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## Opening Pandora's Box: The Measurement of Average Wages

Joseph A. Ritter

Macroeconomists have the dangerous habit of referring to “the” real wage, “the” nominal wage, or just “wages.” A theory’s prediction about “wages” has usually led to a paper or electronic hunt for a time series on “wages.” In this article I describe the differences among the most common choices and explore how their differences can systematically change the answers to some important questions about “wages.” The different characteristics of average hourly earnings (AHE), compensation per hour (CPH), and the employment cost index (ECI) suit them to different purposes, though often none is ideal.

### SOME QUESTIONS ABOUT WAGES

The movement of “wages” is central to a number of issues, including:

- The role of the labor market in initiating and/or sustaining inflation. Do wage increases generate price increases that in turn generate wage increases? Is there a wage-price spiral? In this debate, the distinction between wage inflation and price inflation is pivotal.
- Are workers better off now than they were at some past time? One way to interpret this question is to

look at the trend in real (inflation adjusted) wages during the period in question. But it pays to be wary of that word “workers.”

- Are real wages procyclical or countercyclical? Many macroeconomic theories make unambiguous predictions, and empirical contention over the issue dates back to the 1930s.

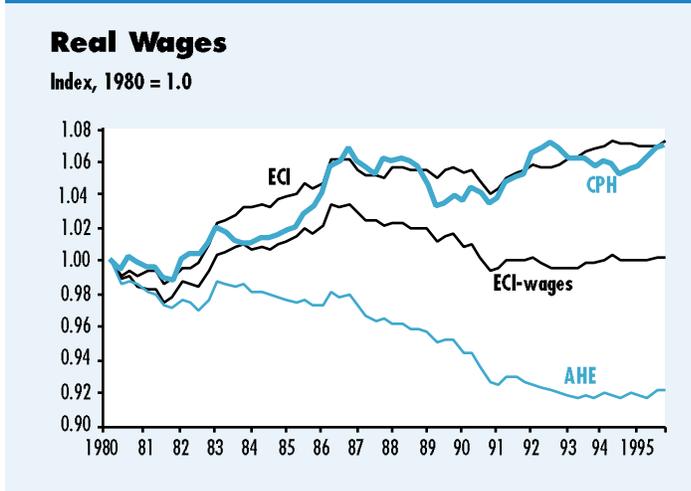
### Wage Increases as Inflation

One of macroeconomic policymakers’ primary concerns is controlling inflation. Although the consumer price index (CPI) is the most frequently used measure of inflation, various alternatives provide additional information on the overall movement of prices in the economy. Most of these alternatives primarily track the prices of goods and services produced by the economy. The indexes of overall wage (or compensation) inflation that I discuss in this article focus instead on the prices of the most important input to production. Input prices both influence and are influenced by output prices, but both reveal information about underlying inflation trends, albeit through somewhat different lenses. In addition, many economists believe the feedback between wages and prices is central to understanding the inflation process, though not the ultimate source.

### Real Wages

In addition to providing information on the dollar prices of the labor hours sold in particular sectors of the economy, the comparison between wage growth and increases in the price level measures the change in real wages—the purchasing power of an hour of work from either the worker’s or the employer’s point of view. Real wages have played an important role in economic theory for decades, but

