The Productivity to Paycheck Gap: What the Data Show

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Executive Summary

After growing rapidly in the early post-war period, real wages for most workers have increased little in the years since 1973. The weakness in wage growth in the years from 1973 to 2006 is usually seen as being primarily the result of an upward redistribution of income from typical workers to profits and higher paid workers. While there has been a substantial upward redistribution of income in the years since 1980, the major cause of weak wage growth since 1973 has been a sharp slowdown in productivity growth compared to the early post-war period.

This paper makes a series of adjustments to the productivity growth in the non-farm business sector, the most often cited measure of productivity growth, as well as to measures of wage growth, to determine the extent to which slower wage growth is attributable to redistribution as opposed to slower adjusted or "usable" productivity growth. The paper shows that:

- "Usable" productivity – productivity growth that can be translated into higher wages and living standards - has been considerably slower in the post-1973 period than in the period from 1947-73. Usable productivity growth averaged 1.2 percent annually in the period from 1973 to 2006, 1.9 percentage points below the 3.1 percent rate in the earlier period. Usable productivity growth was slowest during the period from 1973 to 1995, averaging just 0.9 percent annually. However, even in the years since the productivity upturn in 1995, usable productivity growth has averaged just 1.8 percent annually, 1.2 percentage points below the growth rate in the early post-war years.

- The rate of total economy productivity growth has been 0.3 percentage points less than the rate of productivity growth in the non-farm business sector in the years from 1973 to 2006. This is due to the fact that reported productivity growth in the government, household, and institutional sectors is considerably lower than the rate of productivity growth reported for the non-farm business sector. By contrast, total economy productivity growth was just 0.05 percentage points lower than the rate of growth in the non-farm business sector in the years from 1947-73.

- There has been a growing gap between gross output and net output in the years since 1973 as an increasing share of GDP goes to replace worn out capital goods. Only net output can raise living standards, since the portion of output that goes to replacing depreciated capital equipment cannot directly affect living standards. A net measure of annual productivity growth is nearly 0.2 percentage points lower than a gross measure for the years from 1973-2006. By contrast, the two measures were nearly identical over the period from 1947 to 1973 as the share of output going to depreciation changed little over this period.

- The consumption deflator used to measure real wages has shown a much higher rate of inflation than the output deflator used to measure productivity growth. This is due to the fact that the price of many consumer goods and services, like health care and education, have risen considerably more rapidly than the price of investment goods like computers. If a consumption deflator is used to measure output, then the rate of annual productivity growth is reduced by 0.2 percentage points in the period from 1973 to 2006. In the period from 1947 to 1973 the consumption deflator actually increased *less rapidly* than the output deflator.

As a result, measuring productivity with a consumption deflator increases the rate of annual productivity growth by 0.3 percentage points.

- The non-wage share of labor compensation rose from 12.6 percent in 1973 to 19.5 percent in 2006. The annual rate of real wage would have been 0.5 percentage points higher if the non-wage share of compensation had remained constant. The main factor behind the growth in the non-wage compensation was the rapid increase in the cost of employer provided health insurance.

After making all the appropriate adjustments, there is still a large gap between the rate of usable productivity growth and the rate of growth of hourly compensation for the typical worker. Over the period from 1973 to 2006, median hourly compensation rose by 20.1 percent while usable productivity grew by 47.9 percent. This indicates that there was still a very substantial upward redistribution from typical workers to profits and high paid workers.

This redistribution was the result of a number of policies that were supposed to increase productivity growth, such as the removal of trade barriers, the deregulation of major industries (e.g. airlines, trucking, telecommunications), and less union-friendly labor rules. However, usable productivity growth remained far lower than in the early post-war period throughout the period from 1973 to 2006. Even in the period following the productivity upturn in 1995 the rate of growth of usable productivity was still 1.2 percentage points lower than in the early post-war period.

While it is possible that productivity growth in the years since 1973 would have been even slower without these policy changes, they clearly have not succeeded in boosting productivity growth back to rate for the years from 1947 to 1973. If the economy had sustained the early post-war rate of usable productivity growth rate in the years from 1973 to 2006, the level of usable productivity would be more than 80 percent higher today. This would have allowed for substantial increases in wages and/or leisure.

Introduction

It is widely known that most workers have seen relatively little benefit from the economy's growth over the last three decades. The real hourly wage of a typical worker is only slightly higher in 2006 than it was in the seventies. This fact is typically attributed to the upward redistribution that has taken place over this period. A much larger share of national income is going to profits and high wage earners (e.g. CEOs, doctors, lawyers, and other highly paid professionals) than in the sixties and early seventies.

While this upward redistribution of income has prevented middle-income families from benefiting much from the economy's growth, there is actually a more fundamental problem: economic growth, or more specifically productivity growth - has not been very strong over this period. Productivity growth is the key variable to measure, because over the long-term, productivity is the main determinant of living standards.

Productivity growth, properly measured, has been much slower over the period since 1973 than it was in the early post-war period. While there was a rebound in productivity growth in 1995, even in the years since 1995, the growth rate of "usable productivity" did not come close to matching the rate of the early post-war period.

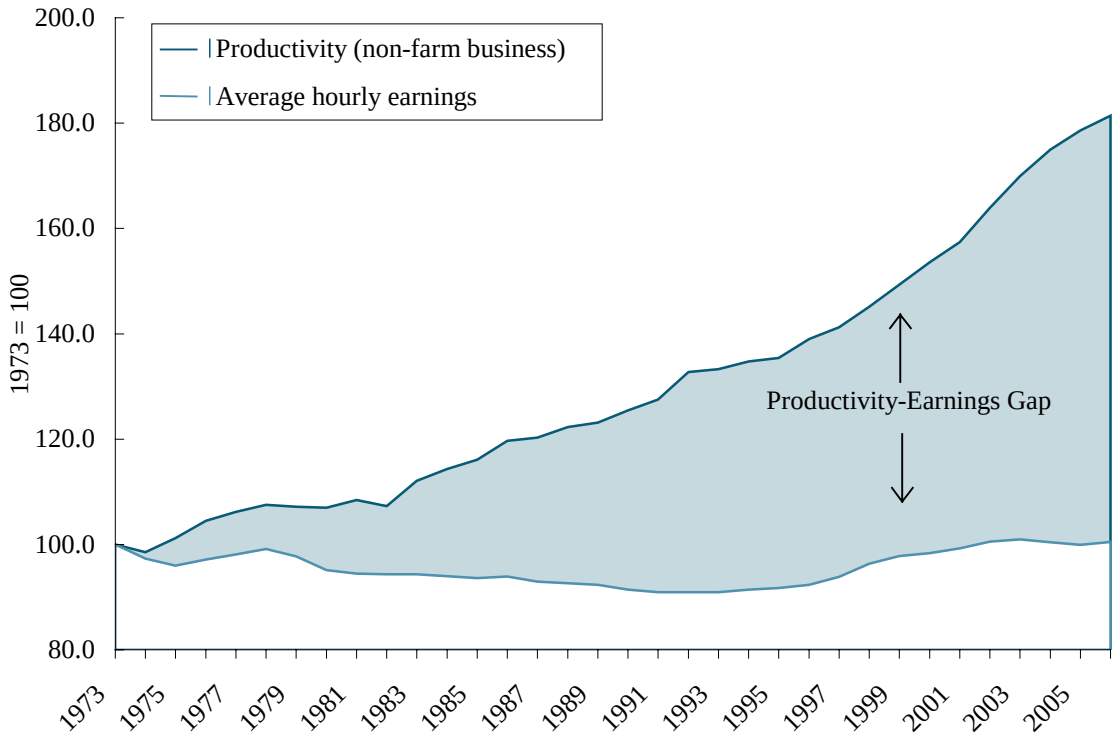
The fact that productivity growth has been so much slower in the post-1973 era than in the period immediately following World War II is not widely appreciated because of several measurement issues that complicate comparisons. This paper briefly examines the key measurement issues and make the appropriate adjustments to the commonly used measures of productivity.

The fact that slow productivity growth has been a factor limiting wage gains should not lessen concerns about the upward redistribution of income over the last quarter century. The policies that have led to this upward redistribution, such as increased trade, deregulation of major industries (e.g. airlines and communications), and weaker unions, were supposed to lead to more rapid growth. If there was little or no growth dividend from these policies, then there was little obvious benefit to policies that redistributed income upward, except to the wealthy few that benefited from this redistribution.

Productivity Growth and Wage Growth: Where are the Gaps?

The standard story of the post-1973 era is that productivity growth has grown at a healthy pace, while wages have barely outpaced inflation. Figure 1 shows the relationship between productivity growth and wage growth since 1973, using the Bureau of Labor Statistics (BLS) measure of productivity in the non-farm business sector and the real average hourly wage for production and non-supervisory workers.[1] (The category "production and non-supervisory work force" includes close to 80 percent of the work force. It excludes most highly paid professionals and managers.) Figure 1 shows that productivity increased by more than 80 percent over the period from 1973 to 2006, while the real average hourly wage increased by just 0.5 percent over the same period. This suggests that there was a huge distribution away from typical workers to profits and highly paid workers.

FIGURE 1
Productivity and Wage Growth



Source: Bureau of Labor Statistics.

While the picture in Figure 1 is dramatic, it is somewhat misleading. Real wages could not possibly keep pace with the measured rate of productivity growth in the non-farm business sector without a substantial redistribution from profits to wages. There are three main reasons why this is the case. First, the non-farm business sector is not the whole economy. Wages for workers in the economy as a whole can only increase as quickly as productivity in the economy as a whole. Second, productivity

[1] The real wage measure in Figure 1 deflates nominal wages by the CPI-U-RS for years after 1978 and the CPI-U-X1 for years before 1978.

measures the rate of growth of gross output, not net output. The difference between gross and net output is the capital equipment and software that wear out or become obsolete. The share of output that goes to depreciation has actually been growing rapidly in recent years, which means that there has been a large gap between the growth in gross output and net output. Finally, output and real wages are measured using different deflators. In order to determine whether workers are getting their share of productivity gains, it is necessary to use the same deflator for both output and wage growth.

It is standard for economists to focus on the non-farm business sector when examining the economy. It comprises the vast majority of the economy (77.8 percent in 2005) and data on wages and output are measured most accurately in this sector.[2] However, productivity growth in the rest of the economy (households, institutions, and government, in addition to the farm business sector) will also affect the extent to which workers can experience wage gains. BLS calculates that productivity growth outside of the non-farm business sector has been much slower since 1973 than in the non-farm business sector. As a result, economy-wide productivity growth has trailed productivity growth in the non-farm business sector. According to the BLS data, economy-wide productivity grew by 66.8 percent in years from 1973 to 2006, considerably less than the 81.4 percent growth reported for the non-farm business sector.[3]

The second important adjustment is for the difference between gross and net output. Over this period, the gap between gross and net output has increased rapidly because a growing share of investment has gone to computers and software that quickly become obsolete. While this investment may lead to dividends in the form of higher productivity, the growing portion of output that goes simply to depreciation does not allow for any direct increase in living standards. If GDP grew by 10 percent, but this increase entirely went to the more rapid replacement of investment goods, we would not be able to enjoy higher living standards. Only increases in net output allow for improvements in living standards. Productivity growth over the period from 1973-2006 has been 57.6 percent using net output instead of gross output as the numerator for productivity.[4]

The third adjustment to productivity is for the difference in the output deflator and the consumer price index used to measure real wage growth. There has been a large gap between the rates of inflation shown in the two indexes in recent years because the prices of consumer goods and services have risen more rapidly than the price of investment goods (most importantly computers).[5] As is the case with the growing share of output going to depreciation, better or cheaper investment goods provide no direct benefit. The benefit should be realized through the economy's ability to produce more consumption goods and services. If investment goods get cheaper and/or better then it should allow us to produce more consumer goods and services. There is no gain to the economy if the quality of investment goods improves in ways that do not eventually increase the economy's ability to produce consumer goods and services.

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[2] Data on output shares can be found in the Bureau of Economic Analysis, National Income and Product Accounts (NIPA), Table 1.9.5.

[3] This is taken from the Bureau of Labor Statistics unpublished series on total economy productivity, which was provided by Phyllis Otto in BLS productivity division.

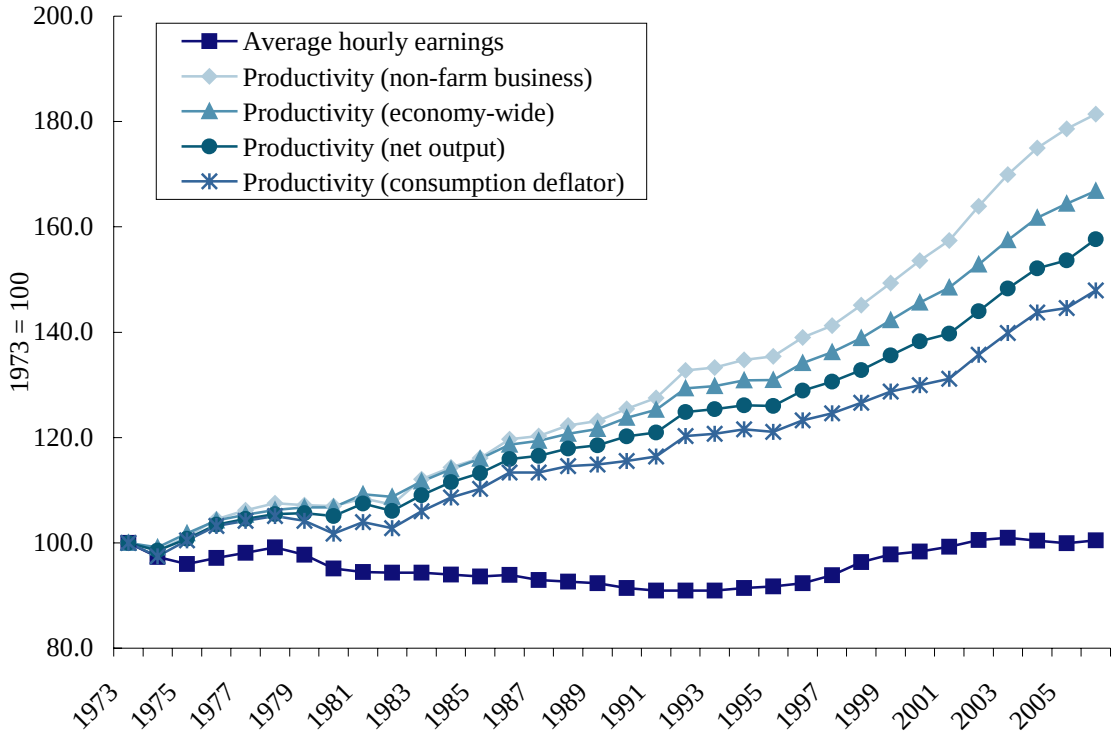
[4] This calculation adjusts the economy-wide productivity numbers from BLS by multiplying by the ratio of the growth in net domestic product to growth in gross domestic product (NIPA, Table 1.7.6, line 13 divided by line 1).

[5] The rates of inflation shown by the indexes also differ because the output indexes are chain-weighted, while the CPI is a fixed weight index. Arguably, the PCE deflator should be used to deflate real wages, but this discussion follows convention in deflating real wages by the CPI-U-RS and CPI-U-X1.

If net output for the economy as whole is deflated by the consumer price index instead of an output price index, then the cumulative increase in productivity from 1973 to 2006 has been 47.9 percent. This increase still far exceeds the trivial gains in the average hourly wage over this 33-year period, but it is considerably less than the 81.6 percent productivity gain generally reported for the non-farm business sector over this period.

Figure 2 shows the path of productivity growth using four alternate measures: standard non-farm business sector measure, the economy-wide productivity measure, the economy-wide net output measure, and the economy-wide net output measure using a consumption deflator. This last measure can be thought of as "usable productivity growth," since it is the rate at which productivity growth can actually be translated into higher living standards. As can be seen, all the measures of productivity growth substantially outpace wage growth over this period, but the gap is successively smaller with each adjustment.

FIGURE 2
Productivity and Wage Growth



Source: BLS, NIPA, and author's calculations, see text.

Productivity Growth and the Strength of the Economy

As noted earlier, productivity is the main long-run determinant of living standards. For the reasons noted in the prior section, the standard measure of productivity growth, productivity growth in the non-farm business sector, has substantially overstated the extent to which rising productivity provides a basis for higher living standards. While this means that the extent to which typical workers have been hurt by redistribution is overstated in many accounts, the downward adjustments to the standard productivity measure imply that the economy is not performing as well as advertised.

In fact, the adjustments that lead to a measure of usable productivity growth that is lower than productivity growth in the non-farm business sector in the period since 1973 actually increase usable productivity in the early pre-war period. In the early post-war years, there was little gap between the rate of reported productivity growth in the non-farm business sector and the economy as a whole. There was also very little increase in the share of GDP that went to depreciation over this period, so that the growth rate of net output and gross output were virtually identical. During this period, the price of investment goods actually rose slightly more rapidly than the price of consumption goods, so that the switch to a consumption deflator leads to a more rapid rate of productivity growth. The average annual growth rate in usable productivity over the period from 1947 to 1973 was 3.05 percent, almost 0.3 percentage points higher than 2.77 percent growth rate reported for productivity in the non-farm business sector.

Table 1 shows the rate of productivity growth for the period since 1948 using the various adjustments described above. As can be seen, using the adjusted measures of productivity growth makes the early post-war period look much better relative to the post-1973 period than using the standard non-farm productivity growth measure. For the whole post-1973 era, the average annual rate of usable productivity growth lags the earlier period by 1.9 percentage points. This compares to a difference of just 1.0 percentage point in the standard non-farm measure. Even in the years of the post-1995 acceleration, productivity growth badly trails the early post-war rate when the appropriate adjustments are made. Adjusted annual productivity growth averaged 1.2 percentage points more in the period from 1948-1973 than in years 1995-2006.

TABLE 1
Average Annual Productivity* and Wage Growth, 1948-2006

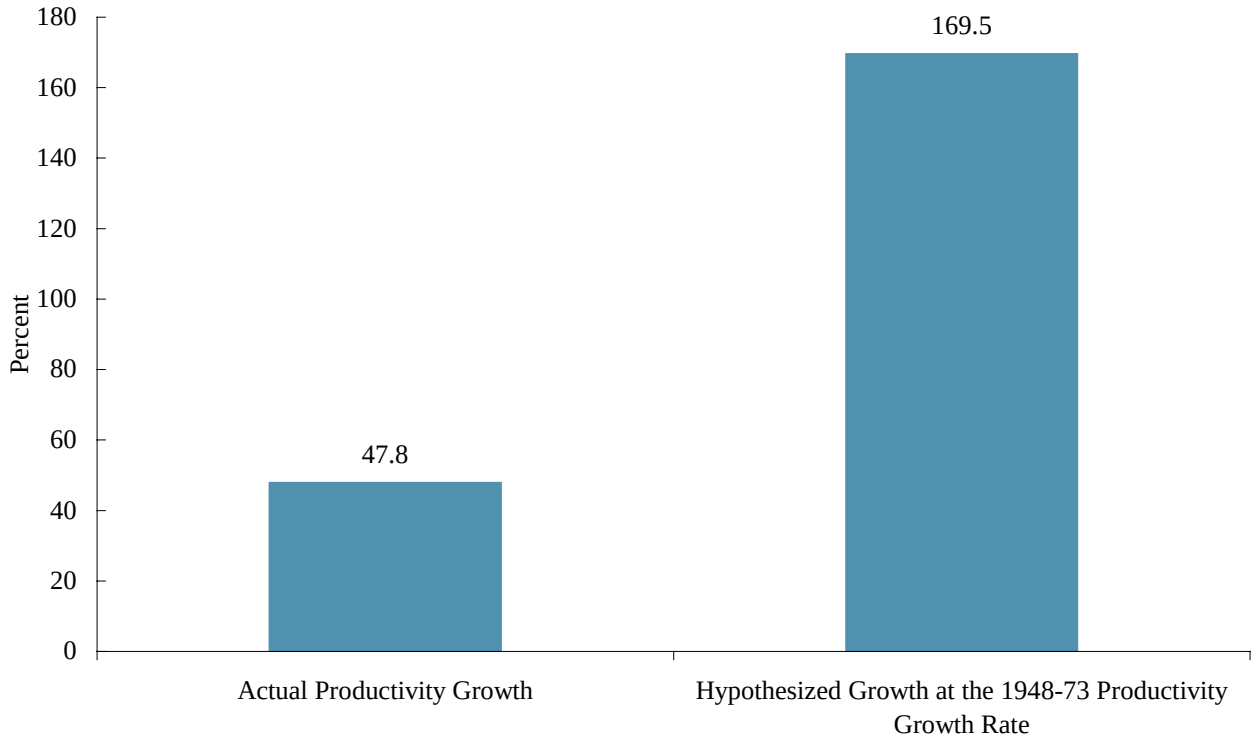
Period	Non-Farm	Economy-wide	Net Output	CPI Deflator	Real Wages
1948-1973	2.77	2.72	2.73	3.05	2.23
1973-2006	1.82	1.56	1.39	1.19	0.02
1973-1995	1.39	1.23	1.06	0.87	-0.39
1995-2006	2.70	2.23	2.06	1.84	0.83

Source: Author's calculations, see text.
* Each column for productivity includes a cumulative adjustment from the standard Non-Farm Business Sector productivity. For example, "Net Output" adjusts for the difference between GDP and NDP as well as the previous "Economy wide" adjustment, while "CPI Deflator" includes also both previous adjustments in addition to adjustment for the deflator.

When these adjustments are taken into account, productivity growth in the post-1973 years looks quite weak. Figure 3 compares the cumulative growth in adjusted productivity in the years from

1973 to 2006, with the growth that the country would have experienced if productivity had maintained its 1948-73 growth rate.

FIGURE 3
Productivity Growth 1973-2006



Source: Author's calculations, see text.

If the economy could have sustained its 1948-73 rate of productivity growth it would be more than 80 percent larger today. This could have allowed for substantial increases in incomes and/or considerably more leisure time.

The Real Story on Distribution Since 1973

To get a fuller sense of the extent to which there was a redistribution away from typical workers in the post-1973 period there are two adjustments that should be made on the wage side. First, the hourly wage of the median or typical worker should be used instead of the average wage for production and non-supervisory workers. While the vast majority of workers are in the production and non-supervisory category, this category does not include all workers. This creates a problem primarily because changes in composition of the category can affect trends in wages. Using the wage for the median worker in the wage distribution eliminates this problem.[6]

The other necessary adjustment is to use total labor compensation rather than just wages. There has been a substantial shift in labor compensation from wage income to non-wage income over this period, primarily due to the rising cost of health care insurance. If the share of labor income going to non-wage compensation increases, then wage growth would be slower than productivity growth, even if there was no redistribution away from wages. Using total labor compensation as the key labor income variable makes it possible to determine the extent to which redistribution of income away from typical workers is preventing wage growth, as opposed to the rapid growth in health care costs or other non-wage benefits.

The first adjustment, switching from average wages for production and non-supervisory workers to the median wage, shows a slightly more positive picture for wage growth. While the real average hourly wage rose by a total of just 0.5 percent in the years from 1973 to 2006, the real median wage rose by 10 percent from 1973 to 2005 (data for 2006 is not yet available).[7] The real average hourly wage fell at a rate of 0.4 percent annually from 1973 to 1995. By comparison, the real median wage was essentially flat over this period. In the years from 1995 to 2005, the average hourly wage rose at an annual rate of 0.9 percent and the real median wage rose at a rate of 1.0 percent annually. In short, the median wage has consistently risen somewhat more rapidly than the average wage.

The non-wage share of labor compensation rose from 12.6 percent in 1973 to 19.5 percent in 2006. This rise in the non-wage share of compensation implies that wages were9.2 percent lower in 2006 than if the non-wage share of compensation had remained constant. In a period in which wages were growing very slowly, the effect of this growth in the non-wage share of compensation is important.

There are two important points worth noting about the growth in non-wage compensation. First, we do not have very good data about the distribution of non-wage payments. Part of the growth was attributable to a rise in the size of employer side of the payroll tax, from 5.2 percent in 1973 to 7.65 percent in 2006. This 2.45 percentage point increase explains approximately one-third of the 6.9 percentage point rise in the share of non-wage compensation. The other two-thirds of the increase in the share of non-wage compensation are attributable primarily to higher employer payments for health insurance. There is no easy method for determining the share of these health insurance payments that go towards the coverage of typical workers. (The basic problem is that employers report what they pay on average, not for each worker. Workers know what they have to pay for

[6] Data on median wages is not available prior to 1973.

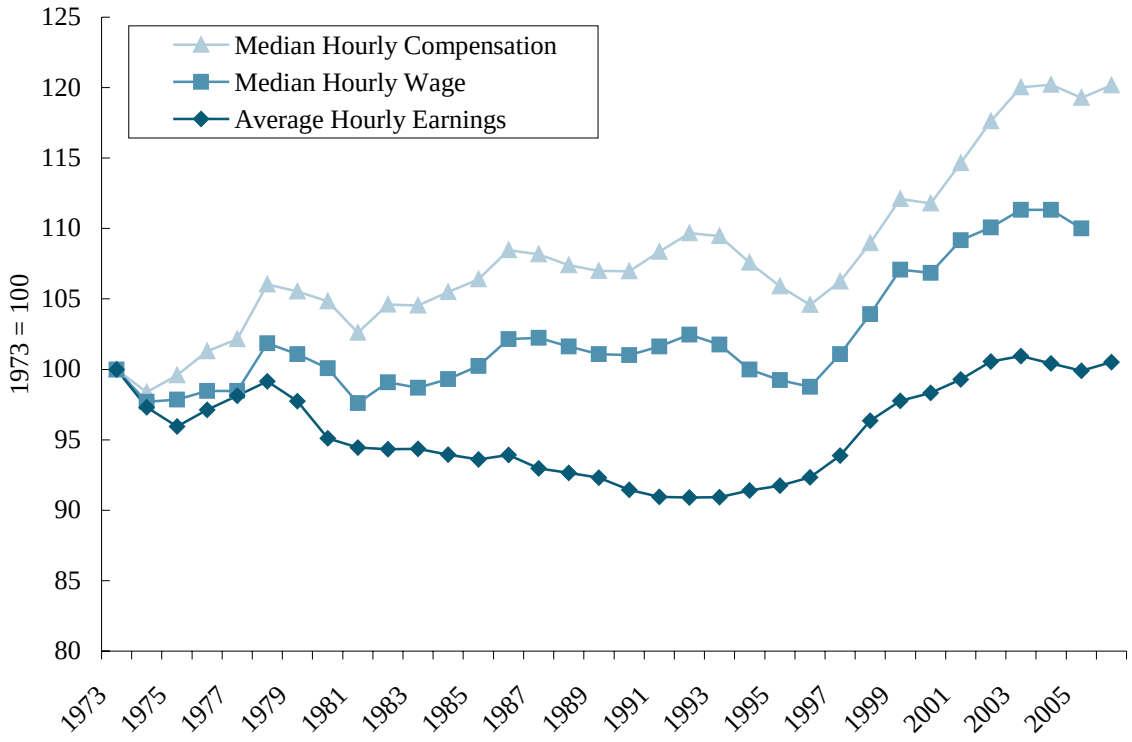
[7] The data on median wages are taken from the Economic Policy Institute's website, [http://www.epi.org/datazone/06/wagecuts_all.xls].

premiums, co-payments, and other out of pocket expenses, but not what their employers pay.) For simplicity, this discussion assumes that the increase in the share of non-wage compensation for the median worker is equal to average increase.

