

**Working Paper Series  
Congressional Budget Office  
Washington, D.C.**

**EARNINGS INEQUALITY AND HIGH EARNERS:  
CHANGES DURING AND AFTER THE  
STOCK MARKET BOOM OF THE 1990s**

Jonathan A. Schwabish (e-mail: [jonathan.schwabish@cbo.gov](mailto:jonathan.schwabish@cbo.gov))  
Congressional Budget Office  
Washington, D.C.

April 2006  
2006-06

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## Abstract

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Studies of earnings trends and earnings distributions are often hampered by public-use data sets that either do not adequately survey high earners or topcode high earnings. This paper uses the Social Security Administration's Continuous Work History Sample (CWHS) and the March Current Population Survey (CPS) to analyze trends in earnings inequality during the 1990s and early 2000s, and to assess where significant differences may exist in the two data sets. The CWHS is used to track the changes in the share of earnings received by those at the very top of the distribution—in particular, those in the top 1 percent, 0.5 percent and 0.1 percent. The analysis shows that the earnings distribution in the CWHS is more evenly distributed at the top and includes more observations at the bottom than the CPS. The analysis also suggests that the share of earnings at the top of the distribution rose quickly between 1987 and 2000 but since that time has fallen precipitously. Similarly, inequality trended upward during the first part of the period before falling markedly during the stock market boom of the late 1990s.

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## **I. Introduction<sup>1</sup>**

In the literature on the U.S. earnings distribution, there is an ongoing debate about whether observed trends in inequality over the past 30 years are manifestations of secular trends in the economy caused by general supply and demand factors or are episodic events caused by institutional and policy changes. This literature does agree on the general trends in U.S. inequality, which grew dramatically during the 1980s and at a slower rate during the 1990s. Recent research on the late-1990s stock market boom has provided some evidence of a further decline in earnings inequality, but there has been little analysis of the post-stock market run-up period. However, many of these studies are based on public-use data sets (such as the Census Bureau's March Current Population Survey, CPS), which, because of topcoding and other survey data issues, are unable to accurately capture the extreme upper tail of the earnings distribution. This study uses the Continuous Work History Sample (CWHS) from the Social Security Administration in addition to the CPS to examine changes in earnings at the very high end of the earnings distribution between 1987 and 2003. The CWHS data have an advantage over the CPS because they come directly from W-2 tax forms and are not subject to the same topcoding and survey error biases. The analysis here expands on the existing literature by using this rich data set to analyze the economic expansion of the late 1990s and the decline in the stock market after 2000.

Trends in earnings and inequality have been extensively examined in the literature. For certain groups, such as full time working men, inequality rose steadily during the beginning part of the 1980s and then settled into a slower rate of growth

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<sup>1</sup> The author would like to thank Amy Harris, John Sabelhaus and Lina Walker for their comments and suggestions. This research supports CBO's long-term modeling efforts and revenue projections.

(Autor, Katz and Kearney, 2005b, 2005a; Lemieux, 2004; Katz and Murphy, 1992). The causes of this change over the last 25 years are still a matter of debate; possible explanations include the decline in the real minimum wage and other policy changes, immigration, globalization of trade, increasing returns to education and skills, growth in demand for technological skills, or other more general structural shifts in the economy (Groschen and Potter, 2003). The literature has just begun to more fully explore the patterns in earnings and inequality in the period from the late 1990s through the early 2000s; this paper examines trends during this period.

This paper addresses three main questions. First, how does the CPS distribution of earnings over the past 20 years compare to the CWHS distribution, and what are the implications of these differences for the historical measurement of inequality? Second, given differences in the two distributions, how does inequality differ between the two data sets, especially during the stock market run-up of the late 1990s and the decline in 2000? When addressing these first two questions, it is evident that the CWHS is better able than the CPS to quantify earnings at the very top of the distribution. The third question extends the inequality analysis to ask: How has the share of earnings received by the top of the distribution changed over the last 20 years? In particular, was the fast growth in wages of top earners during the mid- to late 1990s itself a transitory phenomenon that would reverse course along with the stock market after 2000? This has implications not only for quantifying the share of earnings at the top of the distribution but also for the relationship between strong economic performance, including the stock market, and high earnings. Furthermore, such changes at the top of the distribution have

implications for income tax revenue projections as well as revenue projections for Social Security, which caps taxable earnings at a specific dollar amount.

By better understanding the trends in the share of earnings at the top of the distribution and the standing of high earners relative to the rest of the distribution, this analysis can also enhance projections of future wage trends and tax revenues. Forecasting earnings is important in a wide variety of areas, including predicting the sustainability and solvency of large government insurance programs such as Social Security and Medicare. Understanding trends in earnings at the top of the distribution can also be important for projecting tax revenues, which in large part depend on the taxes paid by high earners.

This paper finds that there are clear differences in the distribution of earnings and measures of inequality in the CPS and CWHS and that these data sources show sharply different trends in earnings growth at the top of the distribution between the early 2000s and the late 1990s. The CWHS earnings distribution is more evenly distributed at the top and includes more observations at the bottom than the CPS. The share of earnings of the top 0.1 percent of earners in the CWHS grew at a 4.2 percent annualized rate between 1987 and 2000. The stock market decline in 2000 corresponded with a dramatic fall in the share of wages earned by these top earners: In 2003, the top 0.1 percent of the distribution held 4.6 percent of total wages, down from 6.5 percent only three years earlier. Inequality followed a similar trend, falling during the stock market expansion and then rising afterward, with slight differences in levels and growth rates in the two data sets.

## II. Earnings Distributions in the CPS and CWHS

The Social Security Administration's Continuous Work History Sample is a 1 percent sample of all Social Security numbers ever issued. In addition to taxable Old-Age, Survivors and Disability Insurance (OASDI) wages and total compensation, the CWHS contains information on the individual's sex, race and year of birth. Data are collected for people with wage and salary earnings subject to Social Security taxes, those with earnings not subject to Social Security taxes, and those with both (Smith, 1989). The CWHS is a restricted-use data set and includes a sample of all Social Security numbers ever issued, and thus may not necessarily be a representative sample of the population, because it can include people who have duplicate Social Security numbers (say, if they replaced their original number). This analysis focuses on wages and salaries, the earnings measure typically used in the literature (Piketty and Saez, 2003; Feenberg and Poterba, 2000; Utendorf, 2001-2002).<sup>2</sup>

The March Current Population Survey collects information on about 60,000 households annually.<sup>3</sup> The data set contains a wide variety of economic and demographic information on the individual, family and household. Several sources of earnings are available in the survey, including self-employment and farm earnings. For purposes of this study, and to be consistent with the CWHS, the analysis is restricted to earnings from wages and salaries.

Although the CPS is used consistently in both the earnings and inequality

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<sup>2</sup> Total earnings, which adds self-employment earnings to total wages, is not used in this analysis, because self-employment earnings were not fully taxable until 1993 (Utendorf, 2001-2002).

<sup>3</sup> The sample size decreased to 50,000 households in 1996. As a comparison, the CWHS includes about 1.5 million respondents in each year, or more than ten times the number of observations available in the CPS. These large sample sizes provide a sufficient number of observations for analyzing top shares of the earnings distribution.

literature, it and other sources of survey data are subject to several common sources of bias. The first form of bias is self-reporting error, which may take the form of over- or underreporting of earnings (Bollinger, 1998) or asymmetric response rates by level of earnings (Bound et al., 2001).<sup>4</sup> Second, public-use earnings records are generally topcoded in order to maintain the anonymity of high-earning respondents. In 1995, the Census increased the topcode limit from \$99,999 to \$150,000; earnings that exceeded this new level were replaced with the average across gender-race-work experience cells.<sup>5</sup> Such topcoding may affect a downward bias on some measures of inequality, such as the 99/10 percentile ratio, since the value of the topcoded 99<sup>th</sup> percentile will be lower than the true value. This topcode limits researchers' ability to accurately measure earnings at the very top of the distribution but should not impact the 90<sup>th</sup> percentile estimates in the CPS, which are typically around \$50,000 and thus well below the topcode. In this study, topcoded wages are multiplied by 1.5 prior to 1995, following the procedure in Katz and Murphy (1992). After 1995, when high earnings were averaged across gender-race-work experience cells, topcoded wages are not adjusted in order to keep as much information as possible about these high earners.<sup>6</sup> Both the CPS and CWHS samples are restricted to those with at least \$590 in real (1993 dollars) annual wages; this ensures that the individual has enough wages to get one quarter of coverage in the Social Security

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<sup>4</sup> Another source of error may exist if respondents provide less accurate information about other members of the household than about themselves, or so-called "proxy reporting" (Ruser et al., 2004).

<sup>5</sup> Between 1988 and 1995, the topcode for total wages and salaries was \$199,998, which is a combination of a \$99,999 topcode on each respondent's main job and secondary jobs. After 1995, earnings greater than \$150,000 are replaced with the average of gender-race-work experience cell. Several other income variables are also topcoded in the CPS and have changed over time but are not especially relevant for this analysis.

<sup>6</sup> Autor, Katz and Kearney (2005a) topcode imputed wages in these more recent CPS files at \$150,000 and then multiply by 1.5 in order to be consistent with the prior years. Gottschalk and Danziger (2005) do not make this adjustment and note that the CPS data prior to 1995 is not completely comparable to the earnings data after the topcoding procedure changed (see footnote 9).

system.<sup>7</sup>

The problems of self-reporting bias and topcoding in the CPS are partially evident when total wages are compared to aggregate wages in the National Income and Product Accounts (NIPA). The NIPAs are a comprehensive set of tables produced by the Bureau of Economic Analysis (BEA) using a number of data sources (such as employer reports from the Department of Labor, Social Security Administration records, and Federal Reserve Board data) to construct aggregate measures of income and products.<sup>8</sup> The CWHS and CPS data (Table 1) show a close approximation of both data sets to NIPA aggregate wages. Throughout the period, CWHS total wages capture about 99 percent of the NIPA aggregate and in some years produce a slightly larger aggregate wage total than reported in the NIPAs. CPS totals are generally lower, except in the last few years when CPS total wages exceed those in the NIPAs.<sup>9</sup> The smaller estimate of total CPS wages relative to NIPA estimates are reflected in other studies that show the CPS tends to vastly understate NIPA total personal income (by about 30 percent), a measure that adds income from dividends, rents, interest, private and public pensions, and government transfers to total earnings (Roemer, 2000; Rector et al., 1999; Coder and Scoon-Rogers, 1996; Ruser et al., 2004).

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<sup>7</sup> The CPS sample is further restricted to those with nonmissing hourly wages between \$2 and \$150. Earnings are converted to 1993 dollars using the consumer price index for urban wage earners and clerical workers (CPI-W) combined with an adjustment to 1993 productivity levels using an index that accounts for historical real wage growth (see Harris and Sabelhaus, 2003).

<sup>8</sup> These NIPA aggregates are adjusted by the author for misreported earnings and wages, data series also constructed by the BEA.

<sup>9</sup> The decision to multiply topcoded earnings by 1.5 in the pre-1995 period and eliminate the low and high hourly wage observations has a significant impact on these CPS observations. In some cases, CPS aggregate earnings are more than ten percentage points higher when these sample restrictions are not imposed. The decision not to adjust topcoded wages after 1995 also has an impact on these totals. In 2003, for example, if imputed wages are multiplied by 1.5, the CPS-NIPA ratio falls to 101.8 percent. If imputed wages are topcoded at \$150,000 and then multiplied by 1.5 (as in Autor, Katz and Kearney, 2005a), the CPS-NIPA ratios falls to 100.7 percent.

In addition to topcoded earnings, there are a several additional explanations for why the CPS does a slightly worse job of matching NIPA aggregates than the CWHS: changes in survey design, increased rounding of incomes, respondent extrapolation from one year to the next and, as discussed above, changes to topcodes (see also Roemer, 2000). The CPS survey was changed in 1993, when new sampling weights were introduced to benchmark the population to the 1990 Census. In 1994, the survey design was changed from paper and pencil to computer-assisted. Roemer (2000) suggests that because the computer-assisted survey was designed in such a way as to automate the periodicity of income, this change alone increased total reported income by about 2 percent. He attributes an increase in the CPS-NIPA total earnings (not wages) ratio from 95.6 percent to 99.7 percent between 1992 and 1993 to these survey changes; a smaller increase from 94.0 percent to 94.9 percent is evident in Table 1.

Increased incidence of rounding reported wages may also add noise to aggregate estimates. In 1984, 15.6 percent of the CPS sample reported income amounts that were multiples of \$5,000, and 8.3 percent reported income multiples of \$10,000. By 2000, income amounts measured in multiples of \$5,000 had increased to 30.3 percent and multiples of \$10,000 to 17.1 percent. Respondents with higher levels of wages were more likely to round their wages although it is impossible to determine whether CPS respondents round up or down. Hence, rounding does not unambiguously push the aggregates in a particular direction but does point to another source of potential bias in survey data.

A third possible source of bias stems from respondents reporting their current salary as opposed to the previous year's salary (Roemer, 2000; Coder and Scoon-Rogers,

1996). In a growing economy, this would tend to push the aggregate higher. The ratio of CPS to NIPA wages makes this explanation plausible during the late 1990s, but the higher ratio between 2000 and 2003 suggests that this is not the case. Using matched tax return-March CPS data, Roemer (2000) finds that workers who extrapolate their earnings do not bias earnings totals upwards; hence, this hypothesis does not explain the trends in the table.

The final columns of Table 1 show the ratio of CWHS to CPS aggregate wages. Over the 20-year period, CWHS totals are higher than CPS totals in every year, save four.<sup>10</sup> Total wages by \$5,000 (nominal) categories for 1987 and 2003 in both data sets are plotted in Figures 1 and 2; four observations emerge. First, the CPS consistently has less in total wages at the bottom of the distribution than the CWHS—in the first category (\$590-\$5,000) this difference declines slightly from \$19.4 billion in 1987 to \$17.4 billion in 2003 (in 1993 dollars). In the bottom three categories (\$590-\$10,000), the CWHS has \$47.6 billion more in total wages than the CPS in 1987 and \$50.1 billion in 2003. The second observation is the greater amount of aggregate wages in the CPS in the lower- to middle-wage classes (\$15,000-\$50,000) than in the CWHS, a trend that grows over time. In 1987, the difference in aggregate wages in these wage classes was \$112.9 billion; by 2003, this difference had grown by almost a third, to \$147.5 billion. Third, total wages in high-wage categories in the CPS are clearly subject to Census topcodes (see the lines in Figures 1 and 2). In 1987, for example, there is a spike in total wages in the \$140,000-150,000 wage class, precisely where the (adjusted) topcode was assigned in that year ( $\$99,999 \times 1.5$ ). As the topcode procedure changed and topcoded wages were averaged

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<sup>10</sup> Roemer (2002) shows that the CPS has more aggregate wages at the high end of the distribution but a shortage of wages at the low end of the distribution.

across age-sex-work experience cells, total wages in the high-wage categories jumped noticeably. In 1995, for example (not pictured), total wages for those earning \$300,000 and above totaled \$204.9 billion (in 1993 dollars), up from zero five years before but less than the \$379.8 billion total in 2003.<sup>11</sup> Hence, topcodes have a large impact on the researcher's ability to use the CPS to analyze the very top of the distribution.

The final observation from Figures 1 and 2 is that the pattern of total wages above the 99<sup>th</sup> percentile is much less evenly distributed in the CPS than in the CWHS. In 1987, the 99<sup>th</sup> percentile in the CPS is about \$8,000 less than the same percentile point in the CWHS (\$82,000 compared to \$90,450; both in nominal dollars). Clearly, there is a more stable distribution of wages above this cutoff in the CWHS than in the CPS where the \$149,999 adjusted topcode ( $\$99,000 \times 1.5$ ) creates a considerable spike in the tail of the distribution. More recently (2003, Figure 2), the 99<sup>th</sup> percentile in the CPS captures the top three wage classes, which spikes in the \$300,000-\$400,000 wage class; the 99<sup>th</sup> percentile in the CWHS is about the same but the tail is more evenly distributed.<sup>12</sup> Overall, these observations provide evidence that the CPS does not accurately capture wages at the very top of the distribution. The analysis of the very top of the distribution will reflect these conclusions.

The differences highlighted above suggest that distributional discrepancies between the CPS and CWHS will have important impacts on measures of inequality. It also shows that it is more useful to use the CWHS to investigate changes in inequality or

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<sup>11</sup> These totals are sensitive to whether topcoded wages are adjusted. In 2003, when imputed earnings (\$150,000 and above) are not adjusted, total wages in these categories equal \$641 billion. When these wages are multiplied by 1.5, this total grows to \$619 billion, and when they are topcoded at \$150,000 and then multiplied by 1.5, the total falls to \$564 billion.

<sup>12</sup> There is some unevenness to the totals in the tail of this distribution, which may be due to the range changes in these top categories.

shares of wages at the very top of the distribution (the 99<sup>th</sup> percentile and higher). The next section discusses total wages at different points in the distribution and the resulting measures of inequality during the 1990s and the first part of the 21<sup>st</sup> century.

### **III. Do CWHS and CPS Give Different Conclusions about Trends in Inequality?**

There is an extensive literature that shows dramatic changes in earnings and inequality in the U.S. over the past 30 years. That literature has fueled a debate about which factors are responsible for these changes. On one side (e.g., Katz and Murphy, 1992; Autor, Katz and Kearny, 2005b; Dew-Becker and Gordon, 2005) are those who argue that the increase in inequality during the 1980s and the slower growth during the 1990s were due to structural changes in the economy. On the other (e.g., Card and DiNardo, 2002; Lemieux, 2004) are researchers who argue that policy shifts, such as the deterioration of the real minimum wage, were mainly responsible for the trends in inequality over the last 20 years. This section uses the CWHS to explore inequality at the very top of the distribution and consider whether differences with the CPS lead to different conclusions about the trends in inequality that underlie the debate. The estimates show that inequality between the top and bottom of the distribution increased slightly in the CWHS between 1990 and 2003 but declined in the CPS. Upper-tail inequality, the difference between top and median earners, increased in the CWHS but declined and was less smooth in the CPS. Because it provides more detailed information about very high earners, the CWHS enhances analysts' ability to examine inequality at the very high end of the wage distribution. Percentile ratios such as the 99/90 and 99/10 are not accurately measured in the CPS, as shown above. The CWHS sample enables an examination of this

part of the distribution and shows an increase in both measures through the late 1990s. However, when the stock market run-up ended, both measures fell, and inequality among high earners (the 99/90 percentile ratio) declined, reversing about half the increase that had occurred between 1995 and 2000.

