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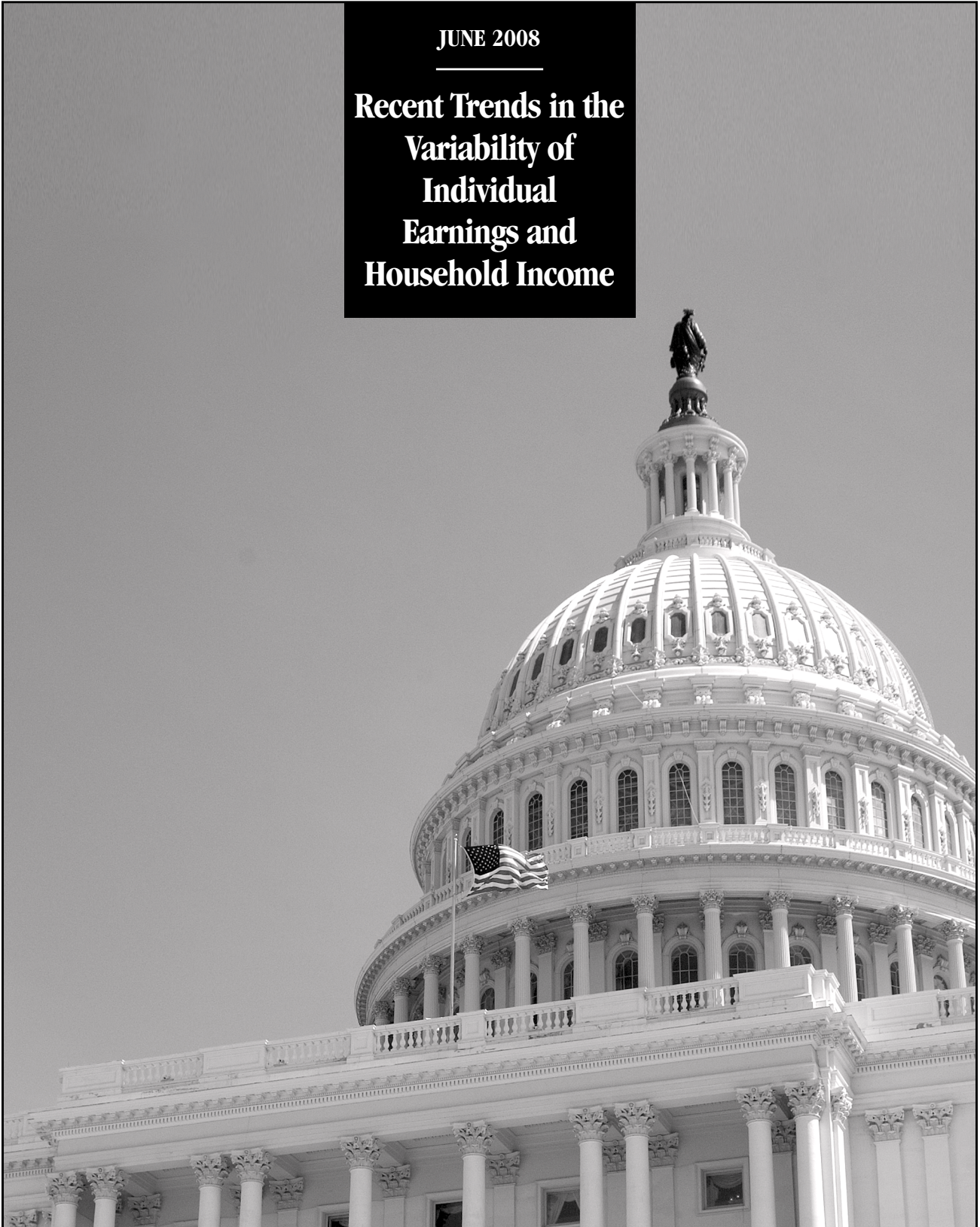
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CBO

PAPER

JUNE 2008

**Recent Trends in the
Variability of
Individual
Earnings and
Household Income**





Recent Trends in the Variability of Individual Earnings and Household Income

June 2008

Notes

Individual earnings and household income were indexed to 2006 dollars using the research series of the consumer price index for all urban consumers.

Numbers in the text and tables may not add up to totals because of rounding.



Preface

Changes in earnings and income are characteristic of a dynamic labor market, as people change jobs or careers, move between part-time and full-time work, or start or stop working. Having that flexibility in the labor market is generally considered a source of strength of the U.S. economy overall. Nonetheless, that variability causes true economic hardship for some people.

This Congressional Budget Office (CBO) paper, prepared at the request of Senator Charles E. Schumer and Senator Jim Webb, uses administrative and survey data to examine year-to-year changes in individual earnings and household income since 1984. It also examines variability in earnings and income by factors such as age, sex, and education. In keeping with CBO's mandate to provide objective, impartial analysis, the paper makes no recommendations.

Molly Dahl and Jonathan A. Schwabish of CBO's Health and Human Resources Division, and Thomas DeLeire, formerly of CBO, prepared the paper under the supervision of Joyce Manchester and Ralph Smith. Alshadye Yemane assisted with data and tabulations. The paper benefited from comments by Patrick Bernhardt, Sheila Dacey, Robert Dennis, Douglas Hamilton, Jonathan Morancy, Benjamin Page, Sam Papenfuss, William Randolph, and Frank Sammartino, all of CBO, as well as David Johnson of the Census Bureau and Gary Solon of Michigan State University. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Sherry Snyder edited the paper, and Loretta Lettner proofread it. Maureen Costantino took the photograph for and designed the cover and prepared the paper for publication. Lenny Skutnik printed copies of the report, Linda Schimmel handled the distribution, and Simone Thomas produced the electronic version for CBO's Web site (www.cbo.gov).



Peter R. Orszag
Director

June 2008



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Recent Trends in the Variability of Individual Earnings and Household Income

Summary and Introduction

Changes in earnings and income are characteristic of a dynamic labor market, as people change jobs or careers, move between part-time and full-time work, or start or stop working. Having that flexibility in the labor market is generally considered a source of strength of the U.S. economy. Nonetheless, for some people that variability causes true economic hardship.

The extent to which the earnings of workers and income of households vary from year to year can have important consequences for how people spend and save their money.¹ The Congressional Budget Office (CBO) has analyzed that variation over the past two decades, both for individuals and for households, using data from the Social Security Administration (SSA) and the Census Bureau. That analysis indicates that a substantial fraction of workers experience large changes in their earnings from one year to the next and that a smaller percentage of households see large year-to-year changes in their income. The variability in individual earnings and household income has changed little since the mid-1980s.

Individual Earnings

CBO's analysis of the extent to which workers' earnings vary from year to year builds on previous work undertaken by the agency.² Despite slight differences in the age ranges examined and the methods used, the results are consistent with those in the earlier analyses. The main

findings of the current analysis, which covers the period from 1984 to 2003, are as follows:

- A substantial fraction of workers ages 25 to 55 (about 40 percent between 2002 and 2003) experience large changes in earnings from one year to the next (defined here as changes in earnings of 25 percent or more). More than a quarter of those workers experiencing large changes in earnings move into or out of employment covered by Social Security.
- Earnings variability, as measured by large increases or decreases in earnings, tends to move in concert with economic growth. The percentage of workers experiencing large increases in earnings tends to decline during periods of slower economic growth and rise during periods of stronger economic growth. The percentage of workers experiencing large decreases in earnings is less sensitive to changes in economic growth, though it did rise during the economic downturn of the early 2000s.
- Overall, the year-to-year variability of earnings has changed little since the mid-1980s.
- Women, younger workers, and workers with lower earnings experience large changes in earnings more frequently than their counterparts do.

1. Understanding how that variation may be changing over time also allows the Congressional Budget Office to construct more accurate long-term projections of earnings. Those projections are, in turn, a key input into CBO's projections of revenues and outlays associated with the Social Security and Medicare programs.

2. See statement of Peter R. Orszag, Director, Congressional Budget Office, *Economic Volatility*, before the Joint Economic Committee, U.S. Congress (February 28, 2007); Congressional Budget Office, Trends in Earnings Variability Over the Past 20 Years," letter to the Honorable Charles E. Schumer and the Honorable Jim Webb (April 2007).

CBO used data from the Social Security Administration to analyze variability in individual earnings. Although such administrative data are not subject to errors in respondents' recall (as survey data are) and are consistently available over many years, the data used in this analysis do not capture all earnings. Omitted are the earnings of the small percentage of workers who are not covered by Social Security (for instance, some state, local, and federal government employees), income from self-employment, and unreported (or "under the table") earnings.

Household Income

Changes in overall economic well-being are better captured by a broader measure than individual earnings. Because many people live in households with other earners or have nonlabor income (including, for example, unemployment insurance or interest income) that may mitigate or exacerbate the economic effect of any changes in their own earnings, CBO extended its work on variability in individual earnings to include an analysis of variability in household income. The main findings from that analysis, which covers the period from 1984 to 2005, are as follows:

- Large changes in household income from year to year (defined here as changes in income of 25 percent or more) are less common than large changes in individual earnings. Still, about 25 percent of U.S. households experienced such large changes in income between 2004 and 2005.
- Overall, the fraction of households experiencing large changes in income has been relatively constant since the mid-1980s. Income tends to vary more for low-income households and for households headed by younger people, by those with less education, and by those who are not married.
- Changes in earnings are a major contributor to the changes in household income.

Although household income is a broader measure of people's resources than individual earnings and is therefore likely to better capture some notion of overall well-being, many aspects of well-being and measures of financial resources are not considered here. For instance, by looking only at before-tax income, the analysis misses the effects of taxes in a given year and the effects of changes in taxes over time on purchasing power. The tax system

tends to smooth out variability at the household level by reducing year-to-year fluctuations in after-tax income. At the same time, however, the tax system imposes costs on the economy by distorting the decisions that households make about how much to work, how much to save, and how to receive their compensation.³ Also, the analysis does not investigate the relationship between household assets, such as savings or equity in a home, and variability in household income. Finally, the analysis does not capture other measures of a household's well-being, such as consumption or the health of household members.

Variability in Individual Earnings

Real (inflation-adjusted) earnings changed by more than 25 percent for a substantial portion (40 percent) of workers ages 25 to 55 between 2002 and 2003 (the most recent years for which data were available). Those large changes in earnings were nearly evenly split between large increases and large decreases (see Figure 1). More than a quarter of workers whose earnings changed by 25 percent or more moved completely (that is, for at least a year) into or out of employment covered by Social Security.

Data and Methods

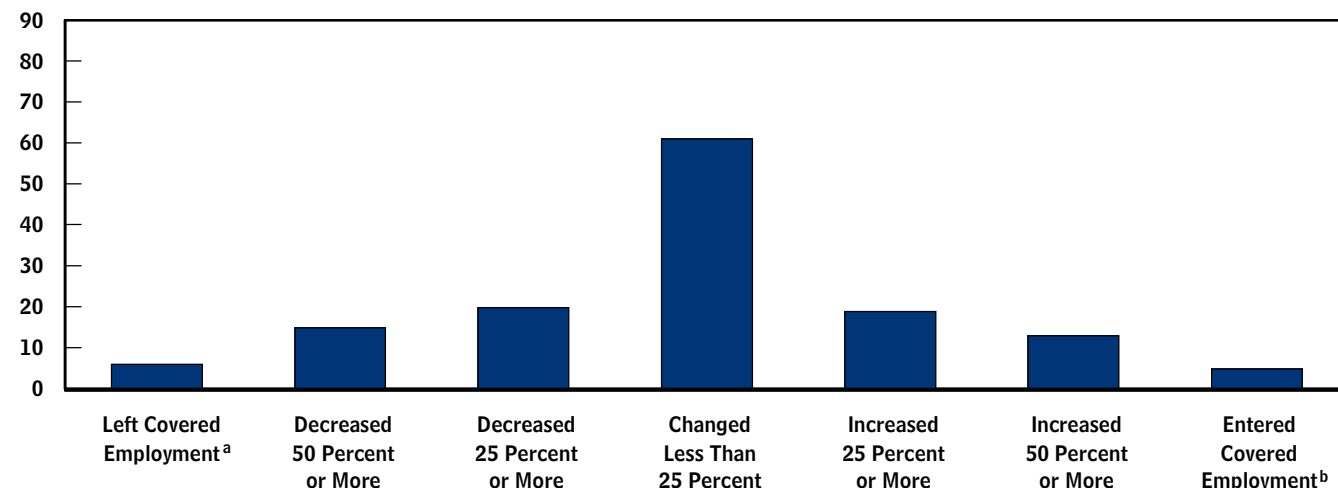
CBO used data from the Social Security Administration's Continuous Work History Sample (CWHHS) to analyze variability in the earnings of individuals ages 25 to 55. Restricting the analysis to people in that age range reduces the effect of decisions about education and retirement on changes in earnings.

