobility reduces long-run inequality measured at a point in time" (OECD, p. 29)—the issue of interest in this paper regarding family income mobility and inequality.

[10] We use the subgroup decomposition developed by Bourguignon (1979) to calculate between-group inequality for Theil and mean log deviation measures. The Gini coefficient cannot be decomposed into (exhaustive) additive between-group and within-group components (largely because rank plays a role in its calculation); a third Gini component would reflect interaction or overlap of subgroup distributions.

Income Dynamics (PSID), which has collected information on the incomes and characteristics of individuals and their families since 1967. The survey was conducted every year from 1968 through 1997 and every other year thereafter; the most recent survey included, conducted in 2005, provides data on incomes in 2004.

We include all families who meet the following criteria at both ends of the period:

- head (and spouse, if present) between 16 and 62 years old
- family income data not missing.

Thus, the sample (approximately 3,000 to 4,000 families) changes for each period. We weight the head and spouse observations, using individual weights, to correct for the PSID's over-sampling of the bottom of the income distribution.[11]

The income measure is based on the PSID's family income, which comprises pretax and post-transfer income of all family members combined, including wages, salaries, rent, interest, dividends, farm and business income, pensions and social security, welfare, alimony, child support, and help from relatives and others. We compute mobility measures based on family income and also using family income adjusted for PSID "needs," an equivalence scale similar to the poverty line, which (like the poverty line) takes account of family size and composition.

In most of the analysis that follows, we start by computing the measures for our "base case," in which income is adjusted for PSID needs, the period over which mobility is measured is 10 years, and income-to-needs is averaged for two years at both the start and end of the 10-year period. Because the data are collected only every other year after the 1996 income year, the two-year endpoints span three years and are calculated by averaging non-adjacent years (t-1 and t+1); for consistency, this approach is also used before 1996. Our labeling convention is that "2003" is the average of 2002 and 2004 income data.[12] It is worth pointing out that since data are available for even and odd 10-year periods ending in years up to 1995 (average of 1994 and 1996), but only for odd years afterwards, the available data points thin out in later periods, making it more difficult to draw inferences about time patterns towards the end of the PSID

[11] We compute average weights for each family over all the years included in each period's measure.
[12] That is, the period labeled 1993–2003 reflects income-to-needs changes between the average of 1992 and 1994 and the average of 2002 and 2004.

time span.

Although the base case represents our preferred approach, we also present and discuss the results using the alternative approaches because they may provide additional information about mobility or a more nuanced understanding of its sources and, in many cases, may reinforce or confirm the findings indicated by the base case measures. Adjusting family income for PSID needs is expected to yield a more accurate indicator of wellbeing than family income itself, as is the case with using any equivalence scale to adjust income for family size and composition,. Averaging two years of income-to-needs at the period endpoints is intended to smooth some of the transitory income changes that occur on a year-to-year basis, as well as reduce the effects of measurement error in single-year income.

Focusing on 10-year periods represents less the selection of a "preferred" measure than simply a middle-ground choice—and one used in much of the literature. We compare this 10-year measure with the same measure for shorter (4-year) and longer (16-year) periods. It is useful to note that the sample of families available for analyzing 16-year mobility is smaller (about 2,700 observations in each period) than that available for 10-year (3,800 observations) and 4-year periods (5,100). The sample for longer periods is also more homogeneous in terms of age, because we require all heads and spouses to be between 16 and 62 years old at both the beginning and end of the period.[13]

Results for Relative Mobility

Overall relative mobility

Figure 1 displays four relative mobility measures and Gini mobility.[14] The time patterns of the individual measures are very similar, showing at least modest decreases in mobility in all measures. For example, 79 percent of families moved up or down one decile or more in the first

[13] Thus, heads and spouses in the sample for 16-year periods are ages 16 to 46 years at the beginning and 32 to 62 years at the end of the period, while the sample for 4-year periods is ages 16 to 58 years at the beginning and ages 20 to 62 years at the end of each period.

[14] Gini mobility is discussed later in the "overall interaction measures" section, but plotted here because of its similar scale and time path.

few periods, while 75 percent of families changed deciles during the last few periods.[15] The number of deciles the average family moved declined from 1.9 to 1.7.[16] Summing up changes from the first few to the last few periods, these two moving-among-deciles measures fell by 5 to 10 percent. The minus chi-squared measure fell from -6.0 to -7.4, a 24 percent decline in observed movement relative to the probabilities one would expect with a random draw. The inverse rank correlation also fell, from 0.39 to 0.34 (a 13 percent drop), indicating a slight increase in the association of the family's beginning-of-period and end-of-period rank. Thus, all these measures show a modest but noticeable decline in mobility over the three-plus decade span of the PSID, although the decline may have come to an end in recent years.

These patterns are broadly similar, albeit with a few exceptions, when mobility is measured using family income (instead of income adjusted for PSID needs); using single-year endpoints; or with periods longer or shorter than 10 years. With single-year endpoints, the mobility measures generally continue declining through 1990–2000, increase sharply for 1992–2002, and then reverse, with mobility lower in the 1994–2004 period than in the 1992–2002 period (see Appendix Figure A-1).[17] When computed using total family income rather than income-to-needs, most measures of mobility declined somewhat later (and fell less) than mobility measures based on income adjusted for needs between 1968–1978 and 1978–1988, and declined somewhat more than those based on income adjusted for needs between 1980–1990 and 1991–2001 (Appendix Figure A-2).[18] Measures using 16-year periods tend to decline throughout, without the leveling or reversal towards the end. Measures using 4-year periods decline and then rise, as do the 10-year measures, but they show a decline again in the final

[15] To reduce sensitivity to jumps in individual periods, the text compares values averaged for 1968–1978 through 1970–1980 with values averaged for 1991–2001 through 1993–2003.

[16] The scale in the figure is average number of moves divided by three.

[17] Mobility measured with single-year endpoints is higher because the two-year averages smooth out some year-to-year variation that is counted as mobility in single-year comparisons.

[18] Mobility (with the exception of decile mobility) is also somewhat higher when measured with family income than when measured with income-to-needs. One might infer that some of the measured mobility of family income does not represent corresponding changes in wellbeing because it does not take account of changes in family size and composition.

(1999–2003) period (Appendix Figures A-3 and A-4).[19]

Origin-specific relative mobility

Origin-specific mobility measures allow us to examine the movement of families who begin in a specific segment of the initial distribution. Figure 2 shows the percentages of families falling out of the top decile and rising from the bottom decile, respectively. Like the overall measures, these origin-specific measures exhibit a slight downward trend over the PSID time span. For example, the percentage of families who rise from the bottom decile declined 5 percentage points, from about 51 percent in 1968–1978 to about 46 percent in 1993–2003. The percentage of those who fall from the top decile declined less, from 56 percent to 54 percent.[20]

Figure 3 displays mobility patterns for families at the bottom and top more broadly, showing the percentage of families in the bottom three deciles who moved beyond the median or into the top three deciles and the percentage of families in the top three deciles who moved below the median or into the bottom three. These measures indicate declines in mobility over the full 1968–2003 time span, although mobility appears to have leveled out more for families beginning in the top three deciles across the final several periods. Figures 2 and 3 taken together suggest not only that mobility has been falling, but that the decline has been more pronounced at the bottom than at the top.[21]

Selected Measures of Absolute (Origin-Specific) Mobility

Figure 4 reports mean income-to-needs at the beginning and end of each 10-year period

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[19] Mobility is much higher during a 16-year period and much lower during a 4-year period than during the standard 10-year period.

[20] If we look at shorter and longer periods, mobility from the top decile changes more than mobility from the bottom. Thirty-eight percent of families starting in the richest or poorest deciles move out within a 4-year period, on average, as compared with 53 percent (richest) or 50 percent (poorest) during 10-year periods, and 62 (richest) or 55 (poorest) percent during 16-year periods. This suggests that being in the top decile is somewhat more transitory than being in the bottom; by the same token, families are more likely to be "stuck" at the bottom.

[21] As with overall measures, the origin-specific measures show greater mobility when using single-year endpoints, and mobility falls in the 1994–2004 period compared with the 1992–2002 period. Similarly, measures based on family income show higher mobility than those using income-to-needs, especially in the 1970s.

for families starting in selected deciles. Families in the richest decile had 10 times the income-to-needs of those in the poorest decile, on average. Mean income-to-needs grew by an average of 119 percent for families who started in the poorest decile and by only 24 percent for those starting in the top decile. While families beginning each 10-year period in richer deciles generally saw smaller percentage increases in income-to-needs, they still ended the period well ahead of those beginning in poorer deciles. Furthermore, the absolute gains in income-to-needs of those starting near the top exceeded the gains of those starting near the bottom in every period. Those who began in the lowest decile gained income equal to an average of 1.03 times needs in each 10-year period and were still quite poor at the end, with income-to-needs averaging about 2. At the opposite extreme, notwithstanding their modest percentage increases, families beginning in the richest decile saw average absolute gains of 2.09 (twice the gains of those beginning in the poorest decile). The average family saw absolute gains averaging 1.3 per period; in every period, the richest decile's absolute gains were above average and the poorest decile's absolute gains were below average.

Figure 5 examines absolute mobility measured as the percentage of families rising above "extreme poverty," which is defined as income-to-needs less than or equal to 1; about 5 percent of all families were in extreme poverty, on average, during the 1967–2004 time span. Sixty-seven percent of families in extreme poverty in 1968 succeeded in escaping after 10 years; the fraction climbing out of extreme poverty fell to 63 percent by 1993–2003. Falling *into* extreme poverty occurred much less frequently and, at just over 2 percent, was essentially the same in 1968–1978 as in 1993–2003. Both of these measures were worse—fewer families escaping extreme poverty and more falling into it—during the late 1970s, 1980s, and through the early 1990s than in either earlier or later periods.

