Employment Indicators Of Economic Activity

By Glenn H. Miller, Jr.

Employment data are widely used in assessing current economic conditions and short-run prospects for the economy. In such use, measures of employment and estimates of changes in employment serve as indicators of the current behavior of, and near-term prospects for, overall economic activity.

In the first week of June, the Bureau of Labor Statistics (BLS) released U.S. labor market data for May that showed an increase in *total civilian employment* of 612,000 since April, an increase at an annual rate of about 6.6 percent. The same release reported a May increase of 123,000 in *nonfarm payroll employment,* a 1.4 percent gain at an annual rate. Such divergences raise questions about which of these two measures is the more reliable indicator of economic activity. For example, in late 1986, *Business Week* commented as follows in an article headed "Two Labor Market Indicators Are At Odds Once Again."

Glenn H. Miller, Jr., is vice president and economic advisor at the Federal Reserve Bank of Kansas City. Michael Grace, a research associate at the bank, assisted in preparation of the article.

Which of the two employment measures published each month do you believe? Most economists favor the measure based on business payroll records. The other measure is based on responses to a monthly survey of households across the nation. Although the two employment gauges frequently give different readings for several months at a time, they tend to move in tandem in the long run.[1]

The two measures of employment—the household measure and the payroll measure—are independently derived series published monthly by the BLS. The two series are complementary, as each attempts to represent different aspects of the employment situation. Significant differences sometimes appear between the levels of the two measures, or changes in them, though they necessarily represent the same underlying economic circumstances.

---

[1] *Business Week,* December 22, 1986, pp. 13-14.

This article examines the two measures of employment and contrasts their differences in concept, coverage, and other factors that might contribute to their divergences. The article then discusses the relationship between relative changes in the two measures in the short run and over somewhat longer periods. Finally, the article examines changes in the two measures as indicators of the current condition of the economy and addresses the question of which measure, when used alone, is the better indicator of the economy's current condition. The article concludes that changes in the payroll measure are generally better indicators of changes in economic activity over short periods than are changes in the household measure.

Differences between the two employment measures

The two measures of employment differ partly because the information is collected from different sources. The household measure of employment is based on interviews with a sample of households across the country. The payroll measure of employment is based on payroll records of businesses and government records. Another important difference is that the household measure estimates the number of workers while the payroll measure estimates the number of jobs.

The household measure

The household measure of employment is produced for the BLS from the Census Bureau's monthly *Current Population Survey*. A sample of nearly 60,000 households in all 50 states and the District of Columbia is used to represent the nation's civilian noninstitutional population. Interviews are conducted to determine the employment status and certain other characteristics of all members of the household at least 16 years old. Information is collected for the week that includes the

twelfth day of the month, called the survey week.

Household members are identified as employed if, during the survey week, they worked at all as paid employees, were self-employed, or worked 15 hours or more without pay in a family enterprise. Also identified as employed are members of the household that did not work during the survey week but were only temporarily absent from their jobs or businesses because of illness, vacations, bad weather, strikes, or personal reasons.

The household measure is an estimate of the number of workers because every employed person is counted only once. People with more than one job are identified with the job in which they worked the most hours during the survey week. Members of the Armed Forces stationed in the United States may or may not be included in the household measure of employment. When they are included, the measure is called total employment. When they are not, the measure is called total civilian employment.

The payroll measure

The payroll measure of employment is produced by the BLS in cooperation with state agencies from monthly reports of the number of workers on the payrolls of a large sample of nonagricultural establishments across the country. Both full-time and part-time employees are included, and data on hours and earnings are also collected. The employment data are for the pay period that includes the twelfth day of the month, except that federal government workers are counted as of the last day of the month.

The payroll measure excludes proprietors and the self-employed, unpaid family workers, farm workers, domestic workers, and members of the Armed Forces. People on establishment payrolls during any part of the pay period are counted as employed. Thus, people on paid sick leave, paid vacation, or paid holiday are considered employed, as are people receiving pay for part

of the period, even though they might be on strike or unemployed for another part of the period. Persons on layoff, on leave without pay, or on strike for the full pay period are not counted as employed. Neither are workers that have been hired but have not yet reported for work.