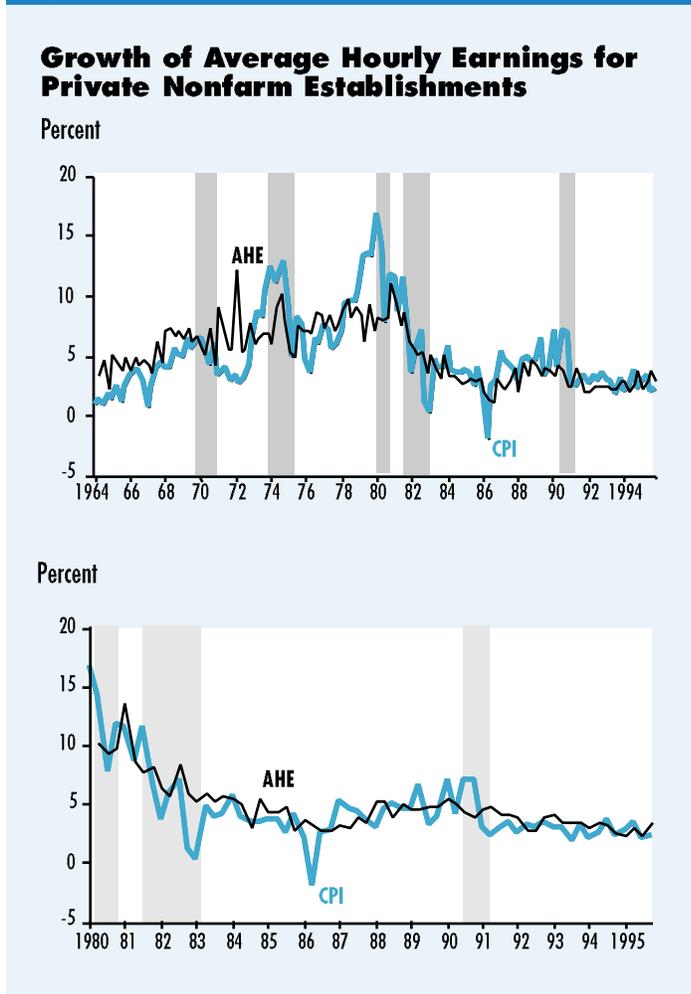
Figure 1



defining an empirical counterpart to the theoretical concept is particularly messy. Figure 1 illustrates the kind of muddle that can arise in measuring real wages. It shows the change since 1980 in real wage measures based on the ECI, CPH, and AHE. A basic understanding of how the wage indexes are constructed reconciles much of the discrepancy illustrated in Figure 1.

Questions about the trend in real wages are riddled with ambiguity, but they are simple compared with the question of whether real wages are procyclical or countercyclical. Though this article may shed some light on why the wage or compensation component of a real wage measure can be critical, I do not attempt to address that question. A recent and comprehensive survey by Abraham and Haltiwanger (1995) finds that cyclicity of the real wage is also sensitive to the choice of price index, sample period, detrending method, and measure of the business cycle.

Figure 2



## AVERAGE HOURLY EARNINGS

AHE of production and nonsupervisory workers is derived from the monthly survey of establishments (Current Employment Survey), which collects data on employees, hours, and payroll from a sample of about 390,000 establishments. (AHE is shown in Figure 2. Table 1 summarizes the features of AHE and the other wage measures.) Since firms do not usually track hours of workers who are not paid on an hourly basis, the hours data cover only production and nonsupervisory employees. AHE is the ratio of total payroll for production and nonsupervisory employees to their total paid hours. Payroll and hours include overtime, paid vacation, paid holidays, and sick leave. The last three are normally considered benefits but, since other benefits are excluded, AHE series measure neither monetary wages nor compensation. Average hourly earnings are available for specific industries at a fine level of detail. Preliminary estimates for a

Table 1

## Comparison of Wage and Compensation Measures

	Average Hourly Earnings	Employment Cost Index	Compensation per Hour
Source	Survey of payrolls and hours	Survey of wages and benefits	Survey of payrolls and hours, supplementary surveys
Wages/earnings	Includes overtime premiums, paid leave	Regular rate of pay for straight-time hours	All forms of compensation
Benefits	Not applicable	Includes overtime premiums, paid leave	
Hours	All paid hours	Not applicable	Hours at work
Broadest coverage	Private nonfarm	Nonfarm, nonfederal	Private nonfarm
Types of workers covered	Production and nonsupervisory employees	All employees	All employees, proprietors, and unpaid family members
Frequency	Monthly	Quarterly	Quarterly
Occupation detail	No	Yes	No
Published sources	Monthly Labor Review, Tables 14, 21, 42 Economic Report of the President (1996), Tables B-43, 44, 45		
Electronic source	Worldwide Web server: <a href="http://stats.bls.gov">http://stats.bls.gov</a>		

particular month are available at the beginning of the following month, making the data quite timely.