Interaction (Overall) Mobility

Gini mobility

The Gini mobility measure, which reflects the association of changes in rank and income during a period, is displayed in Figure 1. Like the overall relative measures in Figure 1 and origin-specific relative measures in Figures 2 and 3, its general path is downward between

1968–1978 and 1993–2003, and its decline is not monotonic, although like many of the other measures, it shows slight increases across the last two periods. Gini mobility fell from 0.36 in the first few periods to 0.31 in the last few, a 15 percent decline; it underwent twice as large a drop from its peak of 0.38 (1971–1981), to its lowest point of 0.28 (1987–1997).

Long-term inequality

To investigate the extent to which longer-term incomes are more equal than individual-year incomes and whether that pattern has changed over time, we employ several alternative measures of inequality: the Gini coefficient, mean log deviation, and Theil's entropy; also, in order to look at inequality at the top and bottom of the distribution, we examine separately the ratio of 80th percentile income to 50th percentile (the median) income and the ratio of 50th percentile to 20th percentile income. We calculate the inequality of longer-term income, where longer-term income is defined as the average of all the observations on each family's income within a (10-year) period.[22]

Figure 6 displays the first three inequality measures of annual and long-term income for each 10-year period between 1967–1977 and 1994–2004. According to the Gini, long-term inequality is 9 to 12 percent lower than annual inequality, indicating that year-to-year changes in income within a 10-year period do, as expected, smooth some of the inequality of annual incomes.[23] The other two measures show even greater long-term leveling; Theil long-term inequality is 20 to 26 percent lower than Theil annual inequality; the mean log deviation of 10-year income is 27 to 35 percent lower than that of single-year income. Transitory shocks are

[22] Available data limit us to income averaged over the six years comprising every other year within each 10-year period. Thus, the first (1967–1977) "longer-term inequality" we calculate is based upon average income for each family observed in 1967, 1969, 1971, 1973, 1975, and 1977; the final measure includes incomes in 1994, 1996, 1998, 2000, 2002, and 2004. See Appendix Figure A-5 for a comparison of inequality based on the average over six years of income observations with one based on all 11 years of income within a 10-year period; the data for this comparison are available from 1967–1977 only through 1986–1996.

[23] If we define "long-term" with shorter or longer period lengths, the degree of equalization is smaller or larger, respectively. According to the Gini measure of inequality, 4-year income-to-needs is 7 percent less unequal than one-year income-to-needs, on average, while 10-year is 11 percent less unequal, and 16-year is 14 percent less unequal than one-year income-to-needs.

likely to show up as extreme values in a single year—and hence contribute disproportionately to single-year inequality—and be wiped out by long-term averaging. The Theil and mean log deviation measures are more sensitive to extreme income values than is the Gini; as a result, they show more reduction in inequality than the Gini in moving from short-term to long-term income.

All three measures show substantial increases in cross-sectional inequality, a finding that has been well established by other research. However, inequality of income-to-needs appears to have risen more steeply, especially in the first two-thirds of the time span, than the (annual) inequality of U.S. household incomes based on the Current Population Survey (CPS).[24] This difference may reflect both the different data sources (PSID and CPS), and the fact that the inequality of family income increased more steadily and steeply than that of income-to-needs, even in the PSID data (see appendix Figure A-6).

While the average single-year inequality measures rose more slowly across the later periods than earlier, the measures for long-term inequality using income-to-needs (solid lines) leveled out—stopped increasing—in the periods after 1985–1995.[25] Over the full time span, the increase in inequality of long-term income-to-needs (or family income) implies that mobility was not sufficient to offset the rise in inequality of annual incomes; that is, the inequality of long-term income is measurably higher in the 1990s to early 2000s than in the late 1960s to 1970s and 1980s. According to the Gini measure, average annual income inequality and the inequality of long-term income-to-needs increased by about 25 percent.[26] The mean log deviation and Theil inequality measures increased more than the Gini measure in percentage terms, 60 to 80 percent (however, unlike the Gini, they are not bounded at 1).

Figure 7 illustrates how changing the length of the period alters the level of "long-term"

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[24] The Census Bureau publishes data on the Gini coefficient, mean log deviation, and Theil measures of inequality for household incomes in the United States annually from 1967 through 2007. See U.S. Census Bureau, Table A-3, Selected Measures of Income Dispersion (click on E-1 at http://www.census.gov/hhes/www/income/histinc/ineqtoc.html). The term "families" in the PSID is comparable to "households" in the Current Population Survey.

[25] However, this leveling-out of inequality does not occur when measures are based on long-term family income rather than long-term income-to-needs, as shown in Figure A-6.

[26] Inequality of family income (not relative to needs) rose 33 to 35 percent.

inequality. As expected, all three measures of inequality are lower when the period length is 16 years, and higher when it is only 4 years, than in the 10-year base case. The measures are 5 to 13 percent lower with 10-year periods than with 4-year periods, and 3 to 8 percent lower with 16-year periods than with 10-year periods. The fact that the reduction in inequality narrows as the period lengthens is evidence that both permanent and transitory income changes contribute substantially to mobility.[27]

More important than reduced inequality for longer period lengths, however, the key pattern to note in Figure 7 is that long-term inequality rose across the periods from the 1970s through the 1990s and early 2000s, regardless of period length. Indeed, the inequality of long-term income for 4-year and 16-year periods increased more steadily than for 10-year periods, even through periods ending in the 2000s.

To investigate whether the top and bottom of the (long-term) income distribution spread out differentially, Figure 8 displays the ratio of 80th percentile to 50th percentile incomes and the ratio of 50th percentile to 20th percentile incomes, for both 10-year and one-year income-to-needs. At both the top and the bottom, long-term income is less unequal than short-term income. Like the more sophisticated inequality measures in Figure 6, these ratios rose over time, indicating that both the upper and the lower parts of the long-term and short-term income-to-needs distribution spread apart considerably between the 1970s and the 1990s, with the 50/20 ratio increasing 18 to 19 percentage points and the 80/50 ratio rising 13 to 16 percentage points.

Mobility-as-equalizer

The mobility-as-equalizer measure, based on long-term and short-term income inequality, paints a slightly different picture (Figure 9). Using the mean log deviation to measure inequality, this measure of mobility rose over the entire time span, as single-year inequality rose faster than long-term inequality; apparently year-to-year (transitory) income changes that disappear in the long-term average accounted for an increasing fraction of (rising)

[27] Shorrocks (1978, p. 389) notes "if income changes are purely due to transitory effects, relative incomes will rapidly approach their permanent values [as the period length is extended] and there will then be no substantial further equalization."

single-year inequality. Using the Gini or the Theil measure of inequality, mobility generally declined from the 1970s through the 1980s. However, the mobility-as-equalizer measure then rose gradually and ended at roughly the level where it began. Thus, over the last few 10-year periods, transitory changes in income-to-needs (eliminated from the long-term averages) accounted for all of the increase in single-year inequality, as long-term inequality stopped rising.[28]

Looking at mobility-as-equalizer separately for the top and bottom of the income-to-needs distribution (Figure 10) indicates that mobility defined in this way generally increased at the top after 1973–1983, and declined at the bottom after about 1978–1988. That is, in the lower part of the income distribution, the inequality of long-term income rose faster than the inequality of short-term income, reinforcing the pattern observed in Figure 2, that mobility of families at the bottom declined more than mobility of those at the top of the distribution.

Figures 6, 7, and 8 indicate that both single-year inequality and long-term inequality were higher in the 1990s than in the 1970s. Furthermore, Figures 9 and 10 indicate that the fraction of annual inequality that mobility "equalized" was about the same overall (at least based on the Theil and Gini inequality measures), but declined for bottom-half inequality. The rise in all the measures of long-term inequality indicates directly that mobility across the PSID time span was not sufficient to offset the substantial rise in cross-sectional (one-year) inequality, either overall or in the top or bottom of the distribution.

Mobility by Race

We also examine separately the income mobility of black families and white families.[29] We consider whether, and by how much, black and white families move relative to the overall

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[28] For total family income, the mobility-as-equalizer measures based on Gini or Theil inequality end the PSID time span lower than they began. As noted in the text above, the inequality of long-term incomes continues to rise throughout the span; mobility that averages out year-to-year income changes is not sufficient to keep long-term income inequality from rising. Indeed, in terms of family income, mobility is equalizing a smaller share of annual inequality in 1994–2004 and several preceding periods than in 1967–1977 and several subsequent periods.

[29] The "other race" category (nonblack, nonwhite) is very small in the PSID. Hispanics (who may be of any race) are also a relatively small share of the PSID sample.

distribution of families and to each other. Thus, for example, we define deciles on the basis of the all-families distribution of income relative to needs, and look at mobility of black (white) families across the deciles.

Figure 11 displays three overall relative mobility measures, comparing black and white families. All three measures show that black families experienced less mobility than white families. Decile mobility was markedly lower for blacks than for whites, with over three-quarters of white families moving out of their origin decile in 10 years compared with fewer than two-thirds of black families. The average white family moved 1.8 deciles during a decade, while the average black family moved only 1.4 deciles. The (inverse) rank correlation (using rank in the overall distribution) is modestly lower for black families than for white families, with the disparity somewhat smaller than seen in the measures based on deciles. The other pattern visible in Figure 11 is that all of the lines move down over time; mobility has been declining for white families as well as for black families.

Figure 12 displays (origin-specific relative) mobility of white and black families out of the poorest decile or poorest three deciles, indicating that poor white families enjoyed much higher rates of upward mobility than poor black families. Thus, 60 percent of the whites who began in the poorest decile escaped it in 10 years, while only about 30 percent of the poorest blacks did. Similarly, over 40 percent of white families who began in the poorest three deciles moved above the 30th percentile, while fewer than 20 percent of black families beginning in the poorest three deciles escaped. And 8 percent of white families who started in the poorest three deciles made it into the richest three deciles by the end of the decade, while only 2 percent of such black families did.