The sample used for estimating payroll employment involves "the largest monthly sampling operation in the field of social statistics."[2] The current sample of about 243,000 establishments covers about 40 percent of all nonagricultural employees. This sample is designed to bring large establishments into the sample with certainty and to include an appropriate number of other establishments based on the distribution of employment between large and small establishments. Estimates of payroll employment are compared with comprehensive counts of employment, or benchmarks, that are not available as often as the monthly estimates. Estimates of payroll employment normally are adjusted to these benchmarks every year.

The payroll measure of employment is an estimate of the number of jobs because persons working more than one job during the pay period are counted every time their names appear on payrolls. Only civilian employees of governments are included in the payroll measure, except that certain employees of federal intelligence agencies are excluded along with military personnel.

The two measures compared

Table 1 shows average annual employment in 1986 according to the household and payroll measures. A comparison of the two measures at the highest level of aggregation, with Armed Forces personnel excluded, shows that the household measure of total civilian employment was

---

[2] "Explanatory Notes," *Employment and Earnings*, U.S. Department of Labor, Bureau of Labor Statistics, March 1987, p. 141.

TABLE 1
Household and payroll measures of employment, 1986
(in thousands)

Household Measure	
Total Civilian Employment	109,597
Agriculture*	3,163
Nonagricultural Industries	106,435
Self-employed workers	7,881
Unpaid family workers	255
Wage and salary workers	98,299
Payroll Measure	
Workers on nonagricultural payrolls	100,167

*Includes self-employed workers, unpaid family workers, and wage and salary workers

Source: Bureau of Labor Statistics

109.6 million, thereby exceeding the 100.2 million workers on nonagricultural payrolls by about 9.4 million, or about 9.4 percent.

As noted earlier, the household measure is the more comprehensive of the two. Total civilian employment includes employment in agriculture, which is excluded from the payroll measure. Also excluded from the payroll measure but included in the household measure of total civilian employment are self-employed workers and unpaid family workers in nonagricultural industries. Data on these components of total civilian employment are published regularly. Subtracting the number of workers in these categories from total civilian employment provides a household measure of wage and salary workers in nonagricultural industries. This household measure, which is also reported regularly by the BLS, is more comparable in coverage to the payroll measure of workers on nonagricultural payrolls. Table 1 shows that in 1986 the 100.2 million workers on

nonagricultural payrolls was about 1.9 million, or nearly 2 percent, more than the number of wage and salary workers in nonagricultural industries given by the household measure.[3]

There are other possible reasons for differences between these two measures, and some of these reasons are discussed below. But, as noted in Gloria Green's comprehensive discussion of the differences between the household and establishment data, "no attempt at reconciliation provides a complete answer accounting for all of the factors that influence the levels of the two series."[4]

Multiple jobholding. The household survey results in estimates that identify the employment status of every member of the civilian noninstitutional population as employed, unemployed, or not in the labor force. Thus, every person is counted only once—the household measure counts workers. For purposes of identifying such things as the industrial or occupational status of people with more than one job, employed people are classified according to the job in which they worked the most hours during the survey week.

The payroll measure, on the other hand, counts jobs not workers. A person is counted and included in the payroll measure every time his or her name appears on a payroll. This conceptual difference in the two measures helps account for the payroll measure being larger than the adjusted household measure of wage and salary workers in nonagricultural industries.

Many kinds of multiple job counting add to the payroll measure of employment. Some people in the civilian noninstitutional population may hold more than one job. Some Armed Forces personnel, not included in the household survey, may hold part-time jobs in the private economy when they are off duty. And some teachers paid on a 12-month basis may have other jobs during the summer.

Some workers may change jobs in such a way that allows both their old and new jobs to be counted in one payroll survey. While the household measure includes workers employed any time during the survey week that includes the twelfth of the month, the payroll measure counts workers on payrolls at any time during the pay period that includes the twelfth of the month. The pay period might be a week or it might be two weeks, half a month, or a full month. This difference between the survey periods for the two measures increases the likelihood that job changing contributes to making the payroll measure larger than the household measure of nonagricultural wage and salary workers.[5]

Unpaid absences. Another difference in the size of the two measures results from the difference in their treatment of workers absent from their jobs during the full survey period. Both measures include those absent from work but paid by their employers. The household measure also counts people as employed if they are temporarily absent from work for any of a variety of reasons, even if they are not being paid. The payroll measure, however, does not count as employed people absent without pay for the whole pay period. For example, a person absent without pay for the full survey period because of a labor-management dispute would be included in the household measure of employment but not in the payroll measure.