The objective of the establishment survey is to provide a comprehensive, up-to-date picture of employment. Therefore the jobs covered by the sample change as industries expand and contract and as industries employ different mixes of occupations. Thus, for example, if during a recession an industry laid off workers having the least seniority, AHE might increase, even if the earnings of remaining workers remained constant or fell. AHE is therefore not a good gauge of pure wage change because it mixes wage change and workforce composition.

### THE EMPLOYMENT COST INDEX

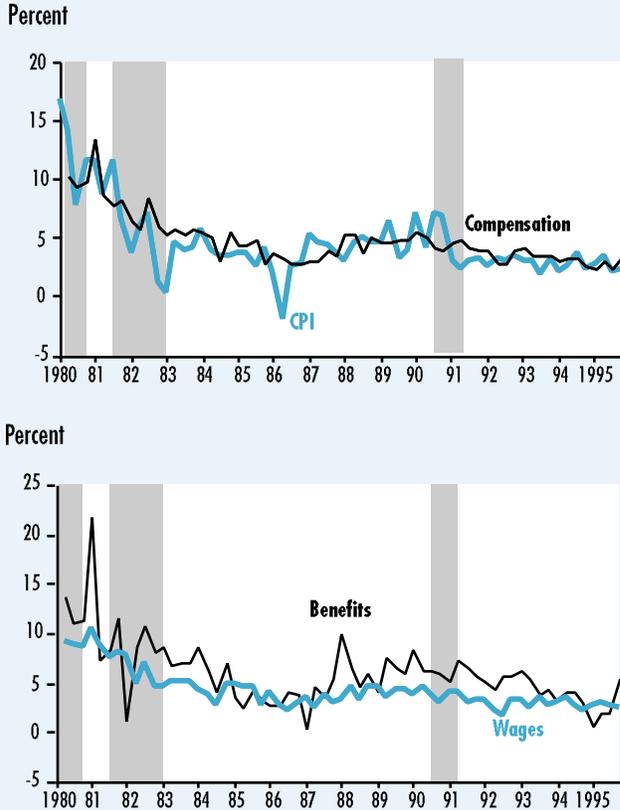
The ECI is probably the easiest of the three measures to interpret. It is a fixed-weight index of employee compensation—a kind of CPI for wages.

The raw data are end-of-quarter reports from a sample of firms on wages and benefits paid for specific jobs (not employees). The data are weighted so that they are representative of all firms and occupations.

The ECI for compensation is calculated as follows. (Similar calculations are made for wage or benefit components.) First, the data on compensation in the current period relative to the base period for all jobs within a particular two-digit SIC industry and one of several hundred occupations (as defined by the Census of Population) are averaged. For example, one cell might be electricians employed in the motor vehicles industry. The idea is that this average within an industry-occupation cell (all the jobs in a particular occupation in a particular industry) is taken across similar jobs in the same industry (that is, electricians in the motor vehicles industry). This step is similar to averaging the prices of, say, loaves of white bread found at different stores before entering the average into the CPI.

Figure 3

## Growth of Employment Cost Index for Private Nonfarm Workers



The ECI is a fixed-weight index of these industry-occupation cells. The weight for a particular cell is its share of total compensation for all cells in the base period. An analogue in the CPI would be the share of consumer expenditure devoted to white bread in the base period. Total compensation is an estimate of average compensation (for jobs tracked in the survey) multiplied by the number of workers in that industry and occupation. The estimate of the number of workers must come from other sources since the ECI survey does not gather employment data. In sum, the ECI uses fixed weights to add up average compensation from many industry-occupation pairs.

Because the weight given to wages from a particular industry and occupation

are fixed, employment shifts among occupations or industries will not affect the ECI by directly changing the composition of the sample. Naturally, as the economy evolves, these weights tend to become obsolete, just as expenditure weights in the CPI become outdated through time. The weights are updated every 8-10 years in the ECI. The current weights are from 1990.

One of the advantages of the ECI is that it tracks total compensation (that is, wages and salaries plus benefits). This makes it much more useful than AHE for measuring the cost of employing workers. The ECI is also available at an industry or occupation level.