Figure 13 shows how average income-to-needs by race evolved during each 10-year period, providing a racial comparison of absolute mobility. Black families had lower incomes at the beginning and end of each 10-year period, on average, than white families. And black families experienced considerably slower growth in income, on average (24 percent as compared with 37 percent for whites).

Figure 14 reports absolute (origin-specific) mobility data similar to those in Figure 5, by race. Over the last 30 years, 60 to 80 percent of whites who began in extreme poverty saw their

incomes rise beyond needs, while 40 to 50 percent of extremely poor blacks did. As with all families, the fractions falling into extreme poverty were fairly small, but blacks were still more likely than whites to move from income greater than needs at the beginning of a period to extreme poverty at the end.

Figure 15 compares between-race inequality of long-term and one-year incomes. Reflecting only differences in *average* income between blacks and whites, these inequality measures are quite low. However, between-race inequality rose steeply between 1975–1985 and 1986–1996, as average income of white families rose faster than that of blacks (recall Figure 13). Looking at long-term income reduces between-race inequality very little compared with one-year income; the lines are practically superimposed (the inequality of long-term income is only about 0.5 percent lower than that of single-year income).

Elbers, Lanjouw, Mistiaen, and Ozler (2005) suggest measuring between-group inequality relative to its potential maximum, because the between-group maximum—which depends on the number and size of the groups and the shape of the overall income distribution—may be low. In our case of two races, the maximum is calculated by computing between-group inequality for two groups the same size as the racial groups, with average income of the smaller group (containing b percent of the total population, where b is the actual fraction of families in the black group) computed over the lowest b percentage of observations in the actual overall distribution.

The maximum inequality between races is lower for 10-year income than for one-year income because the long-term income distribution across all families is more equal than the short-term distribution. But, as Figure 15 shows, actual long-term between-race inequality is barely lower than short-term between-race inequality. As a result, long-term between-race inequality computed relative to its potential maximum is *higher* than short-term (whether we use Theil or MLD to measure inequality); see Figure 16. And when we calculate mobility-as-equalizer using between-race inequality relative to maximum as the measure of inequality, the mobility measure is negative: mobility makes the long-term income distribution more unequal—measured in this way—than the one-year distribution (Figure 17). Furthermore, mobility has become increasingly disequalizing between the races over time.

In sum, the mobility of black families is markedly lower than that of white families, both on average and conditional on starting out poor or near the bottom of the income distribution. While this mobility differential does not appear to be widening, black families fell further behind white families in terms of levels of income-to-needs (long-term and short-term), and the ongoing mobility differentials contributed to that deterioration.[30]

Summary and Discussion

We find that U.S. family income mobility decreased during the 1967–2004 time span, according to a variety of measures. Most overall mobility measures fell, with mobility noticeably lower in the 1990s than in the 1970s. However, many of the overall measures level out after the 1980s, and some even show increases in periods ending after 2000, although it is difficult to draw firm conclusions, as data points are sparse after 1996. Origin-specific relative measures also show declining mobility throughout the entire time span for families beginning in or near the bottom of the income distribution. By contrast, origin-specific absolute measures generally exhibit no trend; in particular, the share of families moving out of extreme poverty is similar in the 1970s and 1990s. For black families, most mobility measures decline over the study's entire time span, but these decreases are no more pronounced than those for white families.

Although the declines in individual measures are modest (and we cannot judge statistical significance), the fact that so many different measures all move down suggests that a decline, not just leveling, did occur.[31] The increase in long-term inequality that we observe is further evidence reinforcing the conclusion that mobility has declined. However, documenting "the facts" still leaves open questions of interpretation. How do we judge this decline in mobility?

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[30] In 1967–1974, black families' incomes averaged 61 percent of white families', while in 1997–2004 the ratio averaged 53 percent.

[31] The small previous literature on changes over time in family income mobility (as distinct from individual earnings mobility) has generally reported that no change is occurring, but these conclusions are based on one or a few measures, each of which declines very little. See Acs and Zimmerman (2008), for example.

As others have noted, there is no simple answer when it comes to judging levels (and trends) in inequality and/or mobility. Some inequality in the potential and actual economic rewards to individuals and families undoubtedly produces efficiencies in allocation and production; it may encourage people to work hard, to save, to invest in human and physical capital, and to innovate. But inequality may also reflect restricted opportunity or barriers to mobility. Such barriers—circumstances or economic/social institutions or arrangements, including discrimination, imperfect capital markets, imperfect information, or other impediments that prevent poor families from improving their situation—result in unequal starting points being reinforced over time. These barriers not only distort market incentives and discourage the very hard work and investment that lead to economic growth but are also likely to result in negative externalities such as crime and reduced social cohesion, making public policy decisions more difficult. This suggests that one way to view the question is to focus on changes and not levels: Is there a reason to think that the efficient level of inequality and/or mobility has changed over the last 40 years? We are inclined to question why this might be so, but others may disagree; the question is far from settled.

In addition, the public may well care about equity or fairness. In particular, increasing economic mobility is a widely shared goal, especially if mobility equalizes lifetime incomes or results in families at the bottom moving up.[32] People who favor raising mobility would presumably be somewhat discouraged by our findings. Long-term income-to-needs (as measured over a 4-, 10-, or 16-year interval) is considerably more unequally distributed among families for periods ending in the 2000s than for periods ending in the 1970s. Hence, family income mobility apparently decreased or did not increase enough between the 1970s and the 1990s to stem increases in inequality of long-term income. Both the minus chi-square and the inverse rank correlation measure also declined, indicating that a family's position at end of a period was less likely to have been produced by a random process and more correlated with its start position than was the case 30-plus years earlier. In addition, declines in mobility seem to

[32] For example, according to a Pew Trusts survey, 60 percent of respondents thought it was a major problem that half of Americans who are at the bottom of the income ladder remain there 10 years later (Economic Mobility Project 2009).

be more pronounced lower in the distribution, as poorer families were decreasingly likely to move up.

What are the implications for policy? Because we find no evidence to suggest that the typical poor family is more likely to move up and out of poverty within several years than it was 40 years ago, policy remedies for those at the bottom should aim beyond short-term help, as the poor at any point in time are likely to have low long-term incomes. Beyond short-term relief, 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 or rising returns to high-stakes labor market promotion practices, including tournament-style regimes common in the professions.

Further research is needed to assess the balance among these potential sources of the decline in mobility. We plan to investigate time-series determinants of mobility patterns during the 1967–2004 period, examining the degree to which such factors as the shifting mix of family types, changing patterns of educational attainment, business cycle conditions, and broader time-series influences are associated with higher or lower mobility.

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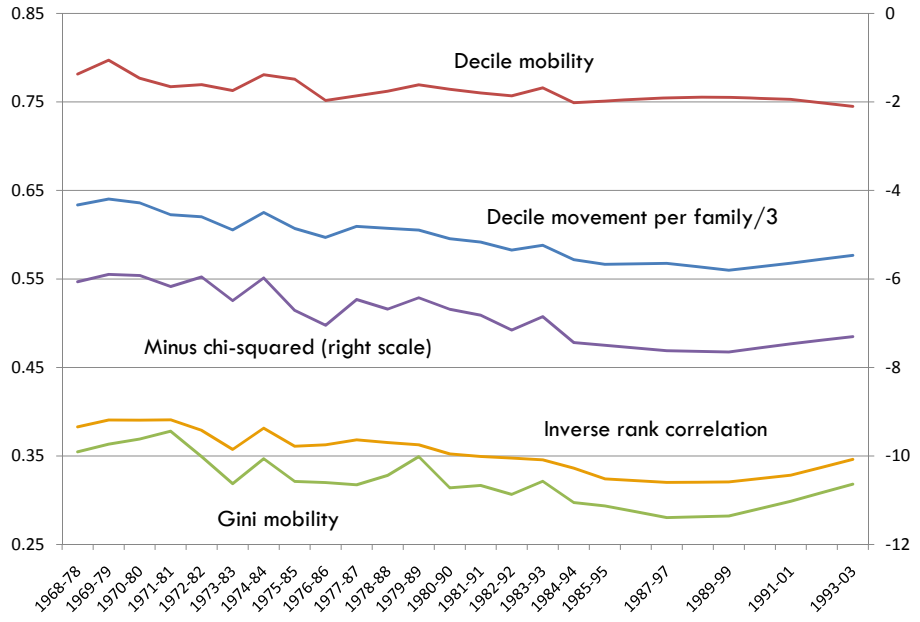
Table 1. Measures of mobility analyzed in this paper

	OVERALL	ORIGIN-SPECIFIC	SUBGROUPS (RACE ONLY)
RELATIVE	• Decile mobility • Per family decile movement • Minus chi-squared • Rank correlation (inverse)	• Fraction of bottom (top) decile who move up (down) • Fraction of bottom (top) three deciles who move beyond median • Fraction of bottom (top) three deciles who move into top (bottom) three deciles	• Decile mobility • Per family decile movement • Rank correlation (inverse) • Fraction of bottom decile who move up* • Fraction of bottom three deciles who move above bottom three* • Fraction of bottom three deciles who move to top three*
ABSOLUTE		• Absolute real income/needs growth of families in 1^{st}, 4^{th}, 7^{th}, 10^{th} beginning deciles • Fraction of families moving into and out of extreme poverty (defined as income/ /needs less than or equal to 1)	• Absolute real income/needs growth of subgroup families • Fraction of subgroup families moving into and out of extreme poverty*
INTERACTION	• Gini mobility • Inequality of long-term income (measured using Gini, Theil, mean log deviation, 80/50 ratio, and 50/20 ratio) • Mobility-as-equalizer		• Between-group inequality (measured using Theil and mean log deviation) • Between-group inequality relative to maximum • Mobility-as-equalizer based on between-group inequality relative to maximum

* indicates origin-specific measures for subgroups

Figure 1. Relative mobility measures and Gini mobility



*These are overall relative measures except for Gini mobility, which is an overall interaction measure.

