Appendix Two:
Previous Research on Income Instability and Volatility Trends
Scott Winship, Doctoral Dissertation

Unlike the research on earnings volatility and instability, most of the studies on family and household income volatility have been produced in the past five years.[1] To a remarkable extent, the development of this literature has taken place not in academic forums, but within think tanks, government agencies, mass-marketed books, and even newspaper columns and outlets of opinion journalism.

Unfortunately, because the earliest figures to garner wide attention turned out to be problematic, it has been unclear what conclusions should be drawn from the research on income volatility trends. In this appendix, I summarize the findings across a range of studies of income instability and volatility. To organize the literature, I return to the categorization from Appendix One's literature review.[2] Chapter Three presents my own results from the PSID that correspond to each of these categories.

Research on Short-Term Relative Mobility

I begin with research on short-term relative mobility, which looks at changes in ranks over periods of five years or less. Unlike the research on relative earnings mobility, previously published time series on relative income mobility extend only as far back as the late 1960s. Peter Gottschalk and Sheldon Danziger examined relative mobility in the PSID among prime-age individuals, adjusting income for family size.[3] Non-directional mobility, as measured by 100 minus the percent staying in the same

quintile in adjacent years, showed little trend between 1969 and 1976. It declined from 1976 to 1980. Over the 1969-1980 period, mobility changed very little.

Gottschalk and Danziger found that upward mobility (100 minus the percentage remaining in the bottom quintile) increased between 1969 and 1978 and declined from 1978 to 1980, increasing over the entire period. Downward mobility from the top quintile showed little trend from the late 1960s through the mid-1970s but declined from 1976 to 1980. Downward mobility declined over the 1970s as a whole.

Maury Gittleman and Mary Joyce also examined trends in the probability of remaining in the same family income quintile over successive years using the PSID.[4] They found that non-directional mobility increased from 1968 to 1976 and then fell a bit late in the decade. Looking at the same measure but comparing incomes separated by five years, they found an increase in mobility from 1972 to 1979, with the decade again finishing with declining mobility.

Joel Slemrod used administrative data from the IRS to estimate downward mobility from top deciles.[5] He found that downward mobility from the top 5% or top 10% of pre-tax income increased from 1968 to 1969 and then declined through 1972. Downward mobility from the top 1% increased from 1968 to 1971. In 1973, downward mobility from the top 5% or top 10% increased, finishing very close to its 1968 level. Downward mobility from the top 1% declined from 1971 to 1973. Finally, downward mobility from the top 5% and top 1% increased between 1973 and 1980, exceeding all earlier levels in the latter year. Downward mobility from the top 10% probably increased a bit as well.

Peter Gottschalk, Sara McLanahan, and Gary Sandefur used the PSID to examine trends in the likelihood of staying in the bottom family income quartile in two adjacent years among all people in the PSID. If one measures upward mobility as one minus this proportion, the trend was basically flat during the 1970s, staying at or just over 20 percent.[6]

In the 1980s, Gottschalk and Danziger found non-directional mobility continuing to decline through 1991. Upward mobility continued to decline between 1980 and 1988, then increased through 1991. It was a bit higher in 1991 (25%) than in 1969 (22%). Downward mobility continued to decline from 1980 to 1985 before increasing from 1985 to 1989. It declined from 1989 to 1991, finishing lower (21%) than its 1969 level (26%). Across Gottschalk and Danziger's measures, mobility consistently declined from the mid-1970s to the early 1990s, though not smoothly. Gottschalk, McLanahan, and Sandefur found that upward mobility continued to be flat throughout the first half of the 1980s.

Gittleman and Joyce found a decline in non-directional mobility from 1979 to 1991, with mobility a bit higher in 1991 than in the late 1960s. Their five-year mobility measure indicated a decline between 1979 and 1985. Mobility then increased sizably from 1985 to 1987, followed by a large decline between 1987 and 1988. After a small increase in 1989, mobility was flat through 1991, ending at a level similar to the early 1970s and early 1980s levels.

Slemrod found little trend in downward mobility from the top 5% and top 10% from 1980 to 1984, but it increased from 1984 to 1986. Downward mobility was higher in 1986 than in 1980, increasing from 22 percent to 27 percent for the top decile and from 26 percent to 31 percent for the top 5 percent. On the other hand, downward mobility

from the top percentile increased from 28 percent in 1980 to 33 percent in 1982, was flat

for several years, and then increased to 40% in 1986. Slemrod noted that the increases in

downward mobility at the end of the period were at least partly due to taxpayers realizing

capital gains in anticipation of tax law changes taking effect in 1987.

Also using administrative records from tax returns, Robert Carroll and his

colleagues examined non-directional mobility in the 1980s and early 1990s.[7] They

showed that in 1980, 34 percent of primary taxpayers age 30-46 the previous year had

changed income quintiles. This share declined to 29 percent by 1983, showed little trend

through 1988, and then declined further the rest of the decade. The share of primary

taxpayers rising up from the bottom quintile was flat over the 1980s, and the share falling

down from the top quintile declined a bit.

Greg Duncan, Tim Smeeding, and Willard Rodgers defined "low", "middle", and

"high" income groups based on real income cutpoints and then held the size of those

groups constant over time.[8] They found that upward mobility from the "low" income

category to the "middle" or "high" categories was lower during the 1980-87 period than

during the 1967-1980 period. Similarly, downward mobility from the "high" category

was also lower. Downward mobility from the "middle" category increased, however, and

upward mobility from the "middle" was unchanged.

In the 1990s, Carroll et al. found an increase in non-directional mobility from

1990 to 1995. Upward mobility from the bottom quintile and downward mobility from

the top were both flat.

Summarizing these studies on short-term relative income mobility, relative

income mobility declined or was stable between the late 1960s and the mid-1990s,

providing little evidence of a Great Risk Shift. Non-directional mobility either declined or was stable in the 1970s and declined in the 1980s. Carroll and his colleagues found an increase in mobility over the first half of the 1990s, though mobility remained below its 1980 level. Gottschalk and Danziger found declines in downward mobility from the top quintile in the 1970s and 1980s, and Carroll et al. confirmed the 1980s decline. Slemrod, however, generally found increasing downward mobility from the top decile, ventile, and centile. Carroll et al. found no change in downward mobility in the early 1990s. Finally, upward relative mobility from the bottom quintile either was unchanged or declined in the 1970s, in the 1980s, and in the first half of the 1980s in particular. Carroll et al. again found no change in the early 1990s.

Relative income mobility trends are similar to relative earnings mobility trends in some aspects but different in others. While it appears that non-directional earnings mobility increased in the 1970s, family income mobility was either stable or declined. Among all adults, male and female, upward and downward earnings and income mobility changed very little, though directional income mobility of both types may have declined, as did upward earnings mobility in the latter part of the decade. Relative mobility, directional or not, in terms of either earnings or income, appears to have declined in the 1980s. The first half of the 1990s saw declines in non-directional earnings mobility but increases in income mobility. Upward and downward mobility, either in terms of earnings or income, however, appear not to have changed much. Finally, trends in directional income mobility do not display the same countercyclical pattern exhibited by the directional earnings mobility trends. This important result would seem to imply that to a large extent, families compensate for the earnings changes of individual members by

adjusting the work decisions of other family members or through public and private

transfers.

