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Earnings Volatility Trends and the Great Moderation: A Multifactor Residual Approach

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Abstract To explore trends in idiosyncratic income volatility, this paper employs a multifactor residual model to extract macroeconomic factors from individual changes in wages and total family income. The data used in this analysis is a subset of the persistently employed from the Panel Survey of Income Dynamics (PSID). Using this subset expands the income volatility literature by bridging an existing gap between studies using the PSID and others using a continuous work history sample. Improved aggregate economic conditions can explain much of the reduction in unconditional income volatility that took place during the Great Moderation, lasting from the mid-1980s into the 2000s. However, macro factors appear to be making larger contributions to individual and household income volatility following the recent rise in GDP volatility. In contrast, idiosyncratic volatility of income, that which remains after accounting for macroeconomic factors, has generally remained consistent. The stability of idiosyncratic income volatility suggests employment changes in the recent crisis were cyclical rather than structural.

Keywords Income volatility · PSID · Great moderation · Multifactor residual · Labor earnings

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Introduction

The period of the Great Moderation that began in 1984 represented a new lower volatility macroeconomic state where U.S. recessions were milder, and expansionary periods were less volatile. Multiple factors likely contributed to this reduced macroeconomic volatility. Possible contributing factors include better monetary policy, structural economic shifts, improved inventory management, or simple good luck (Summers (2005), Stock and Watson (2002), and Davis and Kahn (2008)). Regardless of what led

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to the low macroeconomic volatility era of the Great Moderation, the aim of this paper is to gain a better understanding of the role played by this environment on the income growth volatility of individuals and households.[1]

Numerous studies have noted rising levels of individual and household income volatility after aggregate fluctuations became more moderate in the mid-1980s (Dynan et al. (2012), Gottschalk and Moffitt (1994), Moffitt and Gottschalk (2002, 2011), and Shin and Solon (2011)).[2] Other research on individual income volatility using different data disputes these results, showing volatility remained constant, declined, or only increased in the late 1990s (Congressional Budget Office ("CBO") (2008); Sabelhaus and Song (2009, 2010)). Many of these studies found a significant cyclical relationship even though micro and macro volatility trends appear to have diverged. This paper provides an improved understanding of this literature. Specifically, new evidence shows that income volatility has not increased at the individual level. The importance of reduced macroeconomic volatility at the micro level is also explored at the individual and family level. Income volatility for individuals and households is strongly countercyclical, where income changes become more volatile when aggregate economic conditions worsen. Taken together, it is puzzling that there are cyclical similarities between micro-level and aggregate volatility when longer-run trends appear to be divergent. This paper helps explain this puzzle by merging methods and data used by earlier researchers, and builds on previous literature by using a new approach to explicitly control for the role of macroeconomic factors in income volatility.

The presence of cyclical similarities, despite the apparent divergent trends in micro- and macro-level volatility raises important policy questions that have only recently been explored (Davis and Kahn (2008) and Sabelhaus and Song (2010)). Income fluctuations may be tightly associated with economic risk and uncertainty if an individual cannot count on keeping their source of income from one year to the next. Income volatility might also be a sign of rising opportunity where workers have the ability to shift jobs, careers, and locations more flexibly.

Several of the studies that found rising transitory income volatility used the Panel Survey of Income Dynamics (PSID). The PSID is an unbalanced panel, where respondents may periodically exit and return to the sample. Studies that found flat or declining income volatility used administrative continuous work history data from the Social Security Administration (SSA), sometimes in conjunction with other publicly available data. This paper merges the two approaches by using the PSID to create two continuous work history samples, one for individuals and another for families. Specifically, this study examines earnings volatility of the persistently employed, defined as those with 12 consecutive periods of earnings between 1971 and 2011. The resulting subsample of the original PSID has a time-series component, which is necessary to extract the role of macroeconomic factors from micro-level income data. The approach taken here is an alternative to fixed effects models commonly used in the literature, since income volatility can be decomposed into components that can be explained by either idiosyncratic or macroeconomic factors.

[1] For brevity, "income growth volatility" will hereafter be referred to simply as "income volatility."
[2] Dynan et al. (2012) provide a general summary of the literature on individual and household income volatility.

Similar to CBO (2008) and Sabelhaus and Song (2010), this research finds that unconditional individual income volatility fell in the mid-1980s, but remained relatively stable through the late 1990s and early 2000s. During the sample period, the portion of income instability that appears related to macroeconomic factors varied significantly, rising during contractions and falling during expansions. This suggests a potentially important cyclical relationship between individual income volatility and macro-level cycles. Overall, the amount of income volatility that is explainable by macroeconomic factors is found to have declined considerably following the Great Moderation. Therefore, fiscal or monetary policy adjustments that reduce the magnitude and duration of aggregate cycles likely lead to reductions in micro-level income volatility.

Idiosyncratic income volatility, or that which remains after accounting for macroeconomic factors, displays no discernable trend during the entire 40-year sample period. Within various demographic groups however, idiosyncratic income volatility has exhibited some notable trends. A striking finding is the difference in trend by gender. Women have experienced a decline in overall income volatility of about 25 % since the early 1980s, and the amount of volatility related to macroeconomic factors has fallen by over 75 %. In fact, female overall income volatility during the 2008–2010 period was below male income volatility for the first time. Furthermore, during the last two recessionary periods, men have experienced more income volatility due to macroeconomic factors than women. This is evidence that shifting employment patterns among men and women have resulted in relatively more stable income growth among women, and more cyclical sensitivity among men.

The slow recovery from the Great Recession has sparked debate about whether high unemployment rates and higher income volatility are caused by structural shifts or cyclical frictions. The lack of a discernable long-run trend in income volatility that cannot be explained by macro-level variables suggests there was not a structural shift, but rather a large recessionary shock to income growth.