Figure 2. Mobility of families starting in richest and poorest deciles

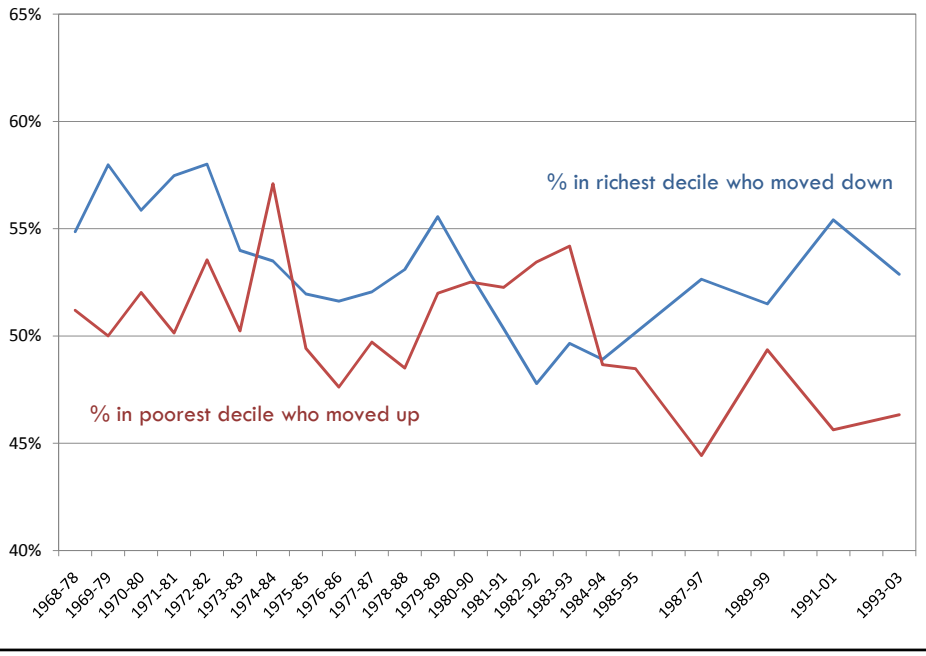


Figure 3. Mobility of families starting in top 3 and bottom 3 deciles

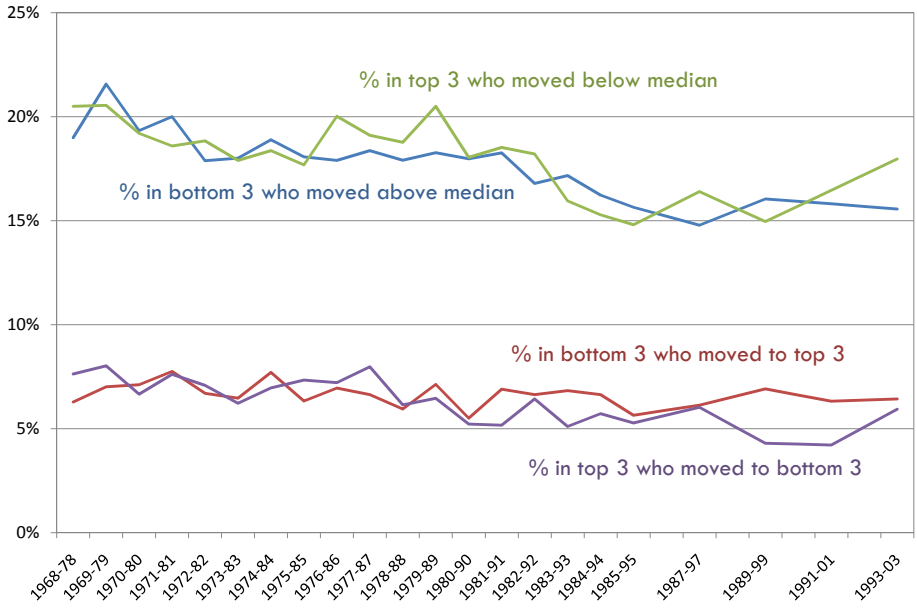


Figure 4. Mean income-to-needs at beginning and end of period for families who began in selected deciles

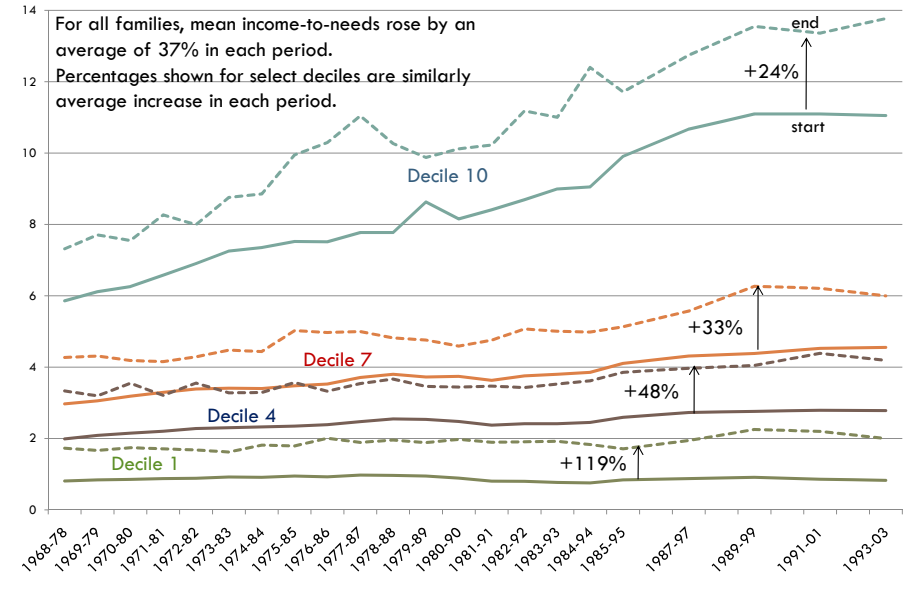


Figure 5. Movements into and out of extreme poverty

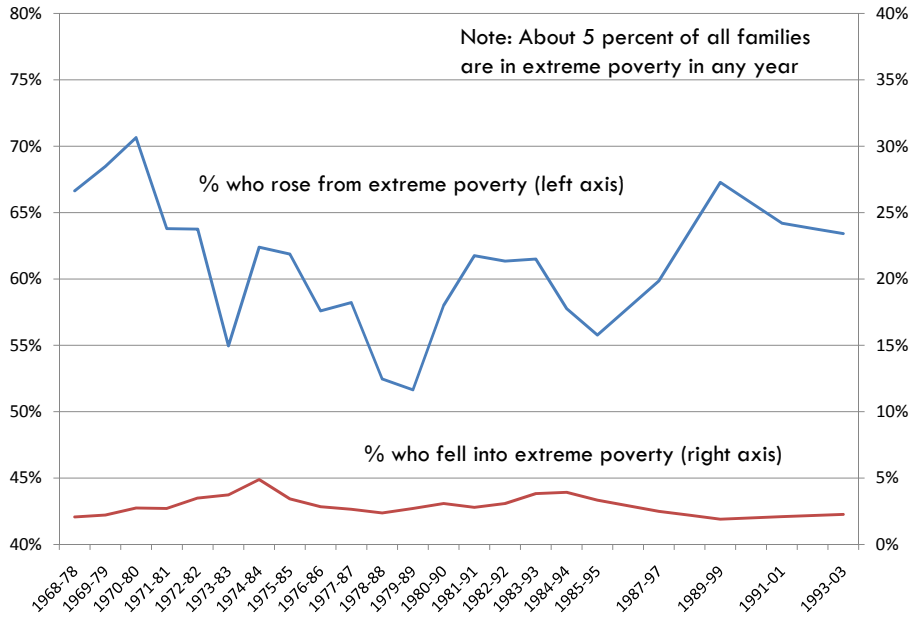
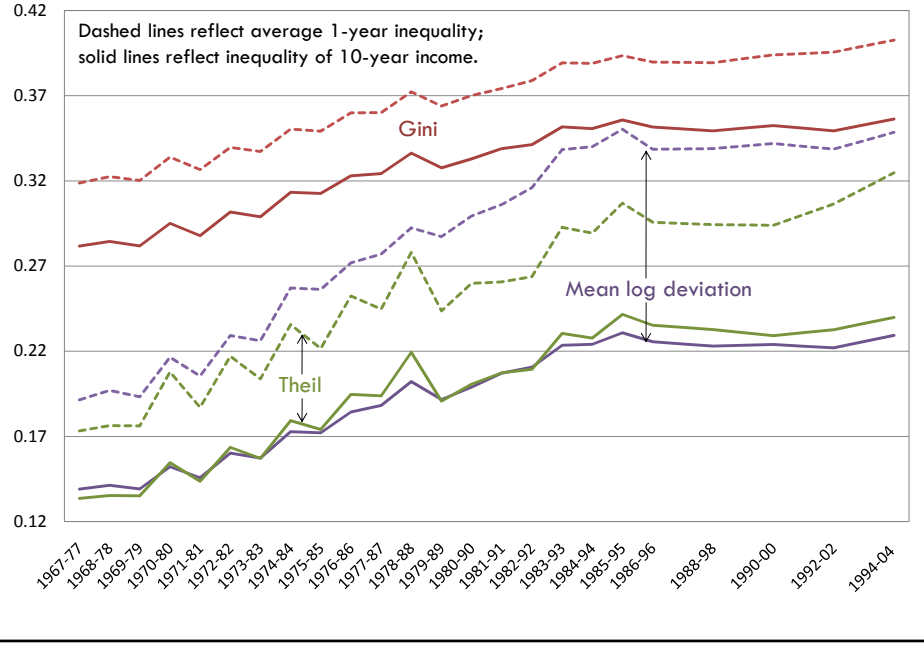


