What Happened to the Gains From Strong Productivity Growth?

By Jonathan L. Willis and Julie Wroblewski

Over the past decade, the United States economy has experienced strong economic growth due in large part to a resurgence in productivity growth. During the period from 1996 to 2006, average labor productivity grew 2.8 percent annually as compared to 1.4 percent from 1974 to 1995. Researchers have devoted considerable effort to understanding the source of this surge in productivity, focusing especially on the role played by computers and advances in information technology.

Less attention has been paid, however, to examining how the gains from this growth have been distributed. In the past few years, observers have noted that the share of income paid to labor has been falling, while corporate profits have surged. Also, observers have pointed out that income inequality appears to have widened, with little increase in real wages for low-income workers, while executive pay has skyrocketed. Consequently, there has been a growing sentiment among the public that the average household is not sharing in the recent economic prosperity.

This article examines how the gains from increased productivity growth have been distributed. There are two traditional ways of analyzing how income in the economy is shared. The first measure is

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based on examining changes in compensation for the two main factors of production: labor and physical capital. The second measure is based on examining changes in the household distribution of income, which includes earnings from work and the ownership of physical capital. The article examines whether the strong productivity growth over the past decade has altered the distribution of income according to these two measures. Has the increase in productivity growth led to a change in the income shares for capital and labor? Has the strong productivity growth over the past decade led to a change in the distribution of income across households?

The first section describes the relationship between growth in productivity and income shares based on economic theory. The second section of the article uses U.S. data to examine the empirical relationship between productivity growth and income over the past half-century. The third section examines changes in the income distribution over the past decade of strong productivity growth. The article finds that the shares of income allocated to labor and capital have been constant on average over the past 35 years. However, during the last decade of high productivity growth, low-income households have seen no increase in real income, and at most, only the top 10 percent of the household income distribution experienced real income growth equal to or greater than average labor productivity growth.

I. THEORETICAL RELATIONSHIP BETWEEN PRODUCTIVITY AND COMPENSATION

Economic theory suggests that changes in productivity should affect compensation for labor and physical capital, the two main inputs for production. This section provides a framework for understanding how inputs combine to produce output, how output relates to compensation, and why compensation shares should remain constant over time.

Each input used for production should be compensated according to its marginal production, measured by the amount of goods or services produced by an additional unit of that input. A standard, simple theory of aggregate production suggests that an increase in productivity of labor should lead to a proportional increase in labor compensation. This implies that the share of total income distributed to each input of

production is constant. Therefore, a change in labor productivity growth will alter the amount of labor compensation but not the overall share of income paid as labor compensation. Theory predicts a similar relationship between productivity of capital and compensation for the owners of physical capital.

The standard model used in economics to describe how inputs are combined to produce output is the Cobb-Douglas production function. The amount of real output (Y) produced is expressed as a multiplicative function of the amount of labor (L) and physical capital (K) inputs. In this context, labor is defined broadly to include the total number of hours worked by individuals in all sectors and occupations in the economy. Likewise, capital is defined to include any physical input to the production process, such as machines, buildings, and other equipment. A technological innovation that makes both capital and labor more productive is represented by a measure of total factor productivity (A). The full production function is expressed as the following

$$Y = AK^{1-\alpha}L^{\alpha}, \tag{1}$$

where α represents the elasticity of output, with respect to labor, which is assumed to be less than 1.[1] The elasticity of output, with respect to capital, is given by $1-\alpha$, assuming that the production function exhibits constant returns to scale.

The most commonly used measure of productivity in the data is labor productivity, the average amount of real output produced per hour of work. This is represented in the model as output divided by labor,

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^{1-\alpha}. \tag{2}$$

For this production function, observed increases in labor productivity could result from three sources: 1) an increase in the overall level of technology, or total factor productivity (A); 2) an increase in the amount of capital (K), commonly referred to as capital deepening; or 3) a decrease in the number of hours worked (L).