Income volatility is only one indicator in a complex economy. Income volatility measures do not necessarily represent changes in welfare, consumption, access to credit, or uncertainty of income. Follow-up welfare-based analyses could be conducted to bring these findings into perspective. Furthermore, it is difficult to determine if changes in income are voluntary, an important feature of job turnover that is not observed here.

Literature Review

Research on wage and income volatility has reached conflicting conclusions when using different datasets, methods, and decompositions. A common approach to studying income volatility in the PSID follows pioneering work by Gottschalk and Moffitt (1994), who decomposed volatility into transitory and permanent components. Transitory earnings volatility is estimated through a process of first determining permanent income (based on 10-year averages), where deviations from permanent income represent volatility (Gottschalk and

Moffitt 2009).[3] Using this approach, transitory variance during any year is measured as the squared sum of all individual deviations from permanent income. Using transitory variance, researchers are attempting to extract the volatility that is subject only to short-term variation. Gottschalk and Moffitt (1994) sparked additional research on income volatility by finding an unexpected rising trend of transitory income volatility in the 1970s and 1980s. Gottschalk and Moffitt (2009) subsequently found that transitory income volatility appeared to stabilize at higher levels after the mid-1980s.

While Gottschalk and Moffitt's variance decomposition approach is useful in many respects, it does not necessarily explain how shocks and trends in permanent income or aggregate variables might also affect individual earnings or family income. Shin and Solon (2011) note that Gottschalk and Moffitt often employ a "descriptive approach" in their work based on simple measures of volatility.[4] Furthermore, Dynan et al. (2012) raise the concern that an increase in income followed by a return to permanent income represents volatility, while Gottschalk and Moffitt (2009) and others find this pattern as representing stability.[5] Since the goal here is to understand how macroeconomic variables have affected income volatility in general, and not specifically transitory shocks, the approach of using trends in simple statistics is followed (similar to CBO (2008), Shin and Solon (2011), and Dynan et al. (2012)). Shin and Solon (2011) note that their approach differs from the Gottschalk and Moffitt method by studying trends that include changes in permanent income that can be important to individuals and families.

CBO (2008) employed a Continuous Work History Sample of SSA data and found that earnings volatility had remained stable over the past few decades. A similar SSA dataset used by Sabelhaus and Song (2009, 2010) describes a secular decline in income volatility. The conflicting findings regarding income volatility between Gottschalk and Moffitt, Sabelhaus and Song, and CBO could be due to differences in volatility for those who are marginally attached to the labor force and those who work continuously.[6] A shortcoming in SSA data is that it fails to capture total family income, transfers, and other demographic characteristics. This paper borrows CBO and Sabelhaus and Song's approach by examining a continuous work history subsample of individuals, and complements that approach by examining a similar family-level sample of the PSID.

A great deal of research on trends in household and individual earnings volatility uses the PSID, including the work of Shin and Solon (2011) and Dynan et al. (2012). The PSID has notable consistency and selection bias problems, which led Shin and Solon (2011) to study trends in male income volatility and Dynan et al. (2012) to examine trends in family income. The general conclusion of research using PSID data has been that earnings volatility has risen in recent years (Dynan et al. 2012). This paper serves as a bridge between the literature on income volatility using the PSID (e.g., Shin and Solon

[3] Variations on this approach are used elsewhere in the literature (Gottschalk and Moffitt (1994), Nichols and Zimmerman (2008), Moffitt and Gottschalk (2002, 2011), Comin and Phillipon (2006), and others).

[4] Shin and Solon (2011) provide an extensive review of the variance decomposition approach and why it may not be the best measure for understanding trends in overall volatility.

[5] On a similar point, Gottschalk and Moffitt (2009) show that permanent income volatility has risen along with transitory variance, although with different trends among sub-groups.

[6] The difference in volatility between marginally attached or low-income earners and the general population was first discussed in Gottschalk and Moffitt (2009).

(2011), Dynan et al. (2012)) and other research using administrative SSA continuous work history data (e.g., CBO 2008; Sabelhaus and Song (2009, 2010)).

Modeling Macroeconomic Impacts on Income and Earnings Volatility

Data

The two subsets of the PSID 1970–2011 data used here capture both the longitudinal features of the PSID and examine only those individuals and households with a continuous work history. To create these subsets, the full individual earner, or family dataset is restricted to include only those respondents who report positive wage earnings over at least a 12-consecutive observation period. The reason for restricting the sample to those with consistent employment income for 12 observations is so that each individual has at least 10 years of changes that can be regressed against macroeconomic variables measured over time. Restricting the data to persistently employed individuals and households has the advantage of allowing for analysis that can be compared to both the PSID and continuous work history literature.

Gosselin and Zimmerman (2008) note that beginning with the 1993 PSID survey, a major change occurred in how data was collected. After 1993 responses were computerized, significantly affecting the way people submitted their income and wage data. In the continuous work history subsets used here, the misreporting of data is likely reduced, since repeatedly surveyed individuals are likely to have consistently reported income data.

The continuous work history subset also excludes the marginally employed who enter and exit the full dataset on a frequent basis. As noted in the literature, including marginally attached workers significantly raises estimated volatility, and masks underlying patterns that apply broadly to the workforce. While losing all income over a one-year period is clearly a source of income volatility, this type of long-term job loss might be better studied separately. By examining only the continuously employed, trends in volatility that have occurred do not have to account for reasons behind deciding to leave the job market or survey for an extended period. Other studies examining income volatility note difficulty in identifying the cause of "zeros" that represent either job leavers or failed responses, and have trouble reconciling how missed observations should be treated (Nichols and Zimmerman 2008). Addressing the zero problem using the continuous work history subset constructed here results in estimates of income volatility that are biased downward. Observed trends and patterns apply to the broader workforce that reports positive earnings for long stretches of time. As noted by CBO (2008), the vast majority of the workforce remains in covered employment from year to year. For example, between 2002 and 2003, only 6.1 % of the SSA sample left covered employment while 4.9 % entered, providing confidence that the findings here can be generalized.