Figure 6. Inequality of income-to-needs, short-term and long-term



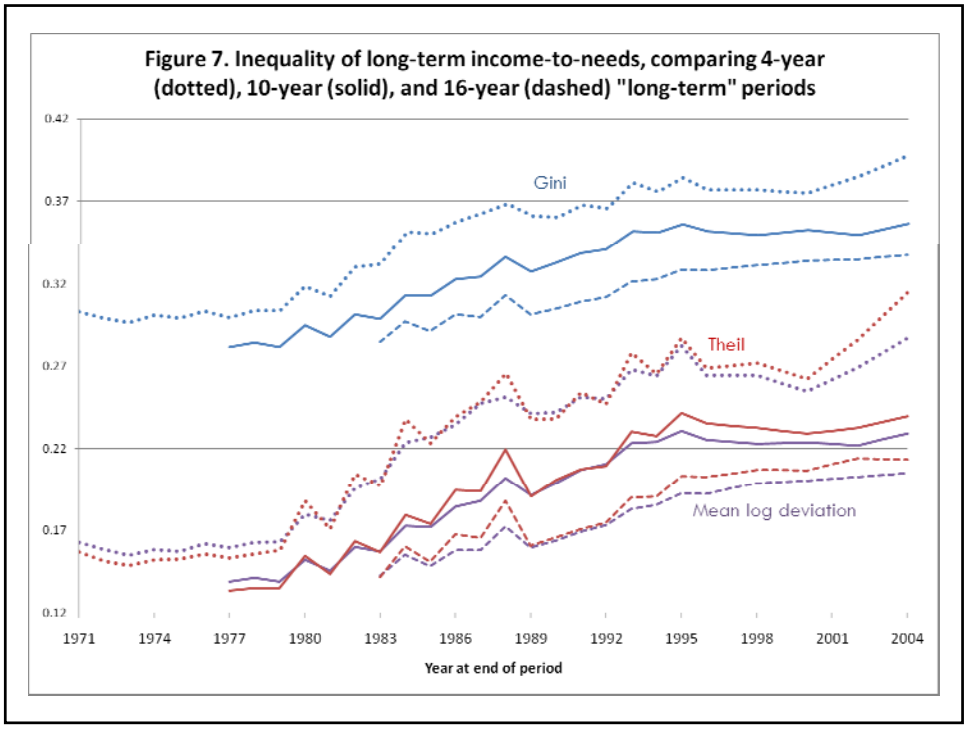


Figure 7. Inequality of long-term income-to-needs, comparing 4-year (dotted), 10-year (solid), and 16-year (dashed) "long-term" periods
0.42
0.37
0.32
0.27
0.22
0.17
0.12
Gini
Theil
Mean log deviation
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
Year at end of period

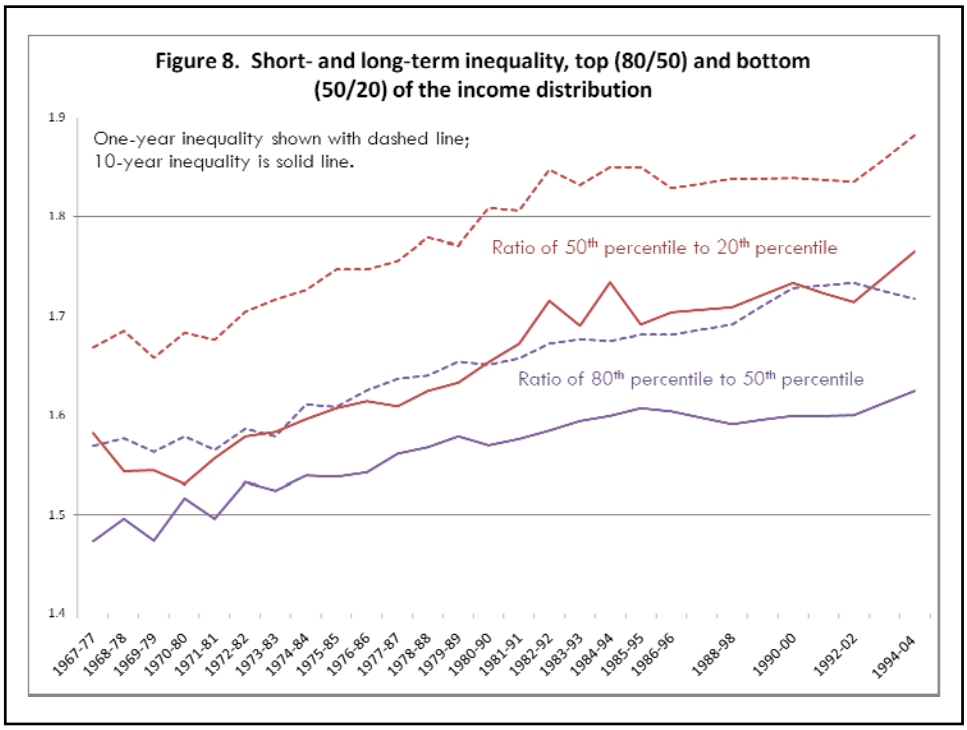


Figure 8. Short- and long-term inequality, top (80/50) and bottom (50/20) of the income distribution
One-year inequality shown with dashed line;
10-year inequality is solid line.
1.9
1.8
1.7
1.6
1.5
1.4
Ratio of 50th percentile to 20th percentile
Ratio of 80th percentile to 50th percentile
1967-77
1968-78
1969-79
1970-80
1971-81
1972-82
1973-83
1974-84
1975-85
1976-86
1977-87
1978-88
1979-89
1980-90
1981-91
1982-92
1983-93
1984-94
1985-95
1986-96
1988-98
1990-00
1992-02
1994-04

Figure 9. Mobility-as-equalizer, using three inequality measures
Reduction in inequality with 10-year income-to-needs compared with average one-year

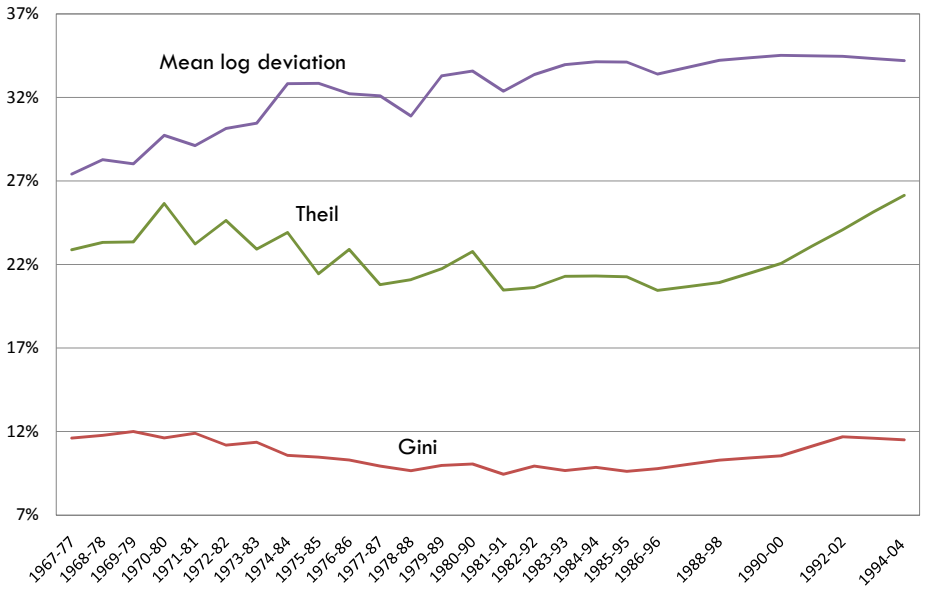


Figure 10. Mobility-as-equalizer based on inequality measured at the top (80/50) and bottom (50/20) of the income-to-needs distribution

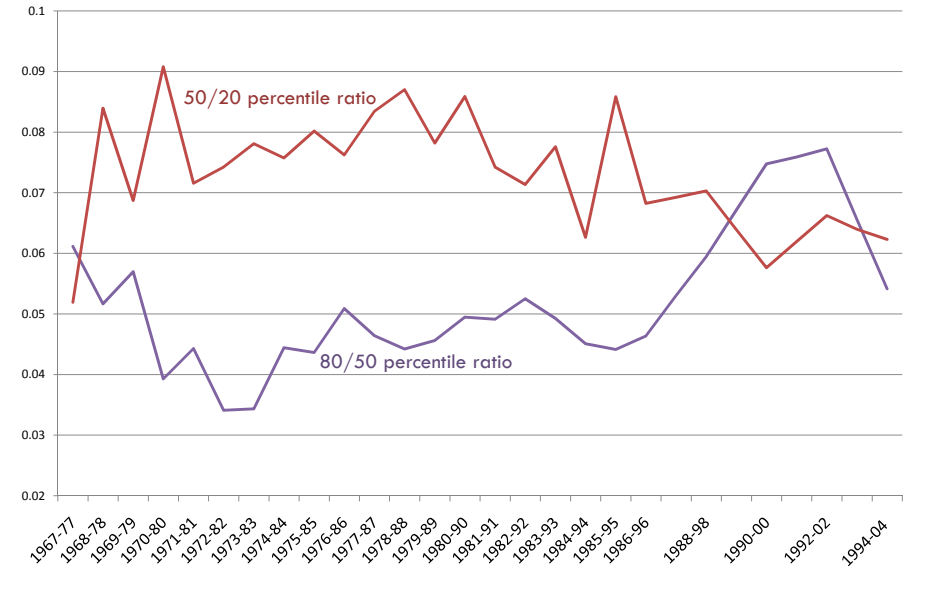


Figure 11. Relative mobility measures, by race
Black families are solid lines, white families are dashed lines