This production function also provides a clear prediction for the change in labor compensation as a result of an increase in productivity. As stated earlier, each production input should be compensated according to

the marginal amount of production by that input. For the Cobb-Douglas production function, the marginal product of labor is the ratio of output to labor, or average labor productivity, multiplied by the labor elasticity.

$$\text{(3)} \qquad \textit{Marginal Product of Labor} = \alpha \frac{Y}{L}$$

In this simple model, total income is equal to total output. All workers are assumed to be identical and receive the same compensation. We also assume that markets in this simple model are competitive, which implies that the real wage for workers is equal to the marginal product of labor. The real wage, defined as the nominal wage (W) divided by the price level in the economy (P), is therefore equal to average labor productivity multiplied by the labor elasticity.

$$\text{(4)} \qquad \frac{W}{P} = \alpha \frac{Y}{L}$$

A change in average labor productivity will result in a proportional change in the real wage.

The relationship between the real wage and average labor productivity in equation (4) can be rearranged to derive labor compensation in this model as a fraction of total income. According to this model, the share of nominal income, PY, that is distributed as nominal labor compensation, WL, is constant.

$$\text{(5)} \qquad \frac{WL}{PY} = \alpha$$

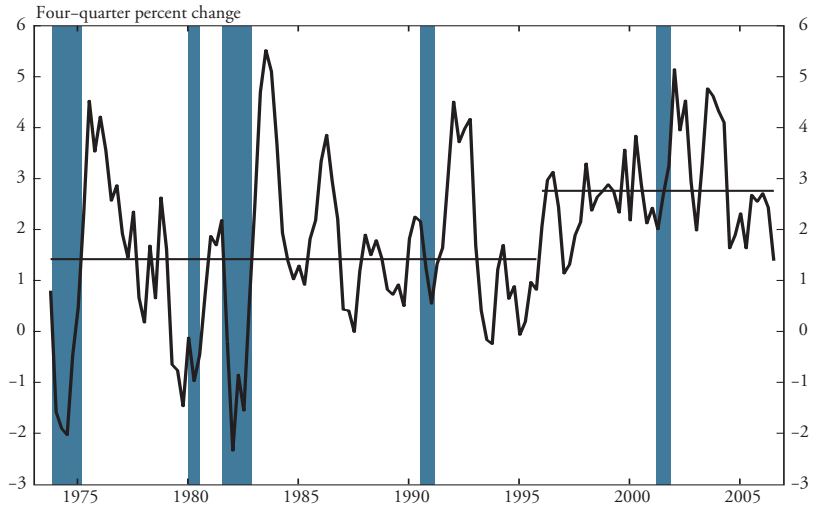
This implies that the share of income distributed to the other factor of production, physical capital, is also constant.

II. EMPIRICAL RELATIONSHIP BETWEEN PRODUCTIVITY AND COMPENSATION

Has the strong productivity growth over the past decade led to a change in compensation for labor and physical capital inputs to production? To examine the relationship between productivity and compensation, we focus on two distinct periods of productivity growth (Chart 1). From

Chart 1

GROWTH IN LABOR PRODUCTIVITY



Note: Labor Productivity growth is for the nonfarm business sector. NBER-defined recessions are shaded.
Source: Bureau of Labor Statistics

late 1973 to 1995, average labor productivity increased at a relatively slow annual rate of 1.4 percent. From 1996 to 2006, labor productivity increased more rapidly, growing at an average annual rate of 2.8 percent.

In the next section, we examine how changes in productivity growth rates over these periods have affected incomes shares. Empirically, income shares have been stable, on average, across the two productivity periods, demonstrating that the share of income received as labor compensation has not changed during the period of high productivity growth. However, income shares have fluctuated in the short term. These fluctuations appear to be closely associated with the business cycle.

Empirical measures of income shares

To determine whether strong productivity growth has led to changes in compensation for labor and physical capital, we examine income shares across two distinct periods of productivity growth. Because it is difficult to measure compensation accurately, we will consider two measures of labor and capital shares.