The benefits of using a restricted PSID dataset come with some drawbacks. A known issue with the PSID is that responses are self-reported (unlike the administrative data available to those working with the SSA dataset). Filtering out periodic respondents and the marginally attached exacerbates the self-selection bias that already exists. The trends and patterns presented here for the individual subsample are very similar to

the administrative data research providing reassurance that the results have merit, and results using the family income subsample broadly agrees with previous PSID research. Finally, the PSID experienced numerous changes in methodology throughout its construction introducing substantial measurement error. Dynan et al. (2012) and Nichols and Zimmerman (2008) explore the issue of measurement error in the PSID, showing trends, patterns, and comparisons using the data are reasonable estimates of changes in behavior. Measurement error limits our confidence in estimates of the level of volatility, but evidence thus far has failed to show trends in these errors that would undermine this analysis.

There are other challenges associated with using the PSID that the approach used here can overcome. First, the recorded income components asked of individuals changed frequently from one year to the next, and some components of the survey are more problematic than others.[7] For reasons described by Shin and Solon (2011), the sample was restricted to the Survey Research Center component of the PSID, and does not include the Survey of Economic Opportunity component. Second, beginning in 1970, respondents report previous year income. Between 1970 and 1997, survey respondents were annually interviewed. After 1997, the PSID only surveyed respondents every other year. Therefore, changes in income are measured over two-year periods beginning with the 1969 to 1971 period using data from the 1970 and 1972 surveys respectively. In the analysis below, wages and income are inflation adjusted to year 2000 dollars using the Consumer Price Index, all urban wage earner series. To include the 1997–2011 vintages of data, percentage changes in inflation-adjusted income ($\%\Delta y_t$) are calculated as the two-year percentage change in income relative to the midpoint between those two years (Eq. (1)).

$$\%\Delta y_t = \frac{y_t - y_{t-2}}{\left(\frac{y_t + y_{t-2}}{2}\right)} \tag{1}$$

Dynan et al. (2012) and others in the literature avoid the use of log differences for two reasons. First, since income might be negative in a given year, log differences cannot be used to estimate changes. Second, some respondents report very large changes in income from one year to the next, such that the log-difference under-estimates the percentage change of income. Large swings in income have been found to be important to understanding why income volatility might be on the rise, so this method preserves the importance of large changes (Dynan et al. 2012). By using the midpoint as the base rather than the initial income amount, positive and negative income changes of the same magnitude are equivalent in percentage change. Using the midpoint, reductions in income of over 100 % are observed even though income might be positive in the second period. For example, if a family went from a $50,000 income to $10,000 income over a two-year period, the midpoint percentage change would be −$40,000/$30,000=−133 %. The final analysis examines the cross-sectional standard deviation of percentage changes estimated using Eq. (1). The use of a straightforward measure like

[7] Specifically, farm income and self-employment income is recorded inconsistently. For example, data on farm and self-employment income is included within wage and salary income in some years, specifically separated in others, and even bracketed in a few years. While other researchers have specifically excluded farm income and self-employed workers where possible, this distinction is not made here because the benefit of doing so is often unclear.

the standard deviation of income changes rather than decomposed variance follows Dynan et al. (2012), Shin and Solon (2011), and CBO (2008).[8]

The individual earnings dataset used here represents 4078 individuals who have positive earnings over at least 12 consecutive periods. The data here can also be used to examine trends in volatility for different demographic subgroups. The dataset consists of 2375 men and 1703 women. The racial makeup of the subsample includes 3720 white and 358 non-white individuals (just under 9 % are in the minority), and an educational makeup of 1447 college graduates, 2284 high school graduates who did not complete college, and 347 individuals that did not graduate from high school.[9] In the family income dataset there are 4920 families reporting income over at least 12 consecutive periods.[10] Family income data is chosen in the same method as individual data to ensure continuous reporting of income, both with and without transfer payments.

At all points in time, wage earners and family heads are restricted to be between the ages of 18 and 64. With a backward looking measure of income, the data includes only individuals who were at least 20 years old in 1971. All individuals studied here have entered the dataset by 1992. The average age of the full dataset rises from 24 to 59 years old, introducing a potential limitation present in panel data. The results might only generalize to an older and aging cohort, which might naturally exhibit less income volatility over time. Therefore, percentage changes in income are age-adjusted by regressing the cross-section of two-year income changes in each year (t) on contemporaneous age and age-squared.[11] When examining total family income, the age of the head of the household is used to adjust income changes.[12]

$$\%\Delta y_{i,t} = \alpha_t + \beta_{1,t} age_i + \beta_{2,t} age_i^2 + e_{i,t} \tag{2}$$

The residual from Eq. (2) is used in all subsequent models, and the cross-sectional standard deviation of $e_{i,t}$ represents an unconditional volatility that only nets out factors related to age.

The Multifactor Residual Approach

The multifactor residual model was proposed by Pesaran (2006) to examine panel data with heterogeneous individual data. Comparing unconditional income volatility with a conditional measure that removes macroeconomic factors estimates the role of changing macro-level variables at the individual level.[13] Theory predicts contemporaneous

[8] Nichols and Zimmerman (2008) provide a lengthy discussion of the caveats when using the cross-sectional variance in the PSID. In particular, it is noted that the cross-sectional volatility is less responsive to overall changes in underlying true volatility, but also less responsive to increases in measurement error.

[9] Years of education were determined as the highest level attained during the sample period.

[10] Because of missing information on transfer income, a total of 18 families were removed from the sample when examining total family income less transfers.

[11] This method is standard in the literature and further explained in Shin and Solon (2011).

[12] Unreported results show that ignoring the age-adjustment procedure produces very similar results across time.