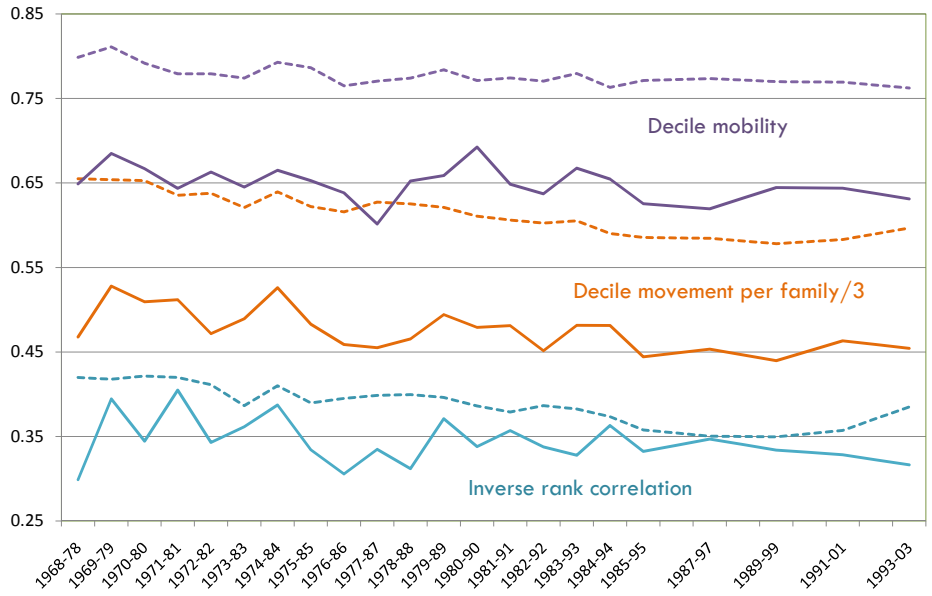
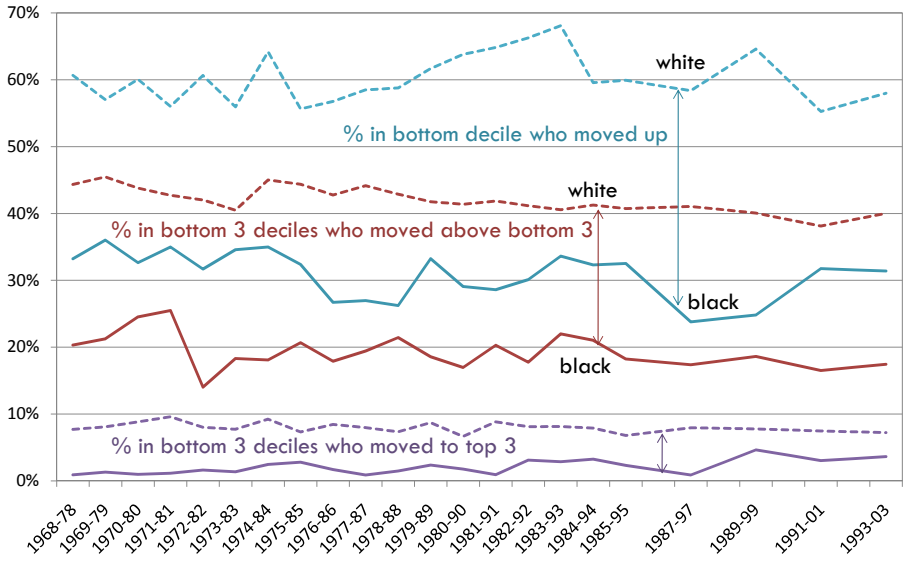


Figure 12. Mobility of families starting in or near bottom decile, by race
Black families are solid lines, white families are dashed lines



Note: On average, 7% of white families start in poorest decile, 26% start in bottom 3; 32% of black families start in poorest decile, 59% start in bottom 3.

Figure 13. Mean income-to-needs at beginning and end of period, by race

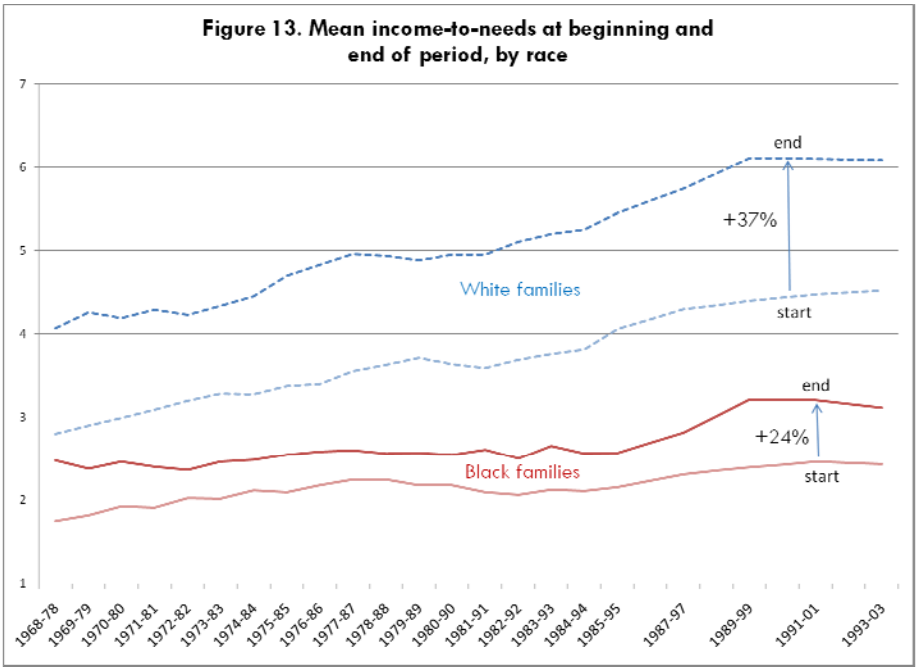
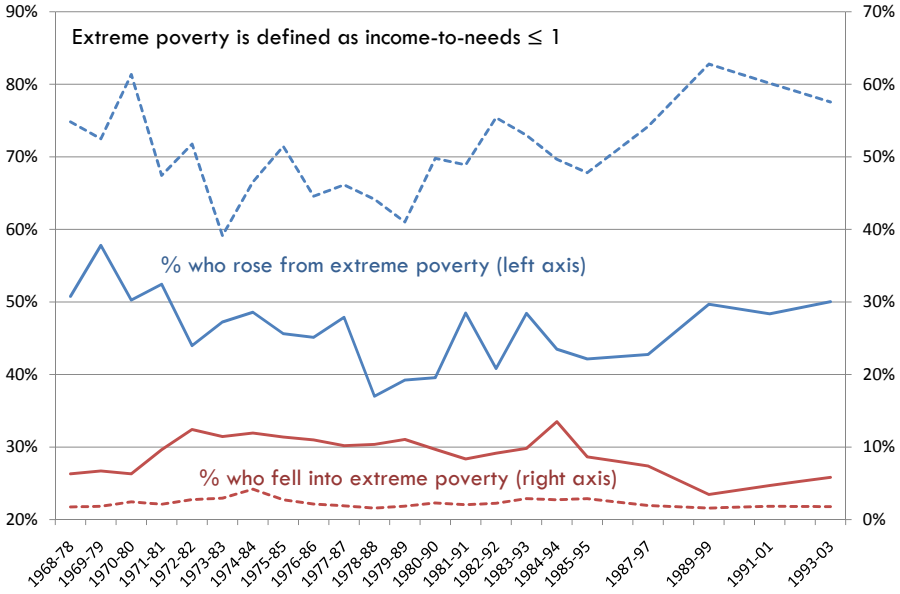


Figure 14. Families moving into and out of extreme poverty, by race
Black families are solid lines; white families are dashed lines



Note: 4% of white families and 22% of black families are in extreme poverty, on average.

Figure 15. Inequality between blacks and whites, 10-year income & 1-year income

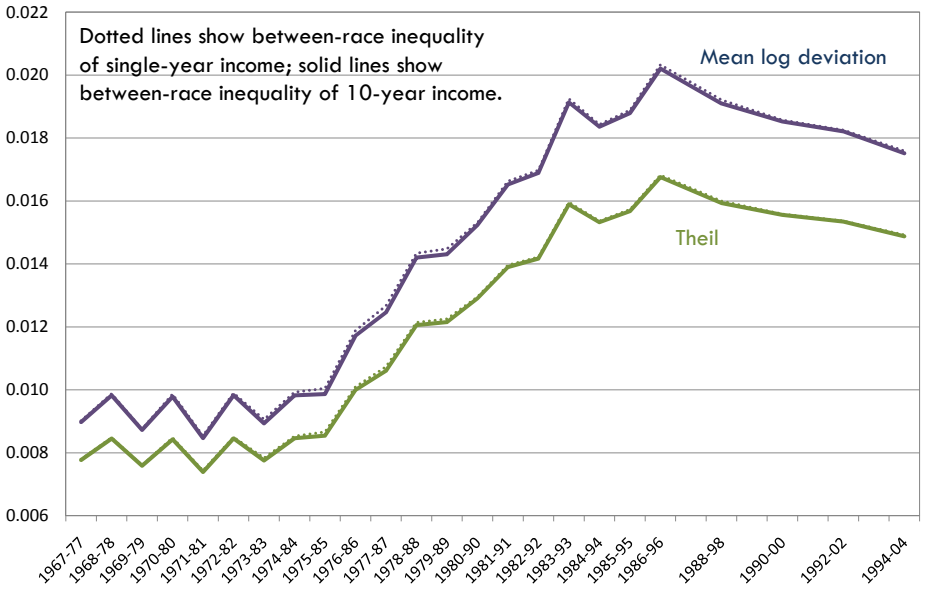


Figure 16. Between-race inequality relative to maximum, 10-year and single-year income-to-needs