Research on Intertemporal Income Associations

In contrast to research that includes correlation matrices for individual earnings

over time, because there has been less research modeling household income dynamics,

intertemporal income correlation matrices are far less common. I found just one study

that examined trends in short-term intertemporal income associations. Tom Hertz

examined household income mobility using matched CPS files.[9] He found mobility as

measured by one minus the correlation over adjacent years increased from 1991 to 1998.

It then declined slightly in 2004, though the change was not statistically significant. The

1990s trend is the opposite of what Bhashkar Mazumder (2001) found for men's earnings,

but these are the only two comparable studies between the earnings and income

literatures using correlations.

Research on Short-Term Absolute Mobility

Rather than defining mobility in terms of movement in ranks or in terms of

intertemporal association, it can be conceptualized as movement in absolute income

levels. Beginning in 2006, Hacker's research began to incorporate short-term absolute

mobility measures. As with the transitory variance measures, Hacker revised his original

estimates downward after *GRS*'s publication, which claimed that the typical two-year

income drop among families experiencing a drop amounted to 44 percent of income in

1998 (up from 27 percent in 1971). The revised edition of *GRS* did not mention the magnitude of the typical drop, so these figures should presumably be disregarded.

The new *GRS* analyses indicated that for the years 1998-2000, 2000-2002, and 2002-2004, an average of 45 percent of nonelderly adults experienced a two-year drop in family income and that this percentage, while fluctuating with the business cycle, had "remained fairly steady" since the 1970s.[10] Roughly 4 percent of adults experienced a drop in income of at least 50 percent between 1969 and 1971, a figure that nearly doubled by 1981, fluctuating with the business cycle along the way. After falling to about 5 percent by 1984, downward mobility was flat through 1989. It then rose sharply to 9.5 percent by 1993, fell to 6.5 percent by 1998, increased nearly to 10 percent by 2002, and finally fell back to about 8 percent in 2004.

Jacobs found patterns very similar to Hacker's revised figures in her initial analysis, showing the same trends in the percentage of people experiencing a 50 percent drop over two years, but lower levels and a smaller increase over time.[11] She omitted the 1991-95 data points due to concerns about the validity of the estimates in those years. Nevertheless, Hacker's and Jacobs's subsequent research brief for the Economic Policy Institute reproduced Hacker's *GRS* chart almost exactly.

Hacker also indicated in a footnote of *GRS* that 15 percent of adults experienced a 50 percent drop over two years at least once in either 1971-73, 1972-74, or 1973-75, citing Jacobs's dissertation. That compares with 23 percent experiencing a 50 percent drop in one of the year-pairs 1996-98, 1998-2000, or 2002-2004.[12]

Finally, Hacker reported trends in the *predicted* probability of a drop in income in several outlets. To do so, he ran logistic regression models that included a time trend,

individual fixed effects, and controls for age, education, race, gender, income averaged over five years, and dummy variables for having experienced each of several income-affecting events. He then reported the predicted probabilities of losses of a given size holding all control variables at their average values.

The predicted probability of a 20% drop in income between two years increased from 4 percent to 11 percent between 1970 and the early 2000s, with the increase concentrated in the early 1970s, early 1990s and early 2000s.[13] The predicted probability of a 50% drop in income between two years increased from 7% to nearly 17%, and the increase was fairly steadily over the entire period, with an anomalous bump in the early and mid-1990s.[14] Clearly these two sets of figures are inconsistent, since the predicted probability of a 20% drop should be higher than the predicted probability of a 50% drop, and Hacker omitted these analyses from later volatility publications.

Reporter Peter Gosselin's research on income volatility has rivaled Hacker's over the past year in the popular attention it has received. Gosselin's work on the topic began in a series of long front-page articles in the *Los Angeles Times*.[15] It culminated in the publication of *High Wire: The Precarious Financial Lives of American Families* in 2008. Gosselin reported that the share of adults in the PSID experiencing a 50% drop in family income from one year to the next grew from just 3 percent in the early 1970s to 6 percent in the mid-1990s. The share experiencing a 50% drop over two years rose steadily from 5 percent in the 1970s to 9 percent in the early 2000s.[16]

Like Hacker, Gosselin also produced a complementary set of analyses to look at changes in the likelihood of experiencing different income-affecting events and of experiencing large income drops as a consequence of them. The risk of a 25% drop in

income between two years rose from 17 percent between 1974 and 1983 to 19 percent between 1994 and 2003, while the risk of a 50% drop rose from 5 percent to 8 percent. Using figures in Gosselin and Zimmerman (2008), one can determine that the risk of experiencing any of seven income-affecting events *and* a 50% income drop grew from 3 percent to 4 percent between 1974-83 and 1994-2003.[17] Over time, these events came to account for fewer income drops, making up two-thirds of drops in the first period but just half in the second period.

Another recent paper garnering a sizable amount of attention (also based on the PSID) is a Brookings Institution working paper by Karen Dynan, Doug Elmendorf, and Dan Sichel. They find that the risk of a two-year family income decline of 50 percent or more grew unevenly from 6 percent in the early 1970s to 11 percent in the early 2000s, following a notable cyclical pattern.[18] On the other hand, an earlier draft of the paper showed that the share of adults experiencing a 25 percent decline grew from about 5 percent to about 11 percent.[19] Once again, the downward mobility levels in these two drafts are incompatible (due to the percentages being calculated two different ways), though the trends show the same pattern.

A forthcoming paper by Stephen Rose and me uses the PSID and finds that the probability of a 25 percent drop in family income over two years rose and fell cyclically between 1969 and 2004 but increased over the entire period. However, they present evidence that this rise is entirely due to a shift in the early 1990s that is likely an artifact of PSID administrative changes.[20] The Congressional Budget Office recently published their latest analysis of income volatility trends, which constitutes one of the rare studies that does not rely on the PSID.[21] CBO researchers (henceforth Dahl et al.) analyzed a

restricted-use version of the Survey of Income and Program Participation (SIPP) linked to individual Social Security earnings data. They relied on the Social Security data to measure adults' earnings and combined them with non-labor income from the SIPP. Analyzed this way, the share of households with one-year income drops of 25% or more was flat from 1985 to 1993, declined from 1993 to 1998, and then increased from 1998 to 2005. However, the changes were small – with estimates ranging from 11% in 1985 and 1993, to 9% in 1998, to 11-12% in 2005. Peter Orszag presented other CBO results, showing trends in the risk of a 50% income drop.[22] This probability declined from about 4.4% in 1985 to about 3.9% in 1994 and then to about 3.5% in 1998; it increased to about 4.4% again by 2002.

Turning to upward absolute mobility, Gosselin found that the probability of a 50% increase in income rose from 12 percent in the 1970s to nearly 16 percent in the 1990s, then fell to 14 percent in the early 2000s.[23] Dynan et al. found an increase from 7 percent in the early 1970s to as much as 13 percent in the late 1990s before upward mobility dropped to 9 percent in the early 2000s.[24] Dahl et al. found a slight decline in the share of households experiencing a 25% gain, falling from 18 percent in the mid-1980s to about 15 percent in the early 2000s. Orszag reported a bigger decline in the share experiencing a 50% gain—4 percent in 1994 and in 2002 versus 8 percent in 1985. Rose and Winship report little change in the probability of a gain of 25 percent over two years from 1969 to 2004. Hacker has never reported trends in upward mobility.

A number of other studies consider trends in upward or downward absolute income mobility. Greg Acs and his colleagues found that the share of adults experiencing a 25% drop in income between successive four-month waves of the SIPP

over the course of a year rose from 40 percent in 1996 to 46 percent in 2001 and then fell to 36 percent in 2004.[25] The share experiencing a 50% drop rose from 14 to 18 percent and then fell to 15 percent, and the percent experiencing a 75% drop rose from 4.0 to 5.1 to 5.6 percent.

Gottschalk, McLanahan, and Sandefur found that the likelihood of staying poor in two consecutive years was fairly constant from the early 1970s to the mid-1980s, with just under 40 percent escaping poverty throughout most of the period.[26] Duncan, Smeeding, and Rodgers examine transition matrices based on fixed real income cutoffs.[27] They find that upward mobility from the "low" income category to the "middle" or "high" categories was lower during the 1980-87 period than during the 1967-1980 period (30 percent versus 36 percent). Similarly, downward mobility from the "high" category was also lower (27 percent versus 31 percent). In contrast, both upward and downward mobility from the "middle" category increased (by roughly a similar amount).

Tom Hertz, in two recent papers relying on matched interviews from the Current Population Survey, examined trends in several measures of absolute mobility.[28] In general, absolute downward and upward mobility between two years both increased between 1987 and the early 1990s and again from the early 1990s to 2004. The share of households with declines of 50% or more and with gains of 50% or more both grew from 1987 to 1994 and then increased by a smaller amount between 1994 and 2005. The median gain increased from 1987 to 1994 and again from 1994 to 2005. The median loss increased from 1987 to 1994, but was flat from 1994 to 2005. The median income gained and the median lost both rose steadily from 1991 to 2004.

The share of adults losing $20,000 or more increased from 13 percent to 15 percent between 1991 and 1998 and then again to 17 percent by 2004. The percent gaining $20,000 or more in one year increased from 1991 to 1998 and then was flat. The percent of adults with income gains of any size rose from 51 percent to 55 percent, then fell back to 51 percent again. Overall, downward mobility became increasingly more prevalent compared with upward mobility, as can be seen in the fact that the median change in log income per person declined from 1987 to 1994 and then declined again between 1994 and 2005.

When Hertz defined quantiles according to fixed 2004 levels, upward absolute mobility from the bottom decile or quintile increased between 1991 and 2004, with the share gaining income, the median income change, and the median increase all growing steadily over the period. Downward mobility from the top decile or quintile increased between 1991 and 1998, but then was flat or declining. In the middle quintile, upward and downward mobility both increased from 1991 to 1998, while downward mobility increased and upward mobility declined between 1998 and 2004.

Finally, several studies allow one to consider trends in non-directional absolute income mobility. Dahl et al. reported that the share of households with one-year income changes (increases or decreases) of 25% or more declined between 1985 and 1991 but changed little thereafter, holding at about 25 percent of households through 2005. Using the SIPP data alone, without linking to the Social Security data, showed the same trend when the authors excluded households with imputed earnings data. Orszag showed that the share experiencing a change of 50% or more declined between 1985 and 1994 and was then flat through 2002.

Dynan et al. showed that the share of household heads experiencing a 25-percent change in income over two years increased from the early 1970s to 2000. It then declined in the early 2000s. In contrast, Rose and Winship find no change over time. Hertz found that the median absolute value of the change in log income per person increased from 1987 to 1994 and increased slightly again from 1994 to 2005.[29] The median absolute change in household income increased from $8,045 in 1991 to $10,874 in 1998, and then to $11,345 in 2004.[30]

Austin Nichols and Seth Zimmerman, using the PSID, show results for the trend in the average (across adults) absolute value of the change in income over five-year periods, controlling for income in the middle year.[31] This measure of absolute mobility increased fairly steadily from the early 1970s to the late 1990s, then declined back to its mid-1990s level.

In sum, there is little consistency in the various estimated trends in absolute income mobility. The one point on which the research agrees is that absolute mobility—non-directional, upward, and downward—increased in the 1970s. The estimates from CBO's SSA-based data consistently show only small changes in mobility, generally in contrast to the results from the PSID-based studies. But the PSID-based studies often disagree among themselves. Most of the evidence from the PSID indicates an increase in mobility over the 1980s and an increase in downward mobility during the late 1980s. The PSID-based studies all agree that mobility was higher in 2000 than in 1970, and the Dynan et al. and Hacker studies find clear counter-cyclical patterns in directional

mobility, in contrast to the findings for relative directional income mobility. Little else can be said comparing the relative and absolute income mobility results.

Comparing absolute income mobility findings to the evidence on absolute earnings mobility trends is also difficult due to inconsistencies. It appears that both men's earnings and income mobility increased in the 1970s. If the PSID results are to be believed, then income mobility increased during the 1980s and 1990s as well, but that is not the case for earnings mobility (or for income mobility based on the SSA data). The cyclicality of directional earnings mobility is mirrored in the results for directional income mobility.[32]

Research Examining the Dispersion of Income Changes

As with earnings instability, the next logical step after looking at changes in the typical person's absolute income mobility is to look at changes in the dispersion of absolute mobility. Dynan et al. (2008) looked at the combined earnings of heads and their spouses and tracked the standard deviation of two-year percentage changes.[33] They found volatility increasing by about 30 percent from the early 1970s to the early 2000s, mostly from the mid-1970s through the early 1980s and during the early 1990s. Similarly, combined head and spouse transfer income volatility rose by about one third, mostly during the early and mid-1970s and early 1990s. On the other hand combined head and spouse capital income volatility only increased by about 10 percent over the period. Finally, total household income volatility increased by about 35 percent from the early 1970s through the early 2000s, with a rapid increase in the early 1990s.

The CBO has also estimated trends in the dispersion of percent changes in income. Orszag reported that volatility dropped between 1985 and 1994, was flat from 1994 to 1998, and then increased slightly from 1998 to 2002.[34] Hacker and Jacobs reported that the standard deviation of two-year changes in income increased 51 percent from 1971 to 2004.

Nichols and Zimmerman showed that the standard deviation of percent changes in income over four years increased unevenly from the early 1970s to the mid-1990s, was flat through the late 1990s, then declined.[35] The increase from the early 1970s to the early 2000s was just 5 percent. When families reporting $0 in income and other suspect observations were dropped, the trend was dominated by noise.

Craig Gundersen and James Ziliak also produced PSID-based estimates of income-change dispersion.[36] They captured the residuals from a regression model predicting one-year income changes from demographic variables, time dummies, and individual fixed effects and then tracked the mean of the squared residuals in each year. They found that volatility fell, rose, and fell again over the 1980s, increased dramatically in the early 1990s before plunging, and then increased modestly through 1997. Over the entire period, volatility rose by about 10-15 percent (measured in standard deviations).

Finally, a new paper by Richard Blundell and his colleagues reports trends in the variance of the one-year change in residualized log post-tax income among married couples, using the PSID.[37] They find that dispersion in income changes increased between 1981 and 1987, fell between 1987 and 1991, and increased in 1992, rising over the 1980-1992 period by about 40 percent (or 22 percent if measured in standard deviations).

These few studies on dispersion in income changes agree that income volatility increased in the 1970s and changed little in the 1980s. The research based on the PSID finds increases in volatility in the 1990s, though CBO's declining trend from the mid-1980s to the early 2000s is inconsistent with the PSID results. Finally, the trend in volatility in the early 2000s is inconsistent across studies.[38] These general findings are consistent with the analogous literatures on trends in absolute income mobility and trends in male earnings dispersion in that all find increases in volatility in the 1970s and all find higher volatility in the early 2000s than in 1970 or 1980 in the PSID-based studies. On the other hand, the CBO research implies declining volatility for both earnings and income since the mid-1980s.

Research Summarizing Within-Person Income Dispersion Across Years

In Appendix One, I showed that previous research on earnings volatility measured as the typical within-person dispersion over a series of years was unclear as to whether volatility had increased since 1980. I now examine the literature on within-person dispersion in family income. To review, there are three basic measures that have been used in earnings volatility research. Peter Gottschalk and Robert Moffitt pioneered the first two types of measure.[39] The first defines volatility as the average within-person variance of incomes over some period, comparing two fixed and non-overlapping periods. The second is similar except that it looks at the mean within-person variance within some window centered on particular year and allows the window to move as different years are considered. The third measure, used by Gosselin, defines volatility as the typical maximum absolute change in income over some moving window.

Hacker reported income volatility results for a fourth measure – a person's lowest family income over some period expressed as a percentage of his or her highest income over the period.[40] His revised results indicated that this figure fell from 42 percent for the 1971-1980 period to 37 percent for the 1981-1990 period, to 28 percent for the 1991-2004 period, indicating rising volatility.

Gottschalk and Moffitt presented income volatility results using one of these methods only once, at a workshop organized by The Pew Charitable Trusts' Economic Mobility Project and the Brookings Institution.[41] They showed that income volatility measured using the PSID as the mean of the within-person variance of income over a nine-year window was flat from 1974 to 1980, then steadily rose through 1998, accelerating in the late 1980s. Over the entire period, volatility increased about 80 percent (which would be less if the results were presented as standard deviations).

Benjamin Keys used Gottschalk's and Moffitt's first method, also using the PSID.[42] He found that income volatility was higher in the 1990s than in the 1980s, which featured higher volatility than the 1970s. The pattern was true for men and women, blacks and whites, ranging from a 46-percent increase among white women from the 1970s to the 1990s to a 228-percent increase among black men.

Gosselin and Seth Zimmerman used the PSID to measure volatility as the variance of family income over four years in a seven-year window.[43] They found that mean volatility rose between 1970 and 1980, flattened out in the early 1980s, rose at an accelerating pace from 1983 to 1992 and then flattened again through 1998. It doubled over the entire period. Median volatility was flat from 1970 to 1985 before increasing through 1998, rising about 75 percent over the entire period. Furthermore, when

Gosselin and Zimmerman adjusted family income for needs by dividing by the poverty line, the results were basically unchanged. Finally, the authors checked their results using the SIPP. They found that volatility was flat from 1983 to 1993 and rose from 1993 to 2001, an increase of roughly 50 percent over the entire period. Comparing years in which volatility estimates are available for both the SIPP and the PSID, Gosselin's and Zimmerman's estimates indicate that volatility rose about 25 percent in the SIPP from 1983 to 1996 and by about two-thirds in the PSID.

Nichols and Zimmerman looked at trends in the typical within-person standard deviation of family income over a five-year window using the PSID.[44] Mean volatility of income levels rose steadily from the early 1970s through the 1990s and then fell between 2000 and 2004. Mean volatility of logs rose slowly from the early 1970s to the mid 1980s, was flat through the early 1990s, rose through 2000 and then fell. Over the whole period volatility of levels rose about two-thirds while log volatility rose about one-third. Median volatility, however, increased by about half these amounts. Median volatility of income levels fluctuated shallowly between the early 1970s and the early 1990s, then rose through 2000 and declined through 2004. Median log income volatility showed essentially the same pattern. The magnitude of the increase in volatility over time depends not just on whether levels or logs, or means or medians are examined but on whether and how low incomes are trimmed.

Yet another PSID-based analysis of within-person dispersion trends comes from Gosselin's *High Wire*.[45] Gosselin measured volatility as the 68th percentile across adults of the maximum real income change (in absolute value) experienced over three years within a five-year window. He found that volatility increased from the early 1970s

through the early 2000s, accelerating in the 1990s before leveling off in the early 2000s. He also reported increases in the 68th percentile of the maximum swing for the bottom decile, the middle quintile, and the top decile, with the increase larger at the bottom than at the middle or top.

A rare non-PSID analysis examining within-person income dispersion is a new working paper by Nichols and Melissa Favreault. Using the SIPP matched to Social Security data, and measuring volatility as the variance of combined head and partner earnings over the previous five years, they find that mean volatility declined between 1981 and 1982, increased between 1982 and 2001, and then declined through 2003. For five of six SIPP panels, mean volatility increased about 75 percent over the entire period (which would be lower if expressed in standard deviations).[46]

In a recent book chapter, Craig Gunderson and James P. Ziliak rely on Gottschalk's and Moffitt's original approach (variance of transitory income over non-moving windows).[47] Once again using the PSID, they measure transitory variance as the within-person variance of deviations from average income over a five-year period. They find declines in mean volatility for five age groups between 1980-84 and 1985-89 followed by increases between 1985-89 and 1990-94. From 1990-94 to 1995-2002, volatility declined among those under age 30 or older than 50, was flat among adults in their thirties, and increased among those in their forties. Overall, volatility declined in this last period. Over the entire period covered by the paper, volatility was mostly unchanged, but it rose among people in their thirties.

Finally, two studies measure volatility as the within-person coefficient of variation over a fixed number of years. Using the PSID, Lily Batchelder regressed

volatility of log taxable income over a six-year period on a number of variables, including a linear time trend that broke the years 1968 to 1992 into four equal time periods (i.e., a trend that imposed the restriction that the change between each period be the same magnitude).[48] She found an increase in volatility over the twenty-four years.

Neil Bania and Laura Leete used the SIPP and measured volatility as the within-person coefficient of variation of monthly income over the previous twelve months.[49] They found that mean volatility of family income in a sample that was relatively low income increased by 17 percent between (roughly) 1992 and 2003. Mean family earnings volatility was flat, while the volatility of AFDC/TANF and of other income was flat. When the value of food stamps and WIC benefits were added to family income, volatility rose by 19 percent.

These within-person dispersion studies, taken as a whole, show a secular rise in mean volatility from the early 1970s to the early 2000s, with the increase (expressed as variances) ranging from roughly two-thirds to 100 percent. Median volatility increased less dramatically according to Nichols and Zimmerman, but Gosselin and Zimmerman report a sizeable increase (though because median volatility levels are relatively low, there is presumably a considerable amount of imprecision in their estimate of the rise over time). While not entirely consistent, the studies generally find volatility increasing in the 1970s, 1980s, and 1990s, but flat or declining in the early 2000s. This rise is much clearer than the probable increase in within-person earnings dispersion among men found in the Chapter Two, and it is more consistent across time than the increase in income-change dispersion.[50]

Research Summarizing Across-Person Dispersion of Income Shocks

My review of the existing literature on income instability and volatility concludes by examining the research organized around "transitory variances". Briefly, the idea behind this approach is to elaborate formal models of individual earnings dynamics, with earnings typically disaggregated into a permanent and transitory component. The models specified imply restrictions on the variances and covariances of earnings across years. In the more sophisticated models, the parameters of the model are estimated by finding the set that produces the covariance matrix that best fits the observed covariance matrix in the data. The parameters of simpler models (with stronger assumptions) can often be estimated without such complicated techniques, as with the variance decomposition model of Peter Gottschalk and Robert Moffitt that Hacker has relied on.

It is unclear that models developed to describe earnings dynamics of individuals are appropriate for modeling income dynamics of households. Households include multiple potential earners who can change their labor force participation and work decisions depending on the decisions of others. Furthermore, income sources other than earnings—such as investment income or public transfers—may not follow the same dynamics as earnings.

For example, in the variance decomposition model of Gottschalk and Moffitt, as discussed in Chapter Two, earnings are assumed to be fixed over a window of years, save for an annual random shock that rapidly dissipates. Income volatility research using the variance decomposition model must assume that all sources of income in a household are subject to the same random shock in every year—that all sources of income are fixed

save for a single annual shock that affects one or more of them. For this reason, far fewer studies of income volatility have been conducted using this approach than studies of earnings volatility.

Using the variance decomposition model, Hacker's pre-tax family income volatility estimates, as reported in *GRS,* indicate a fairly steady increase in volatility from 1974 to 1984, with local peaks that tend to lag recessions by a year or two.[51] Volatility declined slightly between 1984 and 1989 and then took off between 1989 and 1994. It then declined just as sharply between 1994 and 1998, with a small increase in 1996 interrupting the decline. Volatility spiked upwards again from 2000 to 2002. In all, volatility increased by 360 percent from 1974 to 1994, declined by 57 percent from 1994 to 1998, and increased 50 percent from 2000 to 2002. Volatility more than doubled from 1991 to 1993 alone according to these results. Post-tax income volatility showed similar patterns and grew 130 percent over the entire 1974-2002 period.

The next iteration of results from Hacker arrived in the "Revised and Expanded Edition" of *Great Risk Shift*, published in early 2008.[52] This time, rather than volatility increasing 375 percent between the early 1970s and its 1990s peak, the rise Hacker showed was one-third that. The new pre-1990s trend was noisier than Hacker's original estimates, with a sizable decline in volatility during most of the 1980s after the run-up in the first years of the decade. The trend from the early 1990s onward showed a large increase in volatility followed by a large decline in the mid-1990s, with another notable increase from 1998 to 2002. From 1973 to 2004, Hacker showed an increase in volatility of about 95 percent (presented as variances).

Just months after the revised edition of *GRS*, Hacker and Jacobs produced yet another set of estimates, for an Economic Policy Institute research brief.[53] In this most recent version of Hacker's figures, volatility is shown rising 150 percent from 1973 to 1993, falling by more than half between 1993 and 1998, then increasing between 2000 and 2002. Over the entire 1973-2004 period, volatility essentially doubled. The early-1980s increase in volatility is not as sharp as in the revised edition of *GRS*, but the latest figures still imply that volatility increased by something like 75 percent just between 1991 and 1993.

These results followed the earlier estimates of Hacker but also previous estimates by Jacobs.[54] Jacobs found a bigger increase in the transitory variance of income between the early 1970s and the early 1980s than in her subsequent paper with Hacker. She omitted the 1991 to 1995 data points in her chart, owing to a lack of trust in the estimates given the data issues I review in Chapter Three.[55] Her estimates for 1996 to 2004 were similar to her later results, but shifted downward. In all, Jacobs reported a roughly 70 percent increase in income volatility from 1973 to 2004 (expressed in variances).

Gottschalk and Moffitt produced trends in the transitory variance of income only once, in their presentation to The Pew Charitable Trusts/Brookings Institution workshop, and they made no effort to publish those results.[56] They found that the transitory variance declined modestly over the early 1970s, then increased slowly through the mid-1980s. Volatility then declined slightly over the rest of the decade before increasing notably in the early 1990s. Volatility fell between 1993 and 1998 and then increased again through

2002. Over the entire period, the transitory variance increased by roughly 40 percent (or about 20 percent expressed in standard deviations).

Nichols and Zimmerman also presented PSID-based trends in volatility using the Gottschalk-Moffitt variance decomposition method.[57] They found that volatility increased from the early 1970s to the early 1980s, then declined through the mid-1980s. It rose in the late 1980s and early 1990s, before falling again through the mid-1990s. Finally, volatility rose again in the late 1990s and early 2000s. The increase over the entire period was 20 to 48 percent (in terms of standard deviations) depending on how they trimmed high and low incomes.

Rather than this variance decomposition model, two studies by Richard Blundell and his colleagues use more sophisticated error components modeling to generate estimates of transitory income variance. Blundell and his colleagues use a model that includes a permanent household income component following a random walk and a transitory component modeled as a moving average process.[58] In this model, there are both permanent and transitory shocks. The authors found that the variance of transitory shocks declined in the early 1980s, increased notably through 1986, declined slightly through 1989, and increased slightly through 1992. The variance ended 25 to 50 percent higher than in 1980, with the increase occurring entirely in the mid-1980s. The variance of permanent shocks increased in the early 1980s, flattened out in the mid-1980s, then declined through 1992, ending perhaps 35 to 50 percent higher than in 1980.

Blundell and Luigi Pistaferri estimate a similar model using the PSID, which models both income and consumption dynamics as depending on shocks to permanent income.[59] They find that for both low-income and medium- to upper-income households,

the variance of the permanent income shock is smaller in 1985-92 than in 1979-84. The

variance of the transitory component – which the authors assume represents measurement

error – follows the same pattern. When they instead assume that the transitory

component is a shock to income, the changes in the variance of the shocks estimated by

their model become statistically insignificant.

These studies all use the PSID and are generally consistent. Volatility increased

in the 1970s (except in Gottschalk and Moffitt), in the 1980s, in the 1990s (except in

Nichols and Zimmerman), and from 1998 to 2002. These results are consistent with the

trends in within-person income dispersion and in the dispersion of earnings shocks noted

in the Chapter Two. The increase from the early 1970s to the early 2000s was

somewhere between 20 and 50 percent expressed as standard deviations, according to

these studies. That is a much smaller increase than reported by Hacker and Jacobs, who

summarize the previous research in a graph showing increases in the range of 50 to 120

percent (presented as *variances*).[60] It is comparable to the range found in the literature on

male earnings volatility that use the same methods, summarized in Chapter Two as

running from 15 to 65 percent.[61]

Other Approaches to Volatility Measurement

Austin Nichols decomposed variation in incomes across people and years into

inequality, volatility, and mobility.[62] He measured inequality as between-person

variation in mean incomes measured over five years in the previous nine-year period

(using income measured every two years). Within-person variation in demeaned income

is then divided into mobility and volatility, where mobility is measured as within-person,

across-year variation in predicted income (predicted from a linear time trend) and volatility is measured as within-person variation in individual incomes around individual trends.

Nichols found that volatility increased from 1976 to 2004, increasing more sharply from 1984 to 1990 and from 1998 to 2004. When incomes were adjusted for family size, volatility was relatively flat from 1976 to 1985, rose sharply through 1988, changed little through 1998, then increased. Over the entire period the increase was about 40 to 60 percent. Mobility fell from 1976 to 1981, rose sharply from 1981 to 1986, then showed little consistent trend. When adjusted for family size, mobility followed a similar pattern but declined from 1988 or so until about 1996 before increasing. Over the entire period, the increase was about 30 to 50 percent. As the window of time used to examine inequality and mobility is widened, the rise in volatility is sharper and the increase in mobility falls. When Nichols used logs instead of levels, the volatility increase is more constant over time, and the mobility trends become more exaggerated.

