

Recent Trends in Earnings Volatility: Evidence from Survey and Administrative  
Data

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**Abstract:** Recent papers find that earnings volatility is again on the rise (Dynan et al. 2008, and Shin and Solon 2011). Using household survey data—the matched Current Population Surveys and Survey of Income and Program Participation—and the newly available Longitudinal Employment and Household Dynamics administrative dataset, we find that earnings volatility was remarkably stable in the 1990s and through the mid 2000s. This evidence is in contrast to that from the Panel Study of Income Dynamics (PSID) which registers a sharp increase in the early 2000s. We investigate whether adjusting measures based on our sources to more closely match the characteristics of the PSID can reconcile this divergence in trends, but do not find a clear explanation for the divergence. We also find little evidence of a rise over this period in the components of volatility: volatility among job leavers, volatility among job stayers, and the fraction of workers who are job leavers.

**Disclaimer:** 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 composed of 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.” Other papers which followed (for example Haider 2001 and Cameron and Tracy 1998) also concluded that earnings instability increased during the 1970s, reaching a peak during the 1982 recession, before returning to approximately the late 1970s level.

A number of recent papers (Dynan et al. 2008 and Shin and Solon 2011) and a prominently cited book, *The Great Risk Shift* by Jacob Hacker, report a new, upward trend in earnings instability in the 2000s. However, in each of these studies evidence of rising instability has come from a single data source, the Panel Study of Income Dynamics (PSID). Recent papers using different data sources—such as Dahl, DeLeire and Schwabish (2007, 2008, 2011) and Ziliak et al. (2011), which use Social Security earnings data and matched Current Population Surveys respectively—find little evidence of a recent rise. However, these more recent studies use different methods and sample selection criteria, making a direct comparison difficult.<sup>1</sup> Our goal in this paper is to use a single, uniform method to compare across alternative panel datasets—the matched Current Population Surveys (CPS), Survey of Income and Program Participation (SIPP), and the Longitudinal Employment and Household Dynamics (LEHD), to examine trends in earnings instability. We adopt the method followed by Shin and Solon and others, which eschews more complex models of earnings dynamics in favor of a simpler measure of earnings volatility based on dispersion in year-to-year changes in earnings.<sup>2</sup> A notable contribution of our work is to provide comparable estimates from the newly available LEHD data, a matched employer-employee dataset based on administrative earnings records. Compared to survey data, these data have much larger sample sizes and are less prone to survey response error.<sup>3 4</sup>

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<sup>1</sup> For example, Dahl et al. (2011) examine earnings volatility of individuals 25-55 years old, including men and women. Ziliak et al. (2011) examine 16-60 year olds and examine men and women separately.

<sup>2</sup> Gottschalk and Moffitt (1994) introduced a related measure based on deviations from a nine-year average in log earnings. Dynarski and Gruber (1997) were the first to report the variance of year-to-year changes in earnings, soon followed by Cameron and Tracy (1998).

<sup>3</sup> Typically validation studies such as Bound and Krueger (1991) and Bound, Brown, Duncan, and Rodgers (1994) begin with the assumption that administrative payroll records reflect true earnings without measurement error. A recent paper by Abowd and Stinson (2011) takes a different approach, modeling both sources of earnings as noisy measures of the true underlying earnings.

To summarize our main results, we find that earnings volatility has been remarkably stable during the 1990s and 2000s in all three of our alternative panel data sets. The sharpest contrast with the PSID is in the 2000s, where earnings volatility rises sharply in the PSID but not in other data. We explore some potential reasons for these divergent trends, although we are unable to offer a definitive explanation. While we find little evidence of resurgent earnings volatility in the 2000s, it is possible that the evolution of overall volatility could be masking divergent trends among its components. To investigate this possibility, we decompose overall earnings volatility into three components: (1) earnings volatility among job leavers, (2) earnings volatility among job stayers, and (3) the fraction of workers who leave their jobs. We also find little evidence of a rise in any of the components. In particular, we find job separation rates have fallen slightly since the late 1970s, consistent with other findings that job instability contributed little to the earlier rise in earnings instability in the 1970s and the 1980s (Farber 1997, Jaeger and Stevens 1999, and Neumark et al. 1999). We also find that earnings volatility among job stayers remained relatively constant in the 1990s and the 2000s, casting some doubt on the notion that increased utilization of incentive pay contracts contributed to earnings volatility among those who remained on the job (Davis and Kahn 2008, Lemieux et al. 2008, and Abras 2010).

Our paper is structured as follows: In Section II we describe in detail the construction of our data, contrasting the different features of each data set we analyze; Section III reports our main results on the earnings volatility trends; Section IV reports the decomposition of overall earnings volatility between job stayers and job leavers and the fraction falling into each category; and Section V concludes.

## **II. Data**

In contrast to the earlier literature (Moffitt and Gottschalk 2002, 2008, Haider 2001, and Baker and Solon 2003), which used estimates from an error components model to decompose earnings inequality into permanent and transitory components, many recent papers focus on a simpler measure of earnings volatility based on the dispersion of year-to-year changes in earnings.

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They nevertheless conclude that in the case of first differenced earnings, the reliability ratio is higher in administrative data relative to survey data.

<sup>4</sup> Gottschalk, McEntarfer, and Moffitt (2008) also use the LEHD and PSID to estimate the transitory component of a structural error components model. Our study differs from theirs in that we compare across multiple data sets, include more recent years of the LEHD, conduct a decomposition across job stayers and leavers, and check our LEHD estimates for robustness to including data from additional states.

The advantage of this method is that it is transparent and not subject to the restrictions imposed by a particular model of earnings dynamics. Another attractive quality is that data requirements are minimal, allowing us to utilize short panels such as the matched CPS and the SIPP. As pointed out by Shin and Solon (2011) and Dynan et al. (2008), however, this simple measure of earnings volatility is likely to include permanent as well as transitory shocks to earnings. As they also point out, without further information on the volatility of consumption, earnings volatility alone cannot provide information on the actual amount of economic risk faced by individuals and households.