[3] Over the 15 years ended in 1986, the household measure of total civilian employment annually exceeded the number of workers on nonagricultural payrolls by an average of nearly 11 percent. Over the same period, the payroll measure averaged just over 1 percent larger than the household measure of wage and salary workers in nonagricultural industries.

[4] Gloria P. Green, "Comparing Employment Estimates from Household and Payroll Surveys," *Monthly Labor Review*, U.S. Department of Labor, December 1969, pp. 9-10.

[5] For further discussion of job changing and the payroll measure, see Alexander Korns, "Cyclical Fluctuations in the Difference Between the Payroll and Household Measures of Employment," *Survey of Current Business*, U.S. Department of Commerce, May 1979, pp. 19-21.

The different treatment of unpaid absences contributes to the household measure being larger than the payroll measure.

Other factors. Other factors also may influence the size of the two measures. The household measure records the employment status of the civilian noninstitutional population age 16 and over, while there are no age limits for the payroll measure.

The household measure results from surveys using a sample designed to represent the civilian noninstitutional population. Current population estimates based on projections from the decennial population censuses are used as controls for the household survey sample. Thus the current population estimates depend on the completeness and accuracy of the censuses, and undercounts in the decennial censuses can affect the household employment measures resulting from the survey. The payroll measure is not affected the same way because it does not depend on probability population controls.

As noted earlier, employment estimates from the payroll measure are adjusted annually to benchmarks. Benchmark employment information comes primarily from data compiled from reports required under unemployment insurance laws, supplemented by social security records and other sources. Benchmark data are especially important in establishing payroll employment levels. Thus, the accuracy of the payroll measure depends heavily on the accuracy of the benchmarks, which may themselves be subject to various problems. As Green has said,

> The possibility of error in the population censuses or the unemployment insurance benchmarks cannot be disregarded. There is no "true" total against which the accuracy of either can be measured. Although the benchmark data and the population totals are among the best statistical measures available, . . . neither is perfect.[6]

The relationship between changes in the measures

Given the differences in the sampling, collection, and estimation techniques used in the two employment measures, it is not surprising that their levels differ or that they cannot be completely reconciled, although adjustments can be made to account for some of the differences. Differences in the two series are also seen when changes in employment, rather than levels, are examined. Month-to-month changes in the two measures may differ not just in size but even in direction of movement. Such discrepancies in short-run changes tend to be reduced, however, when changes in the measures are compared over longer periods. For example, the household series on total civilian employment and on wage and salary workers in nonagricultural industries declined 335,000 and 252,000, respectively, from January to February 1986 while the payroll measure increased about 133,000. Over the 12 months from February 1985 to February 1986, however, all three of these measures increased. Total civilian employment increased by nearly 2.0 million, the household measure of wage and salary workers in nonagricultural industries by 2.3 million, and the payroll measure by 2.9 million.

Although this illustration fits the conventional wisdom, it does not by itself prove that there is little relationship between the month-to-month changes in the household and payroll measures but a much closer relationship between changes over longer periods. More data and more formal

---

[6] For more detailed discussion of differences in the levels of the two measures, see Gloria P. Green, "Comparing Employment Estimates from Household and Payroll Surveys." For further information on definitions and statistical procedures used in both measures, see "Explanatory Notes" in a recent issue of *Employment and Earnings*, for example, pp. 119-143, in the March 1987 issue.

testing of the relationship are needed to provide more reliable information.

The following data were collected in a search for more reliable information: seasonally adjusted employment by month from January 1948 through December 1986 for the household measure of total civilian employment (HTCE), the household measure of wage and salary workers in nonagricultural industries (HWSW), and the payroll measure of employees on nonagricultural payrolls (PME). To compare relative changes over very short-run and somewhat longer run periods, percentage changes at an annual rate in each of the three series were computed from one month earlier, from one quarter earlier (quarterly averages of monthly data), and from 12 months earlier. Correlation coefficients were then computed to measure the closeness of the relationship of percentage changes in the payroll measure with percentage changes in each of the two household measures. Correlation coefficients vary in size from one, when the values of the two variables being compared coincide exactly, to zero, when there is no relationship at all between the variables. Thus, the closer the relationship between percentage changes in two employment measures, the larger the correlation coefficient.