The first measure of income shares is based on data for the entire economy (Box 1). Total income is measured as national income for the United States.[2] Labor compensation consists of total compensation for all employees, including wages, salaries, and benefits. Wages and salaries consist of all monetary remuneration of employees, including commissions, tips, bonuses, compensation deferment plans, and exercised nonqualifying stock options. Benefits include employer-paid contributions to social insurance, retirement funds, and health insurance. Labor compensation for workers who are self-employed or in partnerships is accounted for by adding a portion of proprietors' income. The measure of proprietors' income includes both compensation for work and an investment return on the physical capital owned by proprietors. We follow a standard assumption by allocating two-thirds of proprietors' income to labor compensation and one-third to returns on physical capital (Johnson). Compensation for the owners of physical capital includes corporate profits plus other sources of rental, interest, and business income.[3]

The second measure does not rely on an assumption about proprietors' income. This measure is based on the nonfinancial domestic corporate business sector, which comprises about half of the total economy (Gomme and Rupert).[4] Since this sector excludes all proprietorships, the measure of labor compensation is straightforward. Total income is represented by the net value added of nonfinancial corporate businesses. An additional benefit of this measure is that we can clearly examine the different forms of compensation for the owners of physical capital. In the nonfinancial domestic corporate business sector, compensation for physical capital is given by the net operating surplus of these businesses. This surplus consists of profits and other sources, such as net interest income and business current transfer payments.

The two measures confirm that both labor and capital income shares have remained constant on average across periods of high and low productivity growth (Charts 2 and 3). For the national income measure, the average labor share was 76.3 percent during the period of low productivity growth from 1974 to 1995 and 75.8 percent during the period of high productivity growth period from 1996 to 2006. For the nonfinancial corporate business sector, the average labor income share was 80.4 percent during the low period and 80.4 percent during the recent high period. Similarly, measures of profit and capital shares

Box 1

COMPONENTS OF NATIONAL INCOME IN 2005

	Billions of Dollars	% National Income
National income	10,812	
Compensation	7,030	65
Wages	5,665	52
Supplements to wages	1,366	13
Proprietors' income	971	9
Rental income	73	1
Net operating surplus	1,888	18
Corporate profits	1,331	12
Net interest and misc. payments	483	4
Business current transfer payments	74	1
Taxes on production and Imports less subsidies	865	8
Other	-15	-0.1

Calculations of Labor and Capital Shares

Labor compensation = Compensation + 2/3 * (Proprietors' Income + Taxes on Production and Imports less Subsidies)

Capital compensation = Net Operating Surplus + Rental income + Other + 1/3* (Proprietors' Income +Taxes on production and imports less subsidies)

Labor Share = Labor compensation/National Income

Capital Share = Capital compensation/National Income

Source: Bureau of Economic Analysis

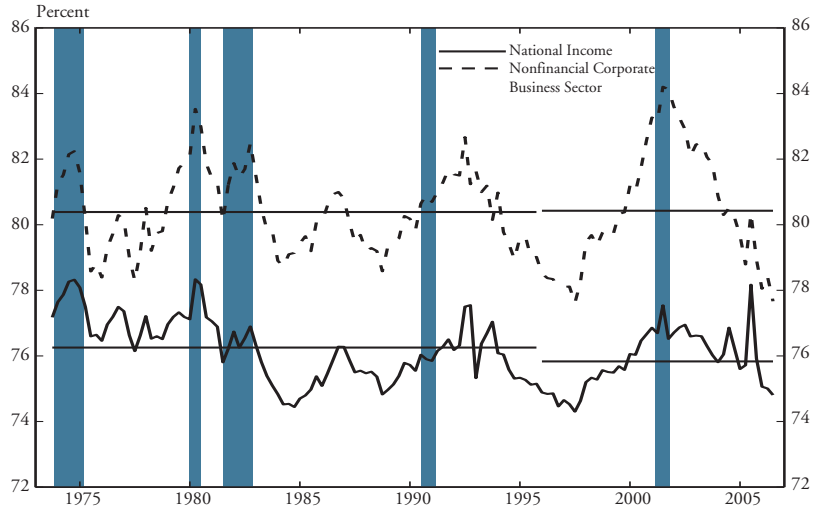
in the nonfinancial corporate business sector have remained constant, on average. This evidence implies that over long periods compensation moves proportionally with average labor productivity.

Fluctuations in income shares

While labor and capital shares show a flat trend over the two productivity periods, fluctuations in income shares from year to year have been sizable. For example, the labor share over the past five years has declined rapidly, which means the capital share has been rising rapidly. Such fluctuations in the labor and capital shares appear to be closely tied to movements in the business cycle (Charts 2 and 3).

Chart 2

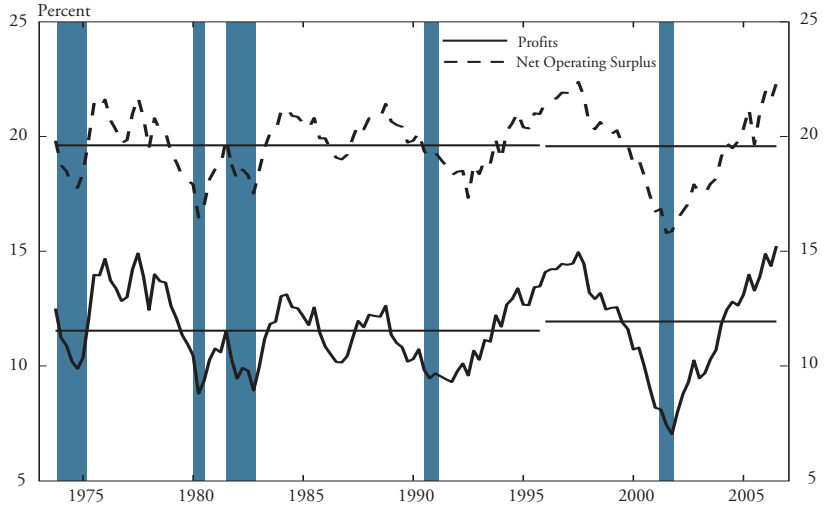
LABOR SHARE



Note: See Box 1 for calculation details. NBER-defined recessions are shaded.
Source: Bureau of Economic Analysis and authors' calculations

Chart 3

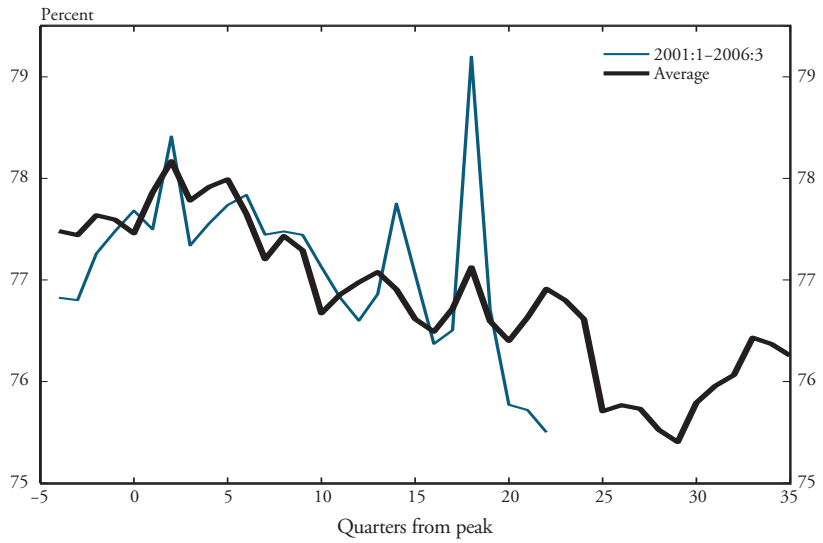
CAPITAL SHARE FOR NONFINANCIAL CORPORATE BUSINESS SECTOR



Note: See Box 1 for calculation details. NBER-defined recessions are shaded.
Source: Bureau of Economic Analysis and authors' calcuations

Chart 4

LABOR SHARE OF NATIONAL INCOME OVER THE BUSINESS CYCLE



Note: The average line represents the average across the past five business cycles, as defined by the NBER.
Source: Bureau of Economic Analysis

A clear pattern emerges when looking at the average fluctuations over the five business cycles since 1973 (Chart 4). The labor share generally increases as the business cycle peaks. It continues to rise for another two quarters after the peak before beginning a long gradual decline. On average, the labor share does not begin rising again until 24 quarters, or six years, after the business cycle peak. The labor share in the current business cycle is following the average pattern very closely. This evidence strongly suggests that fluctuations in the labor share are associated with movements in the business cycle. Thus, the recent decline in labor share is likely to be reversed over time.

Fluctuating income shares over the business cycle do not follow simple theory, which predicts constant income shares. Using a Cobb-Douglas model, labor compensation, *WL*, is predicted to be a constant fraction of total income, *PY* (equation 5). Based on U.S. data, the increase in the labor share following the peak of economic growth and the subsequent decline during the period of economic recovery indicate that growth of economic income, *PY*, is more volatile over the business

cycle than growth in labor compensation, *WL*. Total income grows slower than labor compensation during economic downturns and faster during recoveries.

Several potential explanations exist for these fluctuations. First, the Cobb-Douglas model assumes that all markets are competitive, implying that prices and wages adjust continuously to clear markets. However, wages and salaries for many workers adjust just once a year. This infrequent adjustment may contribute to the delay in the wage growth slowdown during downturns and to a similar delay in the wage growth rebound during upturns. Second, given the uncertainty surrounding the business cycle, firms may delay employment adjustments due to the costs of firing and hiring of workers. Firms will delay decisions until they can determine whether the shifts in demand are temporary or permanent. Third, the volatilities of growth in both income and labor compensation may reflect a risk-sharing arrangement between firms and workers. Workers may have a stronger preference than firms for smooth wage growth over the business cycle. If so, firms and workers may find it beneficial to agree to a labor contract that implicitly offers wage insurance to workers during downturns in exchange for slower wage growth during expansions (Gomme and Greenwood; Boldrin and Horvath).

III. EMPIRICAL RELATIONSHIP BETWEEN PRODUCTIVITY AND THE DISTRIBUTION OF INCOME ACROSS HOUSEHOLDS

As the last section showed, the balance of labor and capital shares does not change during periods of strong productivity growth. But do households share equally in the gains from stronger productivity?

Another way of measuring the gains from increased productivity growth is to examine the distribution of income across households. The simple economic theory discussed above assumes that all individuals are identical and receive the same compensation for work and ownership of physical capital. In the U.S. economy, however, workers are likely to be paid based on their individual labor productivity, which is determined by their experience, skills, and education. There are also large differences

Table 1
ANNUAL GROWTH OF PRODUCTIVITY AND INCOME

	1973:Q4–1995:Q4	1995:Q4–2006:Q3
Labor productivity	1.4	2.8
Labor compensation	1.1	2.3

Source: Bureau of Labor Statistics

across the population in terms of the ownership of capital. To fully explore these issues, we analyze the relationship between productivity and changes in total income growth across households.

First, it is useful to examine the relationship between average compensation growth and average labor productivity growth. The doubling of average labor productivity growth from 1.4 percent from 1974 to 1995 to 2.8 percent from 1996 to 2006 is accompanied by a doubling of average growth in real labor compensation per hour from 1.1 percent to 2.3 percent (Table 1). Combined with the previous evidence showing that income shares have generally remained stable across the productivity periods, this implies that total income growth during the high productivity growth period is approximately twice the rate of the low productivity growth period. This section examines whether income growth has been similar across households during the recent period of high productivity growth.

Household income growth over two productivity periods

Income growth for a household represents the combined growth of compensation for labor and ownership of physical capital, providing a comprehensive measure of the impact of productivity growth. The income statistics are based on data collected by the Census Bureau in the Current Population Survey (DeNavas-Walt and others).[5] The distribution of income is represented by splitting households into five groups, or quintiles, ranked by income level. Income growth is then measured as changes in the average income for each quintile over time (Table 2).[6] Before analyzing the distribution of income across households in the current period of high productivity growth, it is useful to examine the household distribution during the prior period of low productivity.

