# UNDERSTANDING EARNINGS INSTABILITY:

# HOW IMPORTANT ARE EMPLOYMENT FLUCTUATIONS AND JOB CHANGES?

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**CES 09-20 August, 2009**

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Abstract

Using three panel datasets (the matched CPS, the SIPP, and the newly available Longitudinal Employment and Household Dynamics (LEHD) data), we examine trends in male earnings instability in recent decades. In contrast to several papers that find a recent upward trend in earnings instability using the PSID data, we find that earnings instability has been remarkably stable in the 1990s and the 2000s. We find that job changing rates remained relatively constant casting doubt on the importance of labor market "churning." We find some evidence that earnings instability increased among job stayers which lends credence to the view that greater reliance on incentive pay increased instability of worker pay. We also find an offsetting decrease in earnings instability among job changers due largely to declining unemployment associated with job changes. One caveat to our findings is that we focus on men who have positive earnings in two adjacent years and thus ignore men who exit the labor force or re-enter after an extended period. Preliminary investigation suggests that ignoring these transitions understates the rise in earnings instability over the past two decades.

* Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

## I. Introduction

The U.S. labor market witnessed an extraordinary increase in wage and earnings inequality during the 1970s and the 1980s. This rise in inequality was comprised of both a growing gap in earnings across individuals as well as growing within-person variance in earnings. Gottschalk and Moffitt (1994) were the first to document the rise in this latter component, referred to in the literature as earnings instability. They and other papers which followed (for example Haider (2001) and Cameron and Tracy (1998)) roughly reached the following conclusion: earnings instability increased dramatically during the 1970s and reached a peak during the 1982 recession but since that period has declined to the late 1970s level. These earlier studies cover the period up to the mid 1990s. What has happened to earnings instability since then?

A number of recent papers ((Dynan, Elmendorf, and Sichel (2008) and Shin and Solon (2008)) and a prominently cited book, The Great Shift by Jacob Hacker, report a new upward trend in earnings instability in this decade. However, these works have largely relied on a single data source, the Panel Study of Income Dynamics (PSID). A notable exception is a study conducted by the Congressional Budget Office (Dahl, DeLeire, and Schwabish (2007)) which uses Social Security earnings history data and finds no evidence of a recent rise.

Our first goal in this paper is to bring different data sets to bear on the conflicting findings regarding the recent rise in earnings instability. Given that Cameron and Tracy (1998) had earlier found that instability trends in the matched CPS were similar to those in the PSID, we view it as particularly useful to extend their analysis into the recent period. We also bring two additional panel datasets into the analysis for comparison: the

Survey of Income and Program Participation and the newly available Longitudinal Employment and Household Dynamics (LEHD) data. While results from these data cover a shorter time span (1984-2006 in the case of the SIPP, and 1992-2003 in the case of the LEHD), they have an important advantage over the CPS in that they follow movers. With the LEHD data we can also potentially link job changing and earnings instability outcomes for individuals to detailed employer characteristics, a possibility we discuss at the end of the paper.

Our second goal is to understand the contributing factors to the earnings instability trend. We assess two potential channels. First is increasing job separations and job instability. Second is an increase in the importance of bonuses and performance pay which could lead to greater earnings instability among those not changing jobs. A large literature has investigated whether job instability increased with the earlier increase in earnings instability. Using CPS data, Farber (1998), Jaeger and Stevens (1998), Neumark, Polsky and Hansen (1998) find that job separation rates did not increase through the 1980s. Gottschalk and Moffitt (1999) use the monthly SIPP data and find no evidence of an increase in job separation rates in the 1980s and the 1990s. Farber (1998) finds that while overall rates of job loss did not change, job loss among high-tenure male workers increased leading to a decline in long-term employment. With regards to performance pay, a recent paper by Lemieux, Macleod, and Parent (2006) attributes a significant portion of the rise in cross sectional earnings inequality to the increasing prevalence of performance-pay contracts. An interesting extension is to ask whether performance pay also leads to greater earnings instability. Lemieux, Macleod, and Parent (2008) find that performance pay contracts lead to greater wage flexibility in the face of

local labor market shocks although they do not discuss explicitly whether performance pay leads to greater earnings instability overall.

To assess the importance of these potential channels leading to earnings instability, we decompose overall instability into three components: 1) earnings instability among job stayers 2) earnings instability among job leavers and 3) fraction of job stayers (which is the inverse of job separation rates). Our preliminary findings are as follows.

1) In contrast to recent papers that document a new upward trend using the PSID data, we find that earnings instability has been remarkably stable in the 1990s and the 2000s. Earnings instability is strongly correlated with the business cycle, rising during recession years. However, a notable pattern in recent decades is the weakening relationship between earnings instability and the aggregate unemployment rate. While aggregate unemployment rates were lower in the 1990s and the 2000s, earnings instability continues to remain at a relatively high level.
2) We examine the separate contributions of wages and weeks worked to earnings instability and find that wage instability increased modestly. Instability of weeks worked peaked in 1982 and continued to trend down in the 1990s and the 2000s.
3) We find that the fraction of workers who do not change jobs (defined as having the same employer over two years) is relatively constant and if anything exhibits a counter-cyclical pattern. Workers change jobs during good times and stay put during bad times similar to the pattern observed among industry changers (Murphy and Topel (1987)). Consistent with other papers in this literature, we do not see a secular rise in job separation and job changing rates in the recent period.

4) We do find some evidence using the CPS that earnings instability increased among job stayers which lends credence to the view that greater reliance on incentive pay may have increased instability of worker pay. However, we do not find a similar result in the SIPP. We plan to investigate the reasons behind these conflicting results in the future.

5) We also find an offsetting decrease in earnings instability among job changers due to declining unemployment associated with job change. This result should be interpreted with caution, however, in that our analysis focuses on men who have positive earnings in two adjacent years and thus ignores men who exit the labor force or re-enter after an extended period. Our preliminary investigation suggests that incorporating these men into the sample would lead to rising instability over the past two decades.

Our paper is structured as follows. In section II, we briefly describe our data sets (a more extensive description is in the appendix) and the different sample selection statements used. Section III describes the main earnings instability trends, including our separate examination of wage and weeks instability. Section IV reports the decomposition across job stayers and job leavers. Section V summarizes and describes our plans for future work.

## II. The Data

Our empirical results all involve estimates of the variance of year-to-year changes in earnings for men. Here we discuss construction of our three sets of data. We have tried to use consistent sample selection and variable construction rules across data sets where the available information allows. We use the first year of each year-to-year change to date the change in all of our results (e.g. the 2000-2001 change is dated as 2000 in our figures).

### *A. Matched CPS*

We construct matched March CPS files applying the algorithm suggested by Madrian and Lefgren (1999) to files from survey years 1968-2008 (see appendix for details of the matching process). Because the CPS does not follow sample members who move away from the originally sampled address, it is important to note that the matched sample includes only people who did not change address between the two March interviews that provide the information we need. Our first task with the CPS data is to replicate and extend the results in Cameron and Tracy (1998). We then switch to a slightly different sample and empirical specification based on Shin and Solon (2008) to provide results that are comparable to their PSID results over the last 10 years.

For both sets of CPS results we use a sample of men who have non-zero earnings and weeks in both years, and do not have allocated earnings.[1] Because we cannot match across all years, we end up with 32 two-year panels. We focus on wage and salary earnings and ignore self-employment earnings. Weeks worked last year are based on the

retrospective questions regarding the previous year. Prior to the 1976 survey, weeks worked are reported only on a bracketed basis, making comparison across years difficult. To address this issue, we imputed weeks worked for the pre-1976 years in the following manner. We computed average weeks worked by bracketed weeks worked, weeks unemployed, and weeks in the labor force categories using the 1976-1980 surveys and merged these conditional averages into the pre-1976 data.[2]

Cameron and Tracy (1998) begin with the following simple model of individual earnings:

$$y_{it} = X_{it}\beta_t + \varepsilon_{it}$$
$$\varepsilon_{it} = p_t\mu_i + v_{it}$$

where $y_{it}$ denotes log earnings and $X_{it}$ denotes observed characteristics such as age and education. Residual earnings, $\varepsilon_{it}$, is assumed to consist of a person-specific fixed-effect, $\mu_i$, and a transitory component, $v_{it}$, which is assumed to be independent of $\mu_i$. The term $p_t$ represents factor-loading on the person-specific component, such as return to unobserved skill, which may vary by year. Assuming that the factor loading on the permanent component is constant across adjacent years and assuming no serial correlation in the transitory component, Cameron and Tracy (1998) estimate the transitory variance of earnings, $\sigma_{vt}^2$ by taking first difference in the residuals as in the following:

$$\sigma_{vt}^2 + \sigma_{vt+1}^2 = E(\varepsilon_{it+1} - \varepsilon_{it})^2 .$$

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[1] Eliminating allocated earnings is critical for the March files. Following Cameron and Tracy (1998), p. A-4 we delete all individuals who did not respond to questions on the March supplement and had imputations on the majority of questions.

[2] When we compare our results to Cameron and Tracy (1998) we match to their sample selection criteria and variable definitions as closely as possible. See the description of these criteria in the appendix.

We follow their method and select a sample of men who are 18-63 in the first year, and delete individuals who report they did not work at least part of last year due to student status as well as individuals who are classified as self-employed workers last year. We trim outliers in the sample by deleting the top and bottom 1.5 percent of the earnings distribution in each year. Separately for each year, we regress log of annual wage and salary earnings on a quartic function in age, indicator variables for four education categories (high school dropout, high school graduate, some college, and college graduate), and indicator variables for six broad industry groups. For each year, we estimate the transitory variance as one half of the variance of year-to-year differences in wage residuals. Our results that decompose earnings instability into wage and weeks instability follow the same method but we first construct weekly wages by dividing annual wage and salary earnings by weeks worked last year.

For our results that compare to Shin and Solon (2008), we focus on a sample of men who are 25-59 in both years. We also trim the outliers of the sample by deleting the top and bottom 1 percent in each year, leaving us with a total of 195,057 observations on 32 year-to-year differences, or about 6,100 observations per year. Following their methods, we regress the yearly changes in the (log) wage and salary earnings on a quadratic function in age for each year and report the standard deviation of the residuals from this regression as a measure of earnings instability. We define job stayers as those who reported having only one employer in year t and t+1 (not including multiple job holding), worked at least 39 weeks in both years, who reported both zero spells of unemployment and zero unemployment weeks in both years.[3]

[3] This definition is similar to Cameron and Tracy (1998). However, we do not use information on industry changers.

*B. Survey of Income and Program Participation*

Constructing SIPP panels that are comparable to the PSID and the CPS is more challenging because of the different periodicity of the SIPP. Each SIPP panel comes from a nationally representative sample of households in the civilian non-institutionalized U.S. population. We utilize the 1984-1988, 1990-1993, 1996, 2001 and 2004 panels.[4] Sample members within each panel are randomly divided into four rotation groups of roughly equal size. One rotation group is interviewed each month, and asked to report information about the previous four months. Thus, each sample member is interviewed once every 4 months over the life of the panel. One benefit of the SIPP panels is that, unlike the CPS, individuals who move are followed and interviewed at the new addresses.

Our SIPP results follow the sample selection and measures in Shin and Solon (2008). We exclude imputations for missing values and exclude individuals with wage and salary earnings missing for any of the months within the two-year period. We also exclude individuals with zero calendar year weights within the two-year period. We then aggregate monthly data within a calendar year to measure annual earnings. Age is measured as of the last month in each calendar year and the sample is restricted to individuals who are 25-59 in both years. We exclude individuals with zero wage and salary earnings and trim the top and bottom 1 percent among those with positive earnings in each year. This leaves us with a sample of 60,561 observations over 16 year-to-year changes, or an average of about 3,800 observations per year.

Following Shin and Solon (2008) we first regress the annual change in log of wage and salary earnings on a quadratic function in age and report the standard deviation

[4] We exclude only the 1989 panel which had three waves and did not provide even one calendar year of earnings.

of the residuals from this regression. To examine difference in earnings instability for job stayers and others, we focus on the main job and define as stayers those who have the same employer id number in March of the first and March of the second year. All others, including those who have not found a new employer by the following March, are lumped together as "non-stayers." When estimating earnings instability for two groups, we run the regression of earnings changes on age pooling all individuals and then calculate the standard deviation of the residuals separately by group.

*C. LEHD*

The LEHD database draws much of its data from complete sets of unemployment insurance quarterly earnings records for a subset of U.S. states. The database includes records for 1990 to 2004, though some states only have data for a subset of those years. The files provide longitudinal information on workers, employers, and the links between them. The workers' earnings records can be linked to characteristics of their employer gathered in quarterly administrative reports and through Census Bureau business censuses and surveys. Basic demographic data are also available for workers, including age and gender. In this draft, we use data on the 11 states for which we have earnings for all four quarters of years 1992-2003.[5]

We use a sample of men between the ages 25 and 59 as of the end of both years, who have earnings from at least one employer in at least one quarter in both years, and for whom neither gender nor age is imputed. We sum quarterly earnings from all

[5]They are California, Idaho, Illinois, Indiana, Kansas, Maryland, Missouri, North Carolina, Oregon, Washington, and Wisconsin. If an individual works outside of this group of states for part of a year, we may understate their annual earnings that year. Comparing that set of states to a larger set with complete

employers in a calendar year to obtain annual earnings. We trim outliers by deleting the top and bottom 1 percent of (summed) earnings in each year. After applying these sample restrictions, we have an average of 14.7 million records per year for the earnings change regressions. To approximately match our SIPP definition, in the LEHD results stayers are defined as those having the same highest-earnings employer in the first quarter of both years.

## III. Recent Trends in Earnings Instability

### *A. Overall trends*

We begin our examination of trends in earnings instability by applying methods used in earlier analyses to clearly identify sources of differences in comparing our results to others. As detailed in discussion of the matched CPS data above, we first apply methods from Cameron and Tracy (1998) to matched CPS files to estimate the transitory variance of the log earnings residual. We do so both to verify that our results do not differ significantly from theirs for the years of overlap (1967-1996) and to examine recent trends using a consistent methodology.

Their conclusions based on aggregate trends in earnings instability up to 1996 were that (a) earnings instability was higher in the mid-1990s than in the late 1960s and early 1970s, but (ignoring business-cycle effects) it had declined more or less steadily since its peak in the early 1980s; and (b) earnings instability was very sensitive to macroeconomic conditions as measured by the unemployment rate. We find somewhat lower levels of earnings instability overall, and a more modest decline in instability in the 1990s, but as

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data for 1996-2003, we find very similar estimates of earnings instability over that period. We expect to have access to more recent data and a somewhat larger set of states in a few months.

Figure 1 illustrates, we replicate the basic patterns they found. The additional years of evidence indicate that instability remained relatively stable in the 1990s, with only a modest increase during the last recession.

Figure 2 presents results applying Shin and Solon's methodology to CPS data. The main differences in methodology for Figure 2 relative to Figure 1 are (i) a narrower age range for the sample (25-59 versus 18-63), (ii) only age controls are included rather than age, education, and industry controlsi, and (iii) the standard deviation of the difference in log earnings is reported rather than one half of the variance of difference in log earnings. Comparison of Figures 1 and 2 makes clear that differences in methodology between the two papers make little difference in identifying trends.

Based on their evidence from the PSID, Shin and Solon concluded that after trending upwards in the 1970s, instability did not show a clear trend over the following years until climbing again after 1998. Up until 1998, our CPS estimates are very similar to their PSID estimates: the CPS estimates rise slightly less than their PSID estimates do over the 1970s and early 1980s, but then similarly show little evidence of any trend after that point through the late 1990s. But after that point, the pattern in the CPS looks notably different. In the CPS, there is an increase in instability at the beginning of the 2001 recession, but it declines as the economy recovers in the following years, while in the PSID instability continues to increase substantially.

Given that the PSID and CPS show quite different recent trends, additional evidence from other data sources seems quite valuable. With that in mind, Figure 3 adds estimates from the SIPP and the LEHD database to the plot in Figure 2. The level of instability estimated using SIPP data is close to but slightly lower than that found in the CPS (and

the PSID), but estimates seem to have more year to year variation. The LEHD estimates are substantially higher but generally have less year-to-year variation. The trends in the SIPP estimates appear consistent with our finding in the CPS that instability has not shown a trend increase since the late 1990s—if anything the pattern in the SIPP suggests a slight downward trend. The LEHD estimates are increasing towards the end of the sample period, but given that the series ends in 2002 that may simply be a business cycle effect.