CBO adjusted reported earnings for inflation using the research series of the consumer price index for all urban consumers (CPI-U-RS). For this analysis, the percentage change in earnings is defined as the difference in earnings between year t and year $t-1$, divided by average earnings over the two-year period. Defining the percentage change in that way includes people leaving employment (moving from positive to zero earnings) as well as those entering employment (moving from zero to positive earnings). Using a more traditional measure of percentage change

3. See statement of Peter R. Orszag (February 28, 2007); Alan J. Auerbach and Daniel Feenberg, "The Significance of Federal Taxes as Automatic Stabilizers," *Journal of Economic Perspectives*, vol. 14, no. 3 (Summer 2000), pp. 37–56; Thomas J. Kniesner and James P. Ziliak, "Tax Reform and Automatic Stabilization," *American Economic Review*, vol. 92, no. 3 (June 2002), pp. 590–612.

Figure 1.**Distribution of Changes in Workers' Annual Real Earnings from 2002 to 2003**

(Percent)



Source: Congressional Budget Office based on data from the Social Security Administration's Continuous Work History Sample.

Note: The sample consists of workers ages 25 to 55 who had earnings in 2002 or 2003 from employment covered by Social Security. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_{2003} - e_{2002}) / ((e_{2003} + e_{2002}) / 2)) * 100$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers.

- Includes workers who had covered earnings in 2002 but not in 2003. Those workers are also included in the categories reflecting decreases in earnings of 50 percent or more and 25 percent or more.
- Includes workers who had no earnings in 2002 but did have earnings in 2003. Those workers are also included in the categories reflecting increases in earnings of 50 percent or more and 25 percent or more.

and restricting the analysis to workers with earnings in both years yields results similar to those of this analysis.

Variability in Individual Earnings Over Time

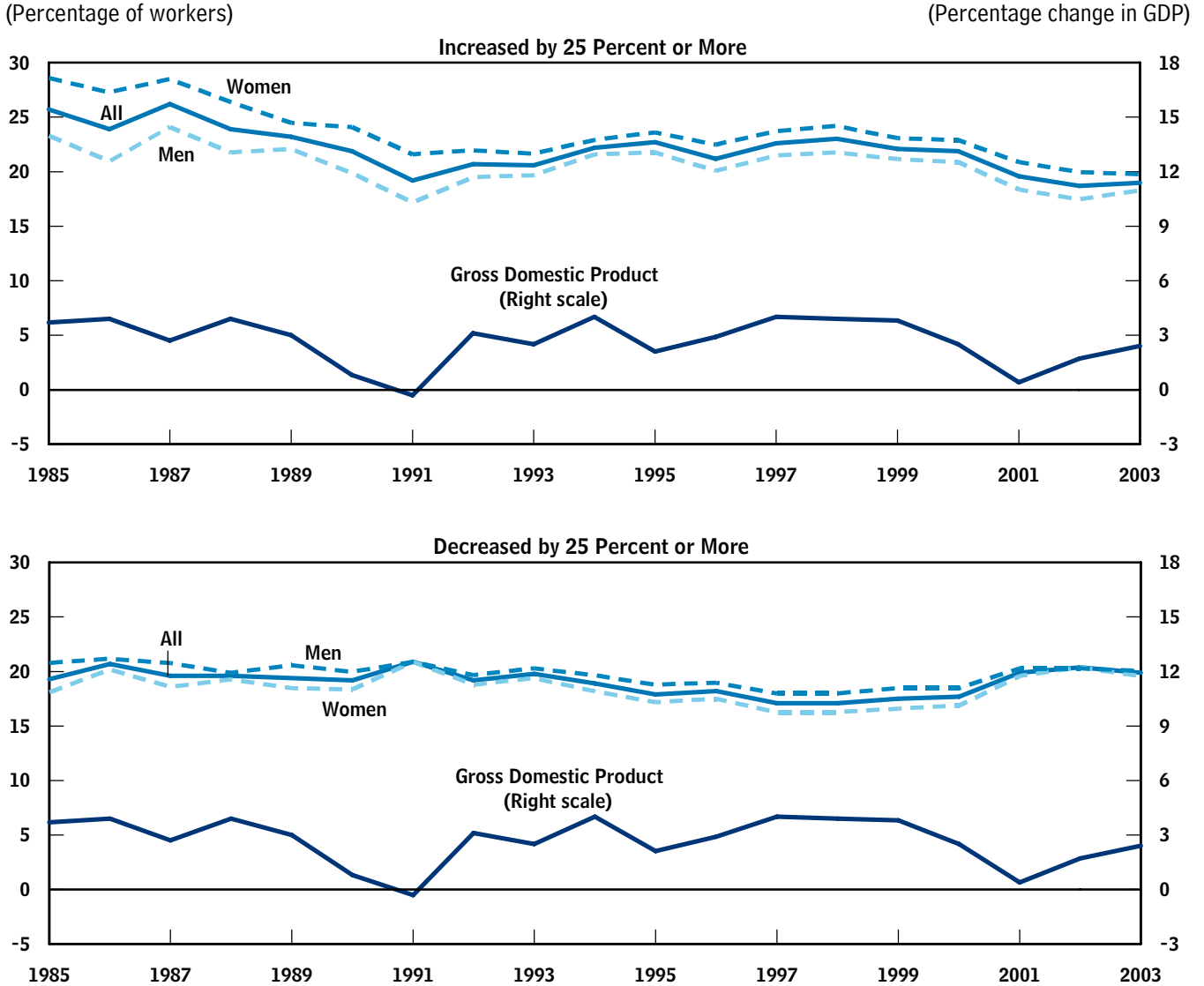
Earnings variability, as measured by the fraction of workers experiencing changes of 25 percent or more in earnings, tends to move in concert with economic growth over the 1984–2003 period. The fraction of workers experiencing a large increase in earnings tends to decline as economic growth slows—for example, during the late 1980s/early 1990s and the early 2000s—and tends to increase as economic growth increases, as in the mid- to late 1990s (see Figure 2, in which changes in gross domestic product represent economic growth). The fraction of workers experiencing a large decrease in earnings

was less affected by changing economic growth during the 1990s, though it increased during the economic downturn of the early 2000s. Despite an underlying cyclical variability to earnings variability, the overall trend has been roughly flat since the mid-1980s. In each year, about 20 percent of workers saw their earnings decrease by 25 percent or more, and 20 percent to 25 percent of workers saw their earnings increase by 25 percent or more.

CBO's finding that earnings variability roughly parallels economic growth over the past two decades is consistent with the economics literature. Two separate studies—one by Donggyun Shin and Gary Solon and one by Karen Dynan, Douglas Elmendorf, and Daniel Sichel—using measures of earnings variability most comparable with

Figure 2.

Percentage of Workers Whose Earnings Increased or Decreased by 25 Percent or More from the Previous Year, by Sex



Source: Congressional Budget Office based on earnings data from the Social Security Administration’s Continuous Work History Sample and on gross domestic product data from the Bureau of Economic Analysis.

Note: The sample consists of workers ages 25 to 55 who had earnings from employment covered by Social Security in either the reference year or the previous year. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_t - e_{t-1}) / ((e_t + e_{t-1}) / 2)) * 100$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers.

those presented here and data from the Panel Study of Income Dynamics (PSID) found similar results.⁴

Another strand of the literature on earnings variability, beginning with the seminal work of Peter Gottschalk and Robert Moffitt, separates changes in men's earnings into two components: the portion due to permanent changes in earnings (such as a pay raise) and the portion due to transitory changes (such as a one-time bonus payment).⁵ The results from those studies are roughly consistent with CBO's, but explicit comparisons are complicated by the substantial differences in the methods used.⁶ CBO makes no distinction between permanent and transitory changes in earnings, choosing instead to examine the overall changes in earnings.⁷

4. Donggyun Shin and Gary Solon, *Trends in Men's Earnings Volatility: What Does the Panel Study of Income Dynamics Show?* Working Paper No. 14075 (Cambridge, Mass.: National Bureau of Economic Research, June 2008); Karen E. Dynan, Douglas W. Elmendorf, and Daniel E. Sichel, *The Evolution of Household Income Volatility*, Finance and Economics Discussion Series, Working Paper 2007-61 (Federal Reserve Board, October 2007).

Making detailed comparisons of the three studies is complicated by differences in methodology and sample selection. For instance, Shin and Solon examined male heads of households; Dynan, Elmendorf, and Sichel examined all heads of households and their spouses; and CBO examined workers, not just individuals who head a household. The administrative data CBO used lack the information required to identify an individual as head of a household.

5. Peter Gottschalk and Robert Moffitt, "The Growth of Earnings Instability in the U.S. Labor Market," *Brookings Papers on Economic Activity*, no. 2 (1994).

6. See, for example, Stephen Cameron and Joseph Tracy, "Earnings Variability in the United States: An Examination Using Matched-CPS Data" (unpublished paper, Federal Reserve Bank of New York, October 1998); Steven J. Haider, "Earnings Instability and Earnings Inequality of Males in the United States: 1967–1991," *Journal of Labor Economics*, vol. 19, no. 4 (October 2001), pp. 799–836; Robert A. Moffitt and Peter Gottschalk, "Trends in the Transitory Variance of Earnings in the United States," *Economic Journal*, vol. 112 (2002), pp. C68–C73; Austin Nichols and Seth Zimmerman, *Measuring Trends in Income Variability*, Urban Institute Report (Washington, D.C.: Urban Institute, May 2008).

Cameron and Tracy (1998) examine earnings variability through 1996; Haider (2001), through 1991; Moffitt and Gottschalk (2002), through 1996; and Nichols and Zimmerman (2008), through 2003. Each study finds relatively stable trends in comparable measures of variability since the mid-1980s.

Variability in Individual Earnings, by Sex, Age, and Earnings Quintile

As part of its analysis, CBO examined the variability in individual earnings by workers' sex, age, and earnings quintile.

Sex. Women tend to experience large changes in earnings more frequently than men, although the difference between the sexes, especially in the fraction experiencing a large increase in earnings from the previous year, declined between 1985 and 2003 (see Table 1 and Figure 2). The gap in the percentage experiencing large increases was about 5 percentage points in the late 1980s; it declined to about 2 percentage points in more recent years. The fact that women are more likely to move completely into or out of covered employment accounts for some of the difference between men and women. That factor does not account for all of the difference, however, because even among workers with earnings in both years, women are more likely than men to experience large changes in earnings. A contributing factor may be that women are more likely to switch between full-time and part-time work or to work only part of the year.

Age. Younger workers experience large changes in earnings more frequently than older workers (see Table 1 and the top panel of Figure 3). Some younger workers may still be making the transition from school to work. In addition, younger men and women may be changing jobs or careers more often as they search for suitable employment, whereas older workers may be on a more established career (and salary) path.⁸ Younger women (and, to a lesser extent, younger men) may also be adjusting their employment patterns to accommodate changes at home, especially changes associated with the birth of a child or the youngest child's reaching school age.