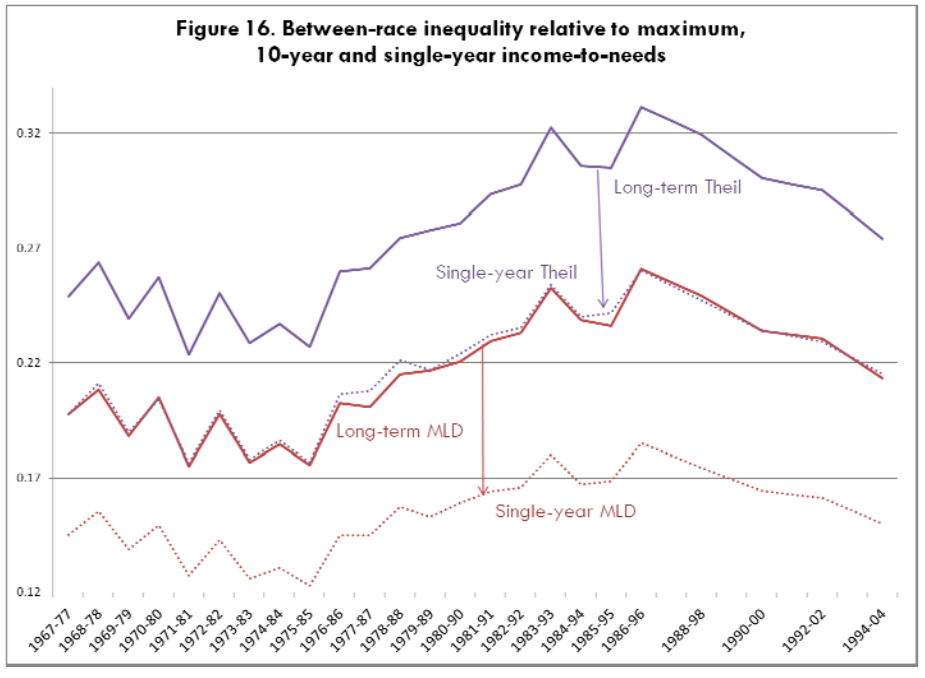
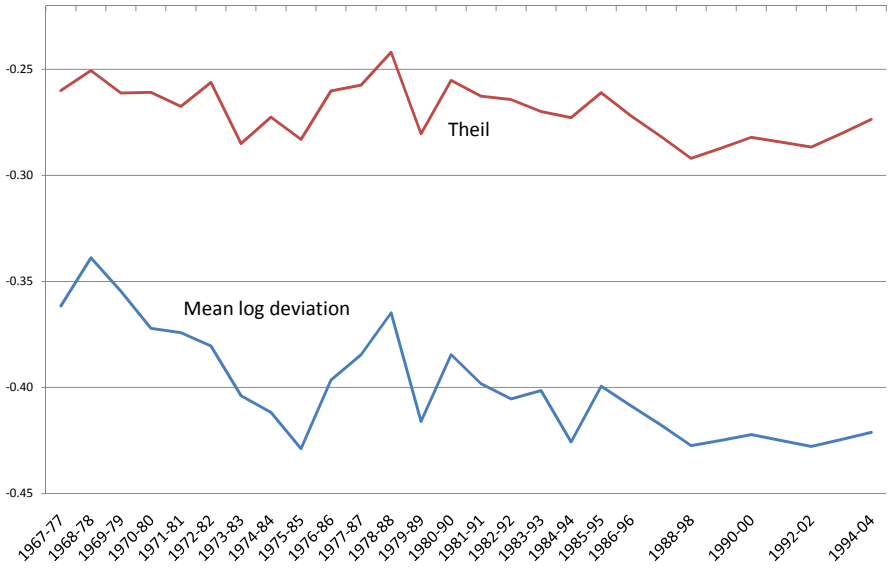


Figure 17. Mobility-as-equalizer (percentage of short-term inequality offset by mobility): Between-race inequality relative to maximum



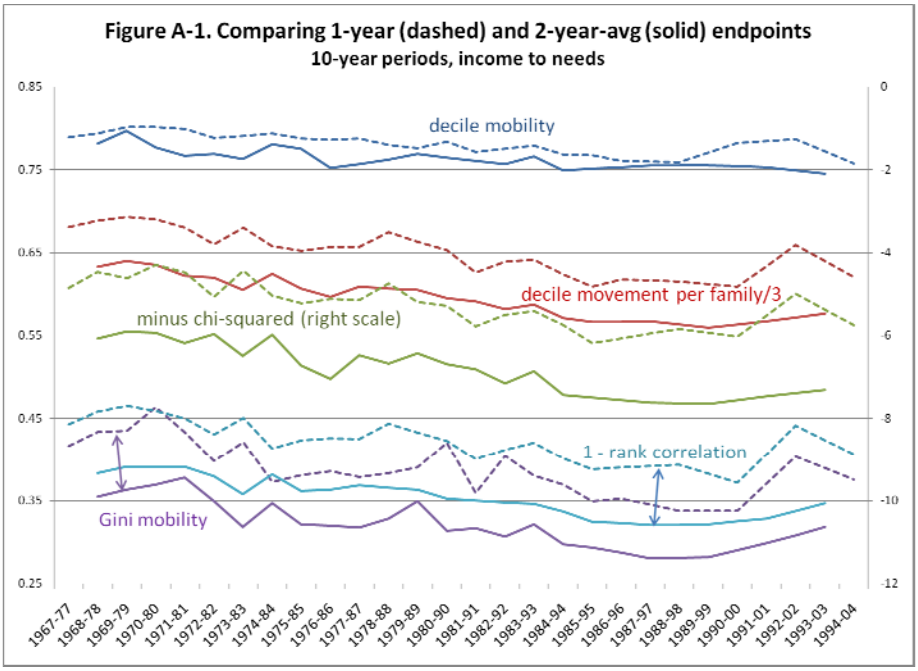


Figure A-1. Comparing 1-year (dashed) and 2-year-avg (solid) endpoints
10-year periods, income to needs
decile mobility
decile movement per family/3
minus chi-squared (right scale)
1 - rank correlation
Gini mobility
0.85
0.75
0.65
0.55
0.45
0.35
0.25
0
-2
-4
-6
-8
-10
-12
1967-77
1968-78
1969-79
1970-80
1971-81
1972-82
1973-83
1974-84
1975-85
1976-86
1977-87
1978-88
1979-89
1980-90
1981-91
1982-92
1983-93
1984-94
1985-95
1986-96
1987-97
1988-98
1989-99
1990-00
1991-01
1992-02
1993-03
1994-04

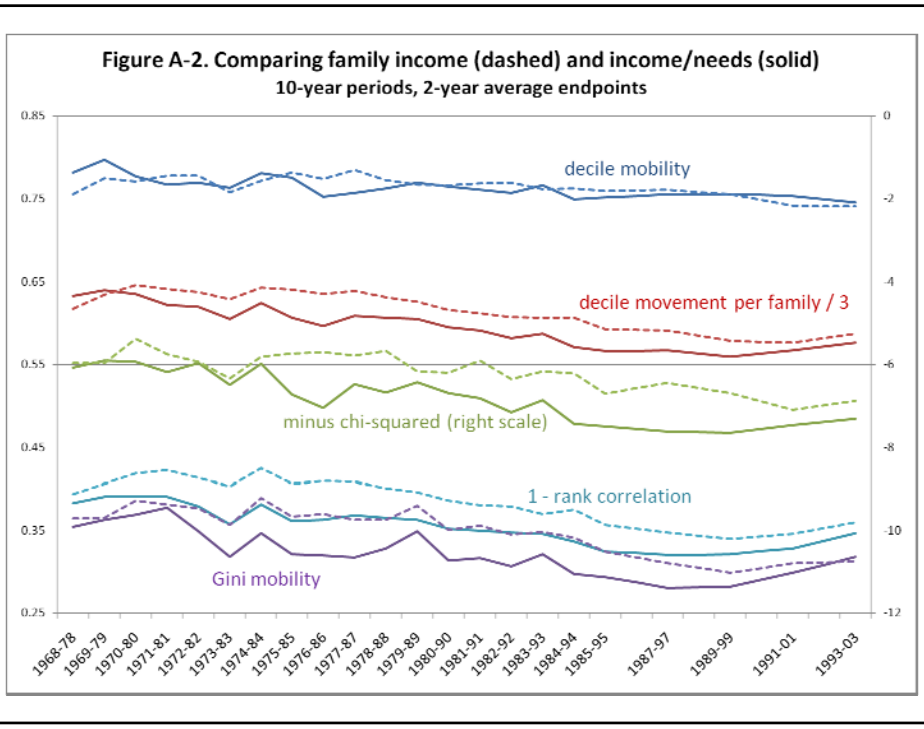


Figure A-2. Comparing family income (dashed) and income/needs (solid)
10-year periods, 2-year average endpoints
decile mobility
decile movement per family / 3
minus chi-squared (right scale)
1 - rank correlation
Gini mobility
0.85
0.75
0.65
0.55
0.45
0.35
0.25
0
-2
-4
-6
-8
-10
-12
1968-78
1969-79
1970-80
1971-81
1972-82
1973-83
1974-84
1975-85
1976-86
1977-87
1978-88
1979-89
1980-90
1981-91
1982-92
1983-93
1984-94
1985-95
1987-97
1989-99
1991-01
1993-03