Since applying a uniform method and comparing across data sets is our main focus, we adopt the method used by Shin and Solon for sample selection and variable definitions for each of our alternative data sets. This allows us to directly compare their PSID estimates to our estimates from three other datasets. Our samples consist of prime-age males who are between the ages 25 and 59 in both years, who have non-zero earnings and weeks worked in both years and who have non-allocated earnings in both years.<sup>5</sup> We focus on wage and salary earnings and exclude self-employment earnings. We also trim outliers in each sample by deleting the top and bottom one percent in each year. We regress yearly changes in (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 our main measure of earnings volatility. We describe below the sampling structure and unique features of each data set that may be important for understanding differences in both the level and the trend in our earnings volatility measure.

#### *A. Matched CPS*

Current Population Survey housing units are interviewed for four months, rotate out of the sample for eight months, then return for another four months. This rotating structure allows a subset of households to be matched across calendar years. We construct matched March CPS files, applying the algorithm suggested by Madrian and Lefgren (1999) to files from survey years 1968-2010 (see Appendix for details of the matching process). The advantage of matched CPS data over the PSID is its considerably larger sample sizes. The CPS is also likely

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<sup>5</sup> Eliminating allocated earnings is critical for the March CPS 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.

to be more representative of the population, especially with regard to immigrants.<sup>6</sup>

One disadvantage is that the CPS samples housing units and does not follow individuals who move away from the originally sampled housing unit. As a result, the matched samples include only those individuals who did not change addresses between the two surveys. In Appendix Table 2 we compare observed characteristics in the initial year across matched and non-matched households to gauge the bias introduced by ignoring movers. We find that on average non-matched households are younger, slightly less educated and slightly worse-off in terms of labor market variables compared to the matched households. Using the matched samples, then, is likely to bias upwards levels of mean earnings and employment rates. It is possible that we are also understating earnings volatility by ignoring movers. A careful review of the matched CPS files by Peracchi and Welch (1995), however, finds that the direction of bias is less obvious when it comes to income changes or labor market transitions. Given the centrality of this issue for discerning earnings volatility trends, we provide a further robustness check below. For administrative reasons, not all years can be matched and we end up with 34 two-year panels, leaving us with a total of 206,023 observations, or about 6,060 observations per year.

## *B. SIPP*

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.<sup>7</sup> 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 four 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 their new addresses.

In our SIPP sample 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

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<sup>6</sup> While the PSID over-sampled low income households and added a representative sample of immigrant households in 1997, researchers have not found these data to be reliable and typically have not used these additional data.

<sup>7</sup> We exclude only the 1989 panel which had three waves and did not provide even one calendar year of earnings.

calendar year to measure annual earnings. We end up with a sample of 60,561 observations over 16 year-to-year changes, or an average of about 3,800 observations per year.

### *C. LEHD*

The LEHD database draws much of its data from complete sets of unemployment insurance (UI) quarterly earnings records for a subset of U.S. states. The database includes records for 1990 to 2008, although some states only have data for a subset of those years. The files provide longitudinal information on workers, employers, and the links between them. Basic demographic data are also available for workers, including age and gender. Here, we use data on 12 states for which we have earnings for all four quarters of years 1992-2008. These 12 states account for about 25 percent of total U.S. employment. If an individual works outside of this group of states for part of a year, we will understate their annual earnings that year and may mismeasure earnings volatility as well. We conduct a robustness check below by using a larger number of states.

State UI programs cover over 96 percent of wage and salary employment and have comparable coverage from state to state (Bureau of Labor Statistics, 1997). Certain types of jobs and workers have lower coverage rates, including employees of small agricultural employers, student employees, insurance and real estate agents who work on commission, and employees of non-profit organizations. Federal employees and ex-military members are covered by separate Federal UI programs and data from these programs are not currently included in the LEHD database. These differences in coverage cause some discrepancies in earnings levels and changes, an issue we return to below. We sum quarterly earnings from all employers in a calendar year to obtain annual earnings. After applying our sample restrictions, we have an average of 12 million records per year for the earnings change regressions.

### *D. PSID*

The Panel Study of Income Dynamics is a longitudinal survey that was conducted annually from 1968 through 1997, and biannually since 1999. Shin and Solon construct a sample that consists of male household heads age 25 to 59 in the nationally representative component of the PSID sample. To make earnings changes comparable over the annual and biannual parts of the panel, they measure volatility using two-year differences in earnings. Their primary earnings measure is wage and salary income, and they exclude imputed values. In the main analysis they exclude observations with zero earnings and trim the top and bottom

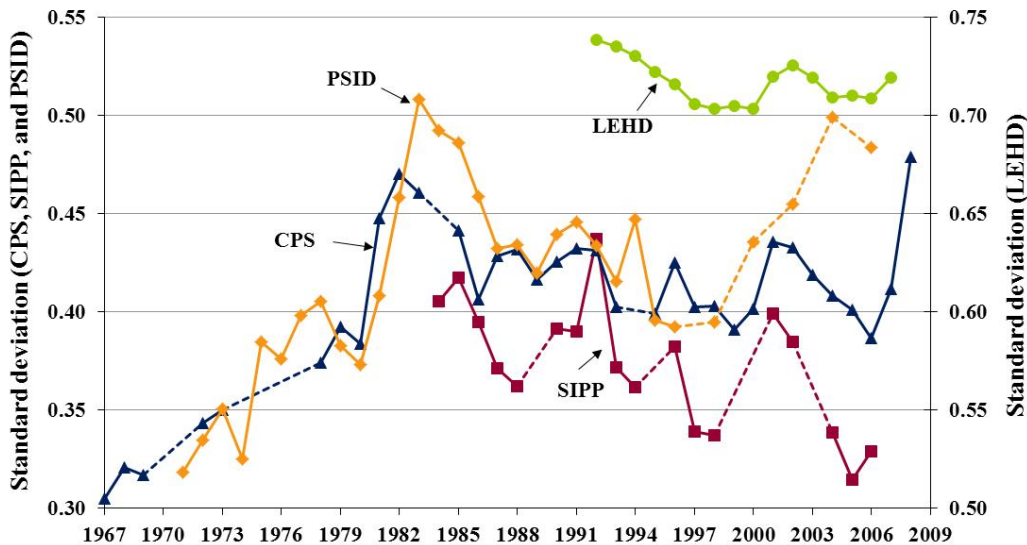
percentile of the distribution in each year, though later analyses examine the effects of including zeros and extreme values. Their main sample includes 43,346 observations on 30 years of two-year differences, for an average sample size of 1,445 per two-year change.