[13] The multifactor residual approach has been used to study the effect of the Great Moderation and aggregate variables on volatility at the firm level. Buch et al. (2009) used the multifactor residual approach to study firm-level sales volatility in Germany, which also experienced a moderation in output volatility. Buch et al. (2009) also studied international income volatility, concluding that idiosyncratic income volatility has remained stable over time while unconditional volatility has declined in a manner similar to the Great Moderation.

unemployment rates, inflation, and slower aggregate growth rates all have a negative relationship with an individual's income. Buch et al. (2009) lays the groundwork for this theoretical relationship by employing a standard Dixit-Stiglitz specification of household preferences such that firm-level prices and output depend on macroeconomic factors, including the price level and aggregate output. The multifactor residual approach controls for both observed and unobserved macroeconomic changes that might affect individual earnings or family incomes. Micro-level age-adjusted changes in income are regressed on macroeconomic factors.

$$e_{i,t} = \alpha_i^{'} d_t + \beta_i x_{i,t} + \varepsilon_{i,t} \tag{3}$$

In Eq. (3), $e_{i,t}$ represents the age-adjusted two-year percentage change in income for a family, such that $i = 1, 2, 3, \ldots N$ represents the cross-sectional number of observations at each point $t = 1, 2, 3, \ldots T$ with time measured in years. The matrix d_t is a $k \times T$ array of observable macroeconomic factors, and $x_{i,t}$ are observed regressors that might be related to a change in income. Macroeconomic variables in d_t include the unemployment rate in a given year, the annual inflation rate, and the annual growth rate of GDP. To study the impact of the Great Moderation, these regressions are repeated with the same dataset including a five-year rolling measure of the standard deviation of output. The Great Moderation began in the mid-1980s with a downward shift in the five-year rolling average standard deviation of output (Fig. 1). The factor $x_{i,t}$ contains the individual hours that a person works in a given year. Thus, the two-year change in income ending in 1971 is regressed against hours worked in 1971.

The regression in Eq. (3) is run for each individual in the dataset. Using the time series of residuals for each individual the data are reassembled into a panel. The $\varepsilon_{i,t}$

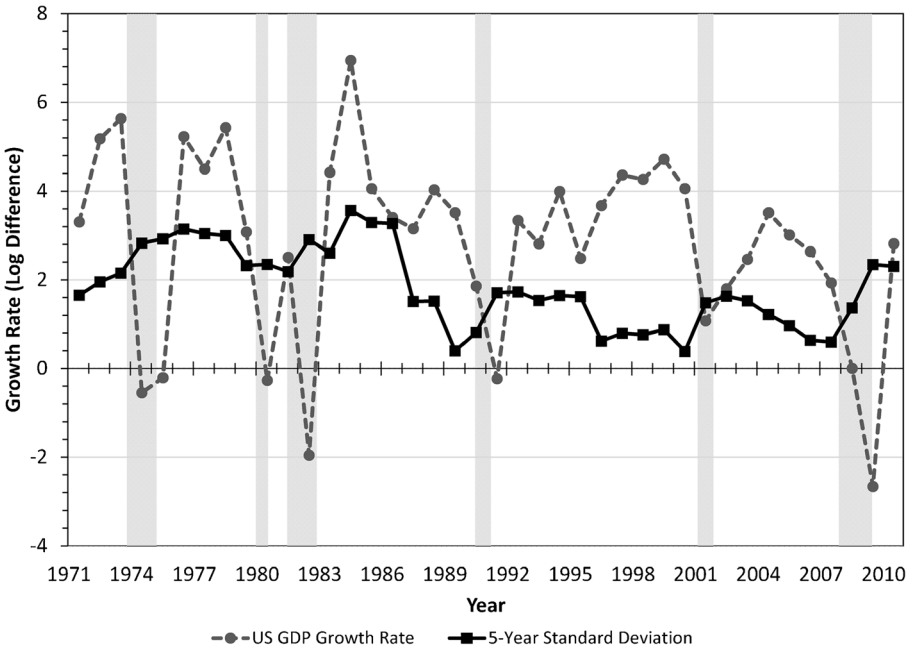

Fig. 1 U.S. GDP growth and volatility

from Eq. (3) controls for the individual's hours worked and observable macroeconomic factors. After reassembling the data, the average of hours worked across the dataset are calculated for each year.

$$\varepsilon_{i,t} = \gamma_t' f_t + u_{i,t} \tag{4}$$

The unexplained portion of income volatility from Eq. (3) ($\varepsilon_{i,t}$) is regressed on unobserved macroeconomic factors (Eq. (4)). Unobserved macroeconomic factors (f_t) used in this model are the sample means of individual specific hours across all i. The residual $u_{i,t}$ is the main variable of interest after regressing incomes on macro factors, since what remains has filtered out both observable and unobservable macroeconomic effects. This regression nets out factors that change across all individuals over time. Once the residuals $\left(u_{i,t}\right)$ are obtained, the cross-sectional standard deviation is calculated for each year. Trends in this residual cross-sectional standard deviation are examined alongside the unconditional standard deviation of age-adjusted income growth.

Analysis of Income Volatility

Three distinct features of this analysis are discussed below. First, overall unconditional age-adjusted earnings growth volatility trends and the changing role played by macroeconomic factors are examined. Next, trends in idiosyncratic income volatility represented as the residual volatility after being adjusted for macroeconomic factors are discussed. Finally, these features of the analysis are discussed within the context of demographic subgroups.

The unconditional age-adjusted earnings growth volatility $\left(e_{i,t}\right)$, measured as the cross-sectional standard deviation of the growth rate of income, rose rapidly in the late 1970s, to an average of 0.50 in the 1977–1986 period, before experiencing a trend decline to 0.43 in the 2000–2010 period (Fig. 2).[14] The observed pattern and declining trend in unconditional individual volatility is similar to what is reported by Dynan et al. (2012), who use the PSID, and continuous worker sample research by Sabelhaus and Song (2010) and CBO (2008).[15]

Next, a simple exercise is used to study the impact of the Great Moderation, comparing results of alternatively excluding and including aggregate volatility measures in Eq. (3). After accounting for macro factors, with the exception of aggregate volatility, the volatility of residual income growth $\left(u_{i,t}\right)$ displays a slight upward trend through the early 1990s, while only recently showing signs of decline. When specifically accounting for the Great Moderation, by including the rolling standard deviation of output growth in Eq. (3) (the bottom line in Fig. 2), a short-lived increase in volatility explained by macroeconomic factors in the mid-1980s is observed. Throughout the

[14] A correlation of over 0.90 between income volatility in the full sample compared to the continuous worker subsample provides some confidence that the pattern of volatility in the subsample is representative of the full sample. As expected the full sample has a higher volatility measure relative to the subsample due to workers who frequently leave the sample or the workforce. The full sample exhibits an average volatility of 0.54 compared to 0.46 for the subsample.