The youngest workers examined here—those ages 25 to 29—were more likely to experience increases of 25 percent or more than decreases of 25 percent or more in

7. Shin and Solon link the two strands of the literature, providing a technical discussion of the differences between their analytic approach, which is closely related to the one used here, and Moffitt and Gottschalk's (2002) analytic approach, which separates the overall changes in earnings into transitory and permanent components.

8. See Derek Neal, "The Complexity of Job Mobility Among Young Men," *Journal of Labor Economics*, vol. 17, no. 2 (April 1999), pp. 237–261.

Table 1.**Distribution of Changes in Workers' Annual Real Earnings from 2002 to 2003, by Sex, Age, and Earnings Quintile**

	Decrease in Earnings			Change in Earnings of Less Than 25 Percent	Increase in Earnings		
	Left Covered Employment ^a	50 Percent or More	25 Percent or More		25 Percent or More	50 Percent or More	Entered Covered Employment ^b
All Workers							
Ages 25 to 55	6.1	15.0	19.9	61.1	19.0	13.0	4.9
Sex							
Men	5.9	14.8	19.6	62.1	18.3	12.3	4.7
Women	6.4	15.3	20.1	60.1	19.8	13.8	5.2
Age							
25 to 29	6.8	18.1	23.7	49.7	26.6	18.4	5.7
30 to 39	6.4	16.0	21.0	57.8	21.2	14.5	5.5
40 to 49	5.8	13.7	18.2	64.9	16.9	11.6	4.7
50 to 55	5.9	13.7	18.2	68.2	13.6	9.2	3.9
Earnings Quintile							
Lowest	24.1	41.5	45.7	14.0	40.3	35.9	19.7
Second	4.5	19.0	26.1	48.8	25.1	16.7	3.4
Middle	1.2	7.6	13.0	73.9	13.1	6.5	1.0
Fourth	0.5	3.8	7.5	84.7	7.8	3.0	0.4
Highest	0.3	3.2	7.1	84.1	8.8	3.0	0.3

Source: Congressional Budget Office based on data from the Social Security Administration's Continuous Work History Sample.

Notes: The sample consists of workers ages 25 to 55 who had earnings from employment covered by Social Security in 2002 or 2003. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_{2003} - e_{2002}) / ((e_{2003} + e_{2002}) / 2)) * 100$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers.

- Includes workers who had covered earnings in 2002 but not in 2003. Those workers are also included in the categories reflecting decreases in earnings of 50 percent or more and 25 percent or more.
- Includes workers who had no earnings in 2002 but did have earnings in 2003. Those workers are also included in the categories reflecting increases in earnings of 50 percent or more and 25 percent or more.

earnings between 2002 and 2003 (see Table 1). Many of them, especially those who attended college in their early 20s, may have experienced the relatively rapid growth in earnings often associated with the early stages of one's career, as one quickly gains valuable knowledge and skills. In some instances, a decline in earnings may be part of a trade-off for improved career opportunities or more flexible work arrangements.

The oldest workers examined here—those ages 50 to 55—were more likely to experience large decreases than large increases in earnings between 2002 and 2003 (see

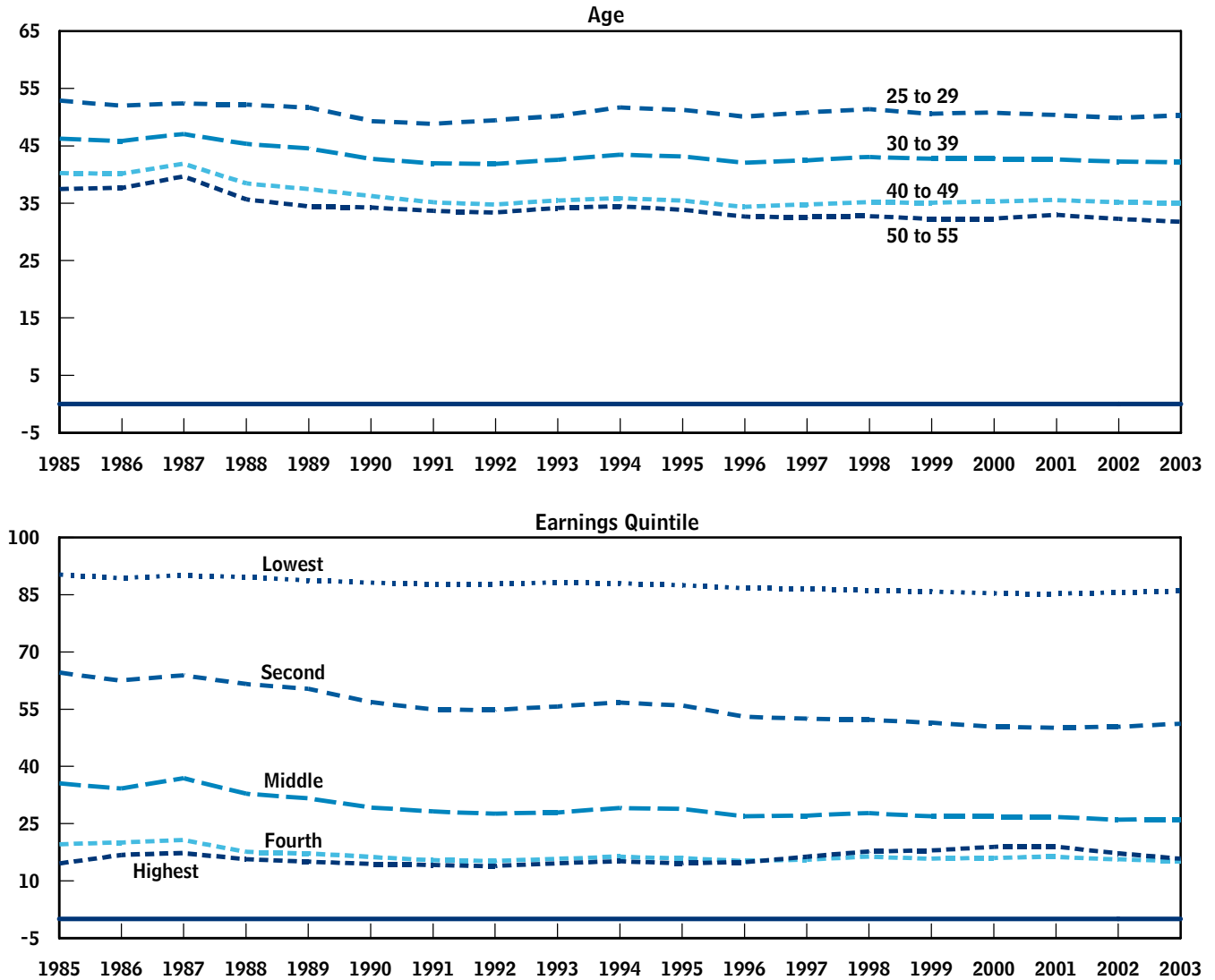
Table 1). Some of those workers may have worked fewer hours because of an illness or disability or in preparation for retirement.

Earnings Quintile. Workers with relatively low earnings tend to have greater variability in their earnings than workers with relatively high earnings (see Table 1 and the bottom panel of Figure 3). Younger workers, many of whom are just beginning their career, and less-educated workers tend to have relatively low earnings (that is, are more likely to be in the bottom quintile of the earnings distribution) and tend to experience greater variability in

Figure 3.

Percentage of Workers Whose Earnings Changed by 25 Percent or More from the Previous Year, by Age and Earnings Quintile

(Percent)



Source: Congressional Budget Office based on earnings data from the Social Security Administration's Continuous Work History Sample and on gross domestic product data from the Bureau of Economic Analysis.

Note: The sample consists of workers ages 25 to 55 who had earnings from employment covered by Social Security in either the reference year or the previous year. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_t - e_{t-1}) / ((e_t + e_{t-1}) / 2)) * 100$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers. Earnings quintiles are based on average earnings over the two-year period.

earnings compared with older or more educated workers.⁹ Furthermore, people who move entirely to or from covered employment have a year of zero earnings included in the calculation of their average earnings. Thus, they are more likely to be in the bottom quintile of the earnings distribution and to experience a large percentage change in earnings.¹⁰

Limitations of the Analysis

An advantage of the CWHS data used in this analysis is that they include the earnings of very high earners, which are often unavailable in survey data.¹¹ Furthermore, the data are not subject to errors in respondents' recall (as survey data are) and are consistently available over many years.

A disadvantage of the data is that they do not capture all earnings. In particular, they do not include the earnings of workers who are not covered by Social Security (for instance, some state, local, and federal government employees), income from self-employment, and unreported earnings.

Excluding the earnings from employment not covered by Social Security as well as income from self-employment and unreported earnings is likely to have little or no effect on the trend in variability. The fraction of civilian workers who are not covered by Social Security is relatively small (less than 10 percent) and did not change substantially over the study period.¹² Thus, including those earnings would probably not appreciably change the overall trends seen here. The CWHS data on self-employment income were available only from 1991 to 2003, and including such income over that period decreases the amount of variability only slightly and does not change the trend in variability. Regarding unreported earnings, unless trends in those earnings changed dramatically over

the study period, omitting that category would not significantly affect the trends in variability. (See the appendix for more details.)

Variability in Household Income

CBO extended its work on the variability in individual earnings to measure the variability in household income. Changes in individual earnings are important, but changes in overall economic well-being are better captured by changes in the income available to a household. Household income includes the labor income (earnings and self-employment income) received by all members of a household in addition to any forms of nonlabor income (such as unemployment insurance or interest income). Those additional sources of income can mitigate—or, in some cases, exacerbate—the effect of changes in an individual's own earnings on well-being.

Large changes in household income are less common than large changes in individual earnings. For example, 25 percent of households headed by people ages 25 to 55 saw their income change by 25 percent or more between 2004 and 2005, but roughly 40 percent of individuals ages 25 to 55 saw their earnings change by that much between 2002 and 2003 (see Figures 1 and 4).¹³

Although large changes in household income are less common than large changes in individual earnings, the link between the two is quite strong. Changes in earnings are a major contributor to swings in household income of 25 percent or more from one year to the next. Many fewer households would experience such large swings in income if the earnings of the household members remained unchanged.

The presence of additional sources of income beyond one's own earnings, whether from other earners or non-labor income, tends to mitigate the effect of large changes in a person's earnings on household income. For example, if one worker in a household with multiple workers loses a job and his or her earnings decline to zero, the earnings

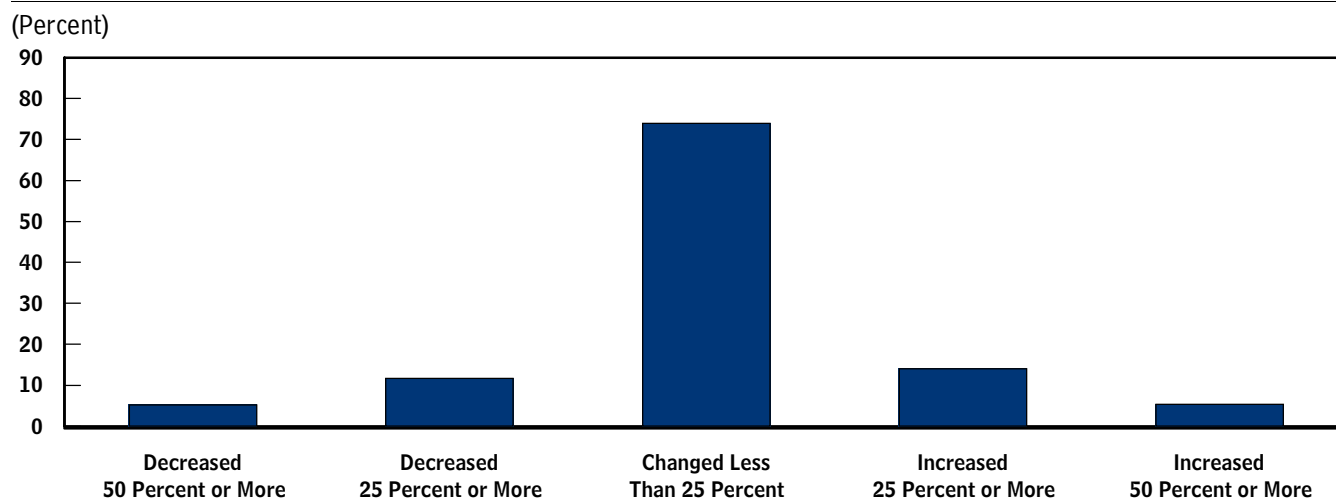
9. For variability of workers' earnings by educational attainment, see Congressional Budget Office, "Trends in Earnings Variability Over the Past 20 Years," Table 2.