### III. Empirical Results

#### A. Earnings Volatility in PSID, CPS, SIPP, and LEHD

Figure 1 presents earnings volatility from the three alternative data sets as well as the PSID. All series in the figure are constructed using the uniform variable definitions and sample selection criteria used by Shin and Solon.<sup>8</sup> Table 1 distills the information in Figure 1 by presenting estimates of volatility from the four data sets at business cycle peaks (or closest to such a peak given the years available).<sup>9</sup> Both the figure and the table show that the CPS and PSID estimates track each other closely until 1998. Earnings volatility rose rapidly in the 1970s, reaching a peak during the 1982-83 recession, but declined more or less steadily in the 1990s. These are also the basic patterns documented in the earlier influential study by Cameron and Tracy, which used the matched March CPS and examined the variance of year-to-year changes in log earnings. Since the late 1990s,

Figure 1. Instability estimates using CPS, SIPP, PSID 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.

<sup>9</sup> We chose years in which the unemployment rate averaged over the two years reached a local minimum to time the business cycle peak.

however, the patterns found in the CPS and the PSID are notably different. In the CPS, volatility remained stable in the 1990s and 2000s before spiking up again during the “Great Recession” to the 1982-83 level. In the PSID, there is a notable increase in trend in the 2000s, even prior to the recent recession. The level of volatility 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.<sup>10</sup> Again, in contrast to the PSID, earnings volatility in the SIPP and LEHD shows no trend increase in the 2000s. Earnings volatility in the SIPP exhibits, if anything, a declining trend since 1984.

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

Year	Standard Deviation of Change in Log Wage and Salary Earnings				Percent Change, Including Zeros and Outliers
	PSID	CPS	SIPP	LEHD	CPS
1968		0.32			0.54
1973	0.35	0.35			0.57
1978	0.41	0.37			0.57
1988	0.43	0.43	0.36		0.62
1998	0.39	0.40	0.34	0.70	0.63
2006	0.48	0.39	0.33	0.71	0.64

Results in columns 1-4 are for men with non-zero wage and salary earnings in both years. Column 1 is based on results reported in Shin and Solon (2008), Figure 2. Columns 2-5 are based on authors' calculations using the matched CPS, SIPP, and LEHD. See text for details. Years refer to the first year of the changes. Years chosen are business cycle peaks based on the unemployment rate, except we use 1998 in place of 1999 because SIPP and PSID estimates are not available for 1999.

<sup>10</sup> Earnings from episodic low-wage jobs in the LEHD appears to be a major explanation for the higher level of earnings volatility. In a companion paper, we have used a SIPP-LEHD matched sample to compare jobs, employment and earnings across SIPP and LEHD for the same set of individuals (Juhn and McCue 2009). While we use the same basic methodology in producing estimates from the two data sources, when we trim the top and bottom 1% of earnings we end up trimming at different levels because the UI data have more very low values. When we use the first percentile in the SIPP data as the cut-off level to trim the bottom earnings in the LEHD, more than half of the discrepancy in the level of earnings volatility between the LEHD and SIPP disappears.

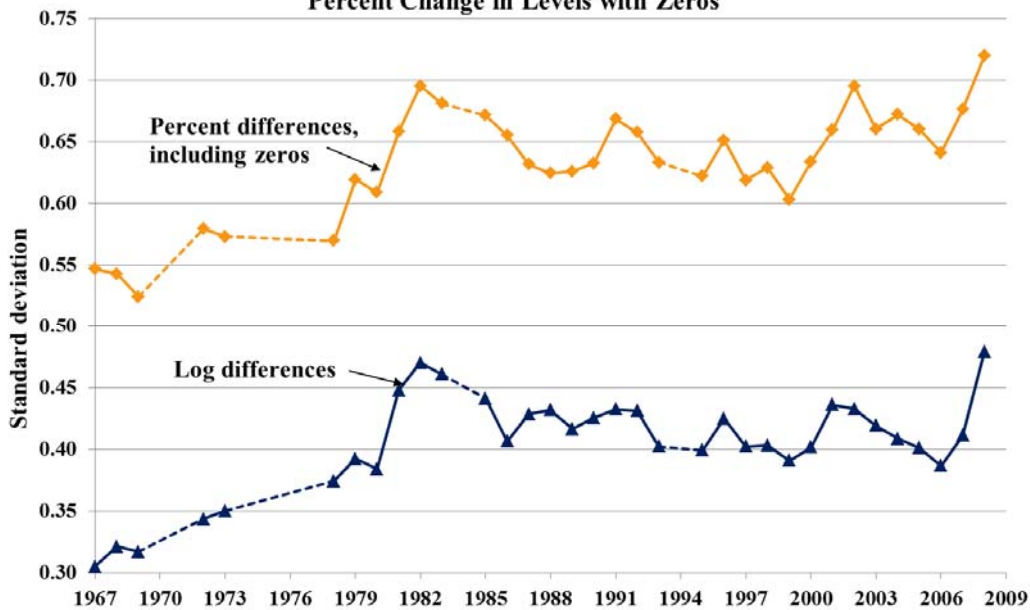


We have so far ignored zero earnings observations and extreme outliers. To the extent that men are increasingly likely to exit the labor force altogether in a weak economy (resulting in zero earnings even over the span of an entire year) we may be understating earnings volatility by excluding these workers.<sup>11</sup> Including zero earnings in our sample necessitates using a different measure of earnings volatility. We adopt the approach used in Dynan et al. and calculate the arc percent change defined as the difference in earnings divided by the earnings averaged over the two years. We use the same sample selection statements as before but include zero earnings and outliers. Figure 2 presents the two alternative volatility series: our baseline measure, which excludes zeros and outliers and is based on log earnings, and the arc percent change, including zeros and outliers.

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<sup>11</sup> Distinguishing zero earnings from missing earnings (that is, those not covered by UI or in out-of-sample states) is difficult in the LEHD data. We thus use the March CPS in this section to gauge the importance of zero earnings observations.

**Figure 2. CPS Instability Estimates, Log Differences versus Percent Change in Levels with Zeros**



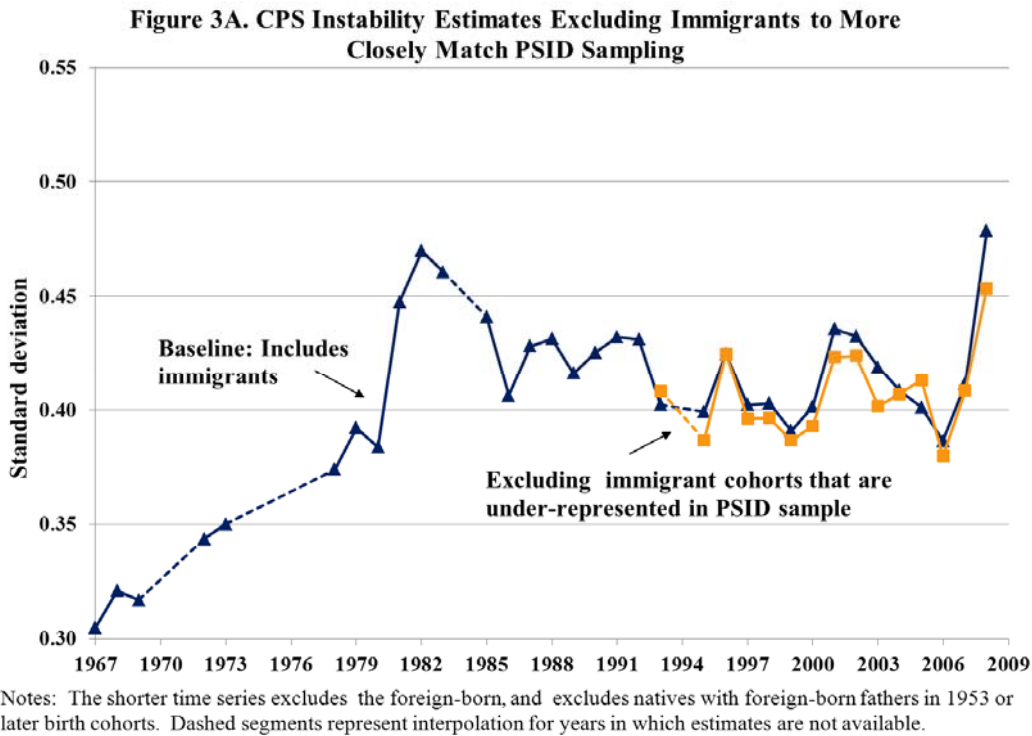
Notes: The bottom line plots the standard deviation of residuals from a regression of the change in log earnings on a quadratic in age. The top line plots the standard deviation of residuals from a regression of the percent change in earnings on a quadratic in age. Dashed segments represent interpolation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

The level of earnings volatility is substantially higher using this alternative measure. The counter-cyclical pattern is also more pronounced with volatility rising more sharply during recessions. The last column in Table 1 gives estimates from this series at business cycle peaks. Including the zeros, we find a small rise in earnings volatility in the 2000s in the CPS data (from .63 in 1998 to .64 in 2006), although the increase is still smaller than the .09 increase observed in the PSID.

*B. Sources of Differences across Data Sets*

While the PSID, CPS, SIPP and LEHD samples should each be broadly representative of prime-age male workers, differences in their construction could explain divergent findings. Here we explore whether adjusting for such differences affects our results.

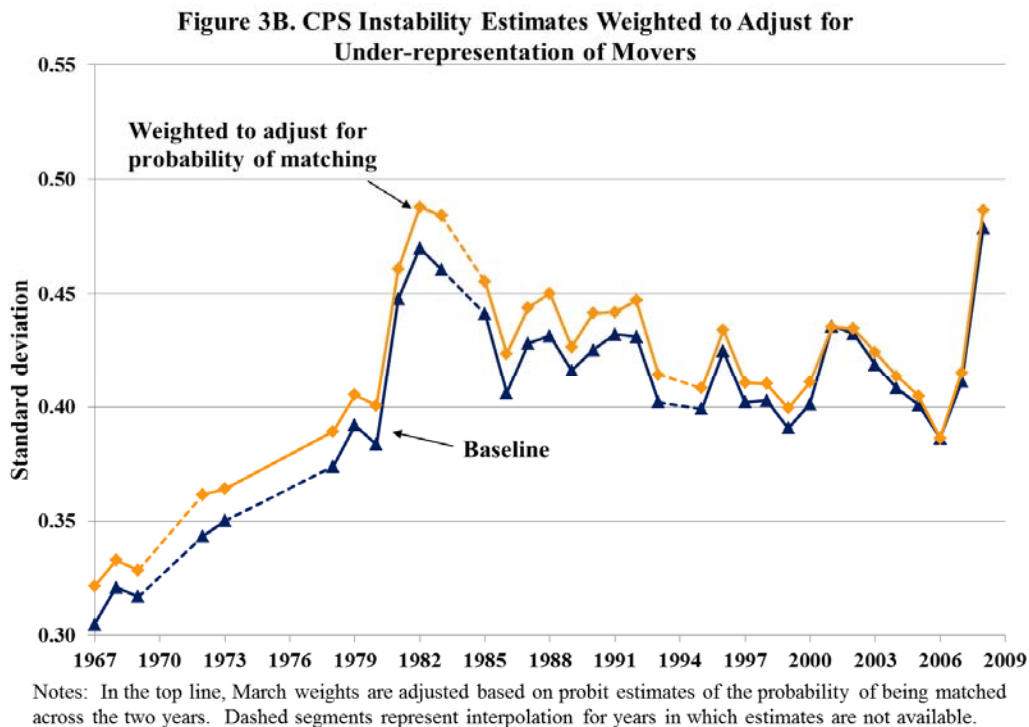
The PSID follows a sample of households selected in the late 1960s, along with new households formed by members and descendants of the original sample. This makes under-representation of immigrants arriving after 1968 and their descendants likely, which may be one source of the discrepancy between the PSID and our other data sources. We explore whether this is likely to affect our results by similarly restricting the inclusion of immigrants in the matched CPS. Country of birth for sample members and their parents is available in the CPS



starting with the 1994 survey. To approximate the sampling of the PSID, we select individuals who were (i) born in the U.S. before 1953 or (ii) born in the U.S. to a native-born father in 1953 or later. Figure 3A compares the earnings volatility trends for our original CPS sample and for the sample that excludes recent immigrants. As the figure illustrates, this adjustment makes little difference in earnings volatility trends.

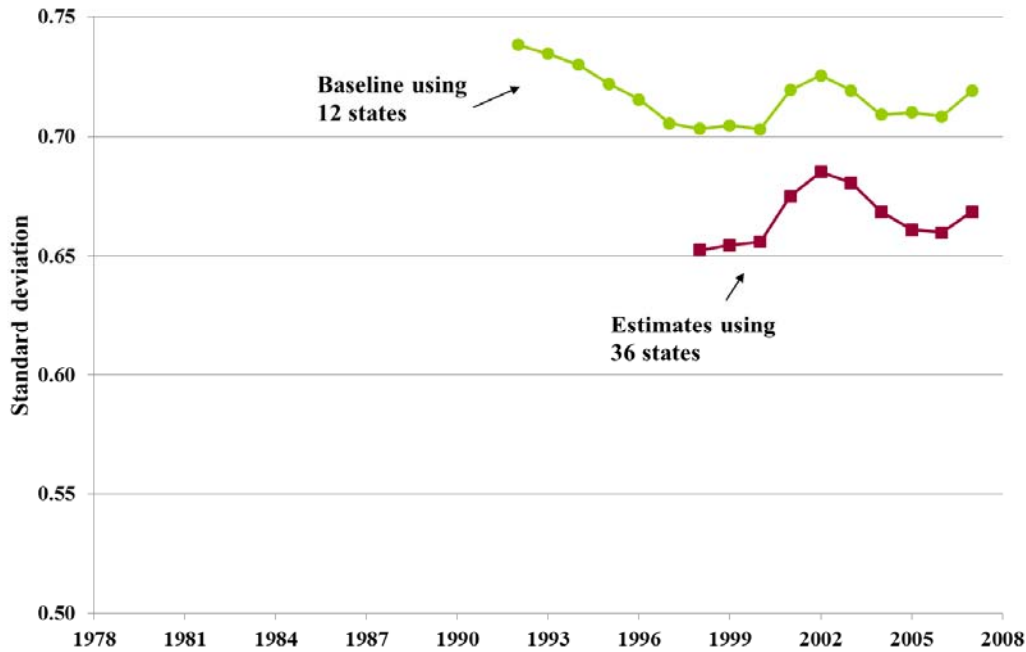
As we mentioned earlier, a major concern with the matched CPS is the inability to follow movers. To gauge the importance of this issue, we estimated probit models of the probability of being matched across the two years as a function of characteristics and variables observed in the first year. We used as regressors head of household status, race, age, age squared, dummy variables for education group, fulltime status, employment status, and weeks worked in the first

year. We adjusted the March weights with the inverse of the predicted probabilities. Figure 3B compares the adjusted and unadjusted series. The adjustment for matching probability increases the level of earnings volatility, particularly in the earlier part of our data, but again does not substantively alter our main conclusion.



One concern with our LEHD sample is that it includes only 12 states. These 12 states may not be representative of the nation as a whole, and if an individual works outside of this group of states for part of a year, we may mismeasure their earnings volatility. To gauge the bias introduced by using a subset of states, we examine estimates based on a sample of 36 states available over a shorter time span. Figure 3C presents the two alternative LEHD earnings volatility measures. The inclusion of additional states reduces the level of earnings volatility significantly, suggesting that workers dividing their time across state boundaries may be important. However, even in the larger sample there is little evidence of rising volatility in the LEHD.

Figure 3C. LEHD Estimates Based on Wider Panel of States



In a companion paper, we have used a SIPP-LEHD matched sample to compare jobs, employment and earnings across SIPP and LEHD for the same set of individuals (Juhn and McCue 2009). Our study and other studies that use matched samples of survey and administrative records point to two broad areas of divergence between the two types of earnings data. Relative to administrative data, individuals responding to surveys under-report earnings from low-paid jobs of short durations. On the other hand, some individuals have jobs that appear to be more informal or “off the books” and are not captured by administrative data systems, particularly in sectors such as agriculture, household services, and construction.<sup>12</sup> While both survey and administrative data have imperfect coverage of jobs, whether and how these patterns cause biases in measuring trends is unclear. Under these circumstances, it is somewhat reassuring that the LEHD and survey data such as the CPS and SIPP exhibit a broadly consistent pattern of stable earnings volatility in the 1990s and 2000s.<sup>13</sup> But the divergent

<sup>12</sup> Abraham et al. (2009) report similar findings using matched CPS-LEHD samples. Roemer (2002) also comes to broadly similar conclusions using SIPP and CPS matched to detailed Social Security Earnings (DER) records.

<sup>13</sup> The absence of rising volatility trend documented by Dahl et al. (2011) using the Social Security earnings data provides further reassurance since coverage issues may be less severe in these data. The one caveat is that Dahl et al. (2011) include both men and women in their sample which makes their results not directly comparable to ours.

pattern found in the PSID in the 2000s remains a puzzle. While we have investigated the most obvious explanations, we are unfortunately not able to offer a definitive conclusion on this issue.

#### IV. Decomposition of Earnings Volatility among Job Leavers and Stayers

While we find little evidence of resurgent earnings volatility in the 2000s, it is possible that the overall trend could be masking divergent trends among its components. To investigate this possibility, we examine three components: (1) earnings volatility among job leavers, (2) earnings volatility among job stayers, and (3) the fraction of workers who leave their jobs. We do not present a full-fledged variance decomposition, but we lay out the components to frame our discussion. Using  $S$  to denote the share of workers who stay with the same employer 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 job leavers, as well as the squared mean residuals:

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

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:

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

The first two components give the contributions of changes in the variances for the two groups, while the last component gives the contribution of changes in the share of job leavers. In the descriptive figures that follow, we focus on the terms

$\Delta V_t^{stayers}$  (change in volatility among job stayers),  $\Delta V_t^{job\ leavers}$  (change in volatility among job leavers), and  $\Delta(1 - \bar{S}_t)$ , change in share of job leavers.

Each of our data sources has somewhat different information on job spells and multiple job holding, making it difficult to both construct measures that are comparable across datasets and to maximize use of the information we have available. In the results presented here, we focus on a definition that is as comparable as possible across our three data sources to identify trends that are common to all three. We have also examined several alternative definitions of job leavers using the LEHD and SIPP data. While the share of leavers and the levels of volatility for the two groups differed substantially across definitions, the trends were not sensitive to the changes in definition.

Identifying workers who stay with the same employer is relatively straightforward in both the SIPP and LEHD datasets because employers have unique identifiers. However, distinguishing multiple job holders from those with consecutive short job spells with different employers in a quarter is not possible in the LEHD. In the SIPP, the main job is defined as the job at which the person worked the most weeks or hours during the reference period. In the LEHD, we do not have weeks or hours to identify the main job, so we use the job with highest earnings. We categorize workers as stayers if they had the same main employer in March (or the first quarter) of both years.

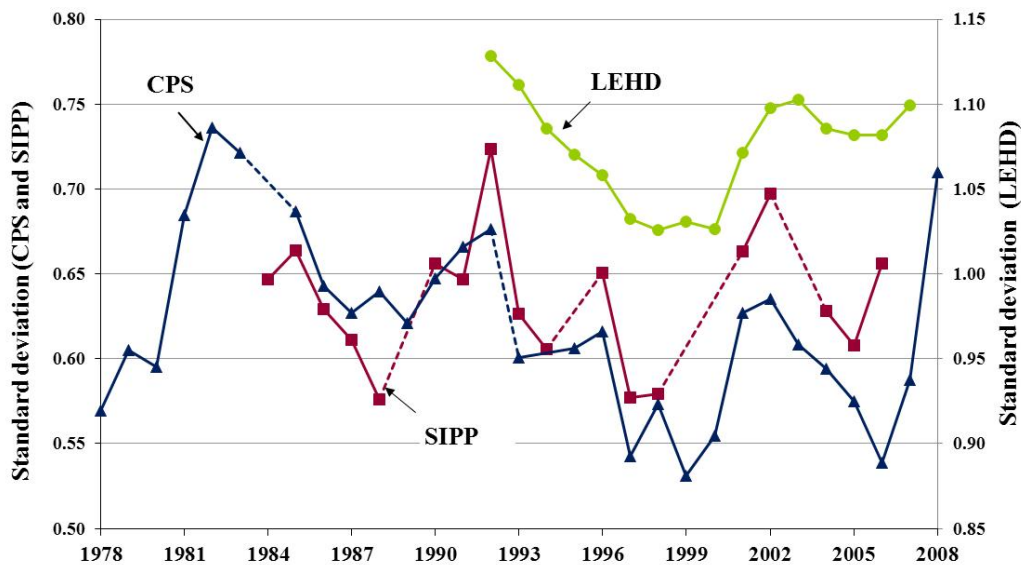
The CPS reports only the number of employers over the course of the year, and instructs respondents to only count one employer when holding multiple jobs. For those who report having one employer in each year, we cannot determine whether it is the same employer in both years. For these reasons, in the CPS we define a job stayer as someone who in addition to reporting a single employer in both years also reported having worked at least 49 weeks each year. To make the definition of job stayer as comparable as possible across all three datasets, we impose the same weeks restriction in the SIPP and require earnings in each quarter of both years in the LEHD.

Thus, our definition of a job stayer is based on keeping the same employer and not having a non-employment spell. The converse includes both those who changed employers and/or those who experienced a non-employment spell during the two-year window. We will use the term “job leavers” as a shorthand for this group. Note that multiple job holders will be categorized as stayers if their primary job in the first quarter stays the same, but as changers if it does not.

#### *A. Earnings Volatility among Job Leavers*

Figure 4 displays earnings volatility among job leavers. The figure shows that volatility among this group is highly cyclical, with volatility rising during recessions and falling during expansions. Comparing across cyclical peaks in unemployment, volatility in the CPS fell through the 2002 recession. The LEHD and SIPP estimates also show declines between 1992 and 2002, although the decline in the SIPP is quite small. These results are consistent with recent papers that document a decline in worker flows from employment to unemployment and a corresponding rise in job-to-job transitions (Davis 2008, Shimer 2007, Elsby et al. 2009, and Stewart 2007). The figure also shows, however, a reversal as earnings volatility increased sharply during the Great Recession.

Figure 4. Earnings Instability of Job Leavers



Notes: Leavers are those who had different primary employers in the first quarter for years t and t+1 and/or suffered a spell of non-employment. See text for details.

### B. Earnings Volatility among Job Stayers

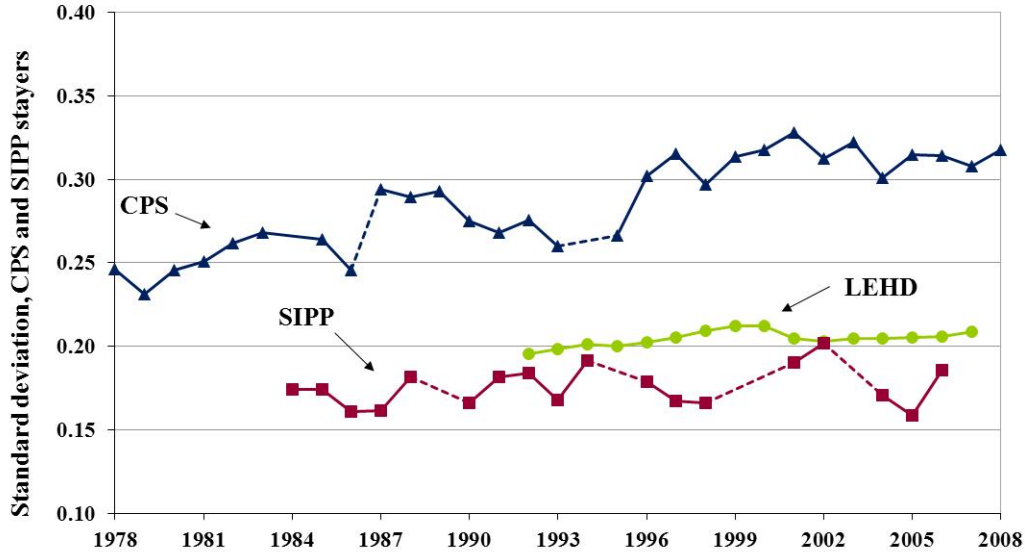
A recent paper by Lemieux et al. (2008) hypothesizes that the rise in returns to skill increased the relative benefit of performance pay contracts at the same time that technology reduced monitoring costs. They find that wages in performance pay jobs are more flexible in response to local labor market shocks, while hours are less flexible. Davis and Kahn (2008) suggest that greater flexibility in pay setting is one explanation that could reconcile declines in aggregate and firm-level volatility measures with a rise in household earnings volatility. Using the matched



CPS data, Abras (2010) finds that earnings volatility among job stayers increased, consistent with the performance pay findings.

Figure 5 examines earnings volatility among job stayers, using our alternative datasets. The figure shows that earnings volatility among job stayers

**Figure 5. Earnings Instability of Job Stayers**



Notes: Stayers are defined as those who have the same primary employer in the first quarter of years  $t$  and  $t+1$ , and who have no non-employment spells in either  $t$  or  $t+1$  (or, in the the LEHD data, no quarters without earnings). See text for details.

in the CPS data did indeed increase from 1978 to 1996, but it has remained relatively stable since that period. Similarly, neither the SIPP nor the LEHD shows indications of a rise in earnings volatility in the recent period. Overall, we find little evidence of a recent rise in earnings volatility among job stayers that could be attributed to incentive pay contracts.

### C. Job Separations

A large literature has investigated whether job instability increased with the earlier increase in earnings instability. Using CPS data, Farber (1997), Jaeger and Stevens (1999), and Neumark et al. (1999) 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 (1997) 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. Farber (2007) updates these results with more recent data and further confirms that mean tenure and fraction of male workers reporting long job tenures have declined. We investigate the importance of job separations in the recent data.

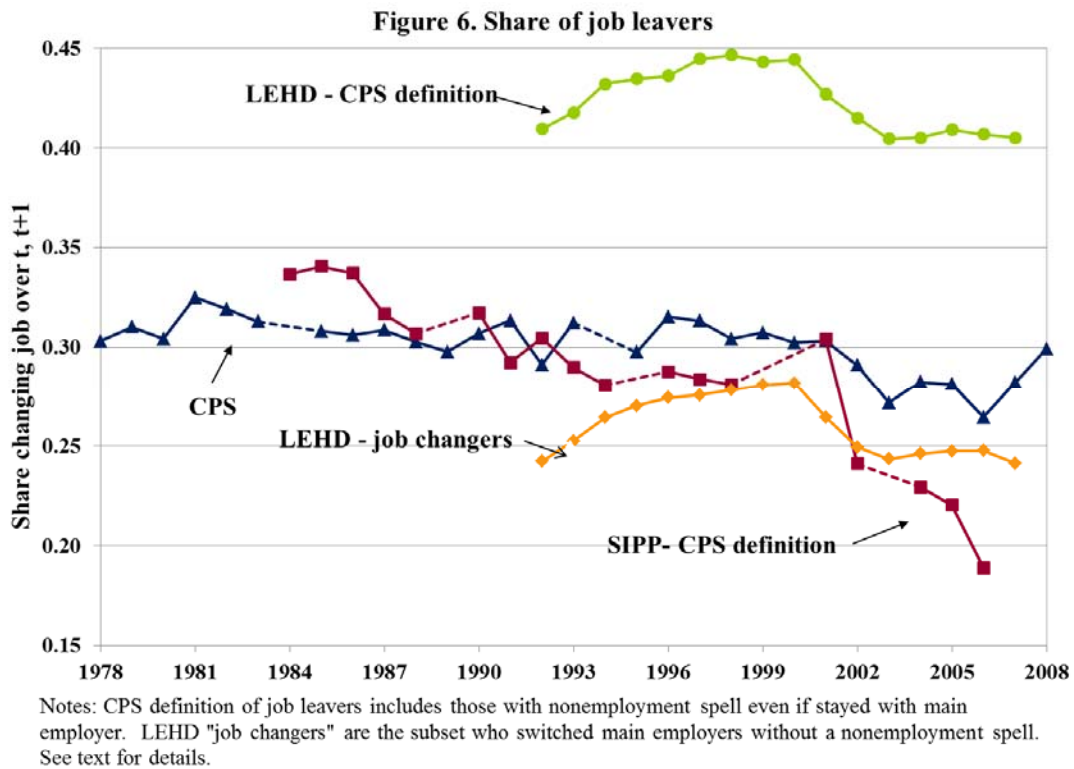


Figure 6 shows the share of workers we define as job leavers according to the CPS definition. For the CPS, job leavers are those individuals who report having more than one employer in either year  $t$  or  $t+1$  and/or report having a spell of non-employment. For SIPP and LEHD, job leavers are those who have different main employers in first quarter of year  $t$  and first quarter of year  $t+1$ , and/or had non-employed weeks or at least one quarter with zero earnings. The share of job leavers defined this way is considerably higher in the LEHD. We find that approximately 20 percent of those who report having the same main employer across adjacent years had at least one quarter of zero earnings during the two-year window. For investigating the importance of job volatility and “churning,” however, it may be more instructive to focus on job changes without non-employment spells. For this reason, we also graph in Figure 6 the share of job changers in the LEHD who did not suffer an intervening non-employment quarter. Using either definition, the figure shows that the fraction of job leavers

has been more or less constant since the early 1990s and actually has declined over time in the SIPP and the CPS. Consistent with previous findings (Farber 1997, Jaeger and Stevens 1999, Neumark et al. 1999, and Gottschalk and Moffitt 1999), our results show little evidence of an increase in job instability or “churning” that could have contributed to rising earnings volatility. These results, however, are not necessarily in conflict with Farber (2007), who documents a decline in mean tenure and incidence of long job spells among men. One possibility is that job changing rates decreased for young workers with low tenure (who change jobs at a much higher rate) while it increased for older workers with higher job tenure.<sup>14</sup>

## **V. Summary**

In summary, we find that earnings volatility, comparably measured using alternative datasets such as the CPS, the SIPP and the LEHD, has been remarkably stable in the 1990s and most of the 2000s. Given the relative strengths and weaknesses of survey and administrative data, we find the congruence of the results across these data to be somewhat reassuring. A remaining puzzle is the divergent pattern found in the PSID, which displays an increase in earnings volatility in the 2000s. While we investigate some potential explanations for this divergence, we fail to find a “smoking gun” explanation and leave this puzzle for future research.

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<sup>14</sup> Farber (2007) shows results that are consistent with this statement. In Table 3, he shows that younger workers (20-29 years old) have much higher job changing rates. Figures 11 and 12 show that job changing rates fell for young workers but increased for older workers.

## Data Appendix - Construction of the Matched CPS Data

CPS housing units are interviewed for four months (Months in Sample, or MIS = 1-4), rotate out of the sample for eight months, then return for another four (MIS = 5-8). For example, a unit that is first interviewed in March (MIS= 1) will be re-interviewed starting in March of the next year (MIS = 5). This allows potentially half of the units interviewed in a given year—those for whom MIS = 1-4—to be matched to their observations in the following year (MIS 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. But 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 that cannot be 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 from our matched samples, and such households may be particularly likely to have a job change or employment/non-employment transition. 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, 1968-2008. It shows that, on average, non-matched men are younger and have worse labor market characteristics. Using the matched samples, then, is likely to bias upwards levels of mean earnings and employment rates. How this will bias earnings volatility, however, is less clear (see Peracchi and Welch). 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.

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

<b>Year</b>	<b>Men 25-59</b>	<b>Men, Month in Sample 1-4</b>	<b>Match Rate</b>
1968	28,130	14,087	75.2
1969	28,509	14,437	72.1
1970	27,160	13,659	76.5
1973	25,775	12,949	49.5
1974	25,276	12,315	74.9
1979	30,516	15,379	70.7
1980	36,418	18,322	73.2
1981	36,842	18,179	65.4
1982	33,323	16,759	72.3
1983	33,887	17,055	70.0
1984	33,718	16,833	68.1
1986	33,747	16,850	66.7
1987	33,411	16,809	69.2
1988	33,882	17,116	64.4
1989	31,626	15,835	70.3
1990	34,700	17,518	69.2
1991	35,028	17,370	68.9
1992	34,638	17,228	69.5
1993	34,482	17,241	52.1
1994	33,328	15,413	51.2
1996	29,089	14,588	70.2
1997	29,662	15,038	70.0
1998	29,766	15,043	70.6
1999	30,046	15,144	70.2
2000	30,607	13,813	76.1
2001	49,367	24,568	50.9
2002	48,790	24,426	52.0
2003	48,711	24,539	52.5
2004	47,808	23,542	46.5
2005	46,981	23,372	49.1
2006	46,569	23,433	49.6
2007	45,229	23,318	50.7
2008	45,904	22,918	51.5
2009	46,130	23,137	51.8

Column 1 gives the number of men in both years. Column 2 gives the number who could potentially be matched. Column 3 gives the percent of those matched.

**Appendix Table 2. Characteristics of Matched and Non-Matched Men**

	Matched	Not-Matched	
<b><u>A. All Years</u></b>	Across Years	Across Years	Difference
Age	41.3	38.0	3.3
Years of Schooling	13.1	12.8	0.3
% Employed	88.0	80.7	7.3
% Unemployed	4.2	6.2	-2.0
% Out of the Labor Force	8.2	8.8	-0.6
Average Weeks Worked	45.4	42.6	2.8
Average Earnings (2005 \$)	40,346	35,638	4,708
Number of Observations	376,498	231,735	144,763
<b><u>B. 1968</u></b>			
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
% Out of the Labor Force	3.8	5.2	-1.4
Average Weeks Worked	48.4	42.7	5.7
Average Earnings (2005 \$)	32,535	28,674	3,861
Number of Observations	10,593	3,486	7,107
<b><u>C. 1999</u></b>			
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
% Out of the Labor Force	9.4	11.0	-1.6
Average Weeks Worked	45.4	43.7	1.7
Average Earnings (2005 \$)	43,459	35,593	7,866
Number of Observations	10,635	4,507	6,128

Source: March CPS 1968-2010. Column 1 shows year-t averages for men matched across years t and t+1. Column 2 shows year-t averages for potential matches to year t+1 (month in sample 1-4) with no match. Reasons for non-match are migration, mortality, and reporting error. See Madrian and Lefgren (1999). Panels B and C compare matches and non-matches in 1968 (first available year) and 1999 (last business cycle peak before oversampling for SCHIP began in 2001).