A new BLS survey measures the ratio of hours worked to hours paid

Hours at work accounted for about 93 percent of the hours paid for production and nonsupervisory workers in 1982, according to a new annual survey which includes only the time required to be on the job site thereby excluding paid holidays, sick leave, and vacations

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For many years the Bureau of Labor Statistics has been collecting data on the hours of production and nonsupervisory workers in nonagricultural establishments. These hours, reported in the Current Employment Statistics survey, measure hours paid and thus include paid holidays, sick leave, and vacations. In 1982, the Bureau of Labor Statistics began collecting data on *hours at work* of nonsupervisory and production workers in nonagricultural business establishments. These hours include the time an employee is required to be on the job site or at the prescribed place of work and thus exclude holidays, sick leave, and vacations. However, in addition to the actual time the worker is engaged in productive activities, this definition includes short rest periods, coffee breaks, standby or ready time, downtime, portal-to-portal time (if paid), washup time (if paid), travel time from job site to job site within the working day, travel time away from home if it cuts across the working day, and paid training periods.[1] In 1982, the most recent year for which data are available, hours at work accounted for about 93 percent of hours paid for production and nonsupervisory employees.

The Hours at Work Survey measures the relationship between hours at work and hours paid in order to provide the Bureau with the necessary data to construct measures of labor input which more closely meet the conceptual re-

quirements for productivity measurement: the actual flow of hours devoted to the production of output.[2] This new

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Table 1. Ratio of hours at work to hours paid, by industry, 1981 and 1982

Industry	1981	1982	Change
Nonagricultural business	.924	.926	.002
Mining	.937	.925	– .012
Construction	.978	.982	.004
Manufacturing	.912	.909	– .003
Durable	.907	.905	– .002
Lumber and wood	.935	.929	– .006
Furniture and fixtures	.941	.931	– .010
Stone, clay, and glass	.906	.903	– .003
Primary metals	.891	.879	– .012
Fabricated metals	.919	.912	– .007
Machinery (excluding electrical)	.900	.906	.006
Electrical machinery	.906	.899	– .007
Transportation equipment	.893	.898	.005
Instruments	.907	.904	– .003
Miscellaneous manufacturing	.927	.921	– .006
Nondurable	.920	.916	– .004
Food and kindred products	.927	.924	– .003
Tobacco	.892	.853	– .039
Textile mills	.943	.937	– .006
Apparel	.948	.939	– .009
Paper	.883	.890	.007
Printing and publishing	.905	.915	.010
Chemicals	.895	.882	– .013
Petroleum and coal products	.899	.892	– .007
Rubber and plastic products	.918	.906	– .012
Leather	.931	.930	– .001
Transportation	.875	.871	– .004
Communications	.887	.883	– .004
Electric, gas, and sanitