Economic Inquiry

DECOMPOSING TRENDS IN INCOME VOLATILITY: THE "WILD RIDE" AT THE TOP AND BOTTOM

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We use 2-year panels from the Current Population Survey to provide a detailed accounting of family income volatility from 1980 to 2009. Volatility doubled overall, and the increase was most pronounced among the top 1% of the income distribution, but in any given year the level of volatility among the bottom 10% exceeds that of the top. The increased volatility comes from higher instability of head and spouse earnings, other nonlabor income, and from reduced covariance between these income sources with the tax system. This suggests that current tax policy is less effective in mitigating income shocks than previous decades. (*JEL* J31, I30)

I. INTRODUCTION

By most accounts income volatility for the typical family in the United States has been on the rise since the early 1970s, with estimates ranging from 10% to a doubling (Dahl, DeLeire, and Schwabish 2011; Dynan, Elmendorf, and Sichel 2012; Gottschalk and Moffitt 2009; Gundersen and Ziliak 2003; Hacker and Jacobs 2008; Winship 2009). Understanding the sources of rising volatility is important because of the possibility that changes in labor supply and public policies may have shifted more idiosyncratic and business cycle risk onto families, which could have negative welfare consequences if it falls predominantly on those who face liquidity constraints and are less able to smooth income shocks (Blundell et al. 2008; Gottschalk and Moffitt 2009; Hacker and Jacobs 2008; Kniesner and Ziliak 2002; Parker and Vissing-Jorgensen 2009). Our aim in this article is to provide a detailed accounting of the trend increase in family income volatility across the income distribution by quantifying the contributions of household head earnings, spouse earnings, nontransfer nonlabor income, transfer income, and tax payments (inclusive of the Earned Income Tax Credit), along with covariances among the income components.

The initial interest in volatility among labor economists focused on earnings of male heads of household in an effort to better understand whether the rise in wage inequality represented temporary shifts or structural changes in the labor market (Gottschalk and Moffitt 1994; Haider 2001). This spawned a series of additional studies, with the consensus being that earnings instability among men peaked in the 1980s and stabilized thereafter (Celik et al. 2009; Dahl, DeLeire, and Schwabish 2011; Dynarski and Gruber 1997; Keys 2008; Shin and Solon 2011; Ziliak, Hardy, and Bollinger 2011). The earnings instability of women also stabilized in the late 1980s, but unlike men, actually fell from peaks in the early 1970s as more women entered full-time employment. Not well known, however, is whether there have been changes in the correlation of earnings shocks between husbands and wives that might contribute to the trend rise in income volatility (Shore forthcoming). The canonical added worker hypothesis stipulates that earnings shocks of husbands and wives are negatively correlated—a fall in husband earnings due to unemployment is offset (at least partially) by a rise in earnings of the wife—but

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ABBREVIATIONS

CPS: Current Population Survey
EITC: Earned Income Tax Credit
NIPA: National Income and Product Accounts
PSID: Panel Study of Income Dynamics

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if there is assortative matching in the marriage market and both spouses work in similar industries/occupations then it is possible that earnings shocks are positively correlated (Lundberg 1985; Shimer and Smith 2000). If the added-worker phenomenon dominates then spousal labor supply should attenuate trends in income volatility, while if assortative matching dominates then we might expect volatility exacerbated.

In addition to secular changes in labor supply of families, there have been dramatic changes to the U.S. tax and transfer system. For example, in 1996 the most fundamental reform to the U.S. welfare system was passed, and it in conjunction with expansions in the EITC in 1993 led to dramatic increases in the labor supply of low-skilled single mothers (Meyer and Rosenbaum 2001). However, because of the clawback in welfare benefits after the reform, due both to mechanical responses (because benefits are means-tested and thus fall with rises in earnings) and behavioral responses, the level of after-tax income among less-skilled women after welfare reform actually fell (Bollinger, Gonzalez, and Ziliak 2009). With restricted access to the safety net it is possible that these families face greater income risk, especially during the recessions of 2001 and 2008.

At the other end of the distribution, the tax reforms of the 1980s greatly reduced marginal tax rates among high-income families. Kniesner and Ziliak (2002) showed that these reforms reduced implicit income and consumption insurance to families. That is, the more progressive the tax system the smaller the decline in after-tax income when before-tax income falls, and thus the move to a flatter tax system resulted in reduced implicit insurance and greater ex ante after-tax income risk among high-income families. Indeed, Parker and Vissing-Jorgensen (2009, 2010) found that the cyclicality of incomes at the top of the income distribution far surpassed that facing the typical household, leading Frank (2011) to characterize this trend as "the wild ride of the 1%." The Parker and Vissing-Jorgensen result that cyclicality at the top of the distribution dominates that of the typical family assuages concerns over negative welfare consequences of volatility assuming that liquidity constraints are not binding at the top, but their use of tax return data does not allow for a detailed analysis of lower-income households because many do not file returns. It thus remains an open question whether the volatility at the top exceeds that at the bottom, and one that we address. The combination of welfare reform and tax reform suggests that examining changes in volatility sources across the income distribution is important.

In order to isolate whether rising after-tax income volatility is explained by an increase in the variance of earnings on the one hand, or a (absolute value) decrease in the covariance of earnings and tax payments on the other hand, we employ a variance decomposition of income volatility into its component parts of spousal earnings, transfer income, other non-transfer income, less net tax payments.[1] A key advantage of the variance is that once we weight each of the income components by their respective shares in (2-year) average income, total volatility is the sum of the volatility of the individual income sources plus the covariances across sources. For our measure of volatility we use the arc percent change in income, which is advantageous over the point percent change because it is symmetric, it is more robust to large swings in incomes, and it easily admits zero (or negative) incomes.

In constructing the weighted variance of the arc percent change we treat the individual income shares and volatility terms as random variables, and use the exact decomposition techniques of Bohrnstedt and Goldberger (1969) for the products of random variables. We also differ from the literature by exploiting a little used feature of the Current Population Survey (CPS) that permits linking of the same individual across annual waves to create a series of 2-year panels (Cameron and Tracy 1998; Gittleman and Joyce 1996; Ziliak, Hardy, and Bollinger 2011). The advantage of the CPS relative to datasets such as the Panel Study of Income Dynamics (PSID) is the large sample sizes that permit more robust examination of trends across the distribution. The CPS is also the workhorse dataset for research on income inequality, and since volatility is a potential contributor to inequality, it is useful to examine volatility in the CPS.

Our results show that overall family income volatility more than doubled from 1980 to 2009,

1. Our study is most similar to Dynan et al. (2012), who examine trends in earnings, cash transfers, and other nonlabor income using data from the Panel Study of Income Dynamics. Our paper differs in that we examine both the variances and the covariances across income sources via our exact variance decomposition, we include taxes and in-kind transfers, and we use much larger CPS data to analyze volatility across the distribution.

and while the increase in volatility was most pronounced among the top 1% of the income distribution, in any given year the level of volatility among the bottom 10% exceeds that of the top, suggesting the potential for substantial welfare losses among the poor facing liquidity constraints. Overall, the variance decomposition indicates that increased family income volatility comes directly from the higher volatility of head and spouse earnings, other income, and a reduced covariance between these three income sources with the tax system, suggesting that the current tax code is less effective today in mitigating income shocks. We present evidence that after 1990 the covariance of spousal earnings switched from negative (or zero) to positive, consistent with assortative matching, and that leads to modest upward pressure on overall income volatility. Although transfers intercede to dampen family earnings volatility among lower income households, there is less smoothing from this source in recent years. The decomposition also shows volatility among higher-income families is driven by earnings and nontransfer other income, and that within this relationship, an increasing negative covariance between earnings and other income occurs—suggesting other income offsets earnings shocks in a way similar to the tax system.

II. A DECOMPOSITION OF INCOME VOLATILITY

In modeling the extent to which disposable incomes fluctuate from one year to the next, and the attendant channels that generate those fluctuations, we highlight five sources of income for a family: the wages of the head (h), the wages of the spouse (s), nontransfer other income (o), transfer income (tr), and tax payments (tx). This leads to a specification of disposable family income for family i in time t as

$$(1) \qquad y_{it} = y_{it}^{h} + y_{it}^{s} + y_{it}^{o} + y_{it}^{\mathrm{tr}} - y_{it}^{\mathrm{tx}},$$

where the first four terms are generally positive and expand family resources, while taxes reduce resources. We note, though, that with refundable credits such as the EITC, tax payments may be negative, and thus resulting in higher after-tax income than before-tax.

We measure disposable income volatility, v_{it}, as the variance of the arc percent change

$$(2) \qquad v_{it} = V\{(y_{it} - y_{it-1})/\bar{y}_i\},$$

where $V\{\}$ is the variance operator, and $\bar{y}_i = (y_{it} + y_{it-1})/2$ is the person-specific time mean across the pair of years.[2] The use of the time-mean in the denominator helps reduce the influence of extreme swings of income across years, with the added feature that this measure is symmetric and bounded below by −200% and above by +200%. Dynan, Elmendorf, and Sichel (2012), Dahl, DeLeire, and Schwabish (2011), and Ziliak, Hardy, and Bollinger (2011) measure volatility with the standard deviation of the arc percent change. We use the variance because it is additively separable in subcomponents whereas the standard deviation is not, and thus the level of volatility here will be lower than these other papers since the variance is between 0 and 1, and the trend increase in overall volatility is higher.

To identify the contribution of each income source to total volatility, we apply the arc percent change to Equation (1) as

$$(3) \qquad \frac{y_{it} - y_{it-1}}{\bar{y}_i} = \frac{\bar{y}_i^{h}}{\bar{y}_i}\left\{\frac{y_{it}^{h} - y_{it-1}^{h}}{\bar{y}_i^{h}}\right\} + \frac{\bar{y}_i^{s}}{\bar{y}_i}\left\{\frac{y_{it}^{s} - y_{it-1}^{s}}{\bar{y}_i^{s}}\right\} + \frac{\bar{y}_i^{o}}{\bar{y}_i}\left\{\frac{y_{it}^{o} - y_{it-1}^{o}}{\bar{y}_i^{o}}\right\} + \frac{\bar{y}_i^{\mathrm{tr}}}{\bar{y}_i}\left\{\frac{y_{it}^{\mathrm{tr}} - y_{it-1}^{\mathrm{tr}}}{\bar{y}_i^{\mathrm{tr}}}\right\} - \frac{\bar{y}_i^{\mathrm{tx}}}{\bar{y}_i}\left\{\frac{y_{it}^{\mathrm{tx}} - y_{it-1}^{\mathrm{tx}}}{\bar{y}_i^{\mathrm{tx}}}\right\},$$

where the arc percent change of each income source is weighted by its share of mean income across each pair of two years. Taking the variance of both sides results in

$$(4) \qquad v_{it} = \sum_{j=1}^{5} V(\rho_i^{j} a_{it}^{j}) + \sum_{k=1}^{5}\sum_{j=1}^{5} C(\rho_i^{j} a_{it}^{j}, \rho_i^{k} a_{it}^{k}),$$

where the left-hand side is total volatility as in Equation (2), $\rho_i^{j} = (\bar{y}_i^{j}/\bar{y}_i)$ is the share of

2. In a sensitivity analysis where negative incomes are permitted owing to business losses we use the absolute value of income in time t and t-1. The volatility measure in Equation (2) still retains its symmetry property in this case. We find that including negatives has negligible impacts on the trend in disposable income volatility, so we do not show trends including negative values. In addition, we note that it is possible for a person to have income that is equal but opposite in sign across years, and instead of averaging to zero our measure reports the average as the absolute value of one of the years. In practice we find that this is not an issue and we do not lose any observations.

component j income to the total, $a_{it}^j = (y_{it}^j - y_{it-1}^j)/\bar{y}_i^j$ is the arc percent change for component j, and $j = h$, s, o, tr, and tx (corresponding to 1,.., 5 in the summation). Equation (4) implies total volatility consists of five variance terms ($V(.)$) and 10 unique covariance terms ($C(.)$).

We treat both ρ_i^j and a_{it}^j as random variables, and use results of Bohnnstedt and Goldberger (1969) to compute exact variances and covariances of the product of random variables as

(5)

$$V(\rho_i^j a_{it}^j) = E^2(\rho_i^j)V(a_{it}^j) + E^2(a_{it}^j)V(\rho_i^j) + E[(\Delta\rho_i^j)^2(\Delta a_{it}^j)^2] + 2E(\rho_i^j) \times E[(\Delta\rho_i^j)(\Delta a_{it}^j)^2] + 2E(a_{it}^j) \times E[(\Delta\rho_{it}^j)^2(\Delta a_{it}^j)] + 2E(\rho_i^j)E(a_{it}^j) \times C(\rho_i^j, a_{it}^j) - C^2(\rho_i^j, a_{it}^j)$$

and

(6)

$$(\rho_i^j a_{it}^j, \rho_i^k a_{it}^k) = E(\rho_i^j)E(\rho_i^k)C(a_{it}^j, a_{it}^k) + E(\rho_i^j)E(a_{it}^k)C(a_{it}^j, \rho_i^k) + E(a_{it}^j)E(\rho_i^k)C(\rho_i^j, a_{it}^k) + E(a_{it}^j)E(a_{it}^k)C(\rho_i^j, \rho_i^k) + E[(\Delta\rho_i^j)(\Delta a_{it}^j)(\Delta\rho_i^k)(\Delta a_{it}^k)] + E(\rho_i^j)E[(\Delta a_{it}^j)(\Delta\rho_i^k)(\Delta a_{it}^k)] + E(a_{it}^j)E[(\Delta\rho_i^j)(\Delta\rho_i^k)(\Delta a_{it}^k)] + E(\rho_i^k)E[(\Delta\rho_i^j)(\Delta a_{it}^j)(\Delta a_{it}^k)] + E(a_{it}^k)E[(\Delta\rho_i^j)(\Delta a_{it}^j)(\Delta\rho_i^k)] - C(\rho_i^j, a_{it}^j)C(\rho_i^k, a_{it}^k),$$

where $\Delta x = x - \bar{x}$ is the deviation from mean for $x(= \rho, a)$, and $E(\,)$ is the expectations operator. This decomposition implies that family income changes can arise directly from one of the five sources or from the covariances between the income sources. For example, if husband and wife labor supply decisions are substitutes, then a negative shock to head's earnings could result in an offsetting increase in the volatility of wife earnings, leaving total volatility of the family little changed. Below we calculate total volatility and the contribution of the 15 variances and covariances for each year over the past three decades.

III. DATA

The data come from the Annual Social and Economic Supplement of the CPS for calendar years 1980–2009 (interview years 1981–2010). With the exceptions of Dahl, DeLeire, and Schwabish (2011) and Parker and Vissing-Jorgensen (2009, 2010), the literature on income volatility has relied exclusively on longitudinal data from the PSID. The PSID is the longest running panel of families available, and is well suited for research on volatility, but the survey was redesigned in 1992 and 1993, and thus papers using the PSID have arrived at different results depending on how they handle the redesign years. Another reason for different results from PSID-based papers is with the treatment of families reporting zero earnings or income. Because much of the literature reports the variance of log earnings or income, person-years with zero earnings/income are dropped from the analysis, which can understate measured volatility because labor-force dropouts are ignored. Although as noted below we observe at most one-half of the CPS sample across 2 years, this is sufficient for our arc percent change volatility measure. Given the large samples in the CPS, we are able to estimate income volatility trends with precision for detailed subgroups, as well as across the income distribution.

Our sample consists of heads of household ages 25–60 years, both married and unmarried with and without dependents. As specified in Equation (1) the focal variable is disposable income, which is the sum of head and spouse earnings (if spouse is present), nontransfer other income, transfer income, less net tax payments. We focus on family volatility and not household volatility, which means that if there is more than one person in the household we only include the contributions of related persons and not unrelated persons such as a cohabiting partner.[3]

Earnings is defined as the sum of wage and salary income, nonfarm self employment, and farm self employment. Other nontransfer income consists of labor income of other relatives beside the head or spouse; rent, interest, and dividends; alimony; child support;

3. Trends in household income volatility are very similar to family volatility, but the level is slightly lower.

private pensions; and gift income.[4] Transfer income consists of Social Security and Disability Insurance; Supplemental Security Income; Unemployment Insurance; Workers Compensation; Veterans Payments; Aid to Families with Dependent Children (and after 1996, Temporary Assistance for Needy Families); General Assistance; food assistance such as food stamps (called Supplemental Nutrition Assistance Program after 2008) along with school breakfast and lunch; and housing assistance from public housing and Section 8 vouchers. Tax payments are the sum of federal, state, and payroll taxes that are estimated for each family in each year using the NBER *TAXSIM* program in conjunction with basic information on labor income, taxable nonlabor income, dependents, and certain deductions such as property tax payments.[5] The federal and state taxes include the respective EITC code for each tax year and state, thus allowing for the possibility of negative tax payments. We assume that the family bears only the employee share of the payroll tax rate. Unless noted otherwise all income data are deflated by the Personal Consumption Expenditure Deflator with a 2009 base year.

The CPS employs a rotating survey design so that a respondent is in sample for 4 months, out 8 months, and in another 4 months. This makes it possible to match approximately one-half of the sample from one March interview to the next. Following the recommended Census procedure we perform an initial match of individuals on the basis of five variables: month in sample (months 1–4 for year 1, months 5–8 for year 2); gender; line number (unique person identifier); household identifier; and household number. We then cross check the initial match on three additional criteria: race, state of residence, and age of the individual. If the race or state of residence of the person changed we delete that observation, and if the age of the person falls or if it increases by more than 2 years (owing to the staggered timing of the initial and final interviews), then we delete those observations on the assumption that they were bad matches.

The CPS imputes income components for observations where such data are missing due to nonresponse. The most prominent source of nonresponse is with earnings, affecting nearly one-third of all families in the March supplement. Bollinger and Hirsch (2006) recommend that imputed data should be dropped owing to potential bias, and many papers in the inequality literature drop these observations (Autor, Katz, and Kearney 2008; Lemieux 2006). Thus, prior to matching we drop those heads with imputed income values. The Census also censors (top codes) incomes in the public release data in order to protect confidentiality of very high income earners. In the mid-1990s, the Census changed the top code from an arbitrary ceiling to a ceiling based on detailed cell means, which were much higher than the former top codes. This results in a dramatic shift toward higher inequality because of the new top codes. Larrimore et al. (2008) gained access to internal Census data and back-casted the new top code procedure to the late 1970s in order to produce a consistent top code series over time. We obtained their cell codes and incorporated them into our data.[6] Burkhauser et al. (2012) find that using the consistent top code method results in CPS measures of income inequality tracking those from proprietary tax return data better than (unadjusted) public-use CPS data, and Ziliak, Hardy, and Bollinger (2011) find the use of the consistent top codes to be important in documenting trends in earnings volatility.

There were major survey redesigns in the mid-1980s and mid-1990s so it is not possible to match across the 1985–1986 waves and the 1995–1996 waves. This yields an interrupted time series across 29 years with gaps in calendar years 1984–1985 and 1994–1995. As indicated in Table A1, we have 8,128 head of household observations in an average year when a match is possible, for a total of 219,462 matches. For most of our analyses we restrict attention to family heads with nonnegative disposable incomes, and those that do not change headship status or marital status from one year to the next. This means that in our baseline series we include families with zero disposable income, which is possible if taxes exactly offset income, or more

4. As a sensitivity check, we also conduct the volatility analyses with simulated data on capital gains produced by the Census Bureau. The measure was discontinued by Census as of 2010 due to data irregularities and poor quality. The general trends and results are not significantly affected by its inclusion.

5. The CPS does not have information on certain inputs to the *TAXSIM* program such as annual rental payments, child care expenses, or other itemized deductions. We set these values to zero when calculating the tax liability.

6. We note that imputation occurs prior to top coding, and thus it is possible for a family to have imputed income that is top coded, but these persons are dropped along with other imputed income families.

likely, if the family depends on nonfamily members such as a cohabiting partner for support. There are 1,171 observations, or 0.53% of stable family heads, that report zero income in one of the two years, and 143 heads, or 0.06%, that report zero disposable income in both years. The arc percent change measure of volatility accommodates zero income in one of the periods with no adjustment necessary, but when income is zero in both years, the arc percent change is not defined. Because "volatility" in practice is zero when income is zero both years, we retain these observations and set volatility to zero.[7] We also retain observations where one or more subcomponents of income equal zero and total income is greater than zero.

Table A1 also summarizes the number and rate of matches for each year, indicating that we match approximately 55% across survey years on average (58% prior to the additional sample filters of constant headship and marital status). The declining match rate after the mid-1990s reflects in part a rise in allocation within the CPS after adoption of computer-assisted telephone interviewing and computer-assisted personal interviewing. A possible concern with declining match rates is with sample attrition affecting our volatility series. Under the assumption that the probability of attrition is unobserved and time invariant (i.e., a fixed effect), then differencing the variable will remove the latent effect (Wooldridge 2001; Ziliak and Kniesner 1998). If there is a time-varying factor loading on the unobserved heterogeneity then differencing will not eliminate potential attrition bias, though if the loading changes slowly over time as suggested in Shin and Solon (2011), then differencing will mostly eliminate bias.

To get a handle on whether failing to match across survey years results in a significant change in sample composition, in Table A2 we compare the means and standard deviations of selected characteristics between the matched CPS sample and the repeated cross-sectional CPS. The cross-sectional CPS sample prior to matching appears to have slightly lower income and earnings, and is also younger and more racially diverse, suggesting that moves are more likely among lower-income families and thus the matched CPS may understate volatility at the low end of the distribution. However, we note that most of the demographic differences across the samples are quite similar, within 2 to 3 percentage points. Moreover, recent work by Bollinger and Hirsch (2013) suggests matched CPS panels may in fact reduce measurement error in annual earnings reporting, an important benefit in the estimation of year-to-year volatility trends. A conservative interpretation, then, is that data from matched CPS provide estimates of volatility among the population of nonmovers. Even if this is true it is still not clear a priori whether potential time-varying attrition affects overall trends in volatility as moves can be accompanied by downward or upward movements in income, or no change at all.

7. Blank (2012) also discusses the issue of zero family income in the March CPS and comes to a similar conclusion that these are legitimate observations and retains them in her analysis.

IV. TRENDS IN INCOME VOLATILITY

We begin in Figure 1 by presenting the trend in after-tax income volatility across all families (i.e., the series represented by the "filled-diamond"). In any given year, the figure presents the year 2 value of volatility so that 1981 refers to families matched across 1980 and 1981, 1982 refers to 1981–1982 matches, and so on. The figure shows a strong secular rise in income volatility, which peaked in 2001, and subsequently stabilized for the remainder of the last decade. By 2009 income volatility as measured by the variance of arc percent changes increased 108% since the early 1980s, suggesting much heightened instability facing the average American family.

In Figure 1, we also examine the sensitivity of trend income volatility to excluding zeros, including capital gains and losses, and including an adjustment factor for higher-income families. The figure shows that when we drop observations with zero income in one (or both) years, the level of volatility falls in every year, and the trend increase is a lower but still substantial 78% increase. On the other hand, when we include the simulated values of capital gains and losses computed each year starting in 1980 by the Census Bureau (but eliminated in 2009), the level of volatility is slightly higher and trend increase is nearly identical to the base case (102% increase). Finally, we estimate trend volatility with an additional adjustment factor over and above the Larrimore et al. (2008) consistent top code that accounts for the censoring of top incomes within the CPS. This interpolation technique, based on the Pareto distribution (Piketty and Saez 2003), does not affect either the level or trend of our main volatility series

FIGURE 1
Trends in Disposable Income Volatility

in Figure 1. In fact, the "All Families" volatility trend and the "All Families—Pareto Adjustment" trend lines are nearly identical, resulting in the latter Pareto-adjusted trend covering the main trend for all families in Figure 1.

Figure 2 demonstrates that the rise in disposable income volatility cuts across race and family structure. In any given year, the volatility of families headed by a black person, or families headed by a single mother, are substantively higher than the volatility among white families or married families, consistent with racial and family structure heterogeneity in earnings volatility (Keys 2009; Ziliak, Hardy, and Bollinger 2011). However, the increase in volatility among white families and married families was actually larger (112% and 134%, respectively) than the other two groups (79% and 62%, respectively). Because the trends are common across major demographic groups, for ease of presentation in the ensuing analysis we focus our discussion on the pooled sample of all families.

A. *Sources of Volatility Trends*

In Figures 3 and 4, we examine the underlying components of rising disposable income volatility based on the decomposition in Equations (4)–(6). Figure 3 presents the five weighted variance terms from Equation (5), along with the total volatility among all families from Figure 1. We see here that the level of volatility in any given year is strongly influenced by the volatility of head and spouse earnings, as well as nontransfer other income. However, volatility increased across all variance components, rising about 87% and 84%, respectively, for head and spouse earnings, 55% for other income, about 20% among tax payments. Although the level is low, transfer payment volatility increased 160%, especially in the last few years with the onset of the Great Recession.

In Figure 4, we depict the ten weighted covariance terms based on the formula in Equation (6). It is important to recall that these are not covariances across levels of income sources, but rather the covariance of income volatilities. Covariances that are positive, or that become less negative from one year to the next, lead to upward pressure on total volatility, while those that are negative or become less positive from one year to the next put downward pressure on total volatility.

FIGURE 2
Trends in Disposable Income Volatility by Race and Family Structure

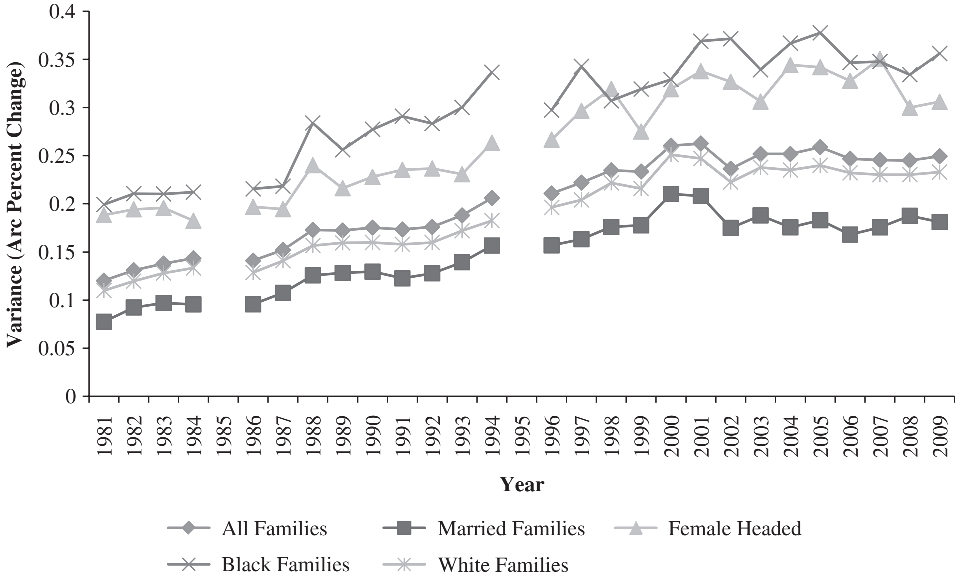


FIGURE 3
Trends in Variance Components of Disposable Income Volatility

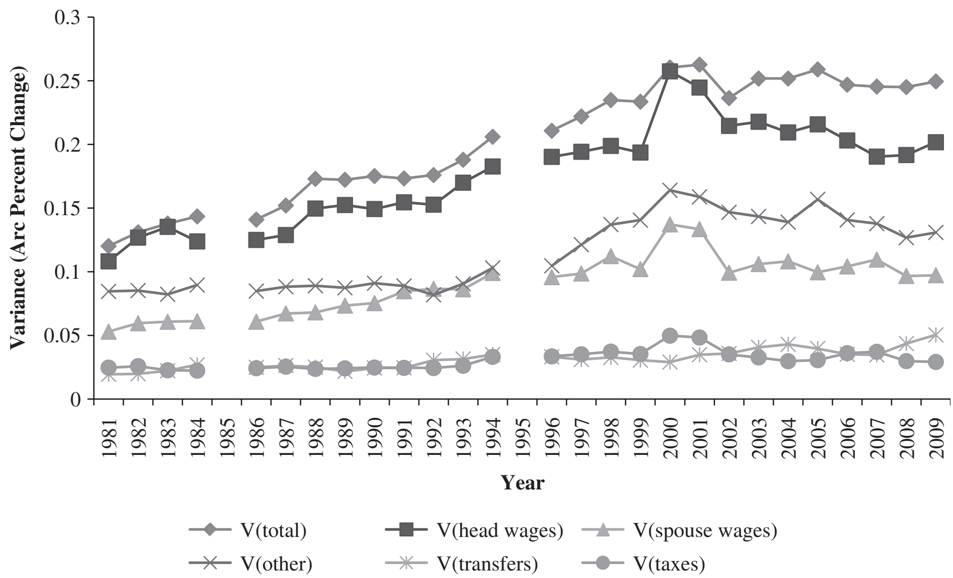
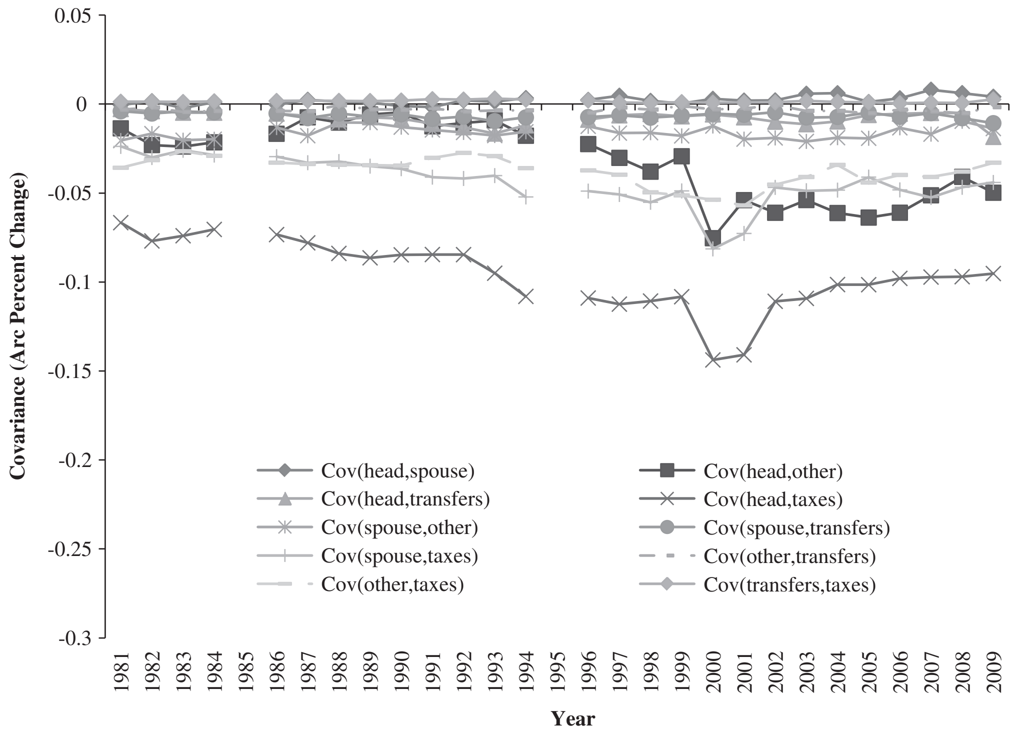


Figure 4 shows that in the first half of the sample period the covariance of head and spouse earnings volatility was negative, or zero, whereas over the past decade it has become positive, albeit small in magnitude (i.e., the series represented by the "filled-diamond"). This suggests that husbands and wives now have positively correlated earnings shocks on average,

FIGURE 4
Trends in Covariance Components of Disposable Income Volatility



which makes it more difficult to smooth family income volatility. At the same time, Figure 4 makes clear the importance of the tax code in smoothing income shocks. For example, as head and spouse earnings volatilities were peaking in the 2000–2001 period, the negative covariances of head wages with taxes (the series represented by the "cross"), coupled with the negative covariance of spouse wages with taxes (the "plus" series), attenuated substantially the growth in total volatility. While the tax system appears to be fairly responsive in mitigating volatility from earnings and other income sources, the covariances between head or spouse earnings with transfers has been little changed over the three decades (the "triangle" and "circle"). Indeed, aside from the tax system, over the past decade total family income volatility was largely kept in check by the growing negative covariance of other nontransfer income volatility with earnings volatility of the head (the "filled-square" series).

To further illuminate the changing roles of the various income sources over time, in Table 1 we present the estimated total variance in the first column followed by the fraction of each of the 15 components in the weighted variance–covariance decomposition to total volatility. Table 1 corresponds directly to Figures 3 and 4, but for brevity we tabulate results for every fourth year of the sample (except 1985 which, as described in Section III, is missing). Each row in the table starting with the second column sums to 1. Comparing the volatility shares in 1981 to those in 2009 we see that in 2009 even though volatility is double, the fraction from the variance of both head and spouse wages fell, as did that of other nontransfer income and taxes, while the fraction from the variance of transfers rose modestly. This suggests that the largest upward pressure came from the (absolute value) reduction in the shares from the covariance of the tax system with earnings and other income. That is, the covariance terms of taxes in Figure 4 are larger in absolute value in 2009 than in 1981, but as a fraction of the total it has declined. Indeed, with the exception of 2009, for most of the past decade the tax code

TABLE 1

Total Variance and Share Decomposition of Disposable Income Volatility, All Families

Year	Total Variance	Variance (head wages)	Variance (spouse wages)	Variance (other)	Variance (trans)	Variance (taxes)	Covariance (head, spouse)	Covariance (head, other)	Covariance (head, trans)	Covariance (head, taxes)	Covariance (spouse, other)	Covariance (spouse, trans)	Covariance (spouse, taxes)	Covariance (other, trans)	Covariance (other, taxes)	Covariance (trans, taxes)
1981	0.12	0.90	0.44	0.70	0.16	0.21	0.00	−0.11	−0.02	−0.55	−0.17	−0.03	−0.20	−0.03	−0.30	0.01
1986	0.14	0.89	0.43	0.60	0.18	0.17	0.00	−0.12	−0.04	−0.52	−0.09	−0.04	−0.21	−0.03	−0.23	0.01
1989	0.17	0.88	0.43	0.51	0.13	0.14	0.00	−0.03	−0.04	−0.50	−0.06	−0.04	−0.20	−0.02	−0.20	0.01
1993	0.19	0.90	0.46	0.48	0.17	0.14	0.01	−0.05	−0.09	−0.51	−0.09	−0.05	−0.21	−0.02	−0.16	0.02
1997	0.22	0.87	0.44	0.55	0.14	0.16	0.02	−0.14	−0.03	−0.51	−0.07	−0.03	−0.23	−0.01	−0.18	0.00
2001	0.26	0.93	0.51	0.60	0.13	0.18	0.01	−0.21	−0.03	−0.54	−0.08	−0.02	−0.28	−0.01	−0.22	0.00
2005	0.26	0.83	0.38	0.61	0.15	0.12	0.00	−0.25	−0.02	−0.39	−0.07	−0.02	−0.16	−0.02	−0.17	0.00
2009	0.25	0.81	0.39	0.52	0.20	0.12	0.02	−0.20	−0.07	−0.38	−0.06	−0.04	−0.18	−0.01	−0.13	0.01

Note: The first column is the variance of the arc percent change of disposable income for all families and individuals, and the remaining 15 columns reflect the respective share of the individual component as a fraction of the total variance. The shares may not sum to 1 due to rounding error.

reduced income volatility just under 19%, while in the 1980s it lowered it by almost 22%. This is consistent with the results of Kniesner and Ziliak (2002) who showed that the tax code prior to the Reagan tax cuts of the 1980s offered more implicit insurance against income shocks.

In our decomposition we specify the arc percent change as the product of the share of the individual components of income times the volatility of that component. A question arises as to whether the trend increase in volatility stems from the shifting composition of incomes, or from changing volatilities of the subcomponents. To examine this issue we conduct a shift-share analysis by assuming that all households face the same income shares based on the mean values from 1981. That is, we rewrite Equation (3) as

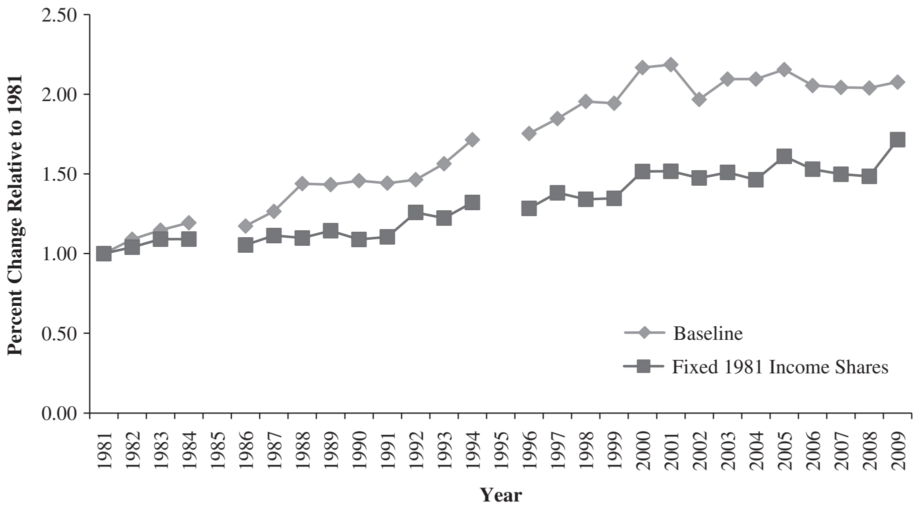
(7)

$$\frac{y_{it} - y_{it-1}}{\bar{y}_i} = \frac{\bar{y}^h_{1981}}{\bar{y}_{1981}}\left\{\frac{y^h_{it} - y^h_{it-1}}{\bar{y}^h_i}\right\} + \frac{\bar{y}^s_{1981}}{\bar{y}_{1981}}\left\{\frac{y^s_{it} - y^s_{it-1}}{\bar{y}^s_i}\right\} + \frac{\bar{y}^o_{1981}}{\bar{y}_{1981}}\left\{\frac{y^o_{it} - y^o_{it-1}}{\bar{y}^o_i}\right\} + \frac{\bar{y}^{\text{tr}}_{1981}}{\bar{y}_{1981}}\left\{\frac{y^{\text{tr}}_{it} - y^{\text{tr}}_{it-1}}{\bar{y}^{\text{tr}}_i}\right\} - \frac{\bar{y}^{\text{tx}}_{1981}}{\bar{y}_{1981}}\left\{\frac{y^{\text{tx}}_{it} - y^{\text{tx}}_{it-1}}{\bar{y}^{\text{tx}}_i}\right\},$$

and re-estimate the 15 variance and covariance terms. Because the shares are constants the expressions for the variance (covariance) take a much simpler form, i.e., $V(ax) = a^2V(x)$ and $C(ax, by) = abC(x, y)$ where a,b are constants and x,y are random variables. In Figure 5, we present the original baseline volatility series for all families as shown earlier in Figure 1, but now normalized relative to the 1981 value, and compare that to the normalized simulated series obtained by assuming fixed 1981 income shares. Figure 5 shows that changing income shares, and their covariance with volatility, play an important role in the changing instability of incomes among American families, and increasingly so in the last decade.

Because Table 1 pools married and unmarried heads of household, the covariances of head and spouse income are muted as it contains zeros for those with no spouse. In Table 2, we isolate married heads of household where it is clear that we are better able to capture the covariation of spousal income. In 1981, the covariance of husband and wife volatility was −0.03, suggesting that earnings shocks were offsetting as

FIGURE 5
Trends in Disposable Income Volatility with Income Shares Fixed at 1981 Values



suggested by the added worker hypothesis, but within a decade the covariance was positive, rising to +0.04 by 2001, and remained above 0 for the remainder of the sample period. The positive covariance is consistent with assortative matching in the marriage and labor markets. Moreover, in Table 2 we see that among married families the weighted variance of head earnings exceeds that of the family overall, and thus there is a greater role of the tax system in any given year to reduce volatility. Again, however, the share of the covariance between head wages and taxes fell more than the head's wage variance, so that the share declined in absolute value resulting in higher volatility overall for married couples (this also came from a substantial decline on the covariance of volatility of other income and taxes).

B. Volatility across the Distribution

We now examine what, if any, differences emerge in the relative contribution of earnings, taxes, transfers, and nonlabor income to family income volatility across income level. As noted in Section I, income instability may have nonnegligible welfare consequences among households facing liquidity constraints or other barriers to their ability to absorb unanticipated shocks. By looking across the distribution of family incomes, we can determine what differences in exposure to income volatility exist, and the extent to which this exposure has shifted over time.

Figure 6 depicts trends in disposable income volatility as a function of location in the 2-year mean disposable income distribution, i.e., $\bar{y}_i$. Specifically, we place families into one of eight mutually exclusive categories of average disposable income: the bottom 1% of the distribution, between the 1st and 10th percentiles of the distribution, the 10th and 25th percentiles, the 25th and 50th percentiles, the 50th and 75th percentiles, the 75th and 90th percentiles, the 90th and 99th percentiles, and lastly in the top 1%. We then compute volatility among those families in each category. As seen in Figure 6, volatility increased across the distribution over the past few decades, ranging from a 36% increase among the bottom 1% to a 222% increase among the top 1%. There is little doubt that the top 1% has experienced substantial upward volatility in recent decades, but this is swamped by the extreme short-term volatility of the bottom 1%, and indeed the bottom 10%. For example, from 1989 to 1990 volatility among the bottom 1% rose by 40%, and there was a 32% increase between 2006 and 2009. Because of small samples, the bottom 1% volatility will be susceptible to outliers. However, among the much larger population in the bottom 10% there is less evidence of year-to-year swings, but in any given year since 1996 the

TABLE 2

Total Variance and Share Decomposition of Disposable Income Volatility, All Married Families

Year	Total Variance	Variance (head wages)	Variance (spouse wages)	Variance (other)	Variance (trans)	Variance (taxes)	Covariance (head, spouse)	Covariance (head, other)	Covariance (head, trans)	Covariance (head, taxes)	Covariance (spouse, other)	Covariance (spouse, trans)	Covariance (spouse, taxes)	Covariance (other, trans)	Covariance (other, taxes)	Covariance (trans, taxes)
1981	0.08	1.46	0.45	0.81	0.08	0.29	−0.03	−0.22	−0.05	−0.91	−0.31	−0.02	−0.19	−0.02	−0.36	0.01
1986	0.10	1.34	0.40	0.68	0.07	0.23	−0.03	−0.20	−0.05	−0.79	−0.18	−0.01	−0.19	−0.02	−0.27	0.01
1989	0.13	1.14	0.37	0.55	0.06	0.16	0.01	−0.07	−0.05	−0.65	−0.12	−0.01	−0.18	−0.01	−0.22	0.01
1993	0.14	1.16	0.39	0.55	0.06	0.17	0.01	−0.05	−0.06	−0.66	−0.13	−0.02	−0.19	0.00	−0.22	0.01
1997	0.16	1.17	0.39	0.56	0.10	0.17	0.02	−0.10	−0.08	−0.67	−0.16	−0.02	−0.18	−0.01	−0.19	0.01
2001	0.21	1.22	0.40	0.70	0.09	0.20	0.04	−0.27	−0.04	−0.70	−0.16	−0.01	−0.22	−0.01	−0.24	0.00
2005	0.18	1.32	0.45	0.79	0.08	0.23	0.03	−0.43	−0.03	−0.75	−0.15	0.00	−0.27	−0.01	−0.26	0.00
2009	0.18	1.25	0.37	0.93	0.08	0.16	0.01	−0.58	−0.03	−0.57	−0.19	0.00	−0.16	−0.02	−0.25	0.00

Note: The first column is the variance of the arc percent change of disposable income for married couples, and the remaining 15 columns reflect the respective share of the individual component as a fraction of the total variance. The shares may not sum to 1 due to rounding error.

level of volatility among the bottom 10% was 81% higher than the volatility among the top 1%, and this level nearly doubled since 1981.[8]

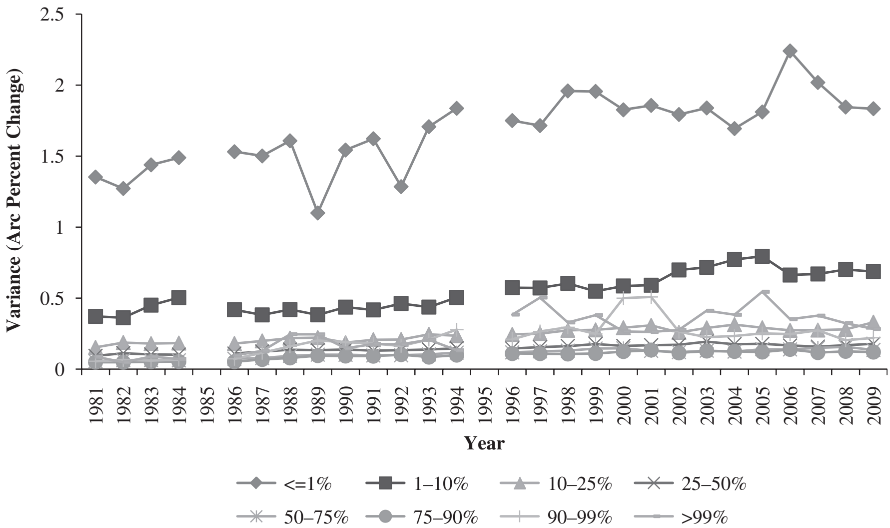
In Table 3, we present the variance decomposition of Equations (5) and (6) for the eight different segments of the income distribution. Instead of presenting 16 figures (two for each segment of the distribution akin to Figures 3 and 4), we present the decomposition for each of four years—two business-cycle peak years (1989 and 1999) and two business-cycle trough years (1981 and 2009).[9] The first column of the table depicts the total volatility, and here we see the dramatic increase in volatility across the distribution from 1981 to 2009, where it doubled or more for most groups except in the bottom quartile where it increased 40–70%. The remaining columns are the shares of the total volatility, and thus sum to 1 as in Tables 1 and 2. The share of volatility owing to head's earnings fell in the bottom half of the distribution, but a similar pattern is less evident in the top half. We also see that the share attributable to wife earnings fell in the bottom 99% of the distribution, but increased sharply in the top 1%. Piketty and Saez (2003) document the rise of labor earnings as a major reason for the rising inequality in the top 1%, and our results here underscore the parallel rise in family earnings volatility at the top. Across the distribution, other nontransfer income volatility and tax payment volatility each fell as a share of the total, while transfer income volatility rose for most groups except the very top. In terms of the covariances, notable is the increased smoothing offered by transfers to changes in head earnings, especially in the middle of the distribution in the depth of the Great Recession, and by the increased negative covariance of other nontransfer income and head earnings in the top half of the income distribution. The decreased share of volatility from the covariance of the tax code with head earnings and with other income at the top of the distribution is offset to some extent by the increased share (in absolute value) between spousal earnings and tax payments. The trend toward more

8. Because volatility before taxes may vary differentially across the distribution, in results not tabulated we calculated before-tax income volatility based on location in the initial year before-tax income distribution. There is strong evidence of increased trend volatility among the top 1%, but again it is swamped by the level of volatility at the bottom 1% and the 1st to 10th percentiles, and it more than doubled in the first decile.

9. Figures containing annual estimates are available from the authors upon request.

FIGURE 6

Trends in Disposable Income Volatility by Location in Mean Disposable Income Distribution



positive covariance of earnings shocks among spouse earnings appears across much of the distribution, potentially exposing the family to less income insurance through assortative matching.

V. INCOME VOLATILITY AND INCOME CYCLICALITY

Parker and Vissing-Jorgensen (2009, 2010) find that the rise in income inequality at the top of the distribution is associated with a rise in the cyclicality of incomes at the top. As reported above we find that the volatility of incomes increased fastest at the top of the distribution. Our focus is more on trend volatility, and not the cyclicality of incomes per se. However, with 2-year percent changes it is clear that our measure of volatility captures aspects of the overall business cycle, and thus in this section we report the results of regression models akin to those in Parker and Vissing-Jorgensen. Specifically, for each income group i in the CPS we estimate models of the form

$$(8) \qquad \Delta \ln(\mathrm{y}) = \alpha + \beta \Delta \ln(NIPA) + \varepsilon,$$

where $\Delta\ln(y)$ denotes the 1-year change in log per capita disposable income and Δln(NIPA) represents the 1-year change in log National Income and Product Accounts (NIPA) income. The "beta" coefficient reflects the elasticity of per capita income with respect to changes in aggregate income, i.e., the cyclicality of income.[10] These results are independently of interest because Parker and Vissing-Jorgensen focused on the top of the income distribution since they used the tax return data in Piketty and Saez (2003), whereas with our CPS data we better capture the low end of the income distribution.

We present the results of the regression models in Table 4. The β coefficients range between .418 and .649 within percentiles 10 and 99, but there is no clear monotonic pattern across these groups. The highest degree of cyclicality occurs at the very top of the income distribution. The estimate of 2.97 says that for a 1% increase in NIPA income, income among persons in the top 1% increases 2.97%. We do find a very large estimate of 6.15 among the bottom 1%, but it is not statistically different from zero, and the estimate for the 1st–10th percentiles is a small and insignificant 0.097. In results not tabulated we also reestimated Equation (7) where instead of using NIPA income we used aggregate consumption as the measure of the business cycle. Here again we find statistically

10. Note that the change in log income for the dependent variable is approximately equal to the point percent change. This differs from our earlier analysis of arc percent changes, the latter of which use mean income in the denominator rather than initial period income.

TABLE 3

Total Variance and Share Decomposition of Disposable Income Volatility by Income Group

Year	Total Variance	Variance (head wages)	Variance (spouse wages)	Variance (other)	Variance (trans)	Variance (taxes)	Covariance (head, spouse)	Covariance (head, other)	Covariance (head, trans)	Covariance (head, taxes)	Covariance (spouse, other)	Covariance (spouse, trans)	Covariance (spouse, taxes)	Covariance (other, trans)	Covariance (other, taxes)	Covariance (trans, taxes)
							Bottom 1% of Mean After-Tax Income Distribution									
1981	1.34	0.17	0.11	0.44	0.33	0.04	0.00	−0.02	0.01	−0.02	−0.02	0.01	−0.01	−0.02	−0.02	0.00
1989	1.09	0.34	0.33	0.17	0.39	0.01	0.01	0.01	0.01	−0.06	−0.02	−0.11	−0.06	−0.01	0.00	0.00
1999	1.93	0.21	0.15	0.32	0.35	0.01	0.00	−0.02	0.00	−0.01	0.01	−0.01	−0.01	−0.01	0.01	0.00
2009	1.82	0.04	0.11	0.27	0.53	0.02	0.00	−0.01	0.01	0.00	−0.02	0.01	0.01	0.02	0.00	0.00
							1–10% of Mean After-Tax Income Distribution									
1981	0.28	0.49	0.35	0.39	0.04	−0.01	−0.07	−0.04	−0.11	−0.09	−0.08	−0.15	−0.05	−0.03	0.01	0.49
1989	0.28	0.44	0.35	0.40	0.03	−0.02	−0.03	−0.08	−0.15	0.01	−0.13	−0.10	−0.14	−0.02	0.02	0.44
1999	0.38	0.43	0.28	0.39	0.04	−0.04	−0.03	−0.05	−0.12	−0.05	−0.11	−0.09	−0.02	−0.02	0.00	0.43
2009	0.56	0.21	0.30	0.45	0.02	0.01	−0.02	−0.06	−0.05	−0.02	−0.03	−0.03	−0.03	0.00	0.00	0.21
							10–25% of Mean After-Tax Income Distribution									
1981	0.11	1.00	0.59	0.59	0.17	0.12	−0.03	−0.20	−0.07	−0.46	−0.19	−0.12	−0.27	−0.07	−0.10	0.04
1989	0.13	0.98	0.55	0.59	0.18	0.11	−0.04	−0.13	−0.14	−0.45	−0.19	−0.10	−0.21	−0.05	−0.13	0.04
1999	0.17	0.78	0.63	0.54	0.17	0.10	−0.12	−0.11	−0.09	−0.33	−0.13	−0.07	−0.24	−0.04	−0.12	0.02
2009	0.18	0.80	0.45	0.42	0.26	0.08	−0.01	−0.10	−0.21	−0.25	−0.05	−0.17	−0.14	−0.05	−0.07	0.03
							25–50% of Mean After-Tax Income Distribution									
1981	0.06	1.28	0.60	0.95	0.09	0.25	−0.05	−0.35	−0.05	−0.75	−0.28	−0.04	−0.29	−0.06	−0.34	0.03
1989	0.09	1.24	0.53	0.62	0.06	0.17	−0.12	−0.19	−0.06	−0.65	−0.19	−0.02	−0.24	0.01	−0.17	0.01
1999	0.12	1.16	0.42	0.88	0.07	0.17	−0.01	−0.33	−0.09	−0.58	−0.20	−0.02	−0.19	−0.03	−0.27	0.03
2009	0.11	1.17	0.60	0.73	0.18	0.17	−0.01	−0.39	−0.18	−0.54	−0.17	−0.10	−0.29	−0.02	−0.19	0.04
							50–75% of Mean After-Tax Income Distribution									
1981	0.04	1.58	0.92	1.15	0.05	0.36	−0.22	−0.39	−0.03	−1.01	−0.68	0.00	−0.35	0.01	−0.39	0.01
1989	0.07	1.24	0.64	0.66	0.05	0.20	−0.08	−0.13	−0.07	−0.71	−0.27	−0.02	−0.30	0.01	−0.22	0.01
1999	0.09	1.20	0.68	1.18	0.04	0.22	−0.06	−0.57	−0.03	−0.59	−0.35	−0.02	−0.33	−0.02	−0.38	0.01
2009	0.09	1.51	0.59	1.02	0.10	0.19	−0.11	−0.68	−0.11	−0.65	−0.29	−0.04	−0.25	−0.02	−0.27	0.02

TABLE 3
Continued

Year	Total Variance	Variance (head wages)	Variance (spouse wages)	Variance (other)	Variance (trans)	Variance (taxes)	Covariance (head, spouse)	Covariance (head, other)	Covariance (head, trans)	Covariance (head, taxes)	Covariance (spouse, other)	Covariance (spouse, trans)	Covariance (spouse, taxes)	Covariance (other, trans)	Covariance (other, taxes)	Covariance (trans, taxes)
75–90% of Mean After-Tax Income Distribution																
1981	0.03	1.37	0.96	1.75	0.03	0.55	0.07	−0.38	0.00	−1.04	−0.90	0.00	−0.47	−0.04	−0.91	0.01
1989	0.06	1.03	0.83	1.04	0.02	0.23	−0.12	−0.32	−0.04	−0.54	−0.34	0.00	−0.41	0.02	−0.40	0.00
1999	0.08	1.39	0.89	1.26	0.03	0.25	−0.22	−0.59	−0.03	−0.69	−0.56	−0.01	−0.34	0.01	−0.39	0.00
2009	0.07	1.52	0.74	1.40	0.05	0.24	−0.08	−1.03	−0.05	−0.67	−0.37	−0.03	−0.34	−0.02	−0.37	0.02
90–99% of Mean After-Tax Income Distribution																
1981	0.04	1.91	0.61	1.91	0.02	0.89	−0.11	−0.06	0.00	−1.83	−0.68	−0.01	−0.21	0.01	−1.46	0.00
1989	0.16	1.45	0.32	0.71	0.00	0.28	−0.03	−0.11	−0.01	−0.96	−0.06	0.00	−0.19	0.00	−0.41	0.00
1999	0.18	1.36	0.69	0.87	0.01	0.34	−0.09	−0.25	0.00	−0.94	−0.16	0.00	−0.42	−0.01	−0.39	0.00
2009	0.15	1.55	0.51	0.88	0.02	0.30	0.07	−0.55	−0.02	−0.97	−0.10	−0.01	−0.34	0.00	−0.33	0.00
Top 1% of Mean After-Tax Income Distribution																
1981	0.09	1.55	0.40	2.14	0.00	1.59	−0.11	1.14	0.00	−2.29	−0.22	0.00	−0.26	0.01	−2.94	0.00
1989	0.25	0.80	0.32	0.90	0.00	0.25	0.11	−0.03	0.00	−0.57	0.09	0.00	−0.29	0.00	−0.59	0.00
1999	0.39	1.75	0.55	0.67	0.00	0.52	0.08	−0.22	0.00	−1.39	0.07	0.00	−0.54	0.00	−0.50	0.00
2009	0.29	1.50	0.93	0.51	0.00	0.39	0.27	−0.73	−0.01	−0.96	0.10	0.01	−0.88	0.00	−0.14	0.00

Notes: The first column is the variance of the arc percent change of disposable income for all families and individuals, and the remaining 15 columns reflect the respective share of the individual component as a fraction of the total variance. The shares may not sum to 1 due to rounding error.

TABLE 4
Cyclicality of Disposable Income across the Distribution

	Bottom 1%	**1–10%**	**10–25%**	**25–50%**
Δ(log Aggregate NIPA Income)	6.151	0.097	0.418**	0.626***
	(3.984)	(0.378)	(0.205)	(0.127)
Observations	1,542	20,119	33,776	56,441
R^2	.0015	.0000	.0001	.0004
	50–75%	**75–90%**	**90–99%**	**Top 1%**
Δ(log Aggregate NIPA Income)	0.393***	0.430***	0.649***	2.973***
	(0.106)	(0.128)	(0.216)	(1.018)
Observations	56,495	33,900	20,352	2,247
R^2	.0002	.0003	.0004	.0038

Notes: The dependent variable is the change in the log of disposable income per capita. Log aggregate NIPA income is measured as personal per capita income excluding current transfer receipts in chained 2005 dollars from the National Income and Product Accounts (NIPA).

zero effects at the bottom of the distribution, and large positive effects at the top. These results corroborate those of Parker and Vissing-Jorgensen. The relatively muted response at the bottom of the distribution likely owes to the greater reliance on transfer income (e.g., cash welfare, disability insurance), which is perhaps less responsive than labor market income, which accounts for the bulk of income at the top.

VI. CONCLUSION

Our results indicate that the variance of income changes more than doubled since 1980, and this increased volatility cuts across race, family structure, and the income distribution. The analysis corroborates that reported in Frank (2011) and Parker and Vissing-Jorgensen (2009) that the rich have experienced a dramatic secular increase in volatility in recent decades, but on most counts the level of volatility is lower at the top than at the bottom, and importantly volatility at the top is around a mean pre-tax income of \$500,000 over the past decade as opposed to a mean pre-tax income of under \$10,000 at the bottom 10th percentile. Families at both ends of the income distribution have experienced the “wild ride” of income volatility.

The increase in volatility came from increased volatility of all major income sources—husband and wife earnings, transfer income, other nontransfer income, as well as tax payments. Moreover, in recent years the covariance of spousal earnings volatilities has become positive, suggesting that husbands and wives now have positively correlated earnings shocks and thus making it more difficult to smooth family income volatility. Likewise, the tax code seems to be less negatively correlated with earnings, providing less implicit insurance to the family. In the absence of the increased negative covariance between the volatility of head earnings with other income, and to a lesser extent with transfer income in the middle of the distribution, overall volatility would be much higher.

Our results of rising family income volatility are consistent with studies based on the PSID (Dynan, Elmendorf, and Sichel 2012; Gottschalk and Moffitt 2009), and to a lesser extent those from the Survey of Income and Program Participation (Dahl, DeLeire, and Schwabish 2011), and are consistent with a shift in risk toward the family and away from public policies. However, with positively correlated earnings shocks, the family is less able to self insure through the labor market, but instead has come to rely on other forms of nonlabor income to absorb volatility in the labor market. The expansion of the safety net as part of the American Recovery and Reinvestment Act of 2009 seemed to slow down some of these trends, but with the temporary provisions expiring, the experience of the past decades suggests that families will continue to have to find mechanisms to self insure against volatility.

APPENDIX

TABLE A1
Number and Rate of Mergers by 2nd Year of CPS. CY 1981–2009

Year	# Merged CPS Observations	# CPS Observations	Merge Rate
1981	7,398	13,346	55.43%
1982	8,106	13,795	58.76%
1983	8,106	13,843	58.56%
1984	7,585	13,721	55.28%
1985			
1986	7,925	13,880	57.10%
1987	8,662	16,224	53.39%
1988	9,298	15,316	60.71%
1989	9,597	16,604	57.80%
1990	10,235	16,752	61.10%
1991	10,183	16,514	61.66%
1992	10,118	16,282	62.14%
1993	7,327	14,765	49.62%
1994	6,494	15,139	42.90%
1995			
1996	7,887	12,864	61.31%
1997	7,792	12,528	62.20%
1998	7,421	12,172	60.97%
1999	7,037	12,333	57.06%
2000	6,624	17,275	38.34%
2001	8,036	17,613	45.63%
2002	7,960	18,031	44.15%
2003	8,323	17,719	46.97%
2004	7,057	17,767	39.72%
2005	7,632	17,531	43.53%
2006	7,915	13,743	57.59%
2007	8,104	13,626	59.47%
2008	8,233	13,977	58.90%
2009	8,407	13,856	60.67%
Average # of Matches	8,128	Average % Matched	54.5%

Note: The sample is restricted to heads of household ages 25–60 years that have nonnegative disposable incomes, that do not change marital status across the pair of years, and that do not have imputed incomes.

TABLE A2
Summary Statistics by 2nd Year, Before, and After Matching

	Repeated Cross Sections		Matched Panels	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Pre-Tax Income				
All Families ($)	63,847	59,060	67,209	58,278
White Families ($)	66,775	60,105	69,858	59,008
Black Families ($)	41,706	42,292	43,686	42,482
Female-Headed Families ($)	35,056	33,722	36,965	33,964
Disposable Income				
All Families ($)	49,256	38,764	51,821	38,369
White Families ($)	51,248	39,361	53,630	38,771
Black Families ($)	34,158	28,448	35,701	28,678
Female-Headed Families ($)	28,965	22,415	30,275	22,488
Demographics				
Age	41	9.9	43	9.5
% Female	36	48	34	47.3
No. of Persons in Family	2.8	1.5	2.9	1.5
% Less Than High School	14	35.1	14	34.4
% High School	33	47.1	34	47.2
% More Than High School	52	49.9	53	49.9
% White	84	36.8	86	35.1
% Black	11	31.5	10	30
% Other	5	21.9	4	20.5
% Married	60	49	65	47.7
Number of Observations	448,267		219,462	

Note: Income data are adjusted for inflation using the 2009 personal consumption expenditure deflator.

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