10. Earnings quintiles are based on average earnings over the two-year period.

11. Surveys often cap reported earnings to protect the identity of respondents.

12. See House Committee on Ways and Means, *2004 Green Book: Background Material and Data on the Programs Within the Jurisdiction of the Committee on Ways and Means*, WMCP: 108-6 (March 2004).

13. The most recent years of data available in the data set used for the analysis of variability in individual earnings were 2002 and 2003. The most recent years of data available in the data set used for the analysis of variability in household income were 2004 and 2005; data for 2002 and 2003 were not available in that data set.

Figure 4.**Distribution of Changes in Households' Annual Real Income from 2004 to 2005**

Source: Congressional Budget Office based on data from the 2004 panel of the Survey of Income and Program Participation matched to the Detailed Earnings Record (DER) from the Social Security Administration.

Note: The sample consists of households headed by a person ages 25 to 55 and in which all members ages 18 to 64 were successfully matched to the DER. Households in the top and bottom 1 percent of the income distribution in each year are excluded from the sample. Income, which is measured before taxes, includes administrative earnings and self-employment income, unemployment compensation, workers' compensation, Social Security benefits, Supplemental Security Income, public assistance, veterans' payments, survivors' benefits, disability benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates or trusts, alimony, child support, financial assistance from outside the household, and other cash income. The percentage change in income is defined here as $((Y_{2005} - Y_{2004}) / ((Y_{2005} + Y_{2004}) / 2)) * 100$. Before the percentage change was calculated, income was adjusted for inflation using the research series of the consumer price index for all urban consumers.

of the other workers are likely to cushion the effect of the one person's earnings loss on household income.

Decreases in earnings may also be partially offset by increases in nonlabor income. Unemployment insurance benefits played a substantial role in maintaining the family income of recipients who experienced a long-term spell of unemployment during the economic downturn in 2001 or early 2002—particularly those who did not have other wage earners in their family.¹⁴

Although income can be used as an indicator of economic well-being, a change in income does not necessarily indicate a change in well-being. To be sure, many households that have a substantial increase in income

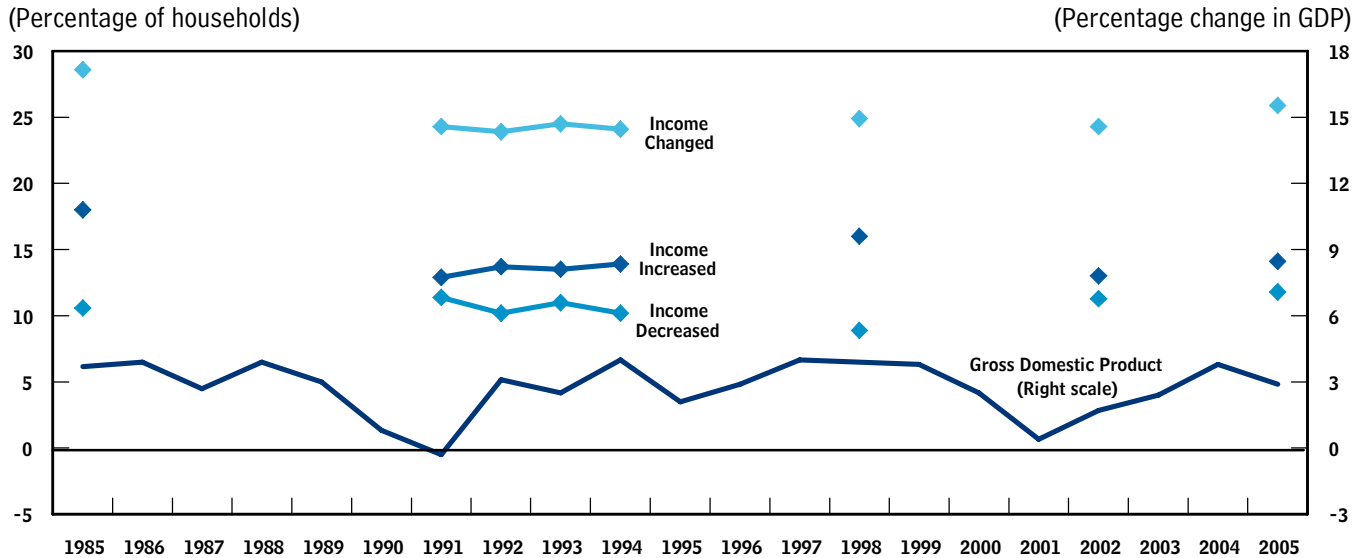
really are better off, and many that have a substantial decrease in income face true economic hardship. However, a household that moves to an area with a high cost of living for a higher-paying job may find itself struggling with larger expenses in the new location. Conversely, a drop in income may be associated with a move to an area with a lower cost of living and thereby with an increase in living standards, not a decrease.

The true economic effect of identical changes in income also may differ across households. For instance, a married couple in which one partner stops working in the paid labor market after the birth of a child may be able to anticipate and prepare for that loss of income. By contrast, an otherwise identical married couple in which one partner unexpectedly loses his or her job and cannot find work may be less prepared for that same loss of income. The two households had similar decreases in income, but the impact on well-being could have been quite different.

14. See Congressional Budget Office, *Family Income of Unemployment Insurance Recipients* (March 2004), and *Long-Term Unemployment* (October 2007). Households may also rely on existing assets (savings or home equity) to offset decreases in earnings. Those assets are not captured by the measure of household income used here.

Figure 5.

Percentage of Households Whose Income Changed by 25 Percent or More from the Previous Year



Source: Congressional Budget Office based on data from various panels of the Survey of Income and Program Participation matched to the Detailed Earnings Record (DER) from the Social Security Administration.

Notes: The sample consists of households headed by a person ages 25 to 55 and in which all members ages 18 to 64 were successfully matched to the DER. Households in the top and bottom 1 percent of the income distribution in each year are excluded from the sample. Income, which is measured before taxes, includes administrative earnings and self-employment income, unemployment compensation, workers' compensation, Social Security benefits, Supplemental Security Income, public assistance, veterans' payments, survivors' benefits, disability benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates or trusts, alimony, child support, financial assistance from outside the household, and other cash income. The percentage change in income is defined here as $((y_t - y_{t-1}) / ((y_t + y_{t-1}) / 2)) * 100$. Before the percentage change was calculated, income was adjusted for inflation using the research series of the consumer price index for all urban consumers.

Data are not available for all years.

Data and Methods

CBO used data from multiple panels of the Census Bureau's Survey of Income and Program Participation (SIPP) matched to data on earnings and self-employment income from the Social Security Administration's (SSA's) Detailed Earnings Record (DER) to examine the variability in income of households headed by people ages 25 to 55.¹⁵

Household income was constructed from SSA's data on earnings and self-employment income for all members of the household and from nonlabor income as reported in the SIPP. Using administrative data for earnings and self-employment income allows for a more consistent measure of household income over the study period than the survey data alone would provide. The effects of using SSA's data are discussed in more detail in the appendix.

15. The earliest panel used was the 1984 panel of the SIPP, in which data for calendar years 1984 and 1985 are available. Subsequent panels for which CBO had access to the matched administrative data were the 1990, 1991, 1992, 1993, 1996, 2001, and 2004 panels. Hence, the data used are not available for every year from 1984 to 2005. The DER data used in this analysis (unlike the CWSHS data used in the analysis of earnings) include SSA's data on self-employment income for all years covered by the study.

CBO adjusted income for inflation using the research series of the consumer price index for all urban consumers (CPI-U-RS). The percentage change in income is defined analogously to the percentage change in individual earnings: It is the difference in income between year t and year $t-1$, divided by average income over the two-year period.

Variability in Household Income Over Time

Variability in household income—as measured by the fraction of households with a change in income of 25 percent or more in either direction—has been relatively stable since 1984. In most years for which data are available, roughly one in four households experienced a swing in income of 25 percent or more from one year to the next (see Figure 5).

Recent changes in household income appear to be sensitive to the business cycle, though less so than changes in earnings. Drawing strong conclusions about the sensitivity of trends in household income variability to the business cycle would require more historical data, covering more economic peaks and valleys, than are available here. However, in recent periods of economic expansion (for example, between 1994 and 1998), the fraction of households experiencing large increases in income rose and the fraction experiencing large decreases fell slightly. And in recent periods of slower economic growth (for example, between 1998 and 2002), the fraction of households experiencing large increases in income declined and the fraction experiencing large decreases rose (see Figure 5).

Consensus has not yet been reached in the economics literature on the trends in variability in household income over the past 20 or so years. CBO's analysis of survey data from various panels of the SIPP linked with data on earnings from SSA's Detailed Earnings Record suggests that variability in household income has changed little since 1985.

Most of the literature on the trends in variability in family income relies on a different data set, the Panel Study of Income Dynamics.¹⁶ Using the PSID and a measure of variability closely related to that presented here, Dynan, Elmendorf, and Sichel found that variability in family income was unchanged in the late 1980s, increased during the early 1990s, and was unchanged again from the mid-1990s to the mid-2000s.¹⁷ They note that PSID data in the early 1990s should be viewed with caution because the survey underwent multiple significant changes during that period.¹⁸ Except for the run-up in

variability seen in the PSID in the early 1990s—the precise time for which caution is suggested—CBO's findings on changes in variability in household income since the mid-1980s are generally consistent with that study.

Other researchers examining the same data set have reached different conclusions. Elisabeth Jacobs analyzed the PSID, omitting the data from the early 1990s because of the major changes in the data, and found no significant increase in variability in family income between 1985 and 2005.¹⁹ However, in later work, Jacob Hacker and Jacobs found that variability in family income was unchanged in the late 1980s, increased dramatically in the early 1990s, decreased dramatically between 1993 and 1998 (though it remained higher than its earlier

16. CBO analyzes households, which include all people living together in a housing unit at the time of the interview. See U.S. Census Bureau, *Survey of Income and Program Participation Users' Guide*, 3rd ed. (prepared by Westat, 2001). The PSID provides data on the family unit, defined as a group of people living together as a family. That includes people related by blood, marriage, or adoption, as well as those who are permanently living together and who share both income and expenses. Not everyone living in a household is automatically part of the PSID-defined family unit. See Martha S. Hill, *The Panel Study of Income Dynamics: A User's Guide* (Newbury Park, Calif.: Sage Publications, 1992).

The differences between a household as defined by the SIPP and a family unit as defined by the PSID are likely to be quite small and, thus, unlikely to be a major reason for differences in results across studies.