An arcane detail important when comparing the ECI with AHE is that the ECI classifies vacation, holiday, and sick leave pay, as well as overtime premiums, as benefits. All of these are included in AHE which therefore includes some things that the ECI classifies as benefits while excluding others. Thus neither the ECI for wages nor the ECI for compensation is directly comparable to AHE.

A disadvantage of the ECI is its relatively short history. The program began in the mid-'70s, but a consistent, seasonally adjusted time series starts only in 1980 for the private nonfarm sector and in 1982 for the nonfarm, nonfederal sector.

One recent development that stands out in Figure 3 is the convergence of the growth rates of the two ECI components; since late 1993, the growth of benefits has slowed to roughly the same rate as the growth of wages, bringing compensation increases in line with wage and salary increases.

## COMPENSATION PER HOUR

The U.S. Department of Labor's CPH series is its broadest measure of average compensation of all workers, not just employees, in the private sector of the U.S. economy. If the ECI is similar to the CPI, then compensation per hour is analogous to the GDP deflator. CPH is basically the ratio of total compensation to total hours—the market value of labor input

divided by total labor input.

The numerator, total compensation, is built up from the national income accounts estimate of compensation of employees in the private sector. The latter includes direct monetary payments to employees plus all supplements, including employer contributions to social insurance and pension funds. Compensation of employees is then adjusted to include estimates of the value of the labor input of the self-employed and unpaid family members, which are lumped into proprietors' income in the national income accounts. Total compensation for CPH is thus significantly larger than the compensation of employees reported in the national income accounts.

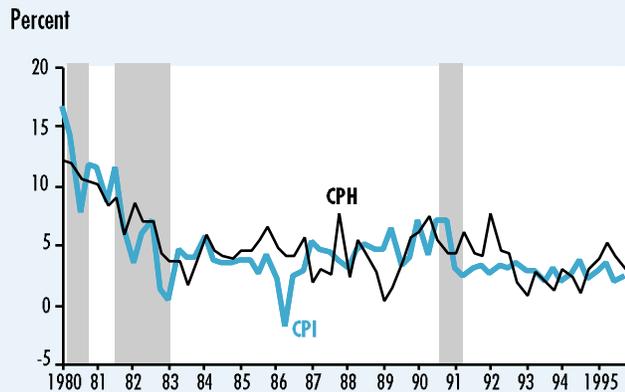
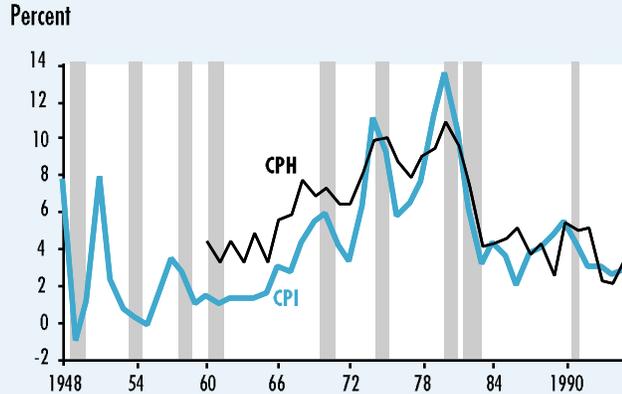
The denominator, total hours, builds on the hours of production and nonsupervisory workers estimated from the establishment survey (the denominator of AHE) by adding an estimate of the hours of nonproduction and supervisory employees' hours based on the number of such employees. This figure is then adjusted to account for the difference between hours paid and hours at work (paid leave is subtracted). This adjustment is based on the Hours at Work Survey conducted by the Bureau of Labor Statistics (BLS). Finally, using estimates from the Current Population Survey, hours are adjusted to include those of proprietors and unpaid family workers.

Since CPH is really just the ratio of total compensation to total hours, it is affected by changes in the mix of industries and occupations in the same way as AHE. This construction implicitly makes CPH a variable-weight index like the GDP deflator: The weight given to the compensation of a particular worker in a particular period is equal to his or her share of total hours in that period.

CPH is closely related to BLS's labor productivity and unit labor cost data. The same hours concept is used as the denominator for labor productivity (output per hour). The same compensation concept is used as the numerator in unit labor costs (compensation per unit of output).