The other point is that it is not clear how much value the increase in non-wage compensation has for workers. Clearly health care is better in 2006 than it was in 1973; however, most other rich countries had larger improvements in health outcomes (to higher levels) than the United States, but had much smaller increases in per person health care expenditures. The health care component of the Consumer Price Index has risen much more rapidly than the rest of the index over this period, which would imply that an additional dollar of spending on health care provided a smaller real increase in consumption that an additional dollar spent on other items.

Fortunately, it is not necessary to determine the value of the additional spending on health care to assess changes in distribution. It is only necessary to use the same deflator for output and income, for both wage income and non-wage income. Figure 4 shows the path of compensation for the median worker since 1973, using the CPI deflator and assuming that the growth in the share of non-wage compensation for the median worker is equal to growth in the average share of non-wage compensation. Figure 4 also shows the growth in the average and median wages over this period.

FIGURE 4
Wage and Compensation Growth



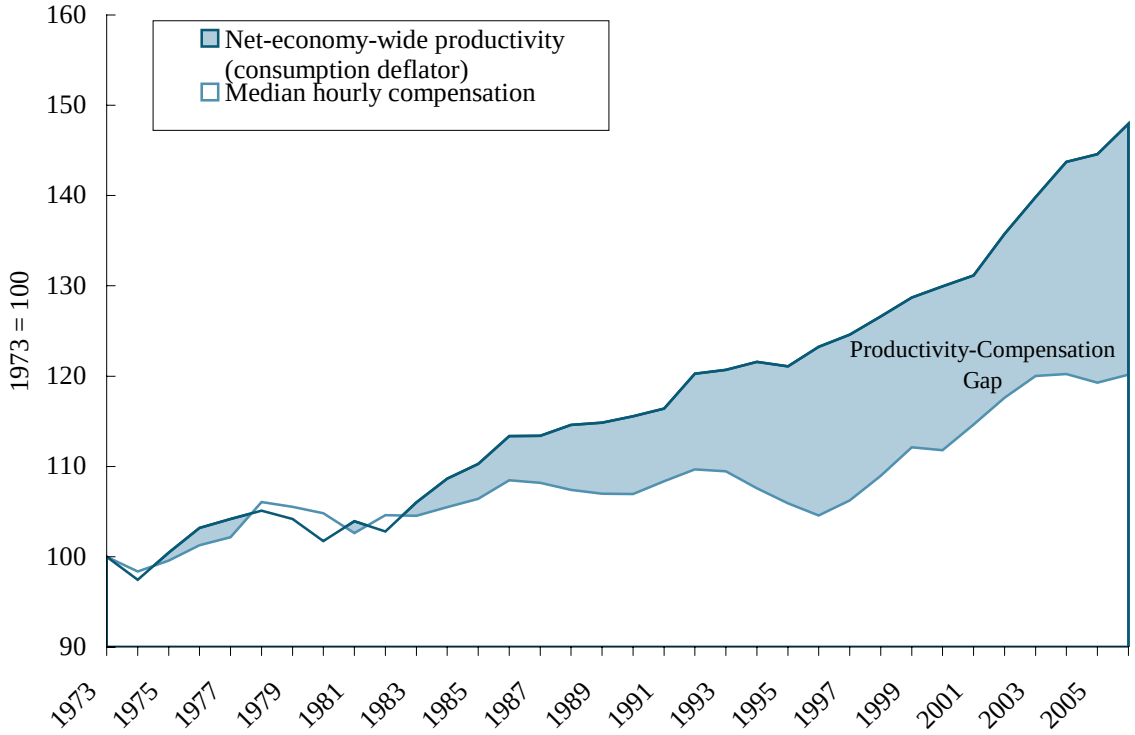
Source: BLS, BEA, EPI and author's calculations, see text.[8]

[8] The median compensation series applies the growth rate for the average hourly earnings series in 2006 to the median compensation data.

The Full Story on Redistribution

To complete the assessment of the extent to which income has been redistributed away from the typical worker since 1973 it is necessary to combine the adjusted productivity data from Figure 2 with the compensation data from Figure 4. Figure 5 compares the growth since 1973 in net economy-wide productivity, using a consumption deflator, against the growth in real hourly compensation.

FIGURE 5
Wage and Compensation Growth



Source: BLS, BEA, EPI and author's calculations; see text.[9]

As can be seen, there is still a substantial gap between adjusted productivity growth and median compensation. The total growth in productivity over this period is 47.9 percent, compared to an increase in median hourly compensation of 20.1 percent. This implies that compensation for the typical worker in 2006 would have been 23.1 percent higher, if there had not been an upward redistribution of income in the years since 1973. While this is a somewhat less dramatic redistribution than is implied by the productivity and wage date shown on Figure 1, it is nonetheless substantial.

Figure 5 also illustrates some interesting points about the timing of this upward redistribution. Through the seventies, hourly compensation and productivity track closely, with compensation growth actually exceeding productivity growth through much of this period. Productivity growth

[9] The median compensation series applies the growth rate for the average hourly earnings series in 2006 to the median compensation data.

only begins to outpace compensation growth in the early eighties, with the rate of divergence increasing in the early and mid-nineties, as real compensation actually fell, even as productivity continued to grow. Compensation grew rapidly through the late nineties' boom, keeping pace with the rapid productivity growth of this period. Finally, productivity growth accelerated at the beginning of the current decade, even as compensation growth slowed and eventually stopped.

The same data appear in Table 2, below. Over the whole period from 1973 to 2006, usable productivity growth averaged 1.2 percent a year while compensation for the median worker grew at an average rate of 0.6 percent. During the seventies, real compensation actually grew slightly more rapidly than usable productivity. Real hourly compensation for the typical worker grew 0.9 percent while usable productivity grew just 0.7 percent. In the eighties cycle this pattern was reversed, with usable compensation rising at an annual rate of 1.0 percent, while real hourly compensation rose at a rate of just 0.1 percent annually.

TABLE 2
Annual Growth Rates Of Productivity, Wages and Compensation

Period	Usable Productivity	Average Hourly Earnings	Median Hourly Wage	Median Hourly Compensation
1973-2006	1.2%	0.0%	0.3%	0.6%
1973-1979	0.7%	-0.4%	0.2%	0.9%
1979-1989	1.0%	-0.6%	0.0%	0.1%
1989-1995	0.9%	-0.1%	-0.3%	-0.2%
1995-2000	1.4%	1.4%	1.5%	1.1%
2000-2006	2.2%	0.4%	0.6%	1.2%

Source: BLS, BEA, EPI and author's calculations, see text.[10]

The divergence between usable productivity growth and wage growth became even sharper in the nineties, with usable productivity rising at a 0.9 percent annual rate, while median hourly compensation actually fell at a 0.2 percent annual rate. In the late nineties, the size of this gap shrank sharply, with usable productivity growing at a 1.4 percent annual rate, while real hourly compensation rose at a 1.1 percent rate. It is worth noting that the non-wage share of compensation actually fell during this period, so that wage growth actually exceeded the rate of growth of compensation. The gap between usable productivity growth and wage growth expanded again in the current cycle with usable productivity rising at a 2.2 percent rate, while median compensation has risen at a 1.2 percent annual rate. The gap between productivity growth and wages has been even larger in the current cycle because there has been a sharp rise in the non-wage share of compensation since 2000.

[10] The median compensation series applies the growth rate for the average hourly earnings series in 2006 to the median compensation data. The bottom row gives the growth rate for the median hourly wage series for the period 2000-2005.

Conclusion

The use of the conventional measure of productivity growth - productivity growth in the non-farm business sector - has led many analysts to exaggerate the extent to which wages have been depressed due to an upward redistribution of income since 1973. Productivity growth outside of the non-farm business sector has badly lagged growth within the sector, so that economy-wide productivity growth is substantially slower than growth in the non-farm business sector. In addition, there is a gap between productivity growth as usually measured, and growth in potential consumption due to the fact that an increasing share of output goes to depreciation and that investment goods have increased in price much less rapidly than consumption goods.

When a consumption deflator is applied to economy-wide net output, cumulative productivity growth since 1973 has totaled just 47.8 percent, instead of the 81.6 percent figure reported for gross output in the non-farm business sector. While this slower rate of productivity growth implies redistribution has been a somewhat less important factor in depressing most workers' wages, it also means that there is no obvious growth dividend from the policies that led to this upward redistribution. Adjusted productivity growth over the whole post-1973 period has badly trailed the pre-1973 rate. Even during the post-1995 speedup the adjusted annual rate of productivity growth was still more than a percentage point less than the 1947-73 average. In short, the economy has seen a sharp upward redistribution of income over the last three decades with little obvious growth dividend. Policies that redistribute income upward, yet fail to increase growth, are very costly to the vast majority of the U.S. labor force.