17. Dynan, Elmendorf, and Sichel, *The Evolution of Household Income Volatility*.

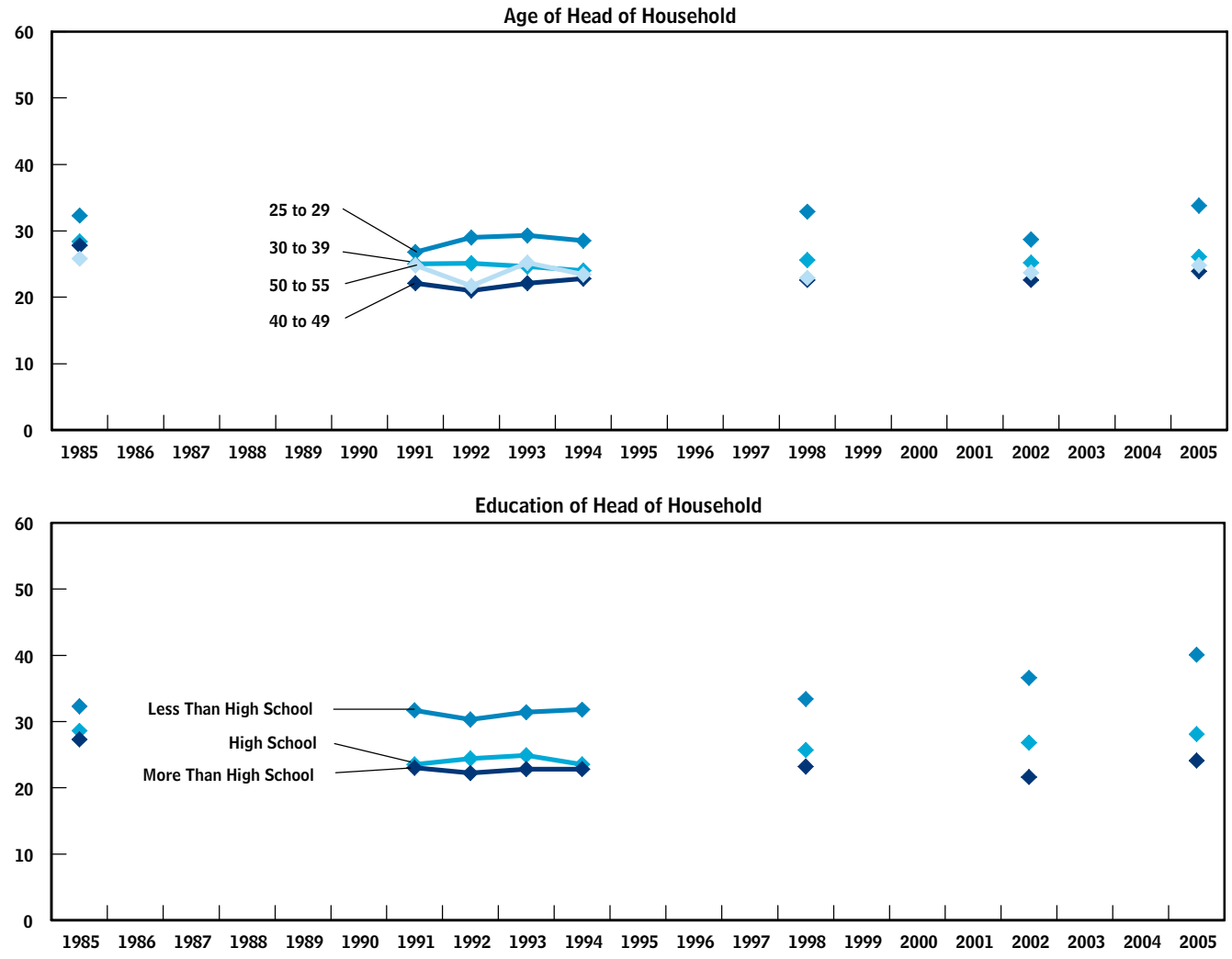
18. See also Yong-Seong Kim and Frank P. Stafford, *The Quality of PSID Income Data in the 1990's and Beyond*, Panel Study of Income Dynamics Technical Paper Series, No. 00-03 (Ann Arbor: University of Michigan, Institute for Social Research, December 2000).

19. Elisabeth Jacobs, *The Politics of Economic Insecurity*, Issues in Governance Studies, No. 10, Brookings Institution (September 2007). Jacobs measures the variability in family income resulting from transitory changes in income (such as a one-time bonus payment).

Figure 6.

Percentage of Households Whose Income Changed by 25 Percent or More from the Previous Year, by Age and Education of Head, Household Structure, and Income Quintile

(Percent)



Continued

level), and increased again during the 2001 recession.²⁰ Using the PSID, Peter Gosselin and Seth Zimmerman

and, in separate work, Austin Nichols and Zimmerman found that variability in family income has been increasing steadily since the mid-1980s.²¹ Nichols and Zimmerman note that their finding is consistent for several different measures of variability. Although CBO’s analysis

20. Hacker and Jacobs also note that results based on PSID data from the early to mid-1990s may be less reliable than for other time periods. See Jacob S. Hacker and Elisabeth Jacobs, *The Rising Instability of American Family Incomes, 1969–2004: Evidence from the Panel Study of Income Dynamics*, Economic Policy Institute Briefing Paper No. 213 (May 29, 2008). Hacker and Jacobs measure the variability in family income resulting from transitory changes in income (such as a one-time bonus payment).

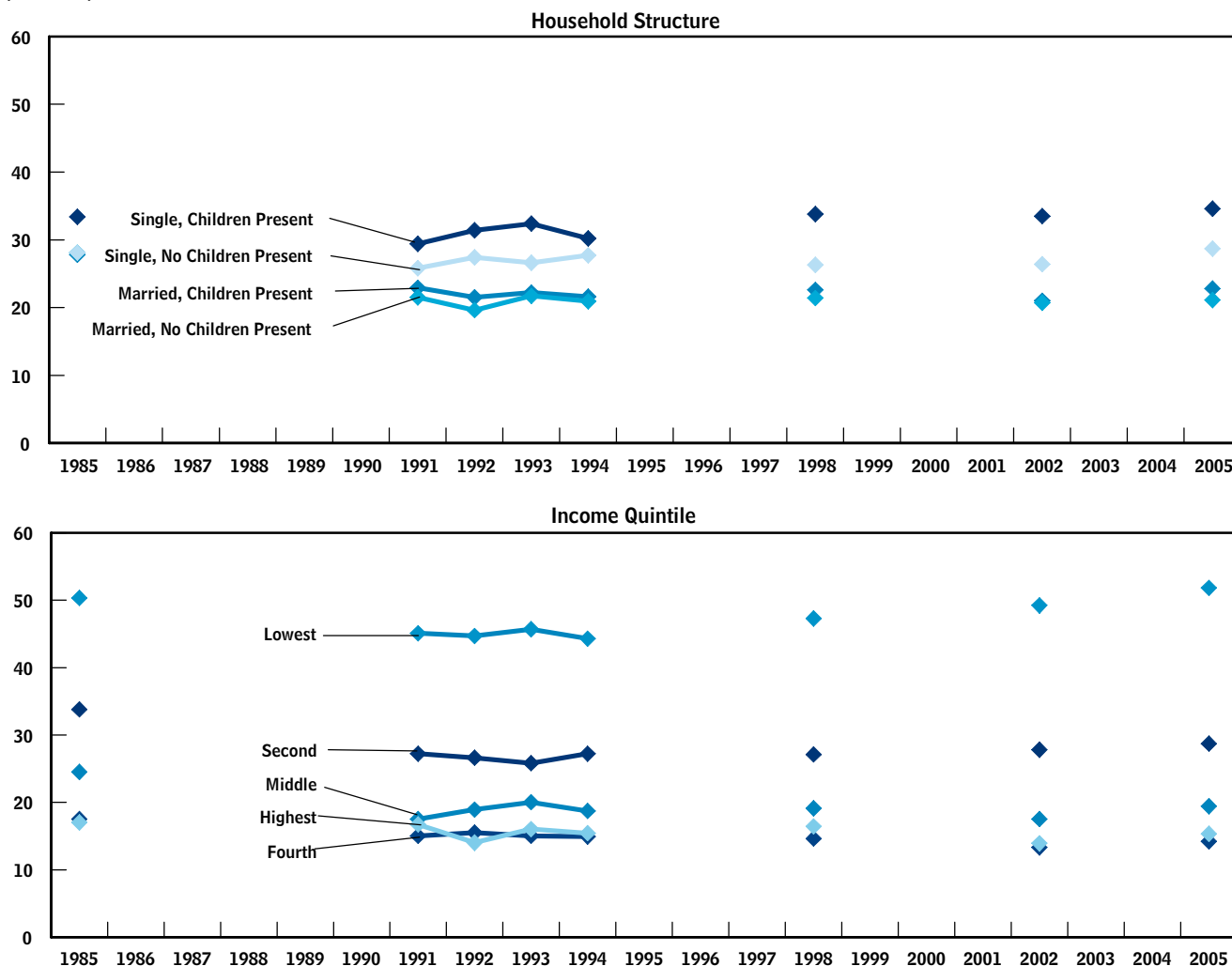
21. Peter Gosselin and Seth Zimmerman, *Trends in Income Volatility and Risk, 1970–2004*, Urban Institute Working Paper (Washington, D.C.: Urban Institute, May 2008); Nichols and Zimmerman, *Measuring Trends in Income Variability*. Gosselin and Zimmerman measure the transitory variability in family income.

Figure 6.

Continued

Percentage of Households Whose Income Changed by 25 Percent or More from the Previous Year, by Age and Education of Head, Household Structure, and Income Quintile

(Percent)



Source: Congressional Budget Office based on data from various panels of the Survey of Income and Program Participation matched to the Detailed Earnings Record (DER) from the Social Security Administration.

Notes: The sample consists of households headed by a person ages 25 to 55 and in which all members ages 18 to 64 were successfully matched to the DER. Households in the top and bottom 1 percent of the income distribution in each year are excluded from the sample. Income, which is measured before taxes, includes administrative earnings and self-employment income, unemployment compensation, workers' compensation, Social Security benefits, Supplemental Security Income, public assistance, veterans' payments, survivors' benefits, disability benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates or trusts, alimony, child support, financial assistance from outside the household, and other cash income. The percentage change in income is defined here as $((y_t - y_{t-1}) / ((y_t + y_{t-1}) / 2)) * 100$. Before the percentage change was calculated, income was adjusted for inflation using the research series of the consumer price index for all urban consumers. Income quintiles are based on average income over the two-year period.

Data are not available for all years.

constructs income using administrative data on earnings, which are more consistent over time and tend to be of higher quality than survey data, more work needs to be done to reconcile the different results across studies.

Variability in Household Income, by Age, Education, Household Structure, and Income Quintile

CBO examined the variability in household income by age and education of the head of the household, the structure of the household, and income quintile.

Age. The income of households headed by a younger person tends to vary more than the income of those headed by someone older (see Figure 6). The earnings of younger people tend to be more variable, which is likely to translate into greater variability in the income of the households they head. Income variability tends to be higher for households headed by people in their late 20s than for those headed by people in their 30s; it is higher for households headed by people in their 30s than for households headed by people in their 40s. Variability is somewhat greater for households headed by people in their early 50s than by those in their 40s, possibly because the older group includes people who begin to work fewer hours as a result of illness or disability or retire early.

Over the past 10 years or so, the income variability of households headed by a younger person has roughly paralleled economic growth. Between 1994 and 1998, a period of strong economic growth, the overall increase in variability for households headed by a younger person resulted entirely from a rise in the percentage of such households experiencing a large increase in income. Between 1998 and 2002, a period of slowing economic growth, that percentage declined, and the percentage that experienced large decreases in income rose somewhat. The relationship between economic growth and variability in household income between 2002 and 2005 is less clear. The overall rise in income variability during that period—a period of stronger economic growth than that from 1998 to 2002—was mostly due to an increase in the proportion of households headed by a younger person experiencing large increases in income. About a quarter of the overall increase was due to an increase in the percentage of such households experiencing large decreases in income.