Esfandiar Maasoumi and Mark Trede measure short-term mobility by comparing the inequality of incomes measured over several years to an average of one-year inequalities within the multi-year window.[63] They found that post-government income mobility among all persons declined from 1985 to 86, increased, then declined in the late 1980s (declining over the period as a whole). When they divided the sample into three age groups (26-35, 36-50, 51-65), the results were inconsistent, except that mobility declined over the entire period for each.

Finally, Richard V. Burkhauser and John G. Poupore, in a paper on inequality trends in the United States and Germany, indicated in a note that income mobility

measured as the percentage reduction in inequality when five years of income are averaged versus the average inequality of the five individual years was "slightly" higher in the 1970s than in the 1980s.[64]

Summary of Previous Research on Income Instability and Volatility

The research on income instability and volatility trends is much more consistent than that on trends for earnings. This fact is largely due to the dominance of PSID-based studies in the research on income instability and volatility trends, and the relatively small number of studies thus far conducted. The research generally finds that short-term relative income mobility was largely unchanged or declined during the 1970s and the 1980s. However, research on absolute mobility and on income dispersion show that income instability and volatility increased in the 1970s, 1980s, and 1990s. There is conflicting evidence for the early 2000s, with research on dispersion of transitory shocks showing an increase and that on within-person income dispersion showing a flat or declining trend.

The big exception to these conclusions is the CBO research, which uses the SIPP linked to Social Security records to correct for measurement error in labor income. The CBO research indicates that income instability was basically flat from the mid-1980s forward. Otherwise, the increases in income volatility since 1970, 1980, or 1990 are consistent with the increases in male earnings volatility over these same periods in the research discussed in Chapter Two. Where quantitative estimates of volatility can be compared between the income and male earnings literatures (studies using dispersion-based measures) the two show increases of similar magnitudes.

In short, while the rise in income volatility has not been nearly as large as Hacker's initial estimates implied, the evidence from the PSID does support his Great Risk Shift hypothesis in that it generally finds steadily increasing income volatility and instability over the past thirty-five years. Some dispersion-based estimates imply a steady rise in volatility of as much as 50 percent over the entire period while the CBO figures suggest that it perhaps did not change at all after the early 1980s. This range is uniformly much lower than the doubling of volatility that Hacker has touted, but it implies potentially high volatility nonetheless. Chapter Three attempts to make more sense of the size and timing of any rise in income instability.

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Notes

[1] I will generally use "family income" and "household income" interchangeably in this review. The PSID asks about the incomes of "family unit" members. Family units in the PSID include most cohabiting partners as well as relatives of the family unit head and his cohabiter ("heads" in the PSID are almost always men). There are only a small number of households in the PSID with multiple family units interviewed.

[2] As in Appendix One, I restrict my review to studies of volatility and instability in the United States. For international evidence, see Morissette and Ostrovsky (2005) on Canada; Burkhauser et al. (1997) and Maasoumi and Trede (2001) on Germany; and Blundell and Preston (1998) on Great Britain.

[3] Gottschalk and Danziger (1998). The authors confine their analyses to individuals age 22-62 in both years within a pair. They adjust incomes for family size by dividing by the poverty line. The SEO sample is excluded from these analyses.

[4] Gittleman and Joyce (1999). The authors include in their sample heads and partners between the ages of 25 and 64, using the SEO and weighting. Their measure is family income adjusted for family size by dividing by the poverty line. They exclude those with incomes below $1,000 or above the lowest real topcode across years.

[5] Slemrod (1992). Slemrod technically measures the share of adults in top deciles that were not there in the previous year, but since he uses balanced panels, this is equivalent to the share of adults in the top decile the previous year who are no longer there in the current year. He relies on two different panels of tax filers – one from 1967 to 1973 and the second from 1979 to 1986. He uses all tax filers in his sample (tax returns being the unit of analysis). That means his analyses exclude those who have no income tax liability and those who do not file. The panels are based on the Social Security number of the primary taxpayer, so there is attrition when that number changes due to marriages or a couple switching who the primary taxpayer is. Very late filers are also attriters. Previous research has shown attriters to be poorer than other sample members, to be less likely to be married, and to be younger. Slemrod's income measure is adjusted gross income plus adjustments plus excluded dividends and long-term capital gains.

[6] Gottschalk, McLanahan and Sandefur (1994). The authors do not elaborate on the methodological details of their study.

[7] Carroll et al. (2007). The authors' sample included primary taxpayers at least 30 years old in 1979 and under 62 years old in 1995. Taxpayers who did not have returns in all 17 years were excluded. Their income measure – "constant law income" – is fairly comprehensive. The authors also examined mobility over 3- and 4-year periods, which show trends broadly consistent with the 2-year trends.

[8] Duncan, Smeeding, and Rodgers (1993). The authors used the 1968-1987 waves of the PSID, applying weights and using the SEO sample. The men and women in the sample were initially aged 25-50. Household income was defined to include food stamps and to exclude federal taxes, and incomes were adjusted for inflation using the CPI-U-X1. The authors examined transitions looking at income averaged over years t and $t+1$ and income averaged over years $t+3$ and $t+4$. The three income groups created constituted 18%, 73%, and 9% of households (low, middle, and high, respectively).

[9] Hertz (2006). The data is from the March supplement to the CPS, using three pairs of years. The matched subsamples are re-weighted to be representative of the first year in each pair. Incomes are adjusted for inflation using the CPI-U-RS.

[10] Hacker (2008). Some information on the methods is available at http://pantheon.yale.edu/~jhacker/method.html. Hacker used the pre-tax family income variable in the PSID and unlike in Hacker (2006), he did not rely on the CNEF at all in his revised analyses. He adjusted income for family size by dividing by the square root of family size, and he then logged the measures and adjusted them for inflation (using the CPI-U this time). His sample was confined to adults 25-61, including the entire core sample. This time he applied the sample weights. Hacker dropped all incomes of $1 or less and then trimmed an additional 1 percent of observations from the bottom, and he top-coded incomes at the top-code level for the year in which the most incomes are affected.

[11] Jacobs (2007). Jacobs used the PSID, examining the pre-tax family income (adjusted for family size and inflation) of persons age 25-61. She trimmed the top and bottom 3 percent of incomes.

[12] Hacker (2008), footnote 41 of Chapter 1.

[13] Hacker (2005). See also Hacker (2007). Hacker does not indicate what specific variables are used in his logistic regression models.

[14] Hacker (2006). Hacker used the PSID and a version of the PSID called the Cross National Equivalent File that includes modified income variables and tax estimates. His measure of pre-tax family income was a composite variable that included taxable income, public energy subsidies, and the rental value of free housing from the PSID, and public and private transfers from the CNEF. The post-tax measure subtracted federal and state income taxes, and payroll taxes taken from the CNEF, and property taxes taken from the PSID. Hacker adjusted income for family size by dividing by square root of family size, and he then logged the measures and adjusted them for inflation using the International Monetary Fund CPI (from the CNEF). His sample was confined to adults 25-61, including the entire core sample. He did not, however, apply the sample weights. These details were obtained through personal communication with Hacker in 2006 and 2007. Footnote 40 in Hacker (2006) gives the events included in the model: unemployment, retirement, disability, illness, divorce, marriage, birth of child, and adoption of child.

[15] Gosselin (2004a, 2004b, 2004c).