Table 2

GROWTH ACROSS HOUSEHOLD INCOME DISTRIBUTION

Quintile		1974-1995	1995-2005
Lowest quintile	**(0-20)**	.4	.0
Second quintile	**(20-40)**	.3	.5
Third quintile	**(40-60)**	.4	.7
Fourth quintile	**(60-80)**	.7	.9
Highest quintile	**(80-100)**	1.4	1.4

Source: DeNavas-Walt and others

From 1974 to 1995, income growth rates differed substantially across the household distribution. For the lowest three household quintiles, the average annual rates for real income growth were 0.4 percent or less, while the average labor productivity growth rate was 1.4 percent. Only the top quintile of households experienced real income growth equal to the labor productivity growth rate. The top 5 percent of all households experienced the strongest income growth of all at 1.9 percent per year.

From 1996 to 2006, it is difficult to identify any household quintile that received strong increases in income growth rates. While average labor productivity growth doubled, real annual income growth for the bottom quintile of households fell from 0.4 percent to 0 percent. Households in the second, third, and fourth quintiles experienced modest increases of 0.2 percentage point or 0.3 percentage point from the low period. For the top quintile income growth was unchanged from the low period. Meanwhile, the top 5 percent of households actually experienced a fall in annual income growth from 1.9 to 1.6 percent.[7] This evidence is in line with recent comments from observers suggesting that a large segment of households are not benefiting significantly from the recent economic prosperity. In fact, it is hard to identify any groups that have received strong increases in income growth associated with strong productivity growth.

Explanations for the changes in the distribution of income

Few households received increases in income reflecting the sharp rise in productivity growth. Across both productivity periods, income growth has differed substantially across household quintiles. In particular, households at the lower end of the income distribution have experienced much slower growth of real income compared to the upper quintiles, leading to increased income inequality. But even for the top two quintiles, income growth did not keep pace with rising labor productivity.

In terms of labor income versus capital income, the increased disparity of income growth is due predominantly to changing labor income. The fraction of income for top income earners derived from capital income has fallen substantially since the 1960s (Picketty and Saez). In this subsection, we will examine the income disparity relative to productivity differences across workers, as well as other factors unrelated to productivity. First, though, we will discuss some measurement issues that have masked the size of income growth at the top of the household distribution.

Measurement issues. For the recent period, not one of the household groups—or even the top 5 percent of households—had income growth close to the 2.8 percent growth in labor productivity. This discrepancy is due in part to measurement issues.[8]

One problem in using household income data from the Current Population Survey is that the upper limit for income sources is set at $999,999 (Welniak).[9] Income sources in excess of that amount are not used when processing the data, potentially masking the true amount of income growth at the top end of the distribution.[10] A related problem is that the sample size of the survey may not properly capture income skewness at the top of the distribution.

A more detailed dataset based on household IRS tax returns confirms that substantial mismeasurement occurs in the top 10 percent of the income distribution.[11,12] According to this alternative dataset, only the top 10 percent of the income distribution received salary income growth equal to or above the rate of average labor productivity growth from 1966 to 2001 (Dew-Becker and Gordon 2005). Approximately half of the growth in total wages and salaries from 1997 to 2001 went to the top 10 percent of households. The top 1 percent received nearly

one-fourth of the increase in total wages and salaries.[13] Because these data cover only the upturn in the business cycle during the economic expansion of the late 1990s, it is not clear that the pattern continued over the entire period of strong productivity growth. However, given the large difference between average labor productivity growth and the income growth from the Current Population Survey over the full period, it is plausible that a large portion of the increases in labor compensation continued to go to the top income earners.

Changes in the distribution of income attributable to productivity. The disparity in income growth rates across households can be related in part to productivity. Changes in technology do not have an equal impact on all workers in the economy. Over the past 30 years, improvements in technology, such as computer innovations, have led to increases in labor productivity for workers with technical skills (Krussell, Ohanian, Rios-Rull, and Violante). These high-skilled workers experienced greater increases in compensation than lower-skilled workers. Technological advances have also benefited an exclusive group of professional athletes and entertainers, contributing to very high income growth at the top of the income distribution (Dew-Becker and Gordon 2005).

Income growth in the top two quintiles is tied in part to the demand for high-skilled workers. Increases in technology have allowed firms to achieve strong growth in labor productivity by shifting demand from low-skilled to high-skilled workers. However, this explanation can only account for part of the disparity in income growth across quintiles. The timing of rising income inequality does not match up with the widespread implementation of computer technology. Based on detailed wage data, the increase in income inequality occurred in large part between 1980 and 1986, while the widespread use of computer technology did not take hold until the late 1980s and early 1990s (Card and DiNardo). Also, the professions most closely linked to computer technology did not experience strong wage growth over this period. From 1989 to 1997, total real compensation of workers in occupations related to math and science increased 0.6 percent annually, and compensation of engineers decreased 0.2 percent annually (Mishel and others).

Increases in technology may also partially explain the rapid growth of income earners at the top of the income distribution. Average annual income growth over the past decade was highest for the top 0.01 percent

of the income distribution (Picketty and Saez; Dew-Becker and Gordon 2005). For a select group of "economic superstars," technological innovations have expanded the size of audiences, leading to strong increases in income (Rosen). These new technologies include CDs, DVDs, cable television, the Internet, and entertainment devices such as video games and iPods. The performers who have benefited include top celebrities and major league athletes. These superstars account for approximately 12 percent of income earned by the top 0.01 percent of the income distribution (Dew-Becker and Gordon 2005). For major league baseball players, a subset of these superstars, salaries grew 8.9 percent annually from 1987 to 2001. The rapidly growing demand for video games has resulted in similar income growth in a narrow segment of the software industry. In the late 1990s, creators of video game software experienced average annual income growth rates estimated to be 6 percentage points higher than workers creating non-entertainment software products, such as for computer databases (Andersson and others).

Other explanations for changes in the distribution of income. Factors unrelated to productivity have also affected income distribution. Changes in labor market institutions have likely slowed wage growth for workers in the lower portion of the income distribution. First, the nominal federal minimum wage has not changed since 1997, so it has declined in real terms over this period as a result of inflation. Second, the decline of labor unions also likely contributed to slower income growth for the lower-half of the income distribution (Card and DiNardo). Third, the number of immigrants has grown rapidly over the past decade, adding a large supply of low-skilled workers to the labor market.

Changes in fiscal policy may have contributed to a shift in income toward high income earners at the top of the household distribution. Fiscal policy may have also contributed to the disparity of income across the household distribution. Shortly after the tax reform act of 1986, which reduced the tax rate for the top income bracket, income for the top 1 percent of the household distribution rose substantially (Picketty and Saez). However, the relationship between taxes and income growth is unclear. A subsequent increase in the top tax rate in 1993 did not lead to a fall in income growth for the top 1 percent of income earners. In fact, income growth surged for these individuals shortly after the tax increase.

A more likely explanation for the strong income growth at the top of the income distribution over the past decade is the rapid acceleration of chief executive officer (CEO) compensation. Executives at 1,500 large corporate firms accounted for 20 percent of the top 0.01 percent of the income distribution (Bebchuk and Grinstein; Dew-Becker and Gordon 2007). A key development during the past decade was the extensive use of stock options as part of compensation packages. The ratio of CEO compensation, including exercised stock options, to average worker compensation increased from 100 in 1995 to 185 in 2003 (Mishel and others).

The magnitude of this strong growth in CEO compensation cannot be fully explained by changes in productivity of CEOs. One empirical study of 1,500 large public firms concluded that executive compensation from 1993 to 2003 increased by 76 percent more than can be explained by factors tied to the performance of the firm (Bebchuk and Grinstein). CEOs in the United States earned three times as much on average as CEOs in 13 other advanced countries (Mishel and others). Such evidence strongly implies that increased compensation for CEOs in the United States is due primarily to factors unrelated to productivity.[14]

IV. CONCLUSION

Over the past decade, the United States has experienced a period of strong growth in labor productivity. While considerable attention has been paid to understanding the sources of the productivity growth, less attention has been paid to examining how the gains from growth have been distributed. During the recent period of strong productivity growth, observers have documented strong increases in corporate profits. But falling labor shares and sluggish growth in real wages suggest that the gains have not been distributed equally.