### *Trends in Inequality*

There are clear differences in the pattern of the 90/10 percentile ratio in these two data sets; CWHS inequality was largely flat over the period, with a small increase during the early 1990s, which then fell during the late boom period.<sup>13</sup> In the CPS, however, there is a clear downward trend in 90/10 inequality over the full period. Before the acceleration of the stock market, the ratio of the 90<sup>th</sup> percentile to the 10<sup>th</sup> percentile (in both data sets) fell during the late 1980s and then rose over the first half of the 1990s. In the CPS, the 90/10 percentile ratio fell from 14.34 in 1987 to 12.57 in 1990, and then rose to 13.00 in 1995 (Figure 3). Over the same period (1987 to 1990) in the CWHS, the 90/10 ratio fell from 18.14 to 17.77, but then rose over the first half of the 1990s, reaching 18.15 in 1995. As the stock market accelerated, the 90/10 percentile ratio fell in both data sets from 1995 to 2000, although the decline from 13.00 to 10.83 in the CPS was markedly faster than the decline from 18.15 to 17.51 in the CWHS. The differences in these percentile ratios are largely a function of the higher level and faster growth rate of wages at the 10<sup>th</sup> percentile in the CPS. In 1987, the CPS 10<sup>th</sup> percentile was nearly \$1,000 greater than the same point in the CWHS distribution (as seen in Figures 1 and 2); by 2003 the CPS 10<sup>th</sup> percentile had grown by 34 percent and was nearly \$2,000 greater than that in the

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<sup>13</sup> This trend is similar to the trend in Internal Revenue Service hourly wage data, found by Dew-Becker and Gordon (2005).

CWHS. At the other end of the distribution, workers at the 90<sup>th</sup> percentile had well over \$1,000 more in wages in the CPS than in the CWHS in the late 1980s. Wages grew by 4.3 percent for CPS workers at the 90<sup>th</sup> percentile between 1987 and 2003, only slightly faster than the 3.4 percent rate of wage growth at the same percentile in the CWHS.

When the stock market reversed its rise at the end of the 1990s, inequality between the tails of the distribution once again expanded. In both data sets, the 90/10 percentile ratio grew between 2000 and 2003; in the CWHS, the ratio had recovered to pre-1996 levels, and in the CPS the 90/10 ratio had grown from to 10.83 in 2000 to 11.16 in 2003. The increase in CWHS inequality was caused by both an increase in wages at the top of the distribution and a decline in wages at the bottom. Although wages at the top of the CPS distribution also grew over the period, wages at the 10<sup>th</sup> percentile fell in 2001 and 2002 before recovering in 2003. These opposite trends signal that workers with higher wages did relatively better than others during this particular economic downturn.

Although this paper shows a decline in annual earnings inequality, much of the inequality literature has found an increase in *hourly wage* inequality over the past 25 years (Autor, Katz and Kearney, 2005b, 2005a; Lemieux, 2004). In a recent paper, Gottschalk and Danziger (2005) address this issue explicitly by comparing CPS hourly wage inequality to annual earnings inequality; their trend in annual earnings inequality is very similar to the one presented here. Clearly, the distribution in the number of hours worked has an important effect on measures of inequality. In fact, differences in the annual number of work-hours across the earnings distribution does emerge in the CPS; earners in the bottom quintile increased their annual work-hours by 36.3 percent between 1987 and 2003, while workers in the top wage quintile increased their work hours by a

much smaller 2.5 percent. Since annual earnings measures may do a better job of measuring well-being than an hourly concept, where work-hours exhibit their own distributional tendencies, this analysis is restricted to measuring inequality with annual earnings.

With respect to the top half of the distribution, trends in inequality again differ in the two data sets; CWHS upper-tail inequality increased steadily over the period, but CPS 90/50 inequality was not as smooth, and remained relatively steady by 2003. In the first three years of the sample period, the 90/50 percentile ratio was essentially unchanged in the CWHS. In the CPS, the ratio of wages at the 90<sup>th</sup> percentile to wages of the median worker fell from 2.60 to 2.44. In the first part of the 1990s, the two data sets are more in concert, with upper-tail inequality growing by 2.6 percent in the CWHS and by 6.4 percent in the CPS. As the economy expanded, inequality in the upper part of the distribution changed very little in both data sets—workers at the 90<sup>th</sup> percentile had roughly 2.5 to 2.8 times as much in wages as those at the median. After the stock market fell in 2000, the 90/50 percentile ratio increased in the CWHS from 2.78 in 2000 to 2.82 in 2003 (a peak over the period). In the CPS, the rise in upper-tail inequality reached 2.59 in 2001 and there remained relatively stable, scarcely falling to 2.57 in 2003.

Overall, the trends in inequality as estimated in the CPS and CWHS data sets differ noticeably; the 90/10 percentile ratio was larger in the CWHS and was flat during the 1987-2003, but in the CPS there was an unambiguous decline. Upper-tail inequality (90/50 percentile ratio) steadily increased in the CWHS over the sample period while the analogous measure in the CPS was less smooth and declined by the end of the period.

### *Extreme Upper-Tail Inequality*

Although the 90/10 percentile ratio remained stable in the CWHS, the difference between the extreme top of the earnings distribution (the 99<sup>th</sup> and 99.9<sup>th</sup> percentiles) and the 10<sup>th</sup> percentile changed dramatically. During the first half of the 1990s, 99/10 inequality grew by 9.9 percent, more than triple the growth rates of both the 90/10 and 90/50 percentile ratios and slightly faster than the difference between the 99<sup>th</sup> and 90<sup>th</sup> percentiles. As the stock market rose during the latter part of the decade and workers at the 10<sup>th</sup> percentile made faster gains, the 99/10 percentile ratio increased again, but at a slower rate (1.0 percent), to 50.36. Further up the distribution, earners at the 99.9<sup>th</sup> percentile made significant gains during the stock market boom compared with workers at the 10<sup>th</sup> percentile, resulting in an 18 percent increase in the 99.9/10 percentile ratio from 155.7 to 183.8. As the economy turned the corner in 2000 into recession, the 99/10 percentile ratio then fell from 50.4 to 49.1, a 2.5 percent decline, while the 99.9/10 percentile ratio declined by a faster 10.3 percent. The ratio of the 99.99<sup>th</sup> percentile to the 10<sup>th</sup> percentile (not pictured) further exacerbates these differences, nearly doubling between 1995 and 2000 and then falling by one-third by 2003. All of these trends run contrary to the increases in the 90/10 and 90/50 percentile ratios pictured in the top panels of Figure 3, signaling asymmetric gains made within the top of the distribution.

Compared with the difference in wages in the upper half of the distribution, as measured by the 90/50 percentile ratio, the difference in wages within the very top of the distribution are more pronounced when extreme upper-tail inequality—the 99/90 percentile ratio—is calculated (bottom right panel of Figure 3). Throughout the decade of the 1990s, the difference between the 99<sup>th</sup> and 90<sup>th</sup> percentiles rose—from 2.48 to 2.63 (a

6.3 percent increase) in the first half, followed by an additional two-tenths increase to 2.88 during the boom years (a 4.6 percent increase). Although estimates in both the CPS and CWHS data sets show a rising trend in the 90<sup>th</sup> percentile, only the CWHS is capable of showing the faster growth in inequality at the very top of the distribution. As the 1990s closed and the stock market turned sharply south, earnings in the 99<sup>th</sup> percentile declined by almost four percentage points. At the same time, the 90<sup>th</sup> percentile remained steady at about \$48,000, resulting in a sudden 5.5 percent decline in the 99/90 percentile ratio, to 2.72. These trends point to significant changes at the top of the distribution, which are difficult to uncover using standard survey data such as the CPS.

The trends in the bottom panel of Figure 3 show the patterns among the top 10 percent of earners, highlighting one of the major advantages of the CWHS over the CPS, which is the availability of information on top earners. This advantage allows for a further decomposition of overall inequality: Between 1990 and 2003, the 90/10 ratio grew by 0.0166 log points; the respective 99/10, 99.9/10 and 99.99/10 ratios grew by much larger 0.1095, 0.0482 and 0.2890 log points. Taking the antilog of each generates 2003 index numbers on a 1990 base equal to 102, 112, 105 and 134. Thus, restricting focus to the 90/10 percentile ratio, as is done throughout the inequality literature, misses the increase in inequality within the top 10 percent of the wage distribution over the last decade.<sup>14</sup>

#### **IV. Was There a Bubble in Top Earnings Shares in the Late 1990s?**

The CWHS allows for a closer look at the top of the earnings distribution, showing rising inequality during the 1980s and 1990s but a distinct break in the trend

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<sup>14</sup> This methodology is borrowed from Dew-Becker and Gordon (2005), who reach the same conclusion.

after 2000. This suggests it is worth exploring the changes in the share of total wages received by top earners—in particular, the top 10 percent, 1.0 percent, 0.5 percent, 0.1 percent and 0.01 percent of the distribution. The estimates show little change in the share of wages earned by the top of the distribution during the early 1990s. During the stock market boom of the mid- to late 1990s, however, the share of wages earned by workers at the top of the distribution rose sharply. This growth was followed by a sharp decline in the post-2000 period: an end to the growth in the share of wages received by top earners, to go along with the decline in the stock market.

### *The Boom Years: The 1990s*

In the early part of the twentieth century, the top 1 percent of American wage earners received around 17 percent of aggregate income. By the end of World War II, this share had fallen to around 11 percent, before falling to roughly 9 percent by the mid-1950s (Piketty and Saez, 2003). Between 1987 and 1995, the first part of the sample period examined here, the share of wages received by the top of the distribution was flat (Figure 4). In 1987, the top 1 percent of workers held more than 10 percent of the total wages in the U.S. economy, and very top earners—the top 0.1 percent of the wage distribution—earned a steady 3.8 percent of aggregate wages prior to the stock market boom of the mid- to late 1990s.<sup>15</sup> The approximately one-percentage point decline in top shares between 1990 and 1991 most likely reflects the recession of those years. The very slight decline between 1992 and 1993 may be due to the Omnibus Budget and

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<sup>15</sup> The upward trend in shares among high earners might simply be due to an increase in the number of individuals at the bottom of the distribution, which would increase aggregate earnings in the top percentiles. However, the dollar cutoff for top shares in the CWHS grew during the period, suggesting that higher earnings are required to be in the top of the distribution. The break point for the top 10 percent of the distribution stayed relatively flat at around \$47,000 (in 1993 dollars) while the cutoff for the top 1 percent increased by almost 40 percent to \$132,000.

Reconciliation Act of 1993, which increased the top marginal income tax rate from 31 percent to 39.6 percent. This change may have resulted in high earners reporting lower earnings as their mix of total compensation shifted from taxable earnings toward non-taxable forms of compensation such as pension contributions or health-plan premiums. In addition, employers may have shifted the timing of bonus payments from 1993 to 1992 in order to avoid this increase in the marginal income tax rate. Feenberg and Poterba (1993, 2000) find a nearly two-percentage point increase in the share of wages earned by the top 0.5 percent of earners between 1986 and 1988 when marginal tax cuts under the Tax Reform Act of 1986 were phased in, from 50 percent to 38.5 percent to 28 percent.<sup>16</sup>

When the economy and the stock market began to accelerate during the late 1990s, growth in the share of wages received by the top of the distribution followed.<sup>17</sup> During the first half of the decade, the top 1 percent of workers earned approximately 10.8 percent of the total. By 2000, their share of earnings had grown to 14.1 percent, a three-percentage point increase (and a 5.2 percent growth rate) in only five years (Figure 4, Table 2). The share of wages earned by the top 0.5 percent of the distribution was just under 8 percent of aggregate wages during the early 1990s, but as the economy expanded, their share grew to 10.9 percent by 2000—higher than the share of wages received by the top 1 percent of earners at the beginning of the period. In the topmost part of the distribution, growth in the share of total wages was equally strong; prior to 1995, the share of earnings in the top 0.1 percent held steady at about 3.8 percent, but in the five

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<sup>16</sup> Utendorf (2001-2002) finds similar changes in the top 0.1 percent and 1 percent of the earnings distribution.

<sup>17</sup> One can certainly argue whether the stock market boom began in 1995 or 1996. For purposes of this paper, 1996 is chosen as the beginning of the stock market boom since the market was in full speed by the first of the year. Some have argued that the beginning of the boom can be traced to the Netscape initial public offering on August 9, 1995 (Lashinsky, 2005). The results are largely unchanged if 1995 is used as the base year.

subsequent years, that share increased by almost three percentage points, to 6.5 percent. This trend suggests that top earners were particular beneficiaries of the stock market boom, which might have been caused by a variety of factors, such as changes in work behavior, income-reporting behavior, or simply working in sectors—such as finance or technology—that were positively affected by growth in the stock market.

The rapid increase in the share of wages earned by the top of the distribution is further demonstrated by the gains made by the top 0.01 percent of the wage distribution. These workers, who each earned more than \$1.7 million in 2003 (in 1993 dollars), saw their share of total wages rise from 1.4 percent in 1996 to 2.9 percent by 2000. These workers represent the very top of the wage distribution and include corporate executives, star athletes, musicians and celebrities (the “superstar” class described by Rosen, 1981), in addition to lawyers, consultants and other high-wage professionals. Bebchuk and Grinstein (2005), using the ExecuComp database, which includes data on executive compensation in public U.S. companies, find that average compensation levels of CEOs in firms belonging to the S&P 500 grew by nearly five times between 1993 and 2000. The top 0.01 percent of wage earners in the CWHS is thus a superset of this CEO (and superstar) group, which witnessed exceptional growth in their share of total wages in the economy.

The rapid increase in the share of wages earned by the top of the distribution was nearly identical to the evolution in the stock market. In Figure 5, annual average closing values for the Dow Jones Industrial Average and the S&P 500 are graphed along with the various top shares measures, all normalized to 1 in 1993. The average compensation levels for CEOs in firms that belong to the S&P 500 (from Bebchuk and Grinstein, 2005)

are also shown in the figure.<sup>18</sup> The similarity in the patterns is clear—the increase in top shares moves almost identically to the increase in all three stock market measures and CEO compensation levels. In fact, the correlation between the top shares and these other series (see the inset in Figure 5) all exceed 0.90.<sup>19</sup> This does not suggest causation, but suggests an important question for further research: Did equity growth drive earnings at the upper end of the distribution or did high earnings drive equities, or were both caused by other factors?

The late-1990s stock market boom was characterized by growth in the technology sector, a sector better suited to younger workers. Goolsbee (2000) shows how these “new-economy” executives (executives from high-technology industries such as biotechnology and computer equipment) responded much more strongly to changes in marginal tax rates in terms of taxable income than did “old-economy” executives.<sup>20</sup> If new-economy workers were better able to take advantage of the market boom, growth in the share of younger workers in the top part of the wage distribution should occur during the boom of the late 1990s. As stock market growth accelerated during the 1990s, the share of 25- to 34-year-olds had grown in every category of top earners by 2000 (Figure 6). By the peak of the boom, the share of 25- to 34-year-olds in the top 1 percent had recovered to 6.2 percent, reversing about half the decline that had occurred between 1987 and 1995. As the next section will show, however, when the stock market run-up ended, so did several other trends.

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<sup>18</sup> Dow Jones Industrial Average and S&P 500 estimates are from Yahoo! Finance and author’s calculations.

<sup>19</sup> Although not pictured, very similar trends exist for annual average values of the Nasdaq Composite Index. The correlation with shares in the top 1.0 percent, 0.1 percent and 0.01 percent all exceed 0.94 for the 1987-2003 period.

<sup>20</sup> Moffitt and Wilhelm (2000), however, show that the very wealthy change the number of hours they work very little in response to tax changes.

*The Bust: 2000-2003*

When the economic expansion of the 1990s ended, so did the share of wages earned by the top of the distribution. Between 1995 and 2000, the top 1 percent of wage earners had increased their share of aggregate wages by three percentage points, from 11.1 percent to 14.1 percent, the highest level since before World War II (Piketty and Saez, 2004; Figure 4). In the three years following the peak of the stock market, the share of wages at the top of the distribution fell by two percentage points to the level observed six years earlier.<sup>21</sup> Very top earners (0.1 percent) saw their share of total wages fall from 6.5 percent to 4.6 percent between 2000 and 2003, an annualized rate of decline of 10.9 percent (Figure 4, Table 2). And although there appears to be some recovery between 2002 and 2003, by between one- and two-tenths of a percentage point, it is clear that top earners had seen the pinnacle of their share of wages at the height of the stock market.<sup>22</sup> At the same time the top of the distribution was accounting for more of the aggregate, the share of wages received by the workers at the middle of the distribution, between the 50<sup>th</sup> and 60<sup>th</sup> percentiles (in the CWS), stayed relatively flat, at around 5.9 percent (a consistent downward trend from 6.5 percent in 1984).

As in the run-up in the stock market during the late 1990s, trends in stock market performance during the bust period are closely related to trends in the top shares of wages (Figure 5). The declines parallel the fall in the S&P 500 and Dow Jones Industrial Index.

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<sup>21</sup> Saez (2005), using the same IRS data as in Piketty and Saez (2003), also finds a dramatic decline in the share of income held by the top 10 percent, 0.1 percent and 0.01 percent of earners after 2000.

<sup>22</sup> As the 1986 marginal tax rate decreases and the 1993 marginal tax rate increases may have resulted in high earners shifting their mix of total compensation and hence increased the share of earnings at the top of the distribution (see page 17, as well as Utendorf, 2001-2002; and Feenberg and Poterba, 1993, 2000), so might have the 2000 and 2002 tax cuts initiated by the Bush Administration. Those tax cuts lowered top marginal tax rates from 39.6 percent to 39.1 percent to 38.6 percent. A much larger reduction to 35 percent in 2003 might help explain the increase in the share of earnings received by the top of the distribution (see also Citizens for Tax Justice, 2002).

The decline in average CEO compensation (Bebchuk and Grinstein, 2005) also mirrors the change in the share of wages attained by these high earners. The increase in mean CEO compensation from \$3.7 million to \$17.4 million between 1993 and 2000 was offset by nearly half after the stock market decline, falling to \$9.1 million in 2003.

The decline in the stock market was associated with a change in the demographic distribution of top earners. As noted in the previous section, the share of younger (25- to 34-year-old) workers increased during the stock market boom; after the market reversed course, the share of young workers also declined. In the three years after the market peak, the percent of younger workers in the top part of the distribution fell by 1.6 percentage points in the top 1 percent and 1.1 percentage points in the top 0.1 percent of the distribution (Figure 6). The demographic distribution in the three years after 2000 then shifted from younger to older workers (55- to 64-year-olds) who accounted for more than one-fifth (22 percent) of total workers in the top 1 percent of the wage distribution and more than a quarter (25.6 percent) in the top 0.1 percent. Furthermore, the proportion of 55- to 64-year-olds in the top 0.1 percent had exceeded the share of 35- to 44-year-olds, and had closed the gap between the two groups in the top 1 percent of high-wage earners. Having tracked these changes in the demographic make-up of the top shares of the wage distribution, the tentative conclusion in the previous section—that the highest-wage earners are generally becoming younger—may no longer be true; young, rich workers now account for a slightly smaller portion of top earners, the effect of which will be interesting to track in the years to come.

So what happened to the wages of the highest earners? What was responsible for the stark downward shift in the share of aggregate wages after the stock market growth

stopped? One hypothesis is the decline in the value and/or realization of stock options; Bebchuk and Grinstein (2005), for example, find a decline in CEO equity-based compensation between 2000 and 2003. A second hypothesis is the sensitive nature of bonuses to the macroeconomy; total Wall Street bonus payments increased steadily between 1990 and 2000, from \$2.1 billion to \$19.5 billion (Office of the New York State Deputy Comptroller, 2006) but after the stock market reversed its rise, these bonus payments fell to \$10.1 billion in 2002, before recovering partially to \$16.2 billion in 2003. If workers report bonus payments or stock options as part of their wage package, the share of total wages received by these workers would decline, as seen in Figure 5. If younger workers were more likely to hold bonuses and stock options (or hold a larger part of their total wages in bonuses and stock options) than older workers, the demographic shifts seen in Figure 6 would follow. Further research on workers in specific industries where options and bonuses constitute a significant share of compensation might help shed light on earnings changes across age groups.

## **V. Why are Trends in Top Shares Important?**

This pattern of the share of top wages in the 1990s and early 2000s not only has important consequences for the study of inequality and wage dynamics in the U.S., but also affects projections of government tax revenues. Government tax revenues depend in large part on the income taxes paid by high earners: In 2003, people with \$200,000 or more in adjusted gross income (AGI) accounted for more than one-fifth of the nation's total AGI (Internal Revenue Service, 2005). For example, the 5.2 percent growth rate in the top 1 percent of earners between 1996 and 1999 produces different revenue estimates

than the 1.0 percent annualized growth rate for the 1990-2003 period. If forecasters base their projections of the earnings distribution on the pre-2000 trend in the growth of earnings concentrated at the top of the distribution, tax increases or cuts will generate significantly larger changes than if projections incorporate the post-2000 period. Using a sample of annualized growth rates to project the share of wages earned by the top 1 percent of earners, Figure 7 demonstrates the variability in possible projections. By 2010, the share of wages received by the top 1 percent of earners will have reached 12.8 percent if the 1.0 percent 1990-2003 growth rate is used. A much larger and somewhat implausible 23.7 percent estimate results if the 5.2 percent 1996-1999 growth rate is used (recall that the top 10 percent of earners held 38 percent of total wages in 2003). Hence, an important question for further research is whether the stock market spike during the late 1990s is an aberration of a longer-term trend or reflects a more general structural shift in the economy.

## **VI. Conclusion**

Prior to the stock market boom of the late 1990s, America's high earners generally received a fairly steady share of total wages in the economy. When the stock market began its record climb during the late 1990s, the share of wages received by top earners also grew, peaking in 2000 before falling along with the stock market and the economy. The pattern of these wages will have an important impact on tax projections and actualized tax revenues.

This paper tracks percentile ratio measures of inequality from the public-use March CPS and the restricted-use Social Security Administration CWHS data sets. The

data sets have different distributions of wages; the CWHS has more aggregate wages toward the bottom of the distribution than the CPS and has a more evenly distributed pattern of wages at the very top. The CWHS also records wages at the very top of the distribution—wages the CPS is unable to measure because of topcoding and other survey bias issues.

The results show that annual levels of wage inequality differ between the two data sets: Overall inequality, as measured by the 90/10 percentile ratio, declined in the CPS and was relatively stable in the CWHS. Upper-tail inequality, as measured by the 90/50 ratio, steadily increased in the CWHS between 1987 and 2003 but in the CPS was less stable and declined slightly over the period. Focusing within the top 10 percent and top 1 percent of the wage distribution in the CWHS shows that inequality between the very top and bottom of the distribution grew during the stock market boom years of the 1990s but then declined with the stock market.

The analysis also tracks the stable upward trend in top shares during the early 1990s, the sharp increase during the stock market boom, and, finally, the subsequent decline during the fall in the stock market. To be considered part of the top 1 percent of the distribution, a worker would need to earn almost \$123,000 (in 1993 dollars), more than seven times the wage level at the median and almost 50 times that of workers at the 10<sup>th</sup> percentile. Expanding the criteria for top workers slightly, the top 10 percent of the workforce held nearly 40 percent of aggregate wages, earned more than 18 times the wages at the 10<sup>th</sup> percentile and nearly three times the wages earned at the median. The top 1 percent of the distribution of total wages now earns 12.1 percent of the total, up

from 10.8 percent 20 years ago but also significantly lower than the 14.1 percent share at the peak of the stock market boom.

These trends have important implications for the study of labor supply, inequality, and tax revenues. Detailed administrative wage data such as the CWHS and comprehensive demographic data such as the CPS are valuable tools in examining those trends.

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**Table 1. CWHS, CPS and NIPA Total Wage Comparison**

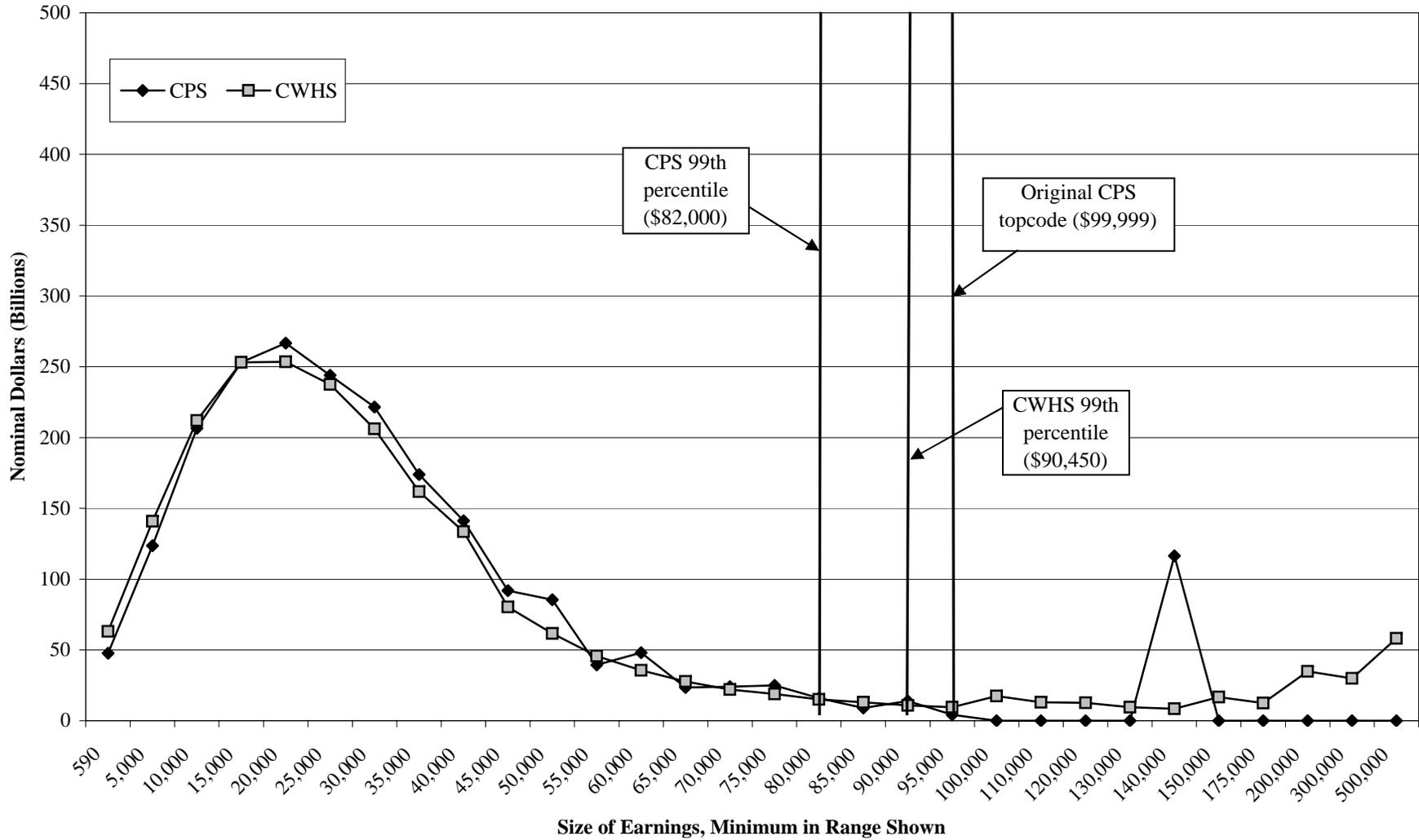
Year	Billions of Nominal Dollars			as % of NIPA		CWHS/CPS %
	CWHS	CPS	NIPA	CWHS	CPS	Ratio
1987	2217	2175	2220	99.9	98.0	101.9
1988	2389	2297	2399	99.6	95.8	104.0
1989	2530	2470	2538	99.7	97.3	102.4
1990	2685	2544	2693	99.7	94.5	105.5
1991	2757	2632	2761	99.8	95.3	104.7
1992	2916	2740	2916	100.0	94.0	106.4
1993	3021	2864	3016	100.2	94.9	105.5
1994	3185	3054	3163	100.7	96.6	104.3
1995	3342	3407	3347	99.8	101.8	98.1
1996	3532	3606	3543	99.7	101.8	98.0
1997	3820	3798	3799	100.6	100.0	100.6
1998	4105	4033	4099	100.1	98.4	101.8
1999	4379	4256	4371	100.2	97.4	102.9
2000	4735	4675	4729	100.1	98.8	101.3
2001	4828	4940	4840	99.8	102.1	97.7
2002	4830	4960	4870	99.2	101.9	97.4
2003	4890	5106	4994	97.9	102.2	95.8

Source: Author's calculations from CWHS and CPS data sets.

**Table 2. Growth Rates for Top Shares in the CWHS**

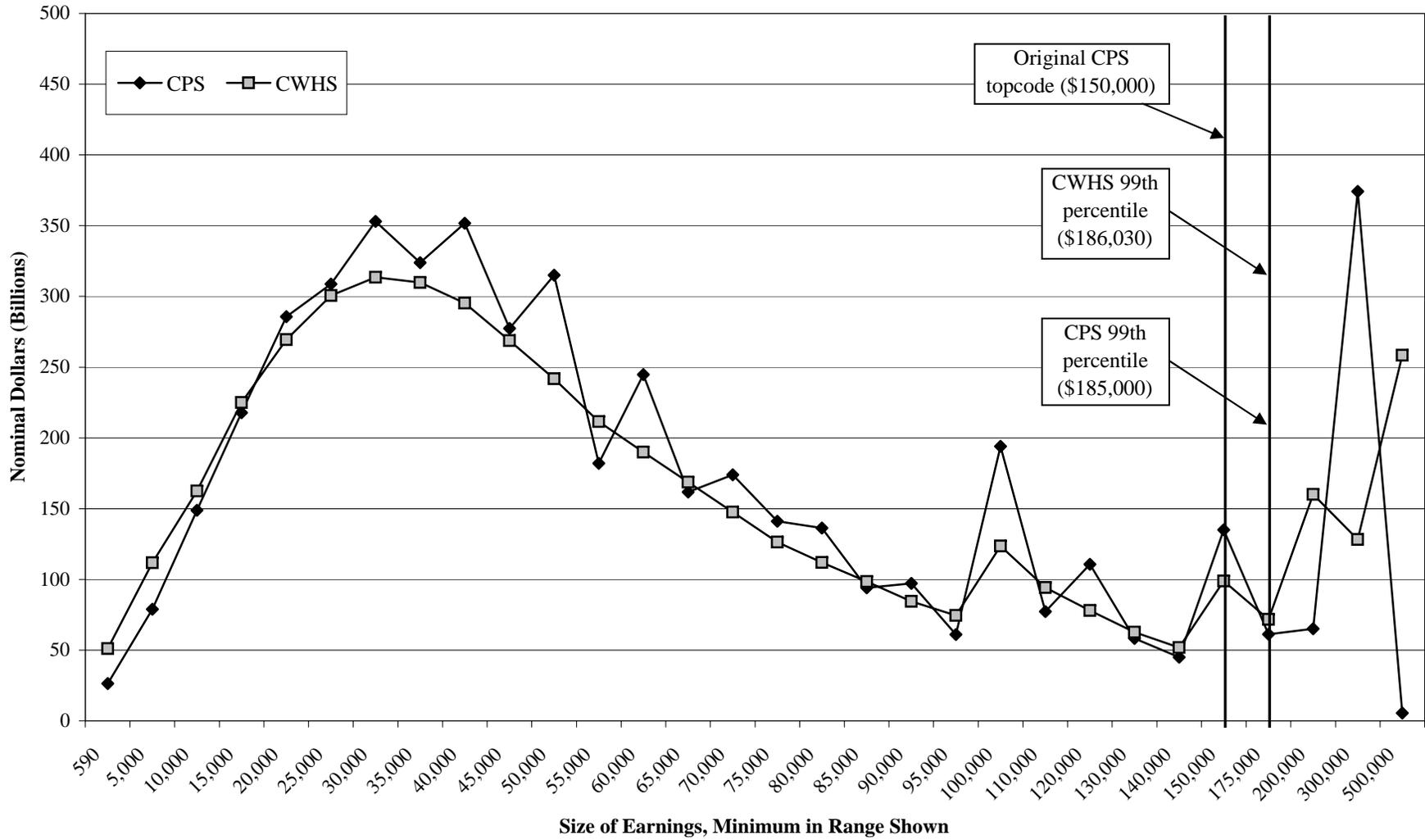
	Top 10%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
<b>Growth Rates</b>					
1990-1999	11.7%	23.8%	30.7%	65.4%	169.3%
1990-1995	5.7%	4.0%	4.5%	13.3%	67.1%
1996-1999	4.7%	16.4%	21.9%	42.0%	71.0%
1990-2003	10.4%	13.6%	17.0%	35.9%	103.7%
2000-2003	-3.3%	-14.3%	-17.8%	-29.3%	-35.0%
<b>Annualized Growth Rates</b>					
1990-1999	1.2%	2.4%	3.0%	5.7%	11.6%
1990-1995	1.1%	0.8%	0.9%	2.5%	10.8%
1996-1999	1.5%	5.2%	6.8%	12.4%	19.6%
1990-2003	0.8%	1.0%	1.2%	2.4%	5.6%
2000-2003	-1.1%	-5.0%	-6.3%	-10.9%	-13.4%

**Figure 1. Total Earnings by Class, 1987, CWHS v CPS**



Note: Topcode and 99th percentile lines are placed within the category where they appear.

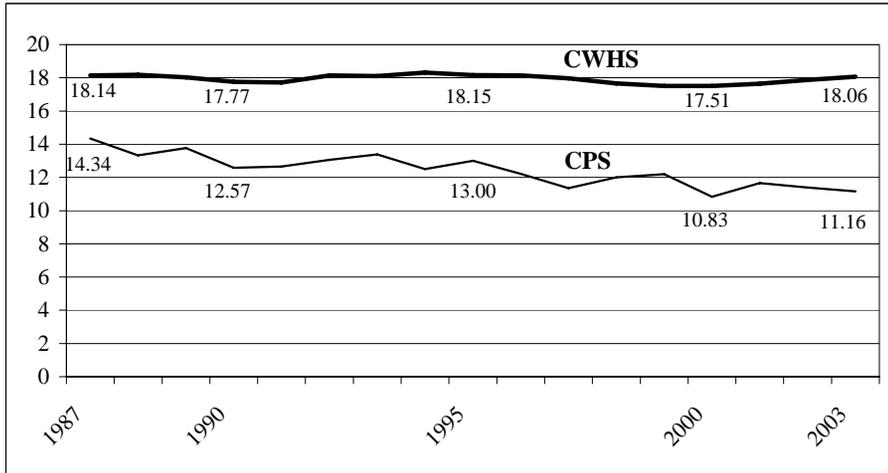
**Figure 2. Total Earnings by Class, 2003, CWHS v CPS**



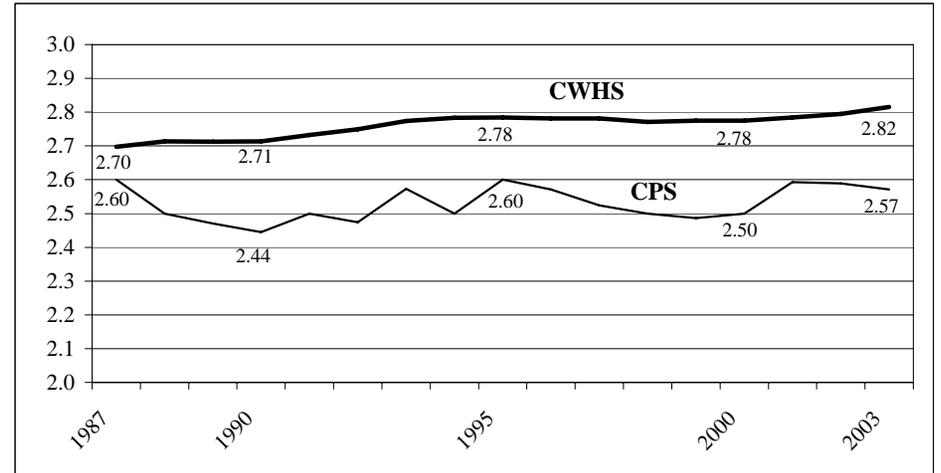
Note: Topcode and 99th percentile lines are placed within the category where they appear.

**Figure 3. Measures of Inequality in the CWHS and CPS**

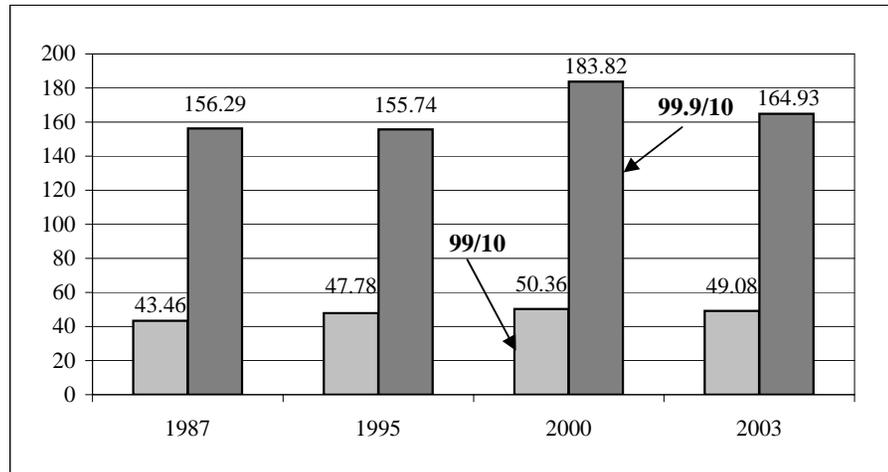
**Inequality in the CWHS and CPS, 90/10 Percentile Ratios**



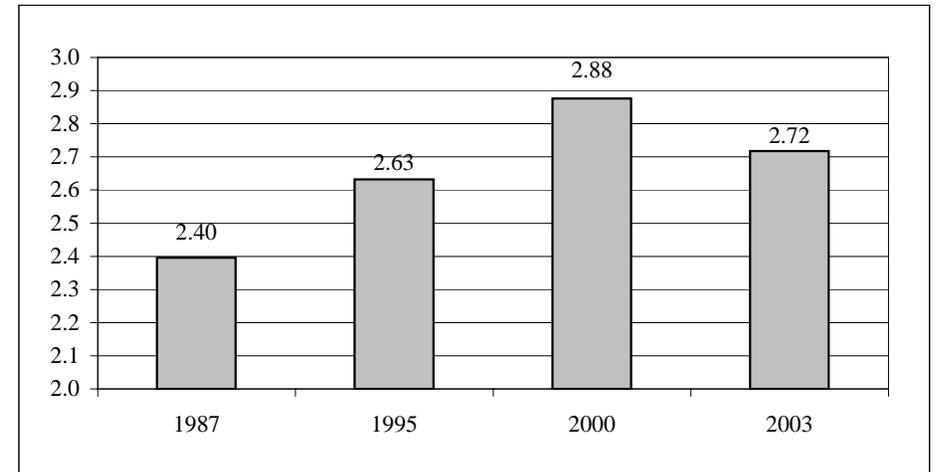
**Inequality in the CWHS and CPS, 90/50 Percentile Ratios**



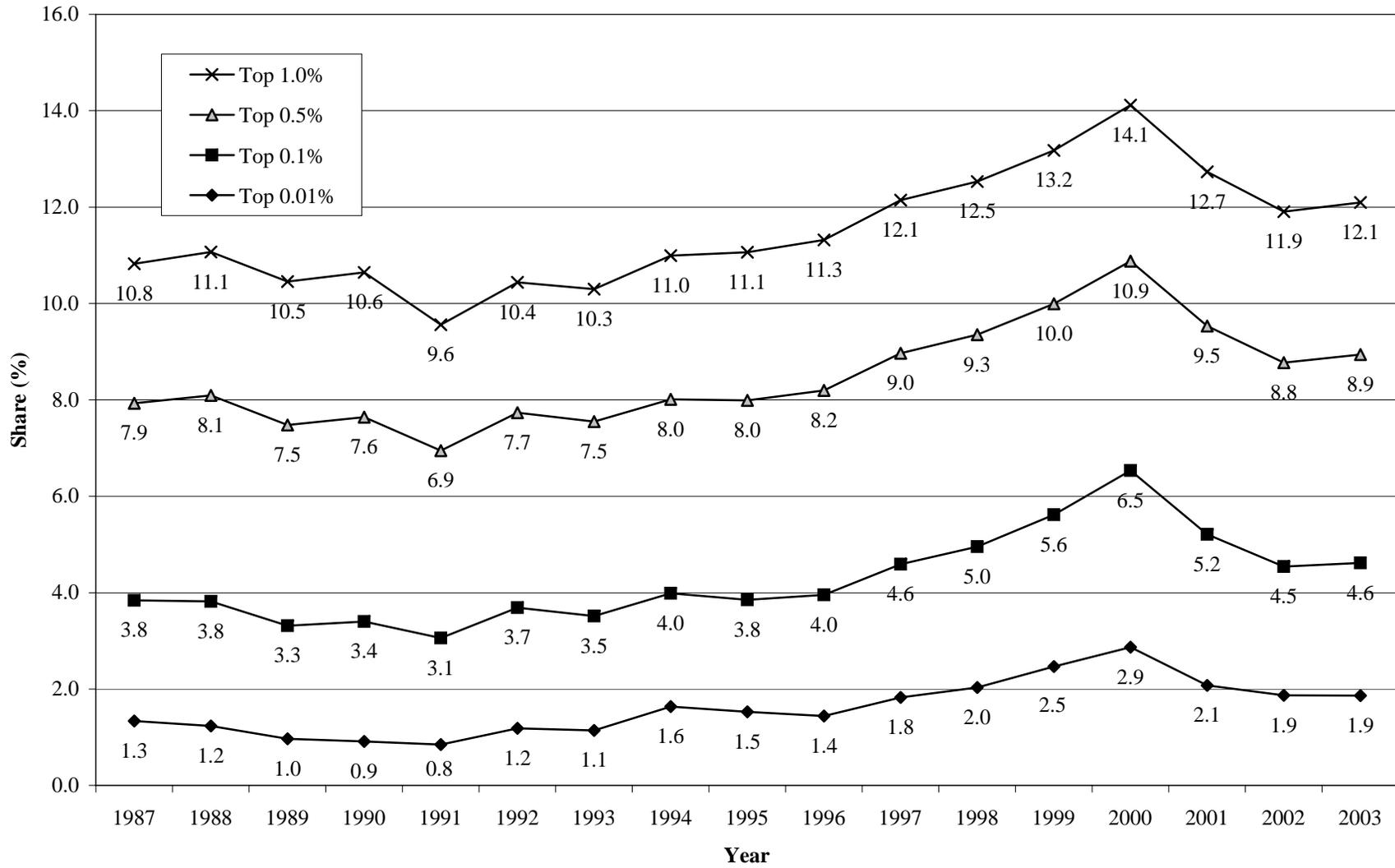
**Extreme Inequality in the CWHS, 99/10 and 99.9/10 Percentile Ratios**



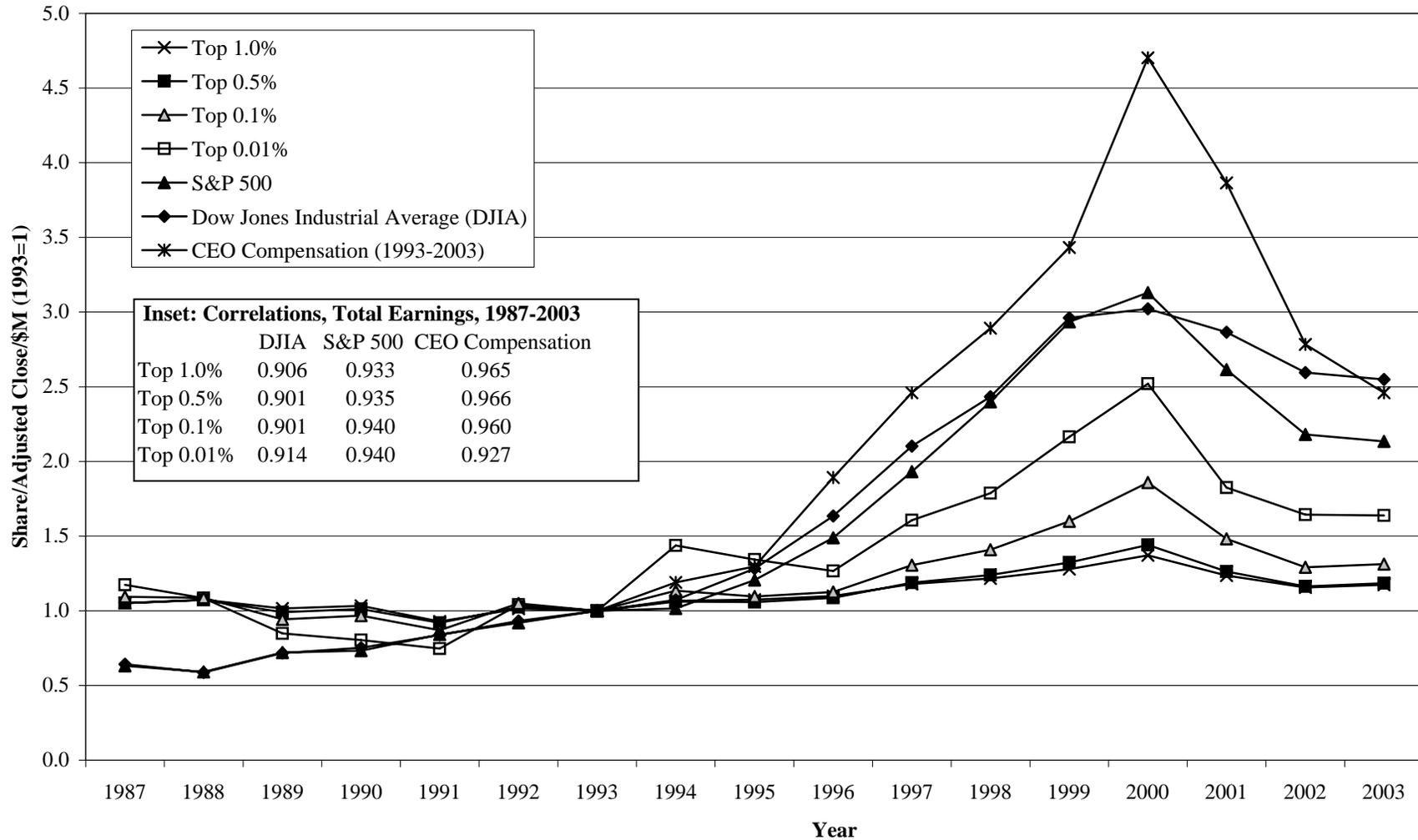
**Extreme Upper-Tail Inequality in the CWHS, 99/90 Percentile Ratio**



**Figure 4. Total Earnings Shares of Top 1.0%, 0.5%, 0.1% and 0.01% from the CWHS**



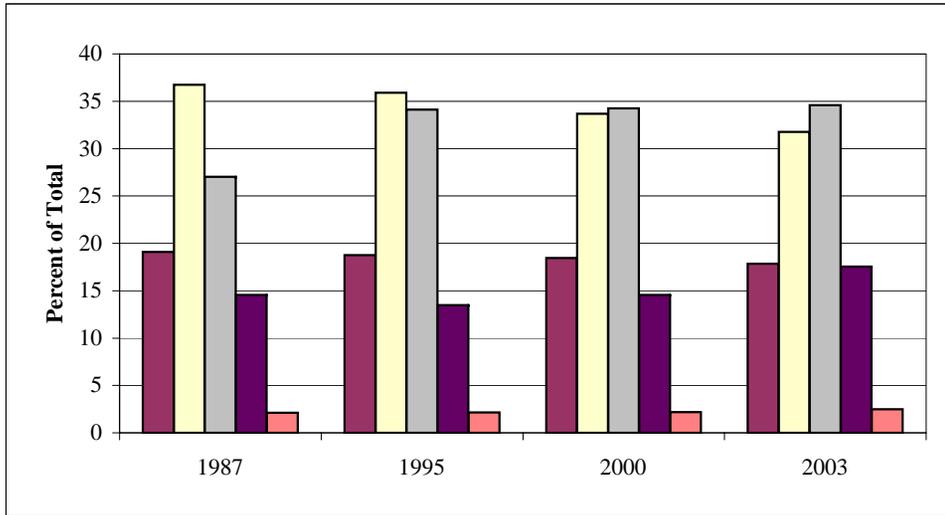
**Figure 5. Total Earnings Shares of Top 1.0%, 0.5%, 0.1% and 0.01% Compared to Stock Market Measures and CEO Compensation (1993=1)**



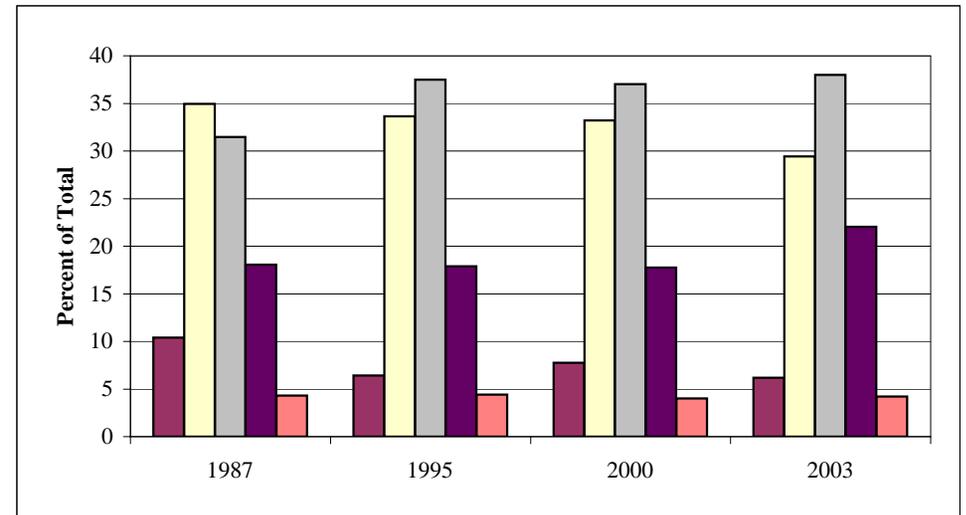
Note: CEO Compensation is the mean compensation levels for CEOs in firms that belong to the S&P 500, as reported in Bebchuk and Grinstein (2005), Table 1.

**Figure 6. Distribution of Age Groups among Top 10%, 1%, 0.5% and 0.1% of Earnings Distribution**

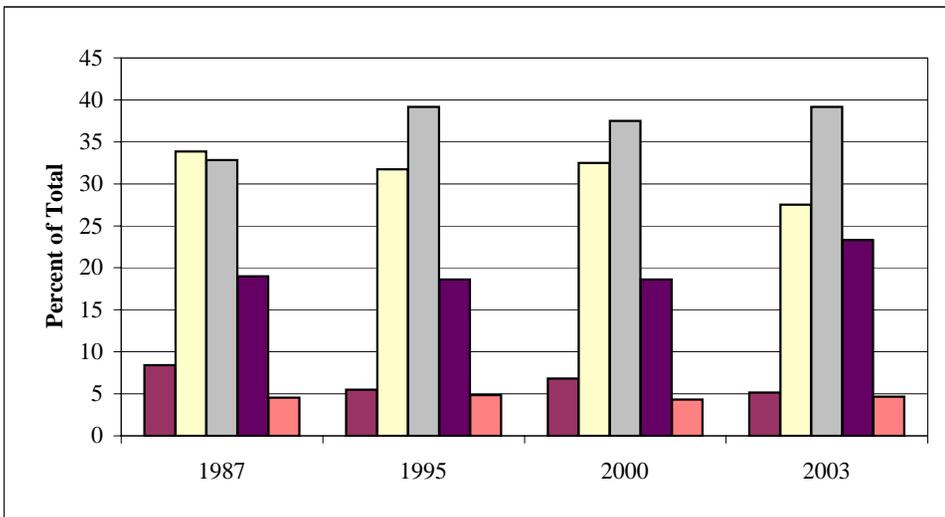
**Top 10%**



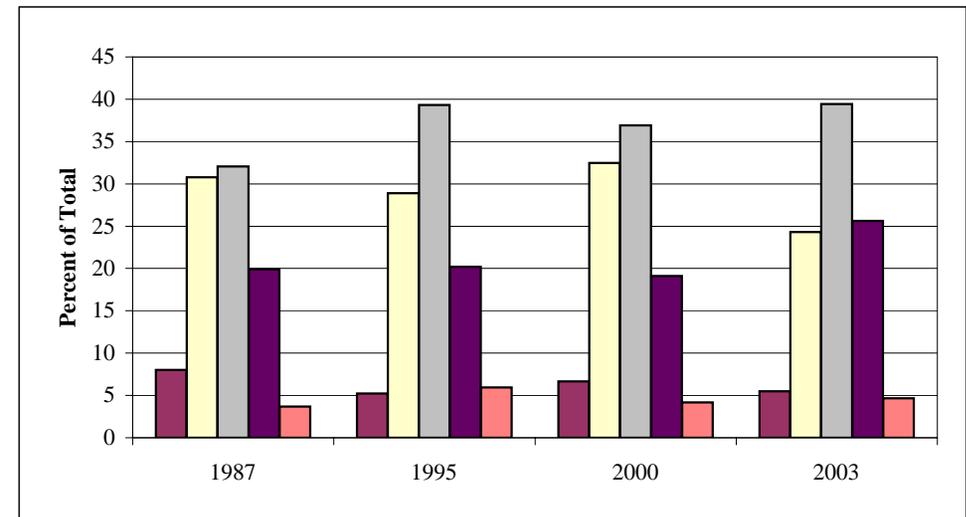
**Top 1%**



**Top 0.5%**



**Top 0.1%**



**Figure 7. Possible Simple Projections for Top 1%  
(Projections Begin in 1996)**