[16] Gosselin (2008). Gosselin used the PSID and focused on adults 25-64 years old. He adjusted family incomes for inflation using the CPI-U-RS, trimming those with incomes under $10 in 2007 dollars. When families broke up, he added inter-household transfers to families receiving them and subtracted them from families paying them. Some of these details are found in Gosselin and Zimmerman (2008).

[17] Gosselin and Zimmerman (2008). The authors use the PSID, including the SEO sample, and weight the data. The sample includes adults age 25-64, and families with less than ten dollars in income (in 2007 dollars) before out-transfers are excluded. Gosselin and Zimmerman drop the top and bottom 2% of income changes. The events examined included divorce/separation, death of a spouse, birth of a child, reduced hours due to retirement or disability, head's unemployment, work loss of head due to illness, and a fall in work hours of the wife. The trends were similar when looking at adults age 35-55 years old and when adjusting incomes for family size. A description of earlier analyses along these lines may be found in Gosselin (2004c).

[18] Dynan et al. (2008). The authors exclude the SEO and immigrant samples of the PSID. Their sample includes adults who were heads in both years, at least 25 years old and not retired. The authors bottom-code incomes at $1and adjust them for inflation using the CPI-U. Top codes are applied to cap the same share of the sample in each year. The authors measure percent changes as the two-year change in income, divided by the average of the two years of income. They drop adults in households where the head reports $0 in earnings but over 120 hours of work.

[19] Dynan et al. (2007). Methodological details are the same as in their 2008 paper, except that they exclude reports of $0 in earnings by the head are dropped and in computing percent drops, the change in earnings between years t and t-2 is divided by the average of years t-2, t-3, and t-4.

[20] Rose and Winship (forthcoming). The authors include the SEO sample and apply the weights. The sample consists of adults age 26-59. They do not adjust family income for family size but adjust for inflation using the CPI-U-RS linked to the CPI-U.

[21] Dahl et al. (2008). The authors use the 1984, 1990-93, 1996, 2001, and 2004 panels of the SIPP data matched to the Detailed Earnings Record of the Social Security Administration. They measure wage and self-employment income from the DER and non-labor income from the SIPP, adjusting for inflation using the CPI-U-RS. The sample includes households headed by an adult age 25-55. Households had to be in the SIPP panel for 24 months. The authors dropped households in the top or bottom 1% in either year, as well as households with a member age 18-64 in month 12 of the panel who was not successfully matched. SIPP panel members who were not matched had heads with less education and more variable SIPP incomes than those matched, but the bias did not change over time. Self-employment earnings are topcoded prior to 1991, affecting the 1984, 1985, and 1990 income measures, but excluding self-employment earnings did not affect the trends they estimated. Percent changes were measured as the one-year change in income divided by the average of the two years.

[22] Orszag (2008). The estimates are from SIPP data matched to Social Security Administration data.

[23] Gosselin (2008).

[24] Dynan et al. (2008). Dynan et al. (2007) found similar patterns for the likelihood of a 25% income gain.

[25] Acs et al. (forthcoming). The authors use the 1996, 2001, and 2004 panels of the SIPP, focusing on family heads and partners age 25-61 who are in families with children. I thank Greg Acs for sharing these results with me.

[26] Gottschalk, McLanahan, and Sandefur (1994). The authors use the PSID but otherwise do not elaborate on the methodological details of their study.

[27] Duncan, Smeeding, and Rodgers (1993). The three categories included low ($0-18,500 in 1987 dollars), middle ($18,500-$55,000), and high. The authors found similar results when they looked at mobility using income-to-needs measures based on poverty thresholds: low (0-2.0), middle (2.0-6.0), and high. For additional methodological details, see footnote 8.

[28] Hertz (2006, 2007). Hertz provides few methodological details in his 2006 paper. In the 2007 paper, he excludes households where imputations account for more than 10% of income, households that don't have at least one person in common in both years, households with income in the top 1.5% in either year, and households with incomes below $500 (in 2005 dollars). He compares three points in time in each study, but they are not the same points of time for both studies. In the 2007 paper he examines log income per person, while in the 2006 study he examines untransformed income.

[29] Hertz (2007).

[30] Hertz (2006).

[31] Nichols and Zimmerman (2008). The measure is technically the predicted absolute value of the change in income from a Poisson regression model that includes year dummies and income measure in the middle year. They use family income in the PSID, including the SEO, and include individuals age 25-61. Income is adjusted for inflation using the CPI-U-RS. This measure shows the same trend regardless of whether incomes of $0 are excluded or not.

[32] In addition to these income volatility studies, Davis and Kahn (2008) report that the mean of the absolute value of the logged change in household *consumption* over six months was larger – indicating more absolute mobility – during the 1992-2004 period than in the 1980-91 period. The authors rely on the Consumer Expenditure Survey and examine consumption expenditures, defined as those on nondurable goods and services, per adult equivalent. Trends are grouped by predicted consumption decile (predicted using the first quarter of consumption data from demographic variables). Volatility increased for the third through tenth deciles. Conley and Glauber (2008) found that short-term absolute wealth mobility rose between the second half of the 1980s and the early 2000s. The authors examine typical changes (in dollars) over five- or two-year periods in the PSID, as well as the share with changes of a given dollar amount.

[33] Dynan et al. (2008). The authors measure volatility as the standard deviation of percent changes in income over two years, where the percent changes are computed as described in note 18.

[34] Orszag (2008). No methodological details are given beyond the source of the data, which is the SIPP matched to SSA data.

[35] Nichols and Zimmerman (2008). They computed percent changes in the same way as Dynan et al. (2008) for illustration.

[36] Gundersen and Ziliak (2003). The authors exclude those less than age 25 in 1980, those not in the sample for at least three years, students, the disabled, the institutionalized, those with more than a 300% increase or a 75% decrease in income or consumption, those with less than $520 in annual food consumption and those with under $1,000 in annual income. Income includes earnings, transfers, and capital income and excludes federal taxes. The authors model income as function of observable demographics, a time-invariant permanent effect, a random growth term, year fixed effects, and a random walk component. They then estimate the change in income using OLS, capture the residuals, and measure volatility as the average squared residual for each year.

[37] Blundell, Pistaferri, and Preston (2008). The authors use the 1978-1993 waves of the PSID, excluding the SEO. The sample consists of continuously married couples headed by a male, and the income measure is labor income plus transfers, minus the estimated federal taxes on these components. Federal taxes are imputed in 1992 and 1993 using the NBER TAXSIM program. The authors exclude those with topcoded income, financial income, or federal taxes, with growth of 500% or more or -80% or less, or with <$100 of income. They also exclude those with missing data on education or region, born before 1920 or after 1959, or less than 30 or over 65. Log income is residualized by regressing it on year dummies, year of birth dummies, and family characteristics and capturing the residuals.

[38] Blundell et al. also examined consumption volatility trends, finding a 15-percent increase from 1981 to 1992. Gundersen and Ziliak (2003) find an increase in volatility of food consumption of about 15 percent (in standard deviations) from 1980 to 1997.

[39] Gottschalk and Moffitt (1994).

[40] Hacker (2008). He dropped all non-positive incomes, then he trimmed the top and bottom 2% of the remaining observations. See note 10 for additional methodological details. Hacker's results in the first

edition of *GRS* indicated that the decline was from 43% to 36% to 25% from 1973-82 to 1983-92 to 1993-2002.

[41] Gottschalk and Moffitt (2007). The authors use the PSID, and examine log family income adjusted for needs by dividing by the poverty line for a family of a given size. They trim the bottom two percent of income.