[15] See Fig. 1 in Sabelhaus and Song (2010) and Fig. 1a in CBO (2008) for comparison.

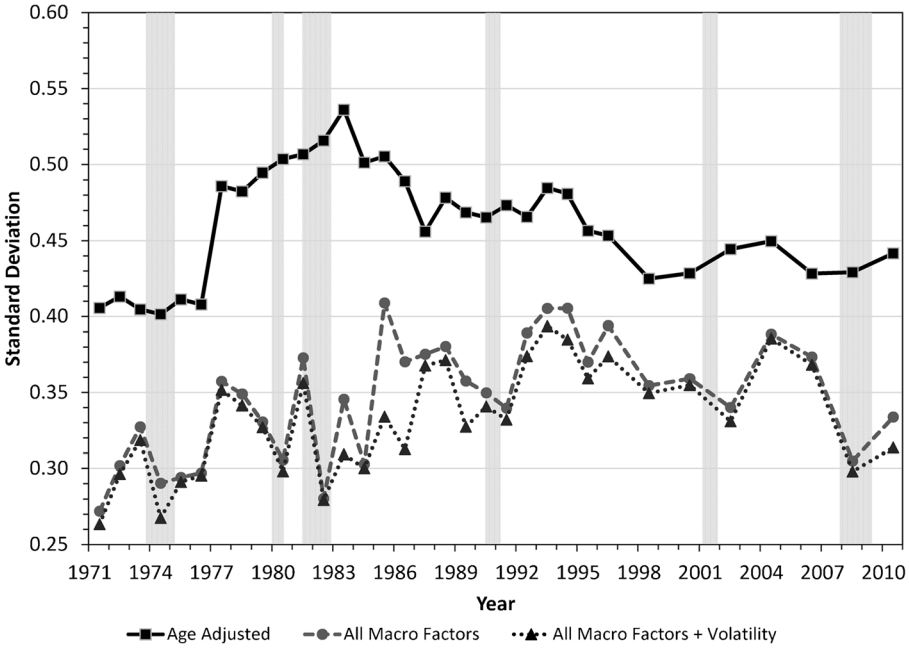

Fig. 2 Cross-sectional standard deviation of 2-year changes in earnings: all individuals

Great Moderation period, and up until the Great Recession, residual income growth volatility displays a similar trend with or without specifically accounting for reduced aggregate volatility. However, during the period of the Great Recession, when aggregate volatility spikes, a new separation occurs between the residual volatilities with and without the rolling standard deviation of output growth. The implication of this finding is that policies or transitions that led to the Great Moderation, and those that led to an increase in volatility during the Great Recession, appear to have had an important short-lived impact on individual income.

However, it also seems as though a low volatility economy does not have a consistent relationship with individual-level income volatility. Idiosyncratic income volatility could be affected by policies including tax policy or social welfare programs, which either enhance or deter income growth opportunities. Since idiosyncratic volatility has uncertain long-run trends, the significant decline in the role played by macro factors since the mid-1980s indicates that aggregate stability is important in reducing income volatility at the individual level.

The volatility explained by macroeconomic factors, measured as the difference between the age-adjusted volatility and the residual volatility after accounting for macroeconomic factors, tends to shrink during expansionary periods and rise during recessionary phases (Fig. 3). Co-movement between aggregate and individual volatility is expected to be strongly cyclical. In a sense, the volatility explained by macroeconomic variables is unavoidable at the individual level, as wages, hours of work, and opportunities for new jobs are more likely to decline during contractionary periods. The gap between age-adjusted volatility and the residual volatility after accounting for macroeconomic factors fell from approximately 0.15 between 1971 and 1983, to 0.12 between 1984 and 1994, and then averaged 0.07 between 1995 and 2006

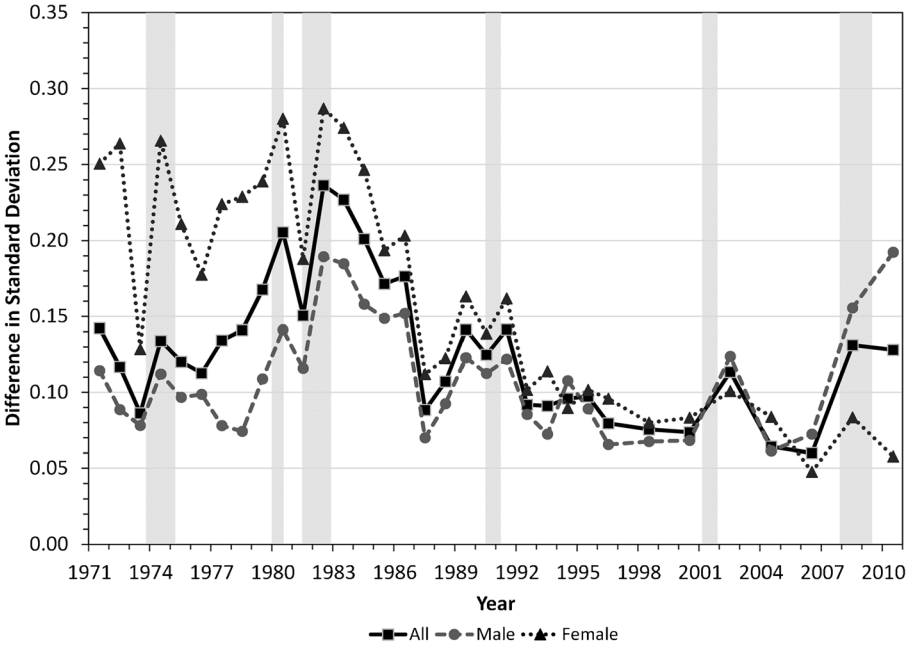

Fig. 3 Volatility explained by macroeconomic factors: gender

(Fig. 3). During the 2008–2010 period the gap rose back to 0.12, indicative of the role that aggregate factors played in changes to individual earnings.

Analysis of Income Volatility by Subgroup

While macroeconomic factors appear to be playing a smaller role through the Great Moderation, there are important variations in the impact across demographic groups. Notably, unconditional age-adjusted income volatility has been rapidly trending downward for women in our sample since the start of the Great Moderation, from a high of around 0.64 in 1977 to 0.41 in 2010. On the other hand, unconditional age-adjusted income volatility for men has remained relatively stable (Fig. 4). Furthermore, in 2010, men experienced higher income volatility relative to women for the first time in the sample. The fact that men experienced higher income volatility than women in the 2008–2010 period is consistent with the narrative that the most recent recession was more damaging to male dominated professions. Much of the overall decline in income volatility among women can be attributed to the secular trend decline in the cyclical sensitivity of their earnings since the beginning of the Great Moderation (Fig. 3). The components of income volatility that cannot be explained by macroeconomic variables exhibit no discernable trend for both men and women throughout the sample period (Fig. 5). However, women exhibit income volatility at the individual level that is 0.07 higher on average when compared to men. These findings have important policy implications if recessions are differentially impacting industries dominated by different genders. Income volatility is indicative of both rising and falling incomes. Persistently higher idiosyncratic volatility among women along with income growth that is less sensitive to cyclical phases may be evidence that women, on average, are choosing less

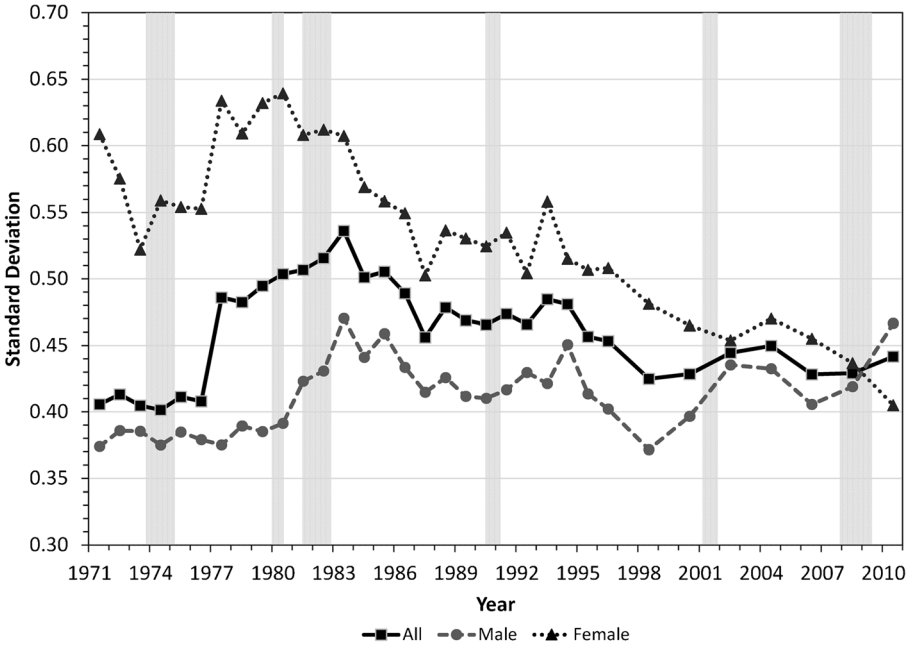

Fig. 4 Comparison of cross-sectional standard deviation of 2-year changes in earnings: gender

cyclically sensitive careers, which may reduce opportunities of higher incomes. It is beyond the scope of this paper to explore the causes of the gap in idiosyncratic income volatility between women and men, but further research into this matter is warranted.