This article uses two empirical approaches to examine these claims and determine how the gains from increased productivity growth have been distributed. Based on the first measure, we find that the shares of national income distributed to labor and owners of physical capital have remained constant, on average, across periods of low and high productivity growth. These shares, however, have experienced sizable fluctuations in the short term. We attribute these movements to fluctu-

ations in the business cycle and therefore conclude that, on average, the gains from strong productivity have been equally shared between labor and capital compensation.

The second approach, however, strongly indicates that the gains from increased productivity have not been equally shared across households. In the recent period, low-income households have seen no increase in real income. At most, only the top 10 percent of income earners experienced real income growth equal to or greater than average labor productivity growth, with most of the gains likely concentrated in the top 1 percent of income earners. Changes in productivity can partially account for the stronger income growth of the upper-half of the income distribution. During this period, technological advances led to a shift in labor demand from low-skilled to high-skilled workers. This likely resulted in greater increases in compensation for high-skilled versus low-skilled workers. Technological advances also led to strong income growth for a select group in the entertainment industry. However, other factors unrelated to productivity, such as changes in labor market institutions, fiscal policy, and accelerating compensation for CEOs, also need to be taken into consideration to understand the income growth disparity.

ENDNOTES

[1]The elasticity of output with respect to labor is defined as the percentage increase in output resulting from a one-percent increase in the amount labor.

[2]The data used to measure capital and labor shares are reported in Table 9 of the GDP news release produced by the Bureau of Economic Analysis.

[3]A final component of national income, taxes on production and imports less subsidies, is allocated between income shares by adding 2/3 to labor compensation and 1/3 to physical capital compensation.

[4]The data used for this alternative measure of capital and labor shares comes from Table 13 of the GDP news release produced by the Bureau of Economic Analysis.

[5]One drawback of this measure is that it does not include employer-paid benefits in worker compensation. Excluding employer-paid benefits (supplements) lowers the average annual growth of national real income from 1.9 to 1.8 percent from 1996 to 2006.

[6]Since households may move from one income quintile to another over time due to changes in income, the average growth of income for a given quintile does not perfectly reflect the average income growth of households currently in a particular quintile.

[7]The Census income measure does not include income received from capital gains, which may result in understated income growth at the top of the income distribution.

[8]A small portion of this disparity can be attributed to differences in the deflators used to control for inflation. Labor productivity is based on using the GDP deflator, while real income measures are constructed using the consumer price index (CPI). From 1996 to 2006, the CPI increased on average 0.4 percentage point faster than the GDP deflator. Therefore, this difference accounts for 0.4 percentage point of the difference between labor productivity growth and real income growth. In addition, a sight decrease in average hours worked per person from 1996 to 2006 can account for 0.05 percentage point of the difference.

[9]Total household income is calculated as the sum of all income sources.

[10]A maximum limit for processing income is used to minimize the possible impact of recording errors and the effect of sample turnover for high-income households (Welniak).

[11]The IRS dataset oversamples households at the very top of the income distribution. For example, about 23 percent of tax returns for the top 0.01 percent of the distribution were sampled in 2001 (Dew-Becker and Gordon 2005). For the Current Population Survey, the survey has a sample rate of 0.07 percent and does not oversample based on income.

[12]For the lower 90 percent of the household income distribution, the IRS dataset and Current Population Survey report similar income measures.

[13]Nearly 8 percent of the total income gains were received by the top 0.01 percent of households. Since the entry-level income for the top 0.01 in 2001 was $3.2 million, none of these gains would likely be reported in the Current Population Survey due to the right-censoring of the data sample.

[14]Dew-Becker and Gordon suggest that rising CEO pay is due in part to a "scratch my back model" where an exclusive class of CEOs determine each other's pay with very few market constraints.

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