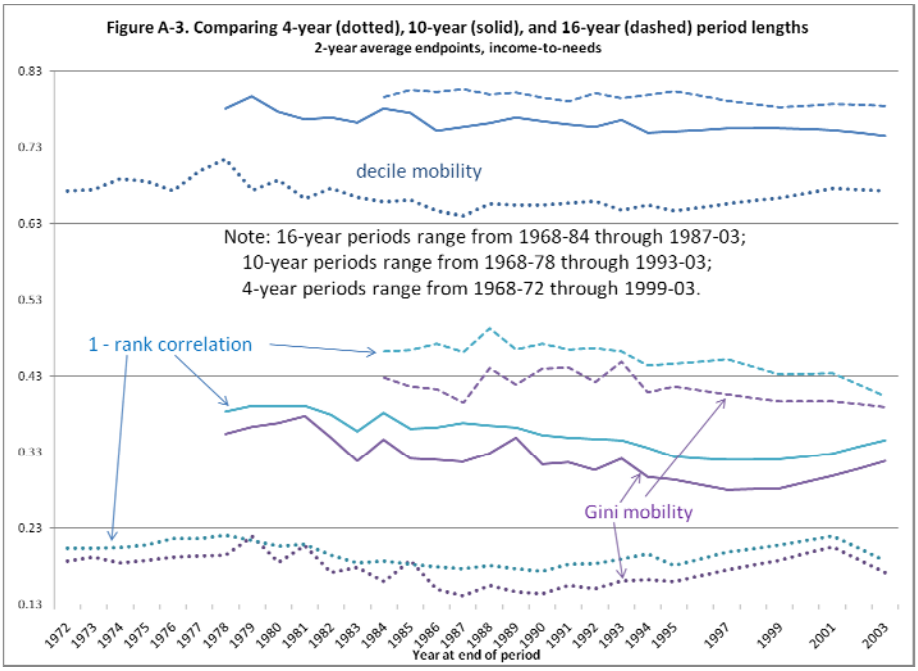


Figure A-3. Comparing 4-year (dotted), 10-year (solid), and 16-year (dashed) period lengths
2-year average endpoints, income-to-needs
0.83
0.73
0.63
0.53
0.43
0.33
0.23
0.13
decile mobility
Note: 16-year periods range from 1968-84 through 1987-03;
10-year periods range from 1968-78 through 1993-03;
4-year periods range from 1968-72 through 1999-03.
1 - rank correlation
Gini mobility
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1997 1999 2001 2003
Year at end of period

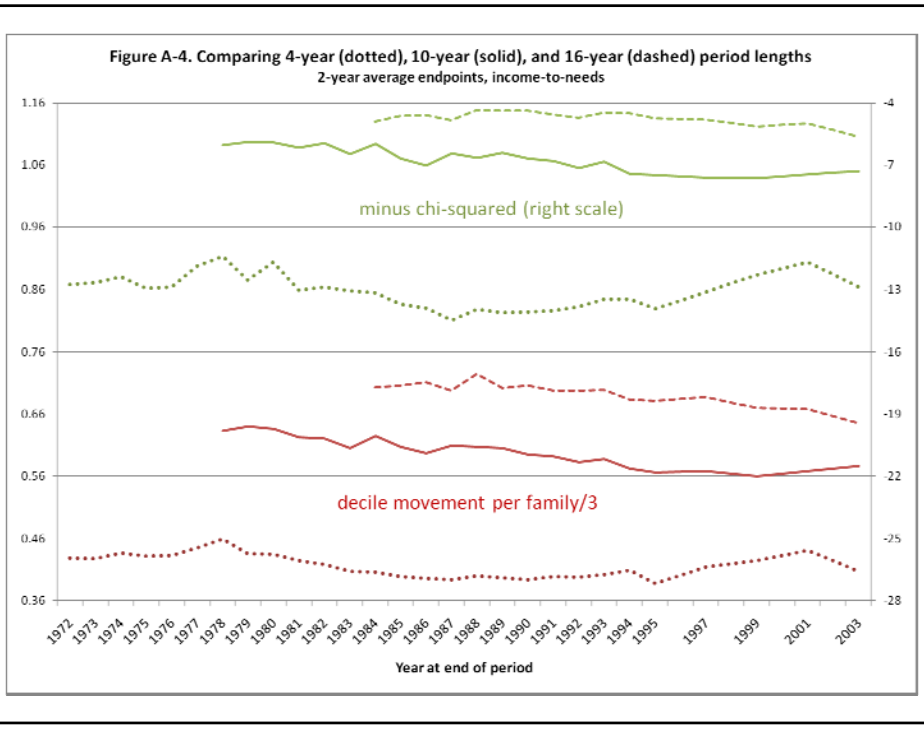


Figure A-4. Comparing 4-year (dotted), 10-year (solid), and 16-year (dashed) period lengths
2-year average endpoints, income-to-needs
1.16
1.06
0.96
0.86
0.76
0.66
0.56
0.46
0.36
-4
-7
-10
-13
-16
-19
-22
-25
-28
minus chi-squared (right scale)
decile movement per family/3
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1997 1999 2001 2003
Year at end of period

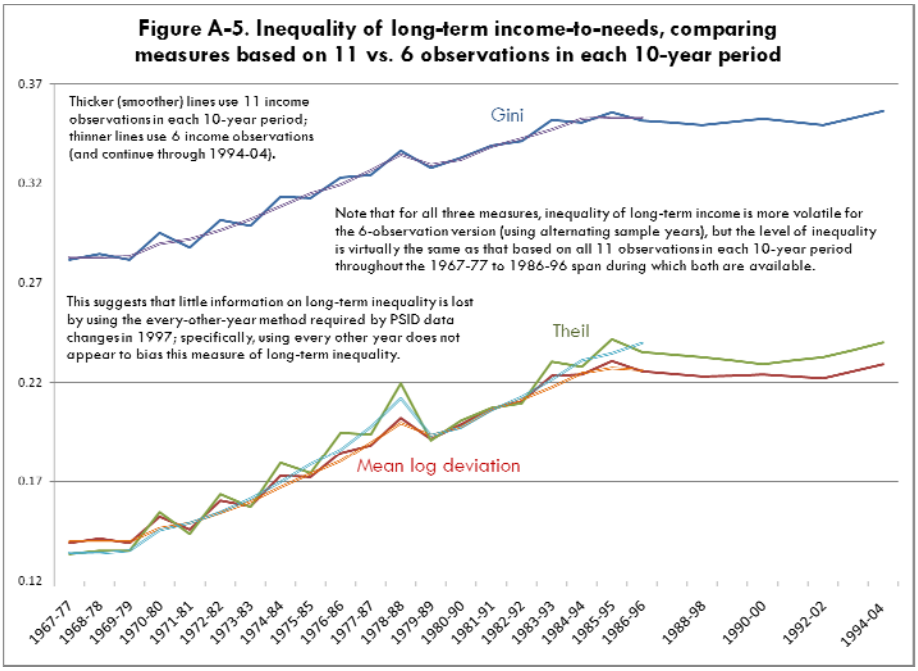


Figure A-5. Inequality of long-term income-to-needs, comparing measures based on 11 vs. 6 observations in each 10-year period
Thicker (smoother) lines use 11 income observations in each 10-year period; thinner lines use 6 income observations (and continue through 1994-04).
Gini
Note that for all three measures, inequality of long-term income is more volatile for the 6-observation version (using alternating sample years), but the level of inequality is virtually the same as that based on all 11 observations in each 10-year period throughout the 1967-77 to 1986-96 span during which both are available.
This suggests that little information on long-term inequality is lost by using the every-other-year method required by PSID data changes in 1997; specifically, using every other year does not appear to bias this measure of long-term inequality.
Theil
Mean log deviation
0.37
0.32
0.27
0.22
0.17
0.12
1967-77
1968-78
1969-79
1970-80
1971-81
1972-82
1973-83
1974-84
1975-85
1976-86
1977-87
1978-88
1979-89
1980-90
1981-91
1982-92
1983-93
1984-94
1985-95
1986-96
1988-98
1990-00
1992-02
1994-04

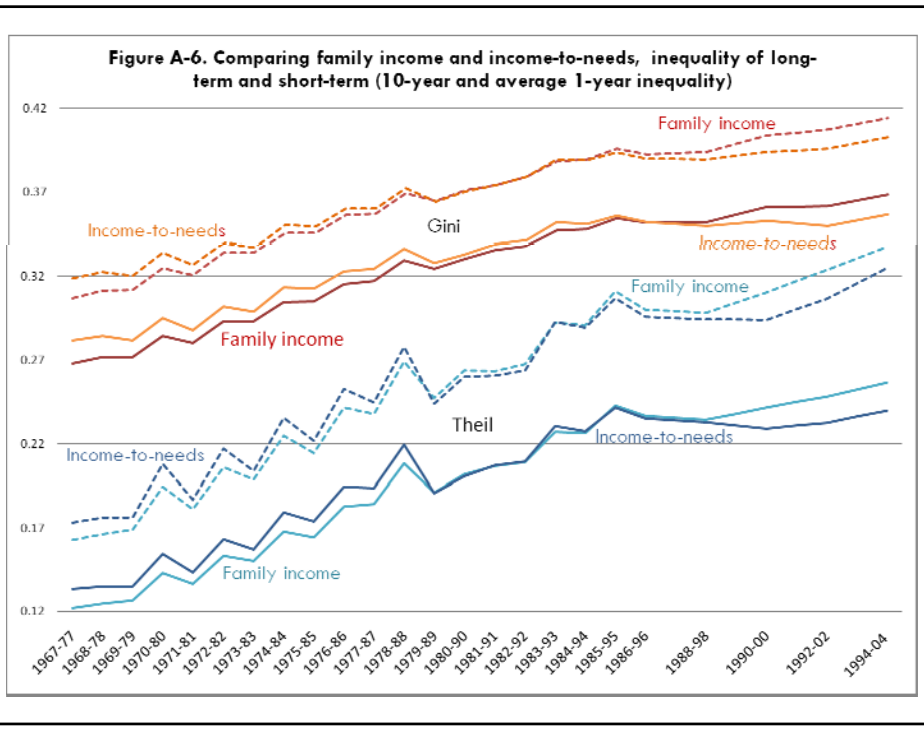


Figure A-6. Comparing family income and income-to-needs, inequality of long-term and short-term (10-year and average 1-year inequality)
Family income
Income-to-needs
Gini
Income-to-needs
Family income
Family income
Theil
Income-to-needs
Income-to-needs
Family income
0.42
0.37
0.32
0.27
0.22
0.17
0.12
1967-77
1968-78
1969-79
1970-80
1971-81
1972-82
1973-83
1974-84
1975-85
1976-86
1977-87
1978-88
1979-89
1980-90
1981-91
1982-92
1983-93
1984-94
1985-95
1986-96
1988-98
1990-00
1992-02
1994-04