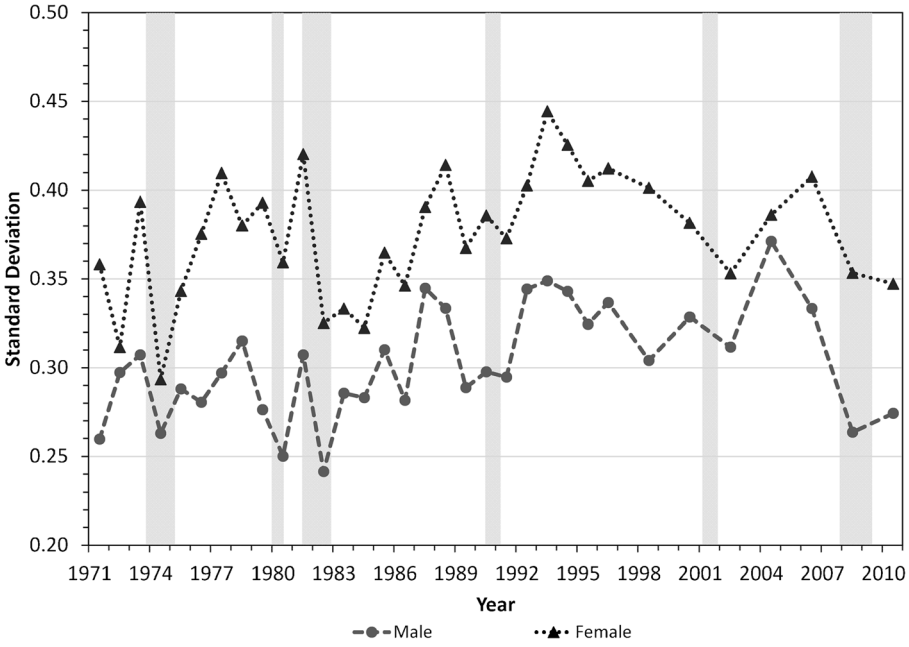

Fig. 5 Idiosyncratic standard deviation of income growth by gender

Macroeconomic factors have played a diminishing role in volatility across educational groups, but the effect is not clearly in favor of any particular educational level. The age-adjusted unconditional volatility for college graduates has declined from 0.51 in the 1980–1984 period before the start of the Great Moderation to 0.46 in the 2006–2010 period. Those with only a high school degree have seen a similar decline in unconditional volatility, from 0.50 in the 1980–1984 period to 0.42 during 2006–2010. Those with more education typically experience elevated levels of idiosyncratic volatility relative to high school graduates following recessions (Fig. 6). One potential reason for elevated levels of idiosyncratic income volatility around cyclical downturns could be that the macro factors included here do not fully capture the cyclical factors that impact college graduates differently than those with less education. If more educated workers experience elevated levels of job turnover or switch job sectors more easily, this may not be captured by changes in the macroeconomic variables used here. The income volatility of those with less than a high-school education fell dramatically, from 0.51 to 0.32 over the 1996 to 2008 period. While those with the least education experienced declining income volatility through 2008, the 2008–2010 period displayed a much larger average standard deviation of 0.52, the highest levels since the 1990–1992 period. The rapid increase in volatility among the least educated is consistent with the narrative that this group experienced difficulties with employment and wage gains following the recent crisis. The longer-term decline in unconditional income volatility also provides evidence that there is less opportunity to increase the wages of those with lower skill levels in today's economy relative to the 1990s. While unconditional volatility was trending downward, the residual volatility after accounting for macroeconomic variables does not show any discernable trend for any educational group.

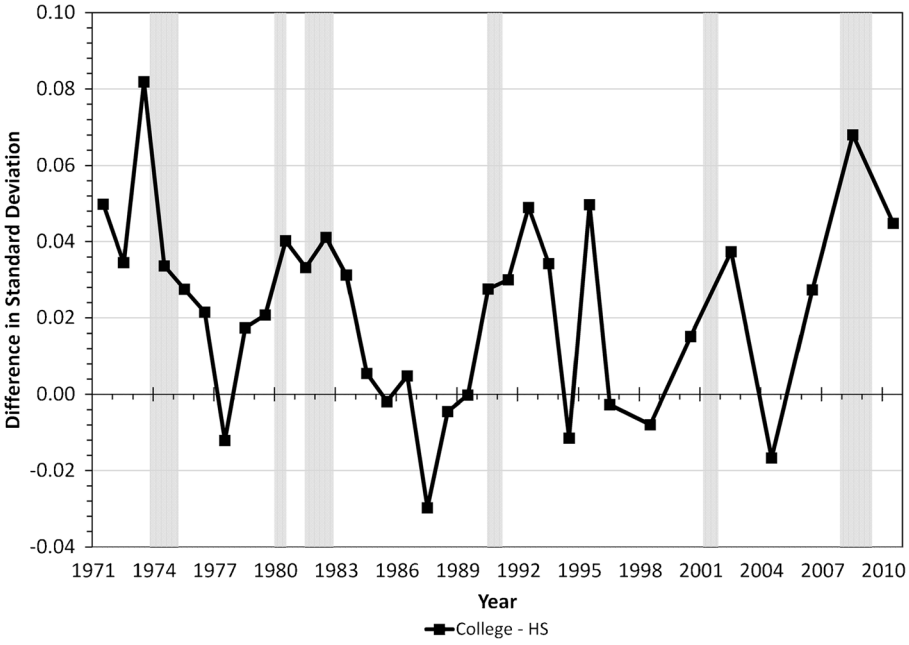

Fig. 6 Difference in idiosyncratic standard deviation of income growth by education level

Racial factors also appear to play a nuanced role. A downward trend in unconditional income volatility among white respondents is observed beginning around the Great Moderation, falling from 0.54 over the 1981–1983 period to 0.43 between 2006 and 2008. Non-white respondents experienced a more rapid decline, falling from 0.55 in the 1993–1995 period to 0.35 in 2008–2010. Idiosyncratic volatility for whites has remained relatively stable, averaging 0.33 over the sample period. On the other hand, non-whites experienced a rapid increase in idiosyncratic volatility, rising from a pre-1992 average of 0.31 to 0.48 by 1995. The increase was short-lived however, as the average volatility from 1998 to 2010 was again 0.31. Rapidly declining levels of idiosyncratic income volatility for non-white groups may indicate more stable employment, fewer opportunities for wage growth, or it may be an issue with the subsample. These questions are left for future study.

Analysis of Family Income Volatility

Total family income exhibits patterns similar to those found in the earlier literature using PSID family-level data (Fig. 7). Income volatility for families when removing transfer payments is noticeably higher, since some lost income is replaced with government support. Unconditional age-adjusted family-income volatility, both with and without transfers, trended upwards through the sample period. Between the start of the sample and 2008, the average unconditional standard deviation of family income measured 0.42. During the same period, an average of 0.09, or 20 %, of this standard deviation can be explained by macro factors. As expected, during each recession the portion of family income volatility that is related to macroeconomic factors increases.