Education. The income of households headed by a person with less than a high school education tends to vary more than that of other households (see Figure 6). People with less than a high school education tend to have low earnings, and low earners tend to have higher levels of earn-

ings variability (see Table 1 and Figure 3). Furthermore, people are likely to marry someone who has a similar level of education.²² A household headed by a high school dropout that has other members who are also high school dropouts is likely to have multiple earners with greater variability in earnings and thus more likely to have highly variable household income.

The percentage of households headed by a person with less than a high school education and experiencing a large change in household income grew between 1994 and 2005. That share changed little between 1994 and 1998, a period of strong economic growth, because the rise in the percentage of those households experiencing a large increase in income was offset by a fall in the percentage experiencing a large decrease. Between 1998 and 2002, a period of slowing economic growth, the fraction of those households experiencing a large decrease in income rose. Then between 2002 and 2005, a period of stronger economic growth, the fraction of those households experiencing a large increase in income rose.²³ In both 1994 and 2005, more than 60 percent of those households headed by a person with less than a high school education that experienced a large change in income saw their income increase from the previous year. In each of those years, nearly 40 percent experienced a large decrease in income from the previous year.

Household Structure. The income of households headed by a person who is widowed, divorced, separated, or never married tends to be more variable than that of households headed by a married person (see Figure 6). For a married couple, changes in one spouse's earnings may be offset by changes in the earnings of the other spouse. For a married couple in which both partners are working, even if the change in earnings of one spouse is not offset by a change in earnings of the other spouse, the

22. Robert D. Mare, "Five Decades of Educational Assortative Mating," *American Sociological Review*, vol. 56, no. 1 (February 1991), pp. 15–32; John Pencavel, "Assortative Mating by Schooling and the Work Behavior of Wives and Husbands," *American Economic Review*, vol. 88, no. 2 (May 1998), pp. 326–329.

23. The fraction of households headed by a person with less than a high school education fell from 9 percent in the 2001 panel of the SIPP (associated with the 2002 results) to 5 percent in the 2004 panel (associated with the 2005 results), a large decline over a relatively short time frame. Some of the changes in income variability between 2002 and 2005 for households headed by a person with less than a high school education may be due to shifts in the underlying sample resulting from changes in the reporting of education in the SIPP, other changes in the SIPP, or changes in the match to SSA's data on earnings.

percentage change in total income from the variation in one person's earnings is smaller than it would be if there was only one worker. In contrast, for a household headed by a person who is not married, changes in that person's earnings are more likely to translate into large percentage changes in household income.

The income of households headed by an unmarried person and in which children are present tends to be more variable than that of households headed by an unmarried person and in which no children are present. Some people in households with children present may choose more flexible work arrangements, which may, in turn, be associated with greater variability in earnings. Others may find that the responsibility associated with caring for a child (including unplanned absences from work to care for a sick child, for instance) make it difficult to maintain a job. That variability in earnings may translate into variability in household income for many such households.

Between 1994 and 2005, income variability rose for households headed by people who are single and in which children are present. During the period of strong economic growth between 1994 and 1998, the percentage of those households that experienced large increases in income rose. That percentage declined as economic growth weakened between 1998 and 2002, but overall variability for that category changed little because more of those households had large decreases in income. As economic growth again strengthened between 2002 and 2005, the fraction of those households with large declines in income fell somewhat, and the fraction with large increases in income rose. In both 1994 and 2005, of those households headed by people who are single and include children that experienced large changes in income, 60 percent saw their income increase by 25 percent or more from the previous year.

Income Quintile. The income of lower-income households tends to vary much more than that of higher-income households.²⁴ Many low-income households are made up of people with earnings that are low and more variable, and because changes in nonlabor income may not completely offset changes in earnings, the variability

in workers' earnings is likely to translate into variability in household income.

For households in the lowest quintile of the income distribution, changes in income variability have roughly followed changes in economic growth over the past decade. During the period of strong economic growth between 1994 and 1998, the fraction of those households experiencing a large increase in income rose. As economic growth weakened between 1998 and 2002, the percentage experiencing a large decrease in income rose. Since the 2001 recession, a period of stronger economic growth, the relationship between income variability and economic growth has been less clear. During that period, about two-thirds of the increase in income variability for households in the lowest income quintile was the result of a rise in the fraction of those households experiencing an increase in income; the remainder was the result of a small rise in the share whose income decreased.

Limitations of the Analysis

The measure of household income used here reflects only before-tax income. Changes in the tax system over time (including expansions in the earned income tax credit) and changes in taxes at a given point in time may have increased or decreased variability in after-tax income. The tax system tends to reduce the tax burden when before-tax income declines and to raise the burden when before-tax income rises. After-tax income therefore tends to vary less than before-tax income.

Although the federal tax system generally smooths out fluctuations in income, that attribute does not apply for every taxpayer. For example, the payroll tax for the Old-Age, Survivors, and Disability Insurance program does not apply to earnings above the taxable maximum (\$102,000 in 2008). As a result, when earnings fluctuate across that threshold, after-tax earnings can vary more in percentage terms than before-tax earnings.²⁵ The measure of household income used in this analysis does not capture the value of household assets, such as savings or equity in a home, and the relationship between assets and household income is not examined. Nor does the measure of household income capture other measures of a household's well-being, such as its consumption or the health of its members.

24. As with low earners, households with low income experience greater variability in part because of the way in which households are categorized into income quintiles. Income quintiles are based on average household income over the two-year period. Households with very large swings in income are more likely to be in the bottom quintile of the income distribution than a better measure of their permanent income might warrant.

25. See statement of Peter R. Orszag (February 28, 2007); Robert Moffitt and Michael Rothschild, "Variable Earnings and Nonlinear Taxation," *Journal of Human Resources*, vol. 22, no. 3 (Summer 1987), pp. 405–421.



Appendix: Data, Methods, and Alternative Measures of Variability

This appendix reviews the data and methods that the Congressional Budget Office (CBO) used to analyze the variability in individual earnings and household income and presents some alternative measures of variability.

Variability in Individual Earnings

To examine trends in variability in individual earnings, CBO used data from the Continuous Work History Sample (CWHS) provided by the Social Security Administration (SSA). Those data contain longitudinal administrative earnings records for a 1 percent random sample of Social Security numbers. Each year of CWHS data contains more than 700,000 people ages 25 to 55 who have earnings, and recent years contain about 1 million such people.

Earnings, as defined in this analysis, include wage and salary earnings, tips, and some other forms of compensation. They exclude self-employment income and deferred compensation, such as an employee's 401(k) contributions. The data are not subject to top-coding; that is, information on the very highest earners is retained. Using the Survey of Income and Program Participation (SIPP) to examine the variability in household income (discussed below) necessarily restricts that analysis to 1984 and later years because earlier data are not available. For consistency, CBO begins its analysis of earnings variability in 1984 as well; that analysis ends in 2003, the most recent year of data available to CBO.

Data and Methods

The analysis focuses on workers ages 25 to 55 during the 1984–2003 period. Restricting the sample to people in that age range reduces the number of earnings transitions

associated with education (earlier in life) or retirement (later in life).

After indexing earnings to 2006 dollars using the research series of the consumer price index for all urban consumers (CPI-U-RS), CBO constructed a percentage change in earnings from one year to the next for each individual. That percentage change (known as the arc percentage change) in earnings e is defined here for time period t as $((e_t - e_{t-1}) / ((e_t + e_{t-1}) / 2)) * 100$. Defining the percentage change in that way includes individuals who move from zero to positive earnings and those who move from positive to zero earnings symmetrically: A person entering employment covered by Social Security has a 200 percent change in earnings and a person leaving covered employment has a -200 percent change in earnings. A more traditional definition of percentage change— $((e_t - e_{t-1}) / e_{t-1}) * 100$ —yields undefined results for workers moving from zero to positive earnings (that is, for whom e_{t-1} equals zero). Relative to the traditional measure of the percentage change, the arc percentage change used in this analysis understates increases in earnings and overstates decreases in earnings.

Benefits and Limitations of Administrative Earnings Data

Using administrative data has both benefits and limitations. Among the benefits, administrative records provide a consistent measure of earnings for individuals over many years. In addition, the sample sizes are quite large. Furthermore, administrative data are based on employers' reports of individual earnings and therefore are not subject to survey respondents' errors in recall or to issues of rounding or nonresponse.

Although data on earnings in administrative records are generally presumed to be of higher quality than self-reported earnings in surveys, administrative data do not reflect all types of earnings.¹ Because they are based on earnings as reported by employers for a random sample of Social Security numbers, administrative records miss cash-based employment (or earnings received in the so-called underground economy) as well as the earnings of workers who do not have or do not report a valid Social Security number. The underground economy can include a variety of illegal activities such as theft and may also include legal activities by illegal immigrants or compensation paid “under the table.” Mark Ledbetter estimates that total wages and salaries paid in the underground economy amount to about 2 percent of the nation’s total earnings.² Whether the amount of, or variability in, those earnings has changed significantly over time is unclear. Earnings in the underground economy, which are not reflected in administrative data, may not be captured well in survey data either.

The CWHS data used here capture earnings only from workers in the covered sector—that is, workers who are actively contributing to Social Security. In 1985, 93 percent of paid civilian workers were in the covered sector; by 2002, that share had risen to 96 percent. The majority of uncovered earnings come from state, local, or federal government workers.³ Including that relatively small sector is not likely to have a significant effect on the results.

1. For discussions of the validity of survey reports of earnings compared with that of administrative records of earnings, see John M. Abowd and Martha H. Stinson, “Estimating Measurement Error in SIPP Annual Job Earnings: A Comparison of Census Survey and SSA Administrative Data” (unpublished, January 2005); John Bound and Alan B. Krueger, “The Extent of Measurement Error in Longitudinal Earnings Data: Do Two Wrongs Make a Right?” *Journal of Labor Economics*, vol. 9, no. 1 (January 1991), pp. 1–24; Julian Cristia and Jonathan A. Schwabish, *Measurement Error in the SIPP: Evidence from Matched Administrative Records*, Congressional Budget Office Working Paper 2007-03 (January 2007).
2. Mark A. Ledbetter, “Comparison of BEA Estimates of Personal Income and IRS Estimates of Adjusted Gross Income: New Estimates for 2004 and Revised Estimates for 2003,” *Survey of Current Business*, vol. 86, no. 11 (BEA, November 2006), pp. 29–36, Table 1.
3. House Committee on Ways and Means, *2004 Green Book: Background Material and Data on the Programs Within the Jurisdiction of the Committee on Ways and Means*, WMCP: 108-6 (March 2004), Table 1-7 and p. 1-4.

The administrative records on earnings used in the main analysis exclude income from self-employment, but the CWHS contains data on that type of income since 1991. CBO examined how including self-employment income would affect the trends in earnings variability from that year forward and found that it had little effect. In the final year of available data (2003), less than 8 percent of people ages 25 to 55 in the CWHS had self-employment income, and about half of them also had covered earnings. Thus, although self-employment income varies more than covered earnings, there are not enough self-employed workers to change the overall story (see Figure A-1).⁴

Another limitation of the administrative data is that they contain almost no information on demographic or household characteristics. Demographic information is limited to year of birth and sex; no information is available on family or household linkages, nonlabor income, or assets. Moreover, there is no information on the reasons for a change in earnings. The data, for example, do not indicate the circumstances surrounding a worker’s move into employment (from zero to positive covered earnings). The worker may have returned to work after an illness, disability, or caregiving for a family member. Or the worker may simply be moving from self-employment or employment in the uncovered sector in one year to covered employment in the next. Or perhaps the worker is an immigrant who has begun working in the United States. Similarly, a worker who stops working in the covered sector (moves from positive to zero earnings) may have quit paid work because of a disability or to care for a family member, moved to uncovered work or self-employment, emigrated, or died.