Table 1 presents comparisons across three data sets, the PSID, the CPS, and the SIPP. We omit the LEHD in this comparison due to the large difference in the level of earnings instability.[6] We highlight years which are business cycle peaks or closest to a peak given the data availability. We find that the earnings instability (as measured by the standard deviation of log earnings changes) increased both in the PSID and the CPS over the 1970s. Instability has returned to the 1979 level in the CPS while it has increased over 30 percent in the PSID from .38 in 1979 to .50 in 2004. While, some of the increase in the PSID may be the business cycle effect, it is hard not to conclude from the PSID that earnings instability has risen over the 1990s and the 2000s. The SIPP, on the other hand, exhibits a slight downward trend since 1988.

Overall, evidence from the CPS and our other sources cast doubt on the reliability of the recent sharp upward trend in earnings instability found in the PSID. However, we note a puzzle: there is clearly cyclical variation in earnings instability, and over roughly the first 2 decades for which we have evidence from the CPS, changes in instability closely track changes in the aggregate unemployment rate; but over the second half of our CPS sample period, the unemployment rate has declined substantially, while instability

remained relatively constant. We illustrate this contrast in Figure 4. While we find that instability does not appear to be increasing, it might still be reasonable to ask why it has not decreased more.

### *B. Role of wages and weeks of work*

We next examine the contributions of wages and weeks worked to earnings instability. We use total earnings divided by weeks worked to construct average weekly wages, in which case log earnings is simply the sum of log hours and log weekly wages. Instability in log earnings can then be decomposed into instability of log wages and log weeks (plus a covariance term which we ignore for now).[7] Figure 5 plots these transitory variances. The results shown in the graph are consistent with Cameron and Tracy's findings through the mid-1990s, and show no change from the long-term pattern in the intervening years: the transitory variance in annual weeks of work has trended slightly downwards (with substantial cyclical variation), while the variance in weekly wages has had a modest but steady upward trend.

The CPS evidence implies that the lack of a trend in instability over the last 20 years reflects a combination of two modest but off-setting trends: less variability in how continuously men are employed offset by somewhat more variability in how much they are paid when working. Variability of employment can come from two sources—temporary layoffs at a continuing job or time off between jobs. Variability of wages can similarly come either from more variation in wages on a continuing job (e.g. through

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[6] We plan to explore the causes of this difference in a separate paper.

[7] Preliminary investigation revealed that the covariance term does not have a notable trend. However, we plan to more formally incorporate this component in future versions. To ease comparison with Cameron and Tracy's results, we have used their sample selection rules and estimation method.

greater use of incentive pay) or from moving across jobs with different pay levels. Thus our next step is to look at the relationship between job changing and earnings instability.

## IV. Job Changing, Instability among Job Stayers vs. Non-stayers

While we do not formally present results of a variance decomposition, we lay out the components below to frame our discussion. Using *S* to denote the share of workers who do not change employers and *r* to denote the residual, the overall (residual) variance of changes in log earnings can be decomposed into a weighted average of variance observed among job stayers and variance observed among non-stayers, as well as the squared mean residuals:

$$V_t = S_t\{V_t^{stayers} + (\bar{r}_t^{stayers})^2\} + (1 - S_t)\{V_t^{nonstayers} + (\bar{r}_t^{nonstayers})^2\}.$$

Note that by construction the regression residuals have mean zero when the two groups are pooled together. The squared mean residuals are very small relative to the variances—for example, the ratio of the squared mean to the variance is less than .002 for all years and groups in the LEHD data—so they contribute little to the variance, and even less to changes in the variance. Since their contribution is negligible, we ignore these terms in our empirical work below. Using $\Delta$ to denote changes between two consecutive years, and $\bar{S}_t$ and $\bar{V}_t$ to denote averages across those two years, the change in the variance can be (approximately) decomposed into:

$$\Delta V_t = \bar{S}_t\ \Delta V_t^{stayers} + (1 - S_t)\Delta V_t^{nonstayers} + \Delta\bar{S}_t\ (\bar{V}_t^{stayers} - \bar{V}_t^{nonstayers}).$$

The first two components give the contributions of changes in the variances of the two groups, while the last component gives the contribution of changes in the share of workers who do not change employers. In the descriptive figures that follow, we focus

on the terms $\Delta V_t^{stayers}$ (change in instability among job stayers), $\Delta V_t^{nonstayers}$ (change in instability among job non-stayers), and $\Delta \bar{S}$, change in share of workers who stay with the same employer.

Figure 6 reports our basic results from the CPS. We graph the share of job stayers as well as instability estimates (standard deviations of changes in residuals) for both groups. Recall that the definition of job stayer in the CPS is a worker who reports having one employer in both years, worked a minimum of 39 weeks and did not experience any unemployment. The number of employers variable is available only since the 1979 survey so we are unable to examine the rise in instability in the earlier years. Consistent with other papers in this literature, Figure 6 shows that the fraction of workers who stay on the job has been more or less constant since the late 1970s casting doubt on the notion that job instability and greater labor market "churning" has influenced earnings instability. Figure 6 does show, however, that earnings instability among job stayers has increased significantly. The standard deviation increases from .24 in 1978-79 to .31 in 2006-2007, an increase of more than 30 percent. These findings are consistent with the hypothesis that increasing reliance on performance pay increased wage flexibility and may have contributed to earnings instability (Lemieux, Macleod, and Parent (2008)). Figure 6 also shows earnings instability among job leavers which shows a highly cyclical pattern. Comparing the late 1970s to the current period, instability fell slightly.

The instability among job leavers can be due to changes in unemployment between jobs or to wage changes accompanying job change. We probe this further by examining separately in Figure 7 instability among job leavers who report no non-employed weeks, which we label as "job to job" transitions, and instability among job

leavers who report some non-employed weeks, as well as the share of job-to job transitions. Interestingly job to job transitions exhibit a pro-cyclical pattern demonstrating that individuals change jobs during economic booms. Over the period, job-to-job transitions as a share of non-stayers increased from .42 to .52. Earnings instability among those in job-to-job transitions has remained remarkably stable while earnings instability among those with some non-employment has fallen slightly. Overall, we conclude from the figure that earnings instability of non-stayers declined slightly due to declining unemployment/non-employment associated with job changes.

Figure 8 and Figure 9 use the SIPP and LEHD data to construct estimates of earnings instability among job stayers and non-stayers. In the SIPP we define job stayers as those who have the same main employer in March of both years. In the LEHD data we define staying as having highest first quarter earnings from the same employer in both years. Non-stayers include workers who work for one employer at a time and change jobs over the course of the March-to-March (or 1$^{st}$ quarter-to-1$^{st}$ quarter) period, but also those who have more complicated relationships with multiple employers. The LEHD instability estimates are higher than SIPP estimates for both groups (as was the case with the estimates for the samples overall), and the gap between stayers and non-stayers is also larger than in the SIPP. The share of stayers is considerably greater in the SIPP data—around 80% in the SIPP estimates versus 65% in the LEHD estimates. The patterns over time are quite similar for the two data sources, however, demonstrating no notable trends in all three series: instability among job stayers, instability among non-stayers, and share of stayers. One notable difference is the contrasting results in the CPS and the SIPP. While CPS data exhibited a sizable increase in earnings instability among job stayers, we

detect no similar trend in the SIPP. What accounts for this difference across the two datasets is a question we plan to investigate more closely in future work.

Figure 7 showed that unemployment and non-employment associated with job change declined over time. While one interpretation of these results is that successively milder recessions in the 1990s and the 2000s helped reduce earnings instability, a caveat to this result is that we focus exclusively on men who have positive earnings in two adjacent years. One possibility is that by ignoring men who exit employment or return after a long period of non-employment we may be understating the increase in earnings instability. This would be a problem if these labor market transitions involving long periods of non-employment became progressively more important over time. Table 2 investigates the joint distribution of weeks worked in year t and year t+1 for men who are 25-59 and who are matched across years. We find that the percent of men who did not work at all in both years (the top left corner of each panel) increased from 2.2 in 1969-1970 to 8.0 in 2006-2007. The incidence of those who exited or returned, the left column and the top row of each panel, also increased over time. For example, in 2006, 1.7 percent of men worked full-year (48+ weeks) in year t but did not work at all in year t+1 while 1.2 percent did not work at all in year t but worked full year in year t+1. The comparable number in 1969 was 0.3 and 0.3 percents respectively. The table suggests that by ignoring these zero earners (particular those who transition in and out of work) it is likely that we understate the increase in earnings instability over the past two decades.

## V. Summary and Future Work

In summary, we find that earnings instability, comparably measured using alternative datasets such as the CPS, the SIPP and the LEHD, has been quite stable in the 1990s and the 2000s. This is in contrast to the evidence of a new upward trend based on PSID data. We next examined components of earnings instability, distinguishing between instability among job stayers, instability among job leavers, and the share of job stayers. We find that the share of job stayers remained largely stable throughout the period casting doubt on the notion that increased labor market "churning" contributed to earnings instability. We do find a sizable increase in earnings instability among job stayers in the CPS, a finding that is consistent with increasing reliance on incentive pay and bonuses. We are cautious in pushing this result however since we do not find a similar trend in the SIPP. We find that earnings instability may have declined modestly over time due to declining non-employment associated with job change. An important caveat here, however, is that our analysis focuses on men who are employed and have positive earnings in two adjacent years. Preliminary investigations suggest that ignoring men who exit or return to the labor force after a long period understates the rise in earnings instability in the last two decades.

We plan extensions to the work included in this draft along two paths. The first is to examine more carefully the sources of individual earnings instability. In particular, we plan to use LEHD data to examine the relationship between year-to-year changes in earnings and employer characteristics such as industry and employment flows. We also plan to use links between the SIPP and CPS surveys and the LEHD database to compare work history and earnings information to better understand differences in our estimates

across these sources—in particular, why are the LEHD instability estimates so much higher. Is it because household surveys miss many short-term jobs? If so, for which types of workers does this matter (young, low earnings, students)? Or do the differences arise from differences in earnings measures on jobs reported in both sources?

The second extension is to examine household labor income instability. Here we have focused only on earnings instability among men but as many households have more than one earner, the implications for household income (much less welfare) are unclear. We plan a parallel analysis of levels and trends in earnings instability for women, and then to look at how correlations between earnings changes of spouses/partners translate individual earnings changes into effects on the stability of household labor income.

## Appendix A: Construction of the Matched CPS Data

Current Population Survey housing units are interviewed for four months (Months in Sample = 1-4), rotate out of the sample for eight months, then return for another four (Months in Sample = 5-8). For example, a unit that is first interviewed in March (Month in Sample = 1) will be re-interviewed starting in March of the next year (Month in Sample = 5). This allows potentially half of the units interviewed in a given year—those for whom Month in Sample = 1-4—to be matched to their observations in the following year (Month in Sample 5-8). Using unique record numbers available on the public-use CPS data files constructed by Unicon Research Corporation and the above "Month in Sample" variable, one can construct a naïve match across years. In actuality, this method leads to many false matches because the record number is unique to housing unit, not household; if, for example, a family moves out of their house after interviews 1-4 and another family moves in, this method would naively match the two different families. Madrian and Lefgren (1999) discuss the trade-offs inherent in using different sets of demographics to improve the quality of the matches. Following their recommendation, we use gender, race and age to exclude potentially invalid matches. Appendix table 1 reports the match rates across years. The match rate varies substantially and is particularly low since 2001, the year that the March CPS sample sizes were increased to allow more precise estimates of minority groups for State Child Health Insurance Program (SCHIP). These years therefore contain households which cannot be feasibly matched across years.

The clear advantages of the matched March sample are its large size and the number of years it encompasses. As noted above, however, a serious drawback is that it follows housing units, rather than households. Consequently, we lose households that move due to job change or employment/non-employment transition from our matched samples. Appendix Table 2 compares observed characteristics in year *t* across matched and non-matched men to gauge the bias this may induce. The top panel shows the average difference across all years, 1968-2006. It shows that, on average, non-matched men are younger and worse in terms of labor market variables. Using the matched samples, then, is likely to bias upwards levels of mean earnings and employment rates. How this will bias earnings instability, however, is less clear (see Peracchi and Welch (1995)). Since our paper focuses on trends, it would be problematic if the bias varied across years. We investigate this in the next two panels. We compare two peak years of the business cycle, 1968-69 and 1999-2000. We choose 1999-2000 mainly due to the fact that it is the last business cycle peak before the introduction of the SCHIP sample expansion which is likely to distort our comparison. We find that the bias has decreased over time in terms of employment and increased in terms of earnings. Overall, we find little systematic evidence of increasing bias over time.

## Appendix B: Construction of the SIPP Data

The Survey of Income and Program Participation (SIPP) is administered in panels and conducted in waves and rotation groups. Each SIPP panel comes from a nationally representative sample of households in the civilian non-institutionalized U.S. population. Within a SIPP panel, the entire sample is interviewed at 4-month intervals called waves.

Sample members within each panel are randomly divided into four subsamples of roughly equal size; each subsample is referred to as a rotation group. One rotation group is interviewed each month about the previous four months, which are referred to as reference months. Thus, each sample member is interviewed once every 4 months over the life of the panel.

Each wave contains core questions that are asked each time, along with topical questions that vary from one wave to the next. The core content covers demographic characteristics; labor force and program participation; amounts and types of earned and unearned income received including transfer payments; noncash benefits from various programs; asset ownership; and private health insurance[8]. Most core data are measured on a monthly basis, although a few core items are recorded only once per wave. Topical module questions aim to gather specific information on a wide variety of subjects and are asked less frequently. Besides the core wave and topical module files, the Census Bureau publishes full panel (longitudinal) files. At the conclusion of the final wave of interviews for a panel, core data from all waves are linked resulting in a longitudinally-consistent full panel file.

We use public-use core wave and full panel files from all available panels conducted as 1984-1988, 1990-1993, 1996, 2001 and 2004 panels. We exclude only the

1989 panel because it was too short to provide even a single year of data for our purposes. No full panels are published for the post-1996 panels, but instead "panel longitudinal" core wave files are published for the 1996 and 2001 panels. Finally, only core wave files are available for the 2004 panel.

In the first wave of a panel, the SIPP identifies an owner or renter of record as the reference person for the household. Other people in the household are listed according to their relationship to the reference person. If an original sample member aged 15 years or older moves, they are interviewed at the new address. If other people join a respondent's household after the first wave interview, the new people are interviewed as long as they continue living with the original respondents.

Although the initial goal was to have each panel cover eight waves, a number of panels were terminated early because of insufficient funding. The 1996 redesign entailed a number of important changes. First, the overlapping panel structure of the earlier SIPP was eliminated with a single 4-year panel structure. Second, the target sample size increased from 20,000 households to 37,000 households. Third, panel length was increased to 12 waves although the 2001 and 2004 panels had only 9 waves. Finally, computer-assisted interviewing with automatic consistency checks during the interview was introduced to help maintain longitudinal consistency of responses.

We begin with longitudinally consistent demographic data from full panel files which consist of variables such as sex, age, year of birth, interview status, calendar year weights and longitudinal panel weights. All records are indexed by reference month not calendar date of the interview. Moreover there is not a one-to-one correspondence between reference month and calendar month within each panel file, since the members

[8] Survey of Income and Program Participation Users` Guide, Westat (2001).

of one rotation group are interviewed each month. Calendar month and calendar year variables along with other necessary labor force variables are obtained from core wave files. Individuals are matched by three identification variables; sample unit identifier (ssuid), entry address identifier (eentaid) and person number (epppnum)[9].

The core wave files before 1990 panel are in wide (person record) format with a single record per person, while the core wave files after 1990 panel are published in long (person-month records) format with one record per person per reference month. In order to merge two different file types within a panel, we first transform the person-month-format core wave files into a single wide record per person separately for each panel. Once the core and longitudinal files are merged in wide format, the data is transformed back to the long format for convenience. Our analysis of changes in earnings focuses on one-year differences of wage and salary earnings for the years between 1984 and 2005 except 1989-1990, 1995-1996, 1999-2000 and 2003-2004. We exclude imputations for missing values and exclude individuals with wage and salary earnings missing for any of the months within a two-year period. Then, we aggregate monthly data to annual in order to analyze the volatility in annual wage and salary earnings.

Age is measured as of the last month in each calendar year and the sample is restricted to the individuals who are between the ages of 25-59 in both years. We also exclude individuals with zero calendar year weights within a two-year period. Finally, we drop the top and bottom 1 percent of positive observations in each year after excluding zero annual earnings.

[9] Variable names from Census public use files are in parentheses.

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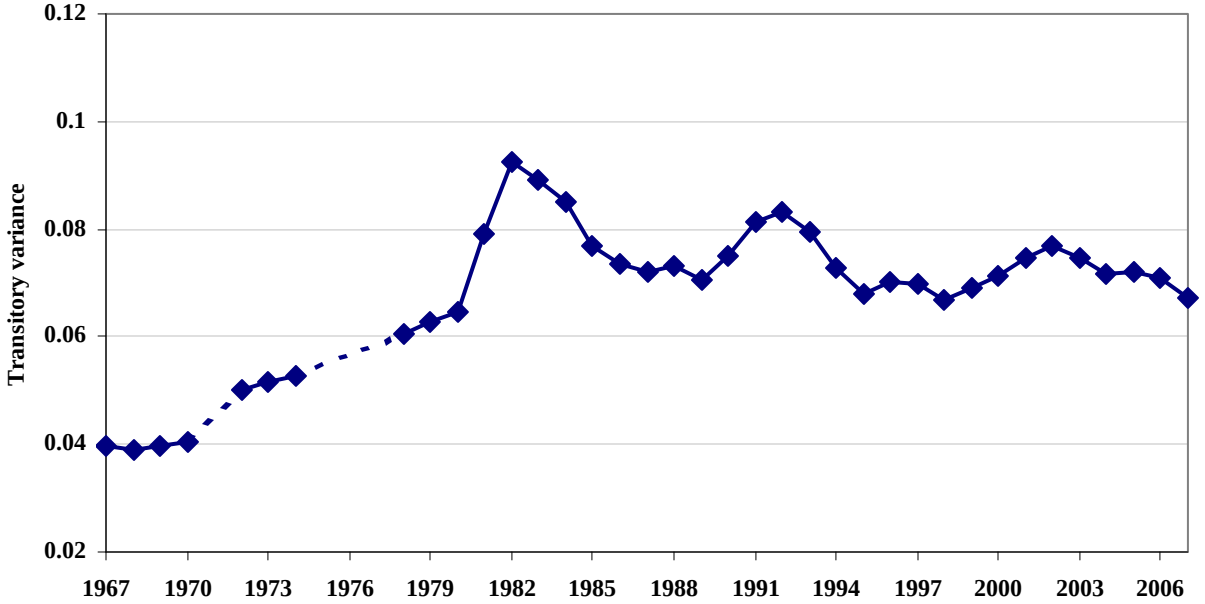
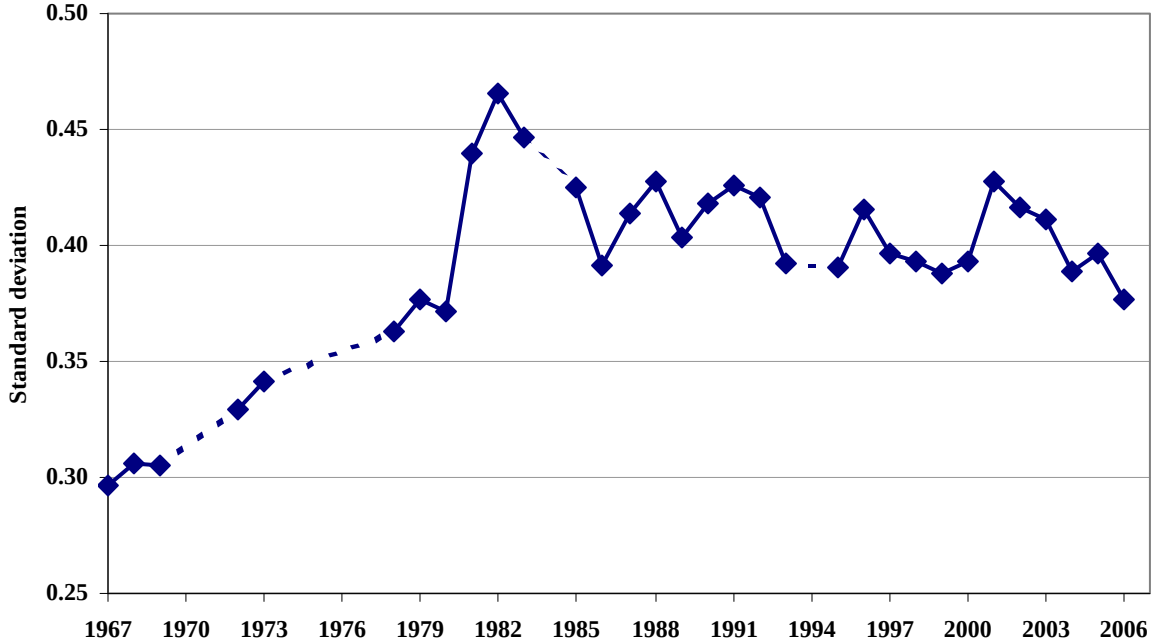
**Figure 1. CPS Transitory Variance (Cameron and Tracy)**



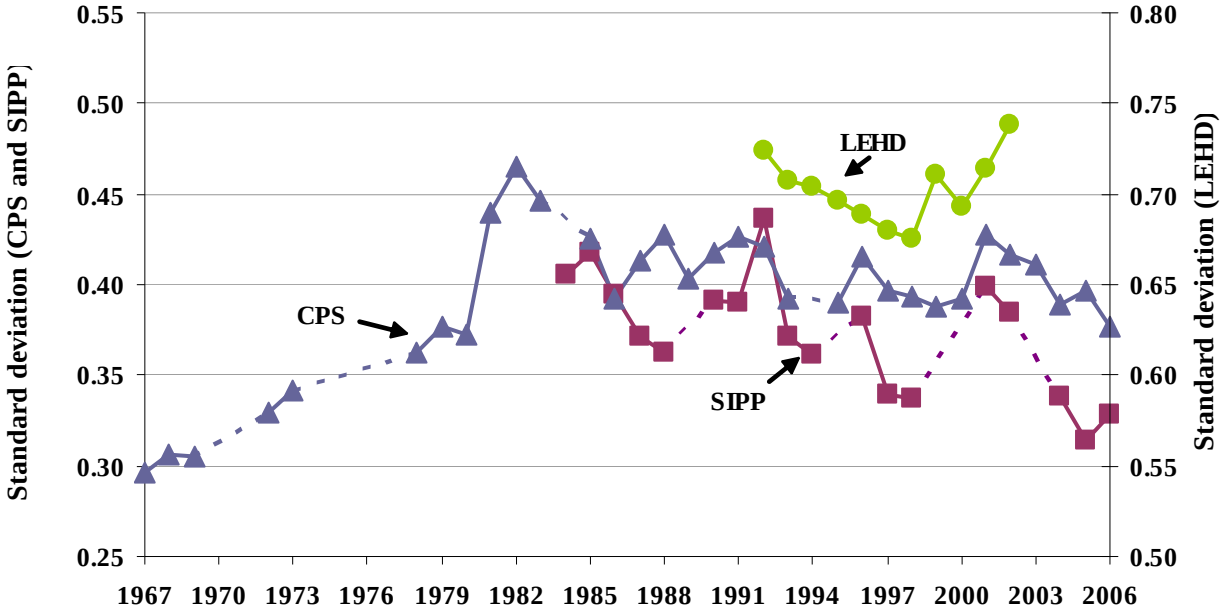

Notes: The figure plots estimates of half of the variance of differences across years in log earnings residuals, following methods in Cameron and Tracy (1998). Dashed lines represent interpolations over years where the inability to match the March CPS makes it impossible to estimate the transitory variance.

**Figure 2. Earnings Instability - Shin and Solon**



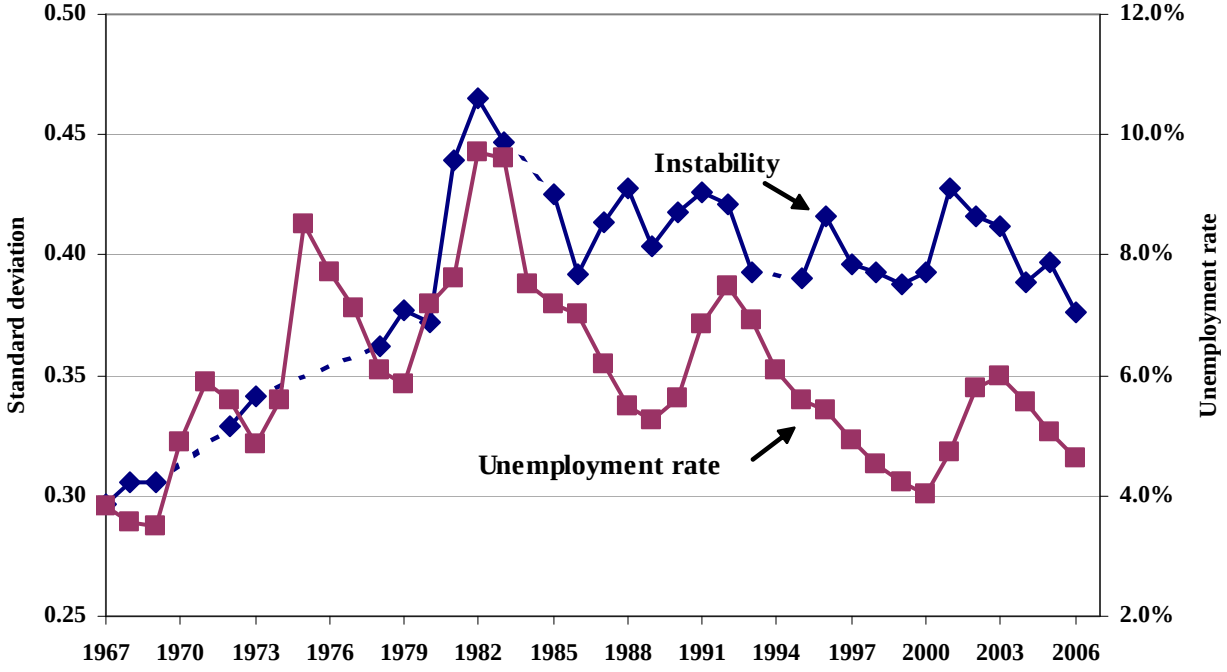

Notes: The figure plots the standard deviation of residuals from a regression of the change in log earnings on a quadratic in age. Dashed segments represent interpolation for years in which the March CPS cannot be matched.

**Figure 3. Instability estimates using CPS, SIPP, and LEHD data**



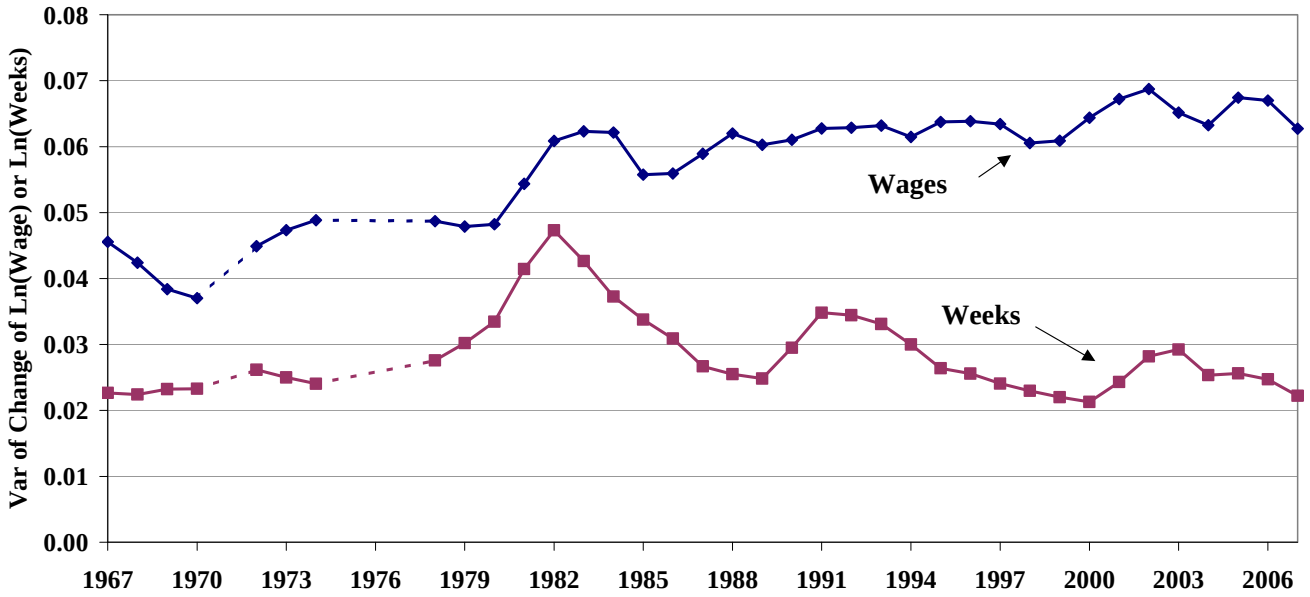

Notes: The figure plots the standard deviation of residuals from a regression of the change in log earnings on a quadratic in age. Dashed segments of the line represent interpolation for years in which estimates are not available.

**Figure 4. Instability and Unemployment Rate**



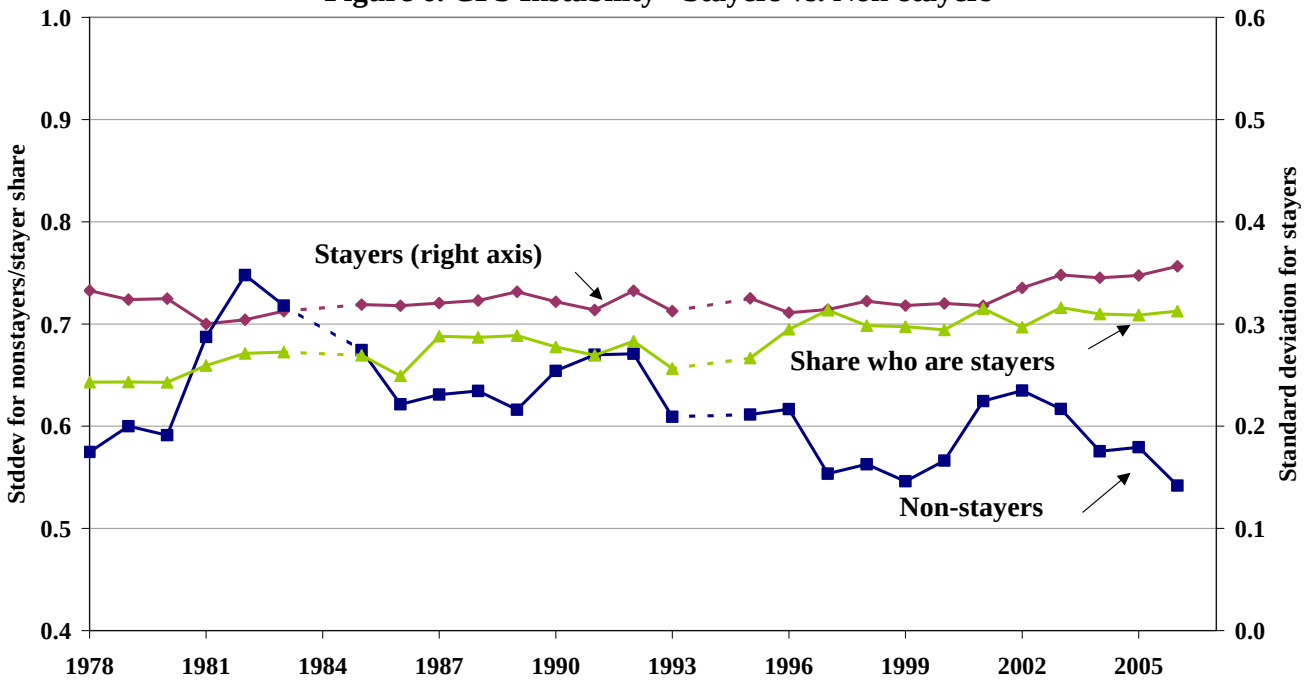

Notes: The instability measure is the standard deviation of residuals from a regression of the change in log earnings on a quadratic in age. Dashed segments represent interpolation for years in which estimates are not available.

**Figure 5. Transitory Variance of Wage and Weeks (Cameron and Tracy)**




Notes: The figure plots estimates of half of the variance of year-to-year differences in log weeks and log weekly wage residuals. Dashed lines represent interpolations.

**Figure 6. CPS Instability - Stayers vs. Non-stayers**




Notes: Stayers are defined as having the sample employer on their main job in March of both years. Dashed lines represent interpolations over years in which estimates are not possible.

**Figure 7. Instability among non-stayers, by type of transition (CPS)**

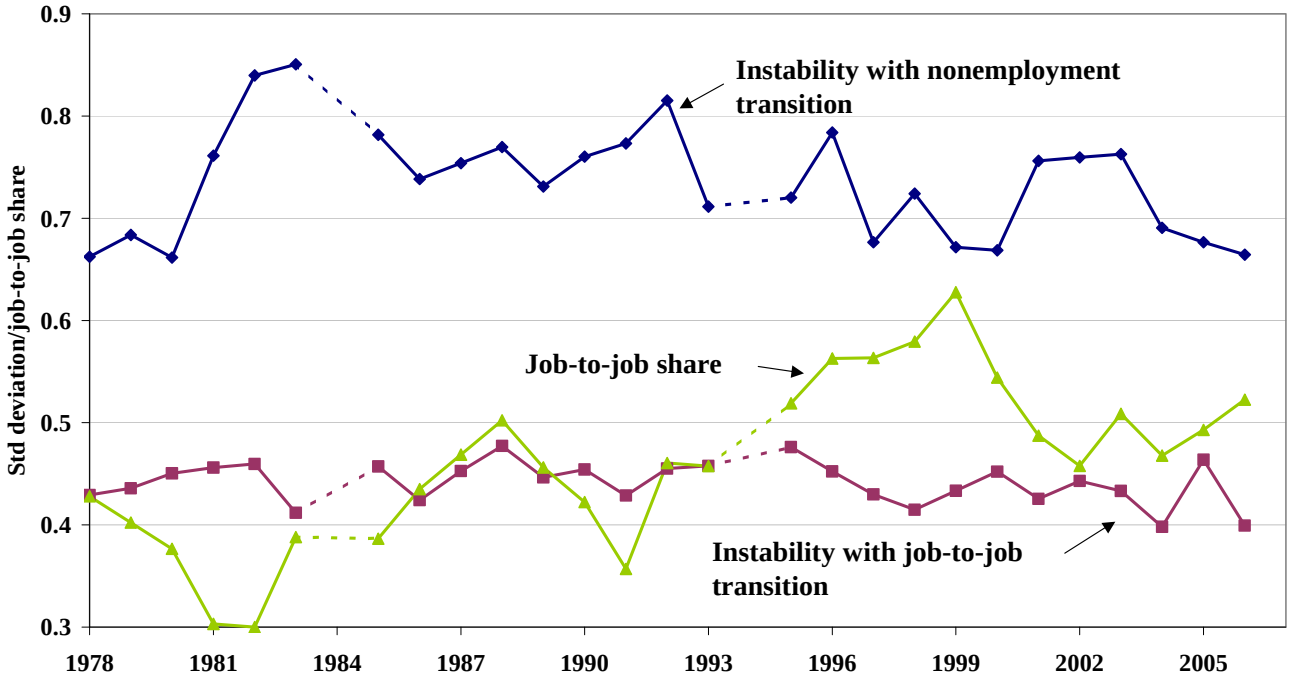
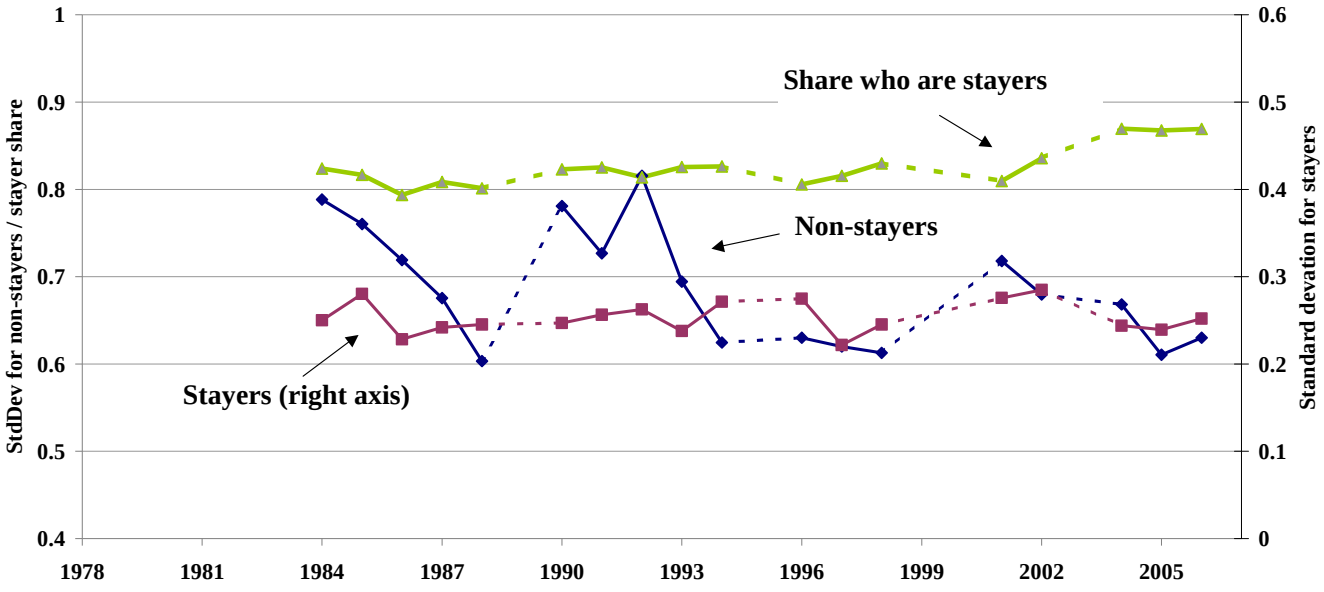
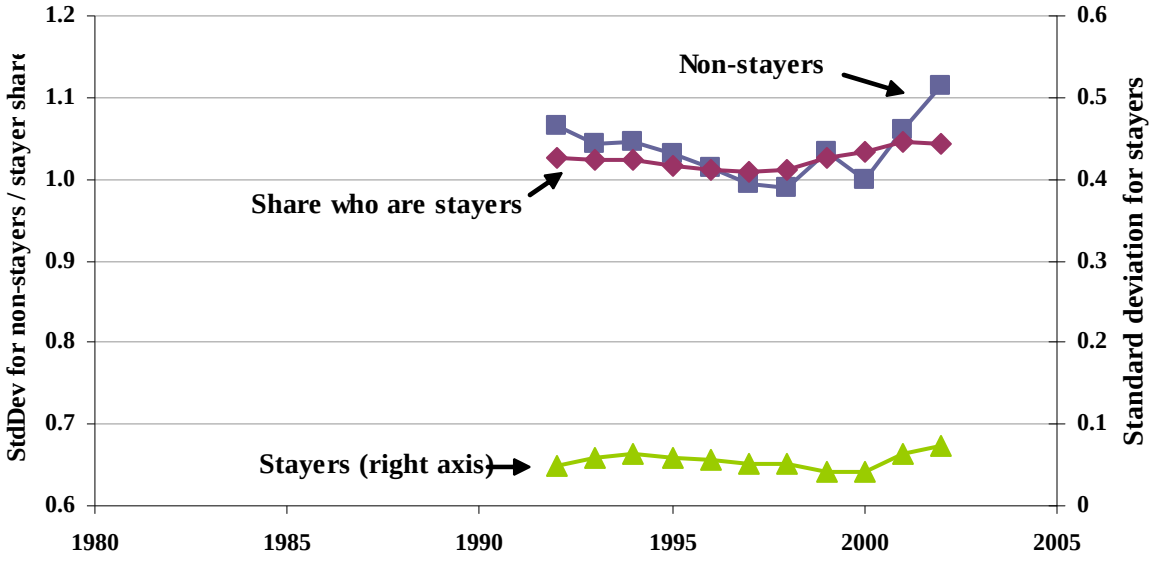



**Figure 8. SIPP instability estimates, stayers vs. non-stayers**




Notes: Stayers are defined as having the same employer on their main job in March of both years. Dashed lines represent interpolations over years in which SIPP panels do not cover the 2-year period required to estimate instability.

**Figure 9. LEHD instability estimates, stayers vs. non-stayers**




Notes: Stayers are defined as those whose highest earnings employer was the same in the first quarter of both years of the difference.

**Table 1. Comparison of Earnings Instability Across Data Sets**

Standard Deviation of Change in Log Wage and Salary Earnings

| Year | PSID | CPS | SIPP |
|---|---|---|---|
| **1969** | | **0.31** | |
| **1971** | **0.32** | | |
| **1979** | **0.38** | **0.38** | |
| **1988** | | | **0.36** |
| **1989** | **0.42** | **0.40** | |
| **1998** | **0.40** | | **0.34** |
| **1999** | | **0.39** | |
| **2004** | **0.50** | | |
| **2005** | | | |
| **2006** | | **0.38** | **0.33** |

Results are based on men who are 25-59 in both years and had non-zero wage and salary earnings in both years. Column (1) are based on results reported in Shin and Solon (2008),figure 2. Columns (2) and (3) are based on authors' calculations using the matched CPS and SIPP using sample selection statements for comparability. See text for details. The years refer to the first year of the two-year change.

**Table 2. Distribution of Weeks Worked in Year t and Year t+1**

| | Weeks Worked 1970 | | | |
|---|---|---|---|---|
| **Weeks Worked 1969** | **0** | **1 to 26** | **27-47** | **48+** |
| **0** | **2.2** | **0.2** | **0.1** | **0.3** |
| **1 to 26** | **0.5** | **0.7** | **0.6** | **1.1** |
| **27-47** | **0.3** | **0.9** | **2.6** | **4.2** |
| **48+** | **0.3** | **1.5** | **6.0** | **78.6** |

| | Weeks Worked 1980 | | | |
|---|---|---|---|---|
| **Weeks Worked 1979** | **0** | **1 to 26** | **27-47** | **48+** |
| **0** | **4.3** | **0.4** | **0.2** | **0.4** |
| **1 to 26** | **0.6** | **1.0** | **0.7** | **1.4** |
| **27-47** | **0.6** | **1.2** | **2.6** | **5.0** |
| **48+** | **0.8** | **2.5** | **5.3** | **72.9** |

| | Weeks Worked 1990 | | | |
|---|---|---|---|---|
| **Weeks Worked 1989** | **0** | **1 to 26** | **27-47** | **48+** |
| **0** | **5.1** | **0.6** | **0.2** | **0.4** |
| **1 to 26** | **0.9** | **1.0** | **0.7** | **1.7** |
| **27-47** | **0.5** | **0.9** | **2.2** | **4.5** |
| **48+** | **0.8** | **1.8** | **5.1** | **73.7** |

| | Weeks Worked 2000 | | | |
|---|---|---|---|---|
| **Weeks Worked 1999** | **0** | **1 to 26** | **27-47** | **48+** |
| **0** | **6.1** | **0.5** | **0.3** | **0.9** |
| **1 to 26** | **0.8** | **0.8** | **0.5** | **1.6** |
| **27-47** | **0.3** | **0.5** | **1.3** | **3.4** |
| **48+** | **1.4** | **1.5** | **3.4** | **76.7** |

| | Weeks Worked 2007 | | | |
|---|---|---|---|---|
| **Weeks Worked 2006** | **0** | **1 to 26** | **27-47** | **48+** |
| **0** | **8.0** | **0.6** | **0.3** | **1.2** |
| **1 to 26** | **0.9** | **0.7** | **0.7** | **1.6** |
| **27-47** | **0.5** | **0.5** | **1.2** | **3.6** |
| **48+** | **1.7** | **1.6** | **3.6** | **73.2** |

Source: March Current Population Surveys. The sample includes men who are 25-59 in both years and were matched across adjacent years.

**Appendix Table 1. Match Rates Across Years**

| Year | # Male Records | # Male Records in Month-in-Sample 1-4 | %Matched across Years |
|---|---|---|---|
| 1968 | 28130 | 14087 | 75.2 |
| 1969 | 28509 | 14437 | 72.1 |
| 1970 | 27160 | 13659 | 76.5 |
| 1973 | 25775 | 12949 | 49.5 |
| 1974 | 25276 | 12315 | 74.9 |
| 1979 | 30516 | 15379 | 70.7 |
| 1980 | 36418 | 18322 | 73.2 |
| 1981 | 36842 | 18179 | 65.4 |
| 1982 | 33323 | 16759 | 72.3 |
| 1983 | 33887 | 17055 | 70.0 |
| 1984 | 33718 | 16833 | 68.1 |
| 1986 | 33747 | 16850 | 66.7 |
| 1987 | 33411 | 16809 | 69.2 |
| 1988 | 33882 | 17116 | 64.4 |
| 1989 | 31626 | 15835 | 70.3 |
| 1990 | 34700 | 17518 | 69.2 |
| 1991 | 35028 | 17370 | 68.9 |
| 1992 | 34638 | 17228 | 69.5 |
| 1993 | 34482 | 17241 | 52.1 |
| 1994 | 33328 | 15413 | 51.2 |
| 1996 | 29089 | 14588 | 70.2 |
| 1997 | 29662 | 15038 | 70.0 |
| 1998 | 29766 | 15043 | 70.6 |
| 1999 | 30046 | 15144 | 70.2 |
| 2000 | 30607 | 13813 | 76.1 |
| 2001 | 49367 | 24568 | 50.9 |
| 2002 | 48790 | 24426 | 52.0 |
| 2003 | 48711 | 24539 | 52.5 |
| 2004 | 47808 | 23542 | 46.5 |
| 2005 | 46981 | 23372 | 49.1 |
| 2006 | 46569 | 23433 | 49.6 |
| 2007 | 45229 | 23318 | 50.7 |

Source: March Current Population Surveys. Column (1) shows the number of male records aged 25-59 in both years. Column (2) shows the number men who are in Months-in-Sample 1-4 and could potentially matched. Column shows the match rate among Months-in-Sample 1-4 who could potentially matched.

**Appendix Table 2. Comparison of Matched and Non-Matched Men 25-59**

| | Matched | Not-Matched | Difference |
|---|---|---|---|
| **A. All Years** | | | |
| Age | 41.2 | 37.9 | 3.3 |
| Years of Schooling | 13.0 | 12.8 | 0.2 |
| % Employed | 88.0 | 80.9 | 7.1 |
| % Unemployed | 4.1 | 6.0 | -1.9 |
| % OLF | 7.9 | 9.7 | -1.8 |
| Average Weeks Worked | 45.5 | 42.6 | 2.9 |
| Average Earnings (2000 Dollars) | 35,824 | 31,376 | 4,448 |
| Number of Observations | 353,152 | 208,932 | 144,220 |
| **B. 1968** | | | |
| Age | 42.0 | 38.3 | 3.7 |
| Years of Schooling | 11.4 | 11.5 | -0.1 |
| % Employed | 94.5 | 84.6 | 9.9 |
| % Unemployed | 1.7 | 3.1 | -1.4 |
| % OLF | 3.8 | 5.2 | -1.4 |
| Average Weeks Worked | 48.4 | 42.7 | 5.7 |
| Average Earnings (2000 Dollars) | 29,151 | 25,704 | 3,447 |
| Number of Observations | 10,593 | 3,486 | 7,107 |
| **C. 1999** | | | |
| Age | 41.5 | 37.5 | 4.0 |
| Years of Schooling | 13.5 | 12.8 | 0.7 |
| % Employed | 87.6 | 81.3 | 6.3 |
| % Unemployed | 2.9 | 4.6 | -1.7 |
| % OLF | 9.4 | 11.0 | -1.6 |
| Average Weeks Worked | 45.4 | 43.7 | 1.7 |
| Average Earnings (2000 Dollars) | 38,988 | 32,045 | 6,943 |
| Number of Observations | 10,635 | 4,507 | 6,128 |

Source: March Current Population Survey 1968-2008. Column (1) shows average characteristics of men in year t matched across year t and t+1. Column (2) shows the average characteristics of men in year t who could potentially be matched to year t+1 (Month in Sample 1-4) but did not have matching observations in year t+1. The potential reasons for non-match are migration, mortality, and reporting error. See Madrian and Lefgren (1999). The bottom two panels compare matches and non-matches in 1968 (the first available survey year) and 1999 (last business cycle peak year before the oversampling for SCHIP starting in 2001).