[42] Keys (2008). The author focused on non-student heads age 20-59. He dropped $0 observations, trimmed the top and bottom 1 percent of incomes, and regressed logged family income on a quartic in age. Volatility is estimated within-person over 10 years.

[43] Gosselin and Zimmerman (2008). The authors first regress log family income on a quartic in age, then compute various quantiles of the variance of the residual over years t, $t+2$, $t+4$, and $t+6$. Individuals must have at least three valid observations in these four years to be included. For additional methodological details, see note 17. Few details are provided for the SIPP analyses, but volatility is measured as the mean within-person variance of income over three consecutive years.

[44] Nichols and Zimmerman (2008). Within-person dispersion is measured over years t-2, t, and $t+2$, and only those with valid incomes in all three years are included. The authors also show trends when other transformations of income are used, including the cube root, the inverse hyperbolic sine, and the neglog transformation. They generally align with the logged results. The authors also report that the results are similar if they adjust family income for needs. For additional methodological details, see note 30.

[45] Gosselin (2008). Gosselin computed, for each individual, the maximum absolute value of the annual change over a five-year window (including years t, $t+1$,…, $t+4$). He then reported the 68th percentile across all adults, or across all adults within some quantile (based on five-year average income). Individuals had to have at least three observations in the five-year window. These details are spread across Gosselin (2008), Gosselin and Zimmerman (2008), and http://www.latimes.com/business/la-fi-riskshift3oct10-method,0,7201216.story. It is unclear how Gosselin addressed the shift of the PSID to a biannual survey after 1997, and it is also unclear whether maximum changes are based on levels and converted to percentages for specific quantiles or based on percentages and then converted to levels for specific quantiles. For additional methodological details, see note 16. Gosselin presented earlier results in his series of Los Angeles Times articles (Gosselin 2004a, 2004b, 2004c). In those articles, he trimmed incomes under $0. He reported increases in volatility for the bottom and top quintiles (Gosselin 2004b).

[46] Nichols and Favreault (2009). The authors use the 1990-93, 1996, and 2004 panels of the SIPP matched to Social Security Administration earnings data. Their sample includes adults born between 1936 and 1956, who were 24 to 44 years old in 1980 and 48 to 68 years old in 2004. They drop the largest one percent of variances.

[47] Gunderson and Ziliak (2008). The authors use the 1980-2003 waves of the PSID. They exclude households where the head was in the sample less than three years, was under 25 in 1980, was a student, institutionalized, or disabled, had a year-to-year increase in income exceeding 300 percent or a decline exceeding 75%, or had family income less than $1,000 in inflation-adjusted dollars. They also regress log family income on a quartic in age prior to computing transitory variances.

[48] Batchelder (2003). She includes the SEO and weights the data. Her sample includes families with heads age 44-49. Batchelder bottom codes incomes at $0 and recodes all top-coded incomes to the mean taxable income of U.S. taxpayers earning above the top code in a given year.

[49] Bania and Leete (2007). The authors use the 1991, 1992, and 2001 SIPP panels, covering October 1991 to December 1992 for the 1991 and 1992 panels and October 2002 to December 2003 for the 2001 panel. Their sample includes household heads age 18-59 who were in households of at least two people and with non-negative pretax incomes no more than 300% of the poverty line.

[50] In addition to these studies, Olga Gorbachev (2008) found an increase in food consumption volatility of 1.0% annually from 1974-78 to 1998-2002, with the increase coming almost entirely in the 1996-2002 period. Keys (2008) also found increases in food consumption volatility in the 1970s, 1980s, and 1990s (except among white women in the 1990s).

[51] Hacker (2006). In computing covariance terms, Hacker used 5-year lags, though to obtain the 2002 estimate, he used a 6-year lag, since there was no 1998 survey to provide 1997 income estimates. For additional methodological details, see note 14.

[52] Hacker (2008). He dropped all non-positive incomes, then he trimmed the top and bottom 1% of the remaining observations. In computing covariance terms, Hacker used 4-year lags. For additional details, see note 10.

[53] Hacker and Jacobs (2008). Once again, Hacker's analyses rely on the PSID's pre-tax family income variable. Incomes are again adjusted for family size by dividing by the square root of family size, and they are once again logged and adjusted for inflation using the CPI-U. Again he looks at individuals age 25-61, including the entire core sample and using the sample weights. He dropped all incomes of $1 or less, then trimmed the top and bottom 1% of the remaining observations. Once again, four-year lags are used in computing covariance terms.

[54] Jacobs (2007). Jacobs used the PSID and focused on persons age 25 to 61. She logged household income and trimmed the top and bottom 3%. Business owners were excluded from the sample. She used a four-year lag for the covariances in computing permanent variances.

[55] Though unacknowledged in Jacobs's paper, she and I collaborated extensively in the initial stages of her research.

[56] Gottschalk and Moffitt (2007). The authors use the PSID and the variance decomposition model that defines the transitory variance as the difference between the total variance and the covariance between incomes measured in two years. For additional methodological details see note 40.

[57] Nichols and Zimmerman (2008). The authors used a four-year lag to compute the covariances. For additional methodological details, see note 30. The authors also present results using income levels instead of logs, however the Gottschalk-Moffitt variance decomposition model applies only to logged income (see Chapter Three above).

[58] Blundell, Pistaferri, and Preston (2008). The authors use the PSID, excluding the SEO sample. They focus on households headed by a male age 30 to 65 who was continuously married to his wife. Income is measured as household labor income plus transfers, minus estimated federal taxes on these components. Federal taxes are imputed in 1992 and 1993 using the NBER TAXSIM program. The authors exclude households with top-coded income, financial income, or federal taxes; with year-to-year growth of 500% or more or -80% or less; with less than $100 of reported annual income; with missing data on education or region; or born before 1920 or after 1959. Prior to estimating their model, the authors regress log income on year dummies, year of birth dummies, and various demographic characteristics.

[59] Blundell and Pistaferri (2003). Income is measured as household labor income plus cash transfers, adjusted for inflation using the CPI-U. The sample is restricted to continuously married couples headed by a man, with no family composition changes. They exclude those younger than age 25 or older than 65, those with top-coded income in any year or with missing data for education or region or who are income outliers. The authors' model derives from a utility-maximization framework. Income is modeled as having a permanent component following a random walk and a transitory component. The permanent shock also affects year-to-year changes in consumption, which otherwise follow a constant path over time conditional on demographic controls. They categorize people as low-income if their pre-1979 average income was below 200% of the federal poverty line.

[60] See http://pantheon.yale.edu/~jhacker/volatility_graph.pdf.

[61] In addition to these studies, Gorbachev (2008) finds an increase in consumption volatility using a model that considers both income and consumption dynamics.

[62] Nichols (2008). Nichols uses the PSID, and his income measure consists of family income plus food stamps. He estimates results with and without taxes, imputed using NBER's TAXSIM. He also estimates them with and without adjusting family size, by dividing by the square root of family size. Nichols drops the top 2% of incomes in every year. The sample includes adults age 30 to 60.

[63] Maasoumi and Trede (2002). The authors use the PSID and measure post-government income as pre-government income (which includes the imputed rental value of owner-occupied housing) plus public transfers, minus income and payroll taxes. They exclude those with post-government income of less than $450.

[64] Burkhauser and Poupore (1997). This study also used the PSID.