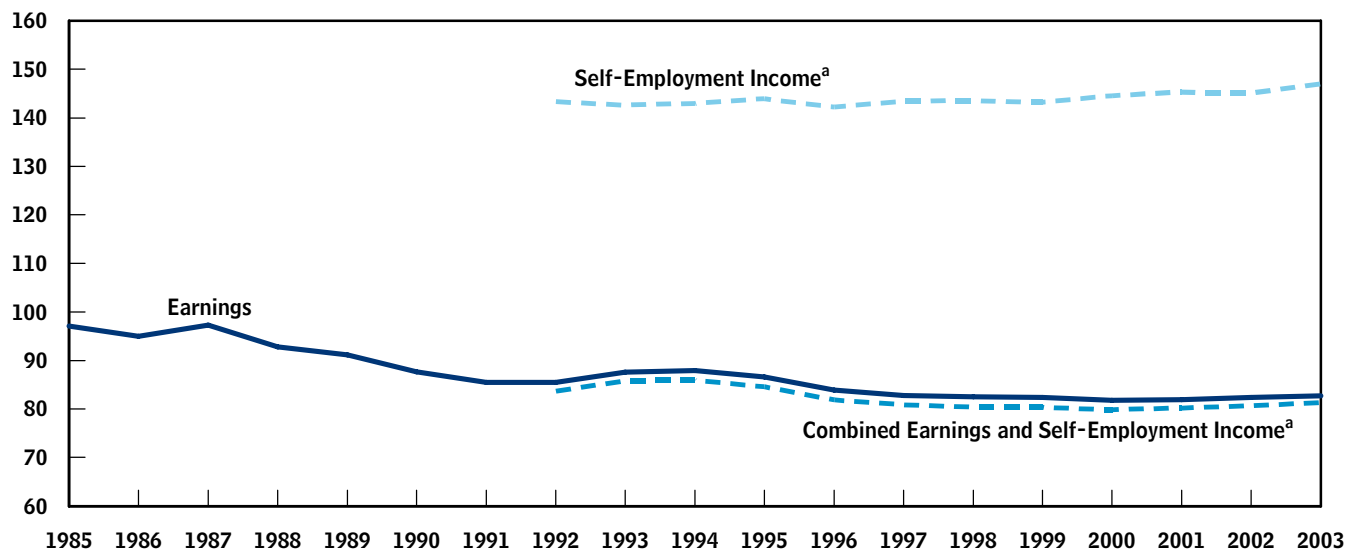
Alternative Measures of Variability

In the main analysis, CBO presents the fraction of individuals for whom the percentage change in earnings crosses a threshold (25 percent or 50 percent). Those measures give an intuitive understanding of the fraction of workers who were subject to large changes in earnings, though the cutoffs are ad hoc. To capture the entire distribution of changes—both large and small, positive and negative—CBO calculated the standard deviation of the one-year percentage change in earnings (see Figure A-2).

4. The standard deviation, the measure of variability presented here, captures the entire distribution of changes, not just changes that are larger than some threshold.

Figure A-1.

Standard Deviation of the Percentage Change in Workers' Earnings, Self-Employment Income, and Combined Earnings and Self-Employment Income



Source: Congressional Budget Office based on data from the Social Security Administration's Continuous Work History Sample.

Note: The sample consists of workers ages 25 to 55 who had earnings from employment covered by Social Security in either the reference year or the previous year. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_t - e_{t-1}) / ((e_t + e_{t-1}) / 2) * 100)$. The percentage change in self-employment income and in combined earnings and self-employment income is defined analogously. Before the percentage change was calculated, earnings and self-employment income were adjusted for inflation using the research series of the consumer price index for all urban consumers.

a. Data on self-employment income were not available before 1991.

That standard deviation trends downward over most of the 1984–2003 period. It also demonstrates cyclicity, rising during the economic downturns of the early 1990s and early 2000s.

CBO also calculated the standard deviation of the year-to-year difference in the logarithm of earnings (see Figure A-3). Calculating the difference in the logarithm of earnings effectively restricts the sample to people with earnings in both years because the logarithm of zero is undefined. The pattern is similar to the one in the main text—that is, a flat trend in variability that exhibits some responsiveness to economic growth over the study period.

Variability in Household Income

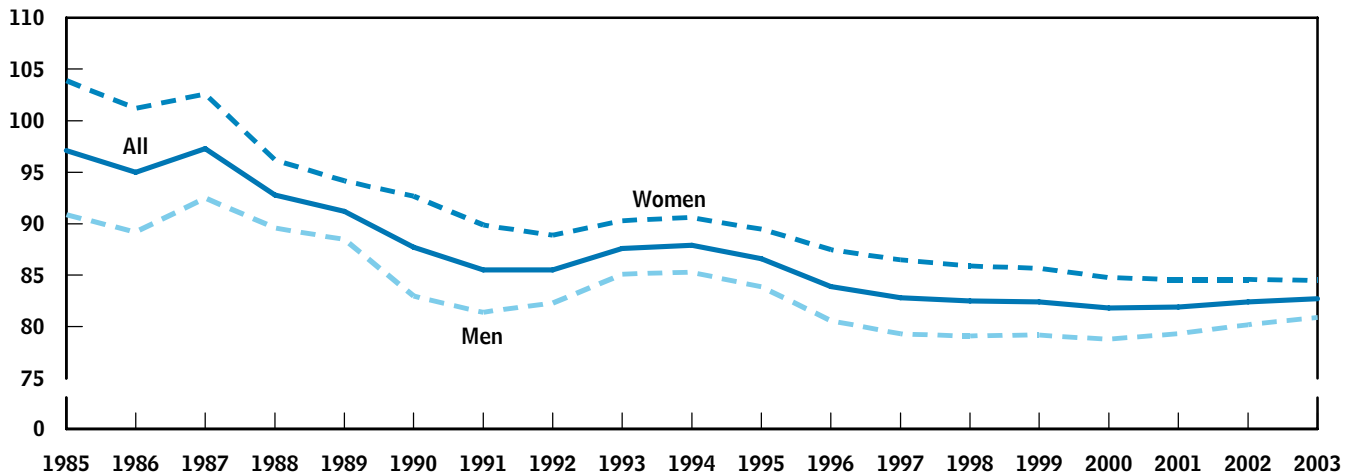
In its analysis of the variability in household income, CBO used matched administrative and survey data on households. Large samples of households surveyed in the 1984, 1990, 1991, 1992, 1993, 1996, 2001, and 2004 panels of the SIPP were matched to administrative earn-

ings and self-employment income records in the Detailed Earnings Record (DER) provided by the Social Security Administration. The administrative data used here are not the same as those used in the analysis of earnings variability. Administrative data on self-employment income are available back to 1984 in the DER. Income was indexed to 2006 dollars using the research series of the consumer price index for all urban consumers.

Data and Methods

The analysis focuses on households headed by a person ages 25 to 55 at the time of the survey.⁵ Households in the bottom or top 1 percent of the income distribution in either the first or second year were dropped from the sample, eliminating the largest outliers in the income distribution. Households in which any member

5. To capture nonlabor income for the household over time, the sample was further restricted to heads of households who were in the survey in each of the 24 months of interest.

Figure A-2.**Standard Deviation of the Percentage Change in Workers' Earnings, by Sex**

Source: Congressional Budget Office based on data from the Social Security Administration's Continuous Work History Sample.

Note: The sample consists of workers ages 25 to 55 who had earnings from employment covered by Social Security in either the reference year or the previous year. Earnings include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The percentage change in earnings is defined here as $((e_t - e_{t-1}) / ((e_t + e_{t-1}) / 2)) * 100$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers.

ages 18 to 64 was not successfully matched to an administrative earnings record were also excluded from the analysis.⁶ The match rate for the SIPP was 89 percent in 1985, 87 percent in 1991, 84 percent in 1992, 85 percent in 1993, 84 percent in 1994, 81 percent in 1998, 62 percent in 2002, and 80 percent in 2004. Although the match rate was substantially lower in 2002 than in other years, the demographics of the matched sample were in line with expectations, thus mitigating the concern that the matched sample was not representative of the same population as the matched samples in the other panels (see Table A-1).⁷

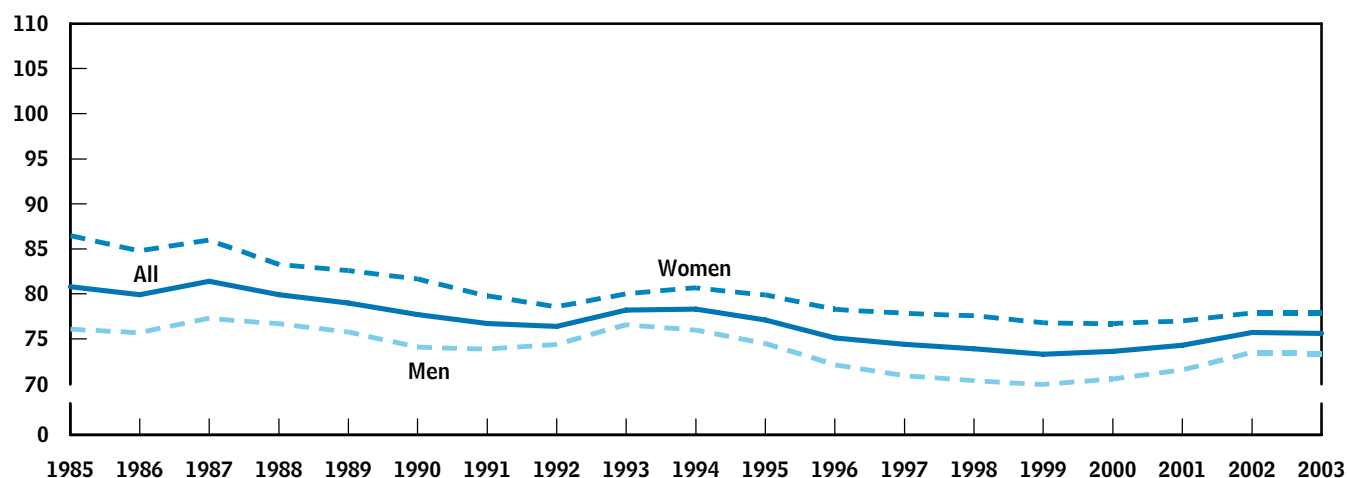
Although the match rates were generally high, not all households in the SIPP were matched to the necessary administrative earnings records. Households that were not matched were not included in the sample from which the main results were derived. The unmatched house-

holds differed from the matched households in some ways. For instance, the unmatched households tended to be headed by people who had less education than their counterparts in the matched households. That is, heads of households in the unmatched sample were more likely to report having less than a high school education and were less likely to report educational attainment beyond high school than those in the matched sample. Furthermore, when based on a measure of income constructed from survey data on earnings, self-employment income, and nonlabor income (as opposed to administrative data on earnings and self-employment income and survey data on nonlabor income), households in the unmatched sample tended to experience large changes in income (changes in income of 25 percent or more) more frequently than those in the matched sample. That difference in income variability does not appear to be changing systematically over time, however, and is therefore unlikely to affect the trends in variability shown here.

CBO constructed total household income by summing three separate components: (1) wage and salary earnings from the administrative earnings records, (2) self-employment income from the administrative records,

6. Household members matched to administrative earnings records are those present in month 12 of the 24 months of interest.

7. CBO matched the SIPP to the DER on the basis of the SIPP identification numbers provided by the Social Security Administration in the DER files. No information is provided as to why an individual in the SIPP might not be matched to his or her DER record.

Figure A-3.**Standard Deviation of the Difference in the Logarithm of Workers' Earnings, by Sex**

Source: Congressional Budget Office based on data from the Social Security Administration's Continuous Work History Sample.