Figure 4

## Growth of Compensation Per Hour for the Private Nonfarm Sector



## COMPARISONS

As Figures 2, 3, and 4 illustrate, the growth rates of the ECI, CPH, and AHE show a downward trend during the 1980s and 1990s. They share this trend with the CPI and other price indexes. The compensation growth rates stayed above the CPI during the early 1990s, largely because of health care cost inflation. (The CPI includes only consumers' premium payments. Employers' contributions are not counted.) At present none of the three gives a much different reading on inflation than the CPI.

The fact that the ECI, CPH, and AHE are currently sending a common message obscures a potentially very important point: The price of labor input is measured only by compensation data. Neither AHE nor

the ECI for wages and salaries measures the price of labor. Therefore, changes in the structure of compensation packages—the mix of wages and various forms of benefits—could substantially alter the relationship between monetary and overall compensation data.

The ratio of wages or compensation to the CPI (or some other price index) produces what economists call real wages. Figure 1 illustrates the real wage series produced using the CPI and the wage measures I have discussed in this article. Real wage growth was much slower in the period shown than in the 1960s and 1970s. But depending on how we choose to look at it, real wages have increased about 8 percent, decreased about 8 percent, or stayed about the same since 1980. At least two factors help generate this confusion.

The first is the difference between wages and compensation. By comparing the ECI for wages with the ECI for compensation, it is apparent that nearly half the difference between the +8 percent and -8 percent results comes from the growth of benefits. Health insurance was a big share of this, of course. In addition, however, employers' share of Social Security payroll taxes rose by more than 1.5 percentage points. This was more than one-fifth of the difference between ECI wages and compensation. Neither health insurance nor employers' share of Social Security taxes is a part of AHE.

Second, differences in the coverage of the indexes can produce systematic differences among them. For example, among production and nonsupervisory workers, there could be a shift toward jobs with lower average earnings. This would be difficult to document directly, but the hypothesis is consistent with the declining prevalence of unions and falling share of manufacturing employment. A fixed-weight index like the ECI would not capture this shift. In addition, however, there was a steep increase in wage inequality during this period, which has been extensively documented by Bound and Johnson (1995) who used data on individual workers. In particular, returns to

education rose dramatically in the 1980s. The ECI includes nonproduction and supervisory workers, the categories of workers most likely to have high levels of education. The increased payoff to education would therefore push the ECI up relative to AHE of production and nonsupervisory workers. The same argument applies to the difference between CPH and AHE.

The price index used to adjust nominal wages for inflation deserves mention from two angles.

First, as a cost-of-living measure, the CPI is subject to some upward bias. Upward bias in the CPI biases real wage measurements downward. For example, a downward adjustment in CPI inflation of only 0.6 percent per year would wipe out the fall in real AHE between 1980 and 1995. An adjustment of that size is well within the range that experts find plausible. To avoid some of the upward bias in the CPI, some economists choose to adjust nominal wages using the personal consumption expenditures deflator, which is a variable-weight deflator. This would also make the growth of real wages look stronger because, in the deflator, the weights on items with rapidly rising prices tend to go down as people substitute lesscostly products.

Second, it may be appropriate for some purposes to deflate wages using a price index based on the prices of the goods and services employees produce, rather than those they consume. Economic theory predicts, for example, that average real wages should be closely related to productivity. Employers care about the value of their workers' output. This value depends on the price of the firm's products, not on what its workers buy. In the comparison of real wages with productivity, the appropriate price index thus would not just measure the prices of consumption goods. Instead, it would cover the prices of all firms' output.

## WHAT WAS THE QUESTION?

Which average wage measure is best? The answer depends on the question.

# REVIEW

MARCH/APRIL 1996

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AHE has an advantage in current analysis since it is available monthly, with only a short lag. The ECI was designed to answer questions on overall compensation for certain jobs. If the question is a broader one, such as what has happened to the pay of the American worker, it is important to account for changes in the structure of employment. In this case, CPH seems more appropriate. Many questions cannot be sensibly answered with averages of any sort and can be addressed only with micro-data on individual workers, such as that available from the Current Population Survey.

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