Correlation coefficients for PME and HTCE, and for PME and HWSW are shown in Table 2. The table contains information that helps answer three questions. Are percentage changes in the two employment measures related less closely in the very short run than in the longer run? Is the closeness of the relationships different in the 1980s from earlier in the post-World War II period? Are changes in the payroll measure of employment related substantially more closely to changes in the household measure of wage and salary workers in nonagricultural industries than to changes in the household measure of total civilian employment?

Percentage changes in the payroll measure are not as closely related to percentage changes in the household measures over very short (month-to-month) periods as over longer periods. There is clearly less correlation between monthly changes than between quarterly changes and even less correlation between monthly changes than between changes from 12 months earlier. The comparisons hold for the correlation of PME with both HTCE and HWSW. The comparisons also hold for the full period 1948 through 1986 and for both subperiods examined.

There has been a concern that the two employment measures have diverged more than usual in this business cycle.[7] But the correlation analysis shows that the relationship between percentage changes in the two employment measures has been somewhat closer in the 1980s than earlier in the post-World War II period. The closer relationship in the 1980s holds for both month-to-month changes and the longer run changes. It also holds for comparisons of PME with both HTCE and HWSW. Statistical tests suggest, however, that the apparent closer relationships between the household and payroll measures in the 1980s are generally not statistically significant.

Changes in the payroll measure of employment do not appear to be substantially more closely related to changes in the household measure adjusted for coverage differences (HWSW) than to changes in the broader household measure (HTCE). This apparent lack of a closer relationship holds for comparisons of monthly, quarterly, and 12-month changes. This lack also holds for comparisons over the full period and both subperiods.

Simple correlation analysis shows that month-to-month changes in the payroll and household measures of employment are much less closely related than changes over longer periods of time. Changes in the payroll measure over the full period and both subperiods do not appear to be

_____

[7] *Business Week*, December 22, 1986, p. 13.

TABLE 2
Correlation coefficients between percentage changes
in employment measures, 1948-86

	Total Civilian Employment—Household Series and Nonagricultural Payroll Employment—Establishment Series		
	1948 Jan/Q1 to 1986 Dec/Q4	1948 Jan/Q1 to 1979 Dec/Q4	1980 Jan/Q1 to 1986 Dec/Q4
Percent change from 1 month earlier	0.41	0.40	0.51
Percent change from 1 quarter earlier*	0.76	0.75	0.84
Percent change from 12 months earlier	0.87	0.86	0.93

	Nonagricultural Wage and Salary Employment—Household Series and Nonagricultural Payroll Employment—Establishment Series		
	1948 Jan/Q1 to 1986 Dec/Q4	1948 Jan/Q1 to 1979 Dec/Q4	1980 Jan/Q1 to 1986 Dec/Q4
Percent change from 1 month earlier	0.45	0.44	0.56
Percent change from 1 quarter earlier*	0.78	0.77	0.87
Percent change from 12 months earlier	0.92	0.91	0.96

*Quarterly averages of monthly data

much more closely related to changes in the household measure adjusted for coverage differences than for the broader household measure. And the payroll measure appears to be somewhat more closely related to both household measures in the 1980s than earlier. The less-than-perfect relationship between changes in the employment measures suggests that one measure may be more closely related than the other to changes in overall economic activity, particularly in the short run. This issue will be discussed in the following section.

The two measures as indicators of economic activity

The most up-to-date data available on economic activity are always in demand by analysts of cur-

rent economic conditions and short-run prospects for the economy. Data on employment, as well as other labor market data, are among the first available every month or every quarter. As a result, analysts tend to rely heavily on employment data as an indicator until other data are available some weeks later, and to infer from employment data something about the coincident behavior of overall economic activity.