Note: The sample consists of workers ages 25 to 55. Earnings are from employment covered by Social Security. They include wages and salaries, tips, and other forms of compensation; they exclude self-employment income and deferred compensation. The change in earnings is defined here as $(\ln(e_t) - \ln(e_{t-1}))$. Before the percentage change was calculated, earnings were adjusted for inflation using the research series of the consumer price index for all urban consumers.

and (3) survey data on households' total nonlabor income, which includes retirement income, Supplemental Security Income, disability payments, unemployment insurance, income from public assistance programs, and other sources of cash income.⁸ Although wage and salary earnings are not subject to top-coding in any year, self-employment income is top-coded, or capped, at the maximum amount of earnings taxable under Social Security before 1991 (affecting the household income measure in 1984, 1985, and 1990 differentially from later years). Including self-employment in household income therefore leads to a slightly inconsistent measure of household income over time. Excluding self-employment income entirely from household income results in slightly higher income variability in a given year but no change in the trends in variability over time (similar to the results for earnings shown in Figure A-1).

For each household, CBO calculated the percentage change in total household income from one year to the

8. As noted in the text, the measure of total household income is a before-tax measure; the results therefore do not reflect the potential effects of the tax system on variability in household income.

next. The formula used was $((y_t - y_{t-1}) / ((y_t + y_{t-1}) / 2) * 100)$, analogous to that used for earnings.⁹

Comparison of Matched Survey/Administrative Data with Survey Data Alone

To provide a comparison with the analysis based on the matched SIPP/SSA data, CBO also conducted its analysis on measures of household income collected from the SIPP survey data alone. The survey data are subject to changing top-codes and imputations—two specific post-survey processes undertaken by the Census Bureau that can affect the comparability of data across panels.

9. In a recent report, the Census Bureau used the 2001 panel of the SIPP to examine changes in household income relative to other households, as captured by movements between quintiles of the income distribution. The report also included an analysis of households that remained in a given quintile but experienced changes in income of 10 percent or more, a measure of income variability that combines relative mobility in the income distribution and absolute changes in income. (See John J. Hisnanick and Katherine G. Giefer, *Dynamics of Economic Well-Being: Fluctuations in the U.S. Income Distribution, 2001–2003*, Current Population Reports, P70-112, November 2007.) CBO's analysis focuses on absolute changes in household income over time and does not address issues of relative mobility, that is, how a household's income changes relative to that of other households.

Table A-1.**Characteristics of Households in the Matched Sample**

Year	Sample Size	Characteristics of the Head of Household					Household Structure (Percent)			
		Age		Education (Percent)			Married		Single	
		Median	Standard Deviation	Less Than High School	High School	More Than High School	Children Present	No Children Present	Children Present	No Children Present
1985	6,327	38.2	8.6	16.2	37.7	46.0	48.4	19.5	12.0	20.1
1986	—	—	—	—	—	—	—	—	—	—
1987	—	—	—	—	—	—	—	—	—	—
1988	—	—	—	—	—	—	—	—	—	—
1989	—	—	—	—	—	—	—	—	—	—
1990	—	—	—	—	—	—	—	—	—	—
1991	9,244	38.7	8.3	12.9	35.3	51.8	42.1	19.0	14.8	24.1
1992	6,274	38.8	8.2	11.8	35.8	52.4	42.9	19.0	12.7	25.4
1993	8,676	39.1	8.1	11.5	35.2	53.3	42.8	19.7	13.3	24.2
1994	8,431	39.4	8.1	11.8	34.0	54.1	42.8	19.1	13.7	24.3
1995	—	—	—	—	—	—	—	—	—	—
1996	—	—	—	—	—	—	—	—	—	—
1997	—	—	—	—	—	—	—	—	—	—
1998	11,958	40.3	8.3	10.3	28.2	61.5	40.4	19.5	14.5	25.5
1999	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	—	—	—	—	—
2001	—	—	—	—	—	—	—	—	—	—
2002	7,890	40.8	8.4	9.0	26.9	64.1	37.8	19.2	15.1	27.9
2003	—	—	—	—	—	—	—	—	—	—
2004	—	—	—	—	—	—	—	—	—	—
2005	14,135	41.2	8.5	5.2	23.5	71.3	38.1	19.4	15.0	27.5

Source: Congressional Budget Office based on data from various panels of the Survey of Income and Program Participation matched to the Detailed Earnings Record from the Social Security Administration.

Notes: The sample consists of households headed by people ages 25 to 55 and in which all members ages 18 to 64 were successfully matched to the Detailed Earnings Record. Households in the top and bottom 1 percent of the income distribution in each year are excluded from the sample.

— = not available.

Top-coding of survey data occurs when income that exceeds some high threshold is capped at a prespecified limit. Such top-codes are often applied to protect the anonymity of survey participants. In the SIPP, those top-codes have changed over time, which creates a problem with consistency in the survey data over the sample period.¹⁰ To mitigate that problem, CBO's analysis of survey-based total household income applied the more

restrictive earnings top-codes in earlier panels to the 1996, 2001, and 2004 panels.

Earnings or income may be imputed when survey respondents fail to report that information to the interviewer. In the case of the SIPP, the Census Bureau imputes missing earnings and income in order to maintain cross-sectional means and variances. The Census Bureau will often impute those values using a "hot deck" procedure. Under that procedure, the missing values will be replaced with the values from an observation randomly chosen from a set of observations that are similar on a number of

10. For more details on the SIPP top-coding methodology, see Census Bureau, *Survey of Income and Program Participation Users' Guide*, 3rd ed. (2001).

dimensions (such as education, race, sex, and age) to the observation to be imputed.¹¹

Although such imputation techniques are useful for various types of research, they are problematic in the current context. The reason is that changes in earnings and, subsequently, income (which is constructed from earnings) are not actual changes because they are not calculated from differences in reported earnings over time. For example, consider an individual who provided earnings data in year $t-1$ but did not provide, and subsequently had imputed, earnings in year t . The measure of the percentage change for that individual—

$$\left(\frac{y_t^* - y_{t-1}}{(y_t^* + y_{t-1})/2}\right) * 100$$

—is based on the difference between the individual's actual income in year $t-1$ and imputed income in year t . Thus, because of the imputation methods used by the Census Bureau, the estimate of the percentage change is closely related to the person's percentage deviation from the cross-sectional average. And since variability in cross-sectional earnings is probably greater than variability in earnings for the same person, using imputed data to estimate the percentage change probably overestimates variability. The problem is potentially compounded in a construct of household income variability in which the earnings of multiple people and nonlabor income are summed together. The imputation procedures that the Census Bureau used to handle missing data were employed much more frequently in the 1996, 2001, and 2004 panels than in previous panels.¹² Because the impu-

tation rates have grown over time, including imputed observations probably creates an upward bias in the estimated trend in variability.

When using the survey data alone, CBO found that trends in the variability in household income among all households differed depending on whether imputed earnings and self-employment income were included. The SIPP was redesigned between the 1993 and 1996 panels, affecting the comparison of the results in 1994 and earlier with those in 1998 and later. Coinciding with the redesign (between 1994 and 1998), the imputation rate for earnings and self-employment income in the SIPP sample used here increased from 35 percent to 54 percent. Over that same time span, the variability in household income rose among all households (including those with imputed data on earnings) but fell among households for which earnings were not imputed (see Figure A-4).¹³ Although dropping a household from the sample if any member of the household has imputed earnings or self-employment income is probably overly restrictive, those results do suggest fundamental differences in longitudinal earnings patterns in the SIPP when imputed earnings records are included in the sample. CBO's use of matched administrative earnings avoids the apparent bias introduced by the imputed records.

11. See Stephen P. Mack and Preston J. Waite, *Nonresponse Research Plans for the Survey of Income and Program Participation*, SIPP Working Paper No. 206 (Census Bureau, 1995). For more information on imputation in the SIPP and about statistical procedures to handle missing data generally, see Donald B. Rubin, *Multiple Imputation for Nonresponse in Surveys* (New York: John Wiley & Sons, 1987).

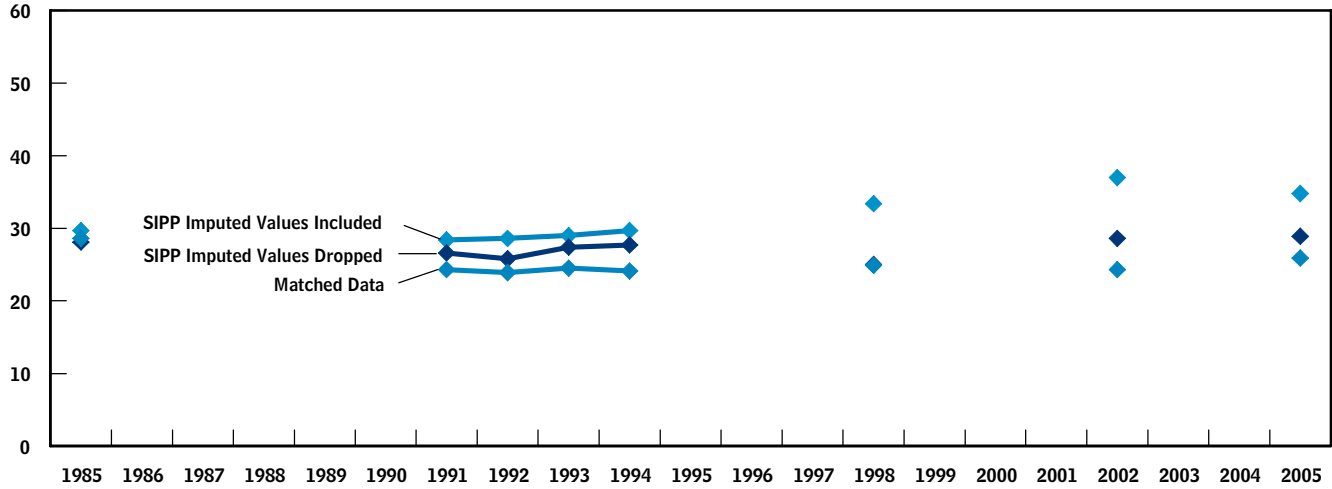
12. A household is deemed to have imputed earnings or self-employment income if the earnings or self-employment income of any member, regardless of age, are imputed in any of the 24 months of interest.

13. Peter Gosselin and Seth Zimmerman use the SIPP to examine trends in variability in family income. Their results show an increase in that variability between the 1993 and 1996 panels that is similar to the increase seen in CBO's analysis when households with imputed data on earnings and self-employment income are included. See Gosselin and Zimmerman, *Trends in Income Volatility and Risk, 1970–2004*, Urban Institute Working Paper (Washington, D.C.: Urban Institute, May 2008).

Figure A-4.

Percentage of Households Whose Income Changed by 25 Percent or More from the Previous Year, by Source of Data

(Percent)



Source: Congressional Budget Office. The “SIPP Imputed Values” series are based on data from various panels of the Survey of Income and Program Participation (SIPP). The “Matched Data” series is from various panels of the SIPP matched to the Detailed Earnings Record from the Social Security Administration.

Notes: The sample consists of households headed by a person ages 25 to 55. Households in the top and bottom 1 percent of the income distribution in each year are excluded from the sample. Income, which is measured before taxes, includes earnings and self-employment income, unemployment compensation, workers’ compensation, Social Security benefits, Supplemental Security Income, public assistance, veterans’ payments, survivors’ benefits, disability benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates or trusts, alimony, child support, financial assistance from outside the household, and other cash income. The percentage change is defined here as $((y_t - y_{t-1}) / ((y_t + y_{t-1}) / 2)) * 100$. Before the percentage change was calculated, income was adjusted for inflation using the research series of the consumer price index for all urban consumers. A household is considered to have imputed survey data if the earnings of any member are imputed (wage and salary earnings from the first or second job or self-employment income from the first or second business). The presence of imputed values of nonlabor income does not eliminate a household from this sample.

Data are not available for all years.