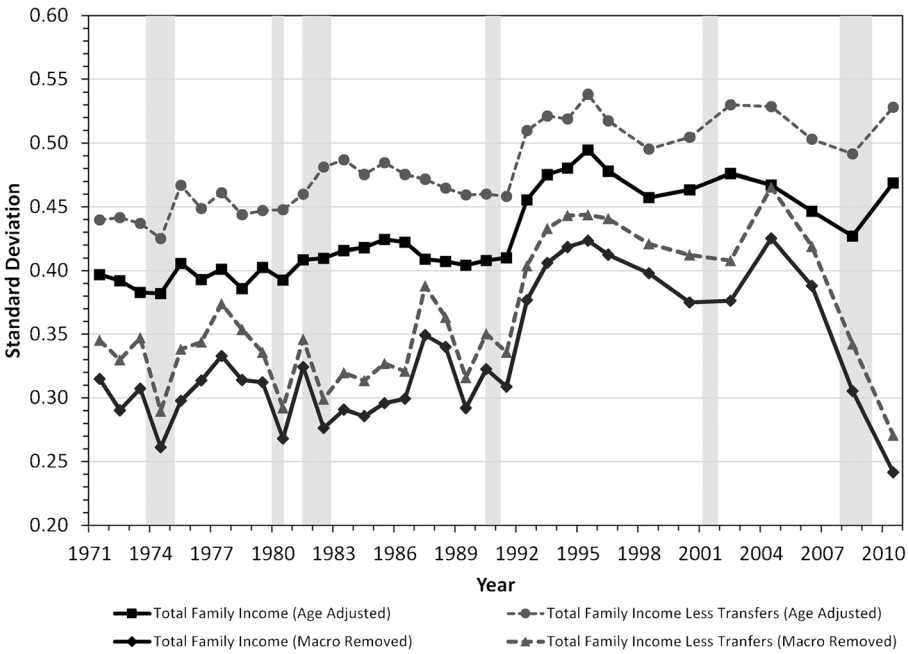

Fig. 7 Cross-sectional standard deviation of 2-year changes in total family income

The increase in explanatory power can be seen in Fig. 7 as the spread counter-cyclically widens between plots of age-adjusted and macro factor adjusted volatility. Following the Great Recession in the 2008–2010 period, the amount of volatility explained by macroeconomic factors jumps to over 50 %, signaling how disruptive the recent contraction was.

One fact that is not captured by the results reported here is the potential shifting of income across household members. There would be no visible change to a household's income if one wage earner loses their job, but their wages were fully replaced by another member of the household. Nichols and Zimmerman (2008) have findings similar to those presented here, including an uncertain trend in individual income volatility and an increase in the standard deviation of family income growth. They discuss two potential reasons for the increase in family income volatility. One likely explanation is the increase in the covariance of income growth across household members. A second explanation is due to the measurement error introduced by changes in the survey methods and patterns of response. Given that there has been an increase in family income volatility but not individual volatility it appears unlikely that data issues are solely to blame. An increase in covariance of income is likely partially responsible.[16] The shifting of income within households in response to contractionary phases of the business cycle is an important issue that warrants further study.

Conclusions

Previous research on income volatility using the PSID often found that unconditional earnings volatility and transitory volatility has risen. Other research using continuous work history samples of SSA data found falling levels of income volatility. The unique subsample of the PSID used here includes only those individuals and households with continuous work histories. Bridging the literature, this dataset shows both that the volatility of individuals has fallen as was observed in the continuous work history data, and that family income volatility has increased as shown in earlier PSID studies. Therefore, this research shows that both strands of the literature make important statements regarding income volatility without being inconsistent with one another.

In order to dissect the role for macroeconomic variables from overall income volatility, this paper employs a multifactor residual approach. In using the multifactor residual approach to decompose income volatility, new evidence is provided that changes in macroeconomic factors are related to changes in individual income growth. The portion of income volatility due to macroeconomic factors can be measured by the gap between the average standard deviation before and after controlling for the overall economic environment. Accounting for macroeconomic factors including unemployment, inflation, output growth, and growth volatility leaves behind a residual income volatility that appears much more stable at the individual level. With relatively stable idiosyncratic volatility over nearly 40 years, it would appear that structural changes and employment trends have only a minor influence on individual-level earnings volatility. Co-movement between aggregate economic conditions and individual income volatility indicates there is a strong cyclical relationship. While highly intuitive, this paper provides empirical

[16] See Nichols and Zimmerman (2008) for an extensive discussion.

evidence of the important role played by macroeconomic variables in the declining income volatility of the Great Moderation, and the rising income volatility during the Great Recession. Furthermore, these findings are evidence that the recent crisis was not a structural shift in the economy, but rather a very strong cyclical shock.

The motivation for this research was to gain a better understanding of whether or not the Great Moderation had a positive or negative impact on the income volatility of individuals and households. As far as the evidence has shown in earlier research, policy was only somewhat helpful in reducing overall volatility during the Great Moderation. Wherever policy could help reduce overall volatility, central banks and fiscal authorities can help reduce the standard deviation of income growth. At the same time, with the exception of women, there does not appear to have been much discernable change in idiosyncratic volatility.

Structural changes in female job opportunities and household structure have likely led to a decline in both overall and idiosyncratic volatility. Policies that can ease women into more stable employment, such as more liberal family leave or equal pay arrangements, could reduce a persistent gap in idiosyncratic income volatility between men and women. A simultaneous decline in the importance of cyclical volatility for women is also indicative of their increased role in maintaining household spending throughout the business cycle. Further analysis of the policies that might have led to these declines in volatility is warranted given the rising importance of women in the workforce.

The findings presented here give us reason to believe that macroeconomic factors can be better accounted for at the individual level when using panel data and the multifactor residual approach. While the PSID is known to have a number of problems in response and construction, the similarities between the findings here and earlier continuous work history research is encouraging. In comparison to previous studies that use fixed effects regression techniques, the multifactor residual method allows for the netting out the volatility that can be attributed to macroeconomic factors to study trends in idiosyncratic volatility. Future research on other panel datasets using the multifactor residual approach to study the effects of the Great Moderation may yield more insight on how macroeconomic factors can affect earnings and income instability.

Individuals and households are not likely to care if the source of their income instability is related to idiosyncratic factors or macroeconomic factors. However, since idiosyncratic income instability is highly consistent over time, policies which result in a more stable economy also may result in more income stability at the individual level. Further research is needed to determine whether or not reduced income volatility improves an individual's welfare or well-being.

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