One approach, which emphasizes the determination of business cycle turning points, identifies comprehensive measures of employment as roughly coincident cyclical indicators of overall economic activity. The cyclical indicator approach to the analysis of business conditions and prospects is used in the U.S. Department of Commerce publication *Business Conditions Digest (BCD)*. In its primary set of comprehensive employment indicators, that publication uses both the payroll measure of employment and a household survey series called "persons engaged in nonagricultural activities."[8] The payroll measure of employment is one of four series included in the BCD composite Index of Coincident Indicators. Turning points in those four series—including the payroll measure of employment—roughly coincide with cyclical turning points in overall economic activity, and "have served as the primary observations for estimating the reference dates of business cycle peaks and troughs."[9] The payroll measure of employment is also identified as the best coincident indicator in the employment and unemployment group of indicators.[10]

A different approach examines monthly changes in employment to assess changes in industrial production or personal income to be reported later in the month or to assess the change in gross national product (GNP) to be reported later in a quarter after a quarterly average change in employment can be computed. As shown earlier, simple correlation analysis supports the conventional wisdom that quarter-to-quarter changes in the two employment measures are not perfectly related and that month-to-month changes are considerably less related. Since the two employment measures move differently over short periods of time, which is the better indicator until more information is available?

Regression analysis was used to find the employment measure that better explains same-period changes in overall economic activity. Thus, month-to-month percentage changes in the payroll measure and the two household measures were each used alone to explain same-month percentage changes in the index of industrial production and in real personal income. Quarter-to-quarter percentage changes in the employment measures were also used to explain same-quarter changes in real GNP as well as changes in industrial production and real personal income. The comparisons were made in terms of how much of the observed percentage changes in GNP, personal income, and industrial production are accounted for by percentage changes in each of the employment measures. That is, a comparison was made of the sizes of the coefficients of deter-

[8] The household measure of wage and salary workers in nonagricultural industries used in this article (HWSW) plus self-employed workers and unpaid family workers in nonagricultural industries equals the BCD series "persons engaged in nonagricultural activities."

[9] Victor Zarnowitz and Charlotte Boschan, "New Composite Indexes of Coincident and Lagging Indicators," Appendix 2, *Handbook of Cyclical Indicators*, U.S. Department of Commerce, Bureau of Economic Analysis, 1977, p. 185.

[10] This identification results from the use of an indicators scoring system that evaluates series according to seven criteria: timing, conformity, smoothness, currency, statistical adequacy, economic significance, and revisions. Scores for the series are based on their performance over business cycles between 1948 and 1980, and are shown in *Handbook of Cyclical Indicators*, 1984, Table 7, p. 169. For an explanation of the scoring system see Zarnowitz and Boschan in *Handbook of Cyclical Indicators*, 1977.

TABLE 3
Coefficients of determination (R^2's)
for regression of measures of economic activity on measures of employment,
percentage changes from one month earlier, 1948-86

Dependent Variable	Independent Variable	R^2 1948-86	R^2 1948-79	R^2 1980-86
Index of	PME	.51	.53	.39
Industrial	HTCE	.12	.11	.16
Production	HWSW	.10	.09	.14
Real	PME	.14	.14	.13
Personal	HTCE	.01	.01	.01
Income	HWSW	.02	.02	.00

PME —Payroll measure of nonagricultural employment
HTCE—Household measure of total civilian employment
HWSW—Household measure of wage and salary workers in nonagricultural industries

mination produced by the regression analyses (the R^2's). Comparisons are made for the full period 1948-86, for the 1980s, and for the period 1948-79. Finally, tests were performed to see if the differences between the 1980s and the earlier period were statistically significant.

Table 3 shows R^2's for the regressions of month-to-month percentage changes in industrial production and real personal income on percentage changes in the payroll measure and two household measures of employment. About 40 to 50 percent of the monthly percentage changes in industrial production is explained by percentage changes in the payroll measure, compared with about 10 to 15 percent that is explained by changes in the household measures. These comparisons suggest that percentage changes in the payroll measure are relatively good indicators of same-month changes in industrial production and substantially better indicators than changes in either of the household measures. As the lower section of Table 3 shows, none of the employment measures are good indicators of monthly changes in real personal income, but the payroll measure is better than the household measures.

Table 4 shows R^2's for the regression of quarter-to-quarter percentage changes in industrial production, real personal income, and real GNP on percentage changes in the payroll measure and the two household measures of employment. Quarterly changes in all the employment measures are better indicators of changes in output and income than are monthly changes. And as might be expected from the earlier discussion, differences in the R^2's between the payroll and household equations are less for quarterly changes than for monthly changes. All three employment measures are least useful as indicators of changes in real personal income. Comparisons of the R^2's show that in nearly all instances the payroll measure remains a more reliable indicator than the household measures. The exceptions are the cases of industrial production and real GNP in the 1980-86 period, when the sizes of the R^2's are virtually the same for all three employment measures.[11]

TABLE 4

Coefficients of determination (R^2's)
for regression of measures of economic activity on measures of employment,
percentage changes from one quarter earlier, 1948-86

Dependent Variable	Independent Variable	R^2		
		1948-86	1948-79	1980-86
Index of	PME	.67	.68	.60
Industrial	HTCE	.40	.37	.58
Production	HWSW	.43	.40	.56
Real	PME	.24	.22	.33
Personal	HTCE	.10	.08	.20
Income	HWSW	.17	.15	.20
Real	PME	.50	.48	.58
GNP	HTCE	.29	.24	.59
	HWSW	.34	.30	.57

PME —Payroll measure of nonagricultural employment
HTCE—Household measure of total civilian employment
HWSW—Household measure of wage and salary workers in nonagricultural industries

[11] Two other analytical approaches tend to support the conclusion that the payroll measure is a more reliable indicator than the household measures. In one approach, all the regressions were run with two independent variables, PME and either HTCE or HWSW. Adding a household measure variable did not increase the R^2, nor was its contribution statistically significant, in any of the regressions dealing with changes from one month earlier. The same was true for changes from one quarter earlier, except in the cases of industrial production and GNP in the 1980-86 period. In those instances, the R^2's were increased very slightly by the addition of a household measure as a second independent variable, and the HTCE variable was close to being statistically significant. Still, this extension of the analysis generally supports the view that the payroll measure of employment is a more reliable indicator of short-run, same-period changes in output and income.

In the second approach, the regression equations from the 1948-79 period were used to predict the monthly and quarterly percent changes in output and income in the 1980-86 period. Predicted values were compared with actual values and the better predictor was identified in each instance. In all but one instance, the payroll measure's prediction was closer in more than half the comparisons to the actual change in output or income than

It is not clear from looking at Tables 3 and 4, however, whether the differences in the values of R^2 between the 1980s and the earlier period are true differences. A statistical test can be used to determine whether observations on the variables in the 1980s are from the same population as those from the earlier period. Application of the test to all the relationships shown in the tables

either household measure's prediction. Test results show that in three instances the payroll measure's better predictions were statistically significant at either the 10 percent or the 5 percent confidence level. Thus, based on relationships established earlier in the postwar period, changes in the payroll measure provided better predictions of changes in the output and income measures in the 1980s than did changes in the household measures, further supporting the conclusion that the payroll measure is a more reliable indicator.

reveals no statistically significant difference between comparable R^2's for the 1980s and the earlier period. Thus, while the relationships between the employment measures and the other measures of economic activity may be changing in the 1980s, there is not yet firm evidence that such a change has occurred.[12]

Summary and conclusions

Comprehensive measures of employment are good indicators of economic activity. There are two independently derived measures of employment in the United States—the household measure and the payroll measure. Differences between these measures—both in levels and changes—can arise from several sources, such as conceptual differences in the measures, differences in coverage, and differences in how the data are collected and estimates made. Some but not all of the differ-

ences can be reconciled, as for example, by adjusting for coverage differences.

Correlation analysis of data from 1948 through 1986 makes clear that changes in the household and payroll employment measures are somewhat related, though not perfectly, and that monthly changes are much less closely related than changes over longer periods of time. Because the measures move differently over short periods, it might be better to rely on one or the other as an indicator.

Regression analysis over the same years suggests that percentage changes in the payroll measure are relatively good indicators of changes in industrial production and real GNP over short periods, and generally better than changes in the household measures. Statistical tests also show no significant difference between the 1980s and the earlier post-World War II period in the explanatory power of the various employment measures.

While employment changes alone are not the best predictors of same-period changes in overall economic activity, better inferences about changes in economic activity can be made by examining changes in the payroll measure than changes in the household measure of employment.

---

[12] The test used is the "Chow test." See Jan Kmenta, *Elements of Econometrics*, Second Edition, Macmillan Publishing Co., New York, 1986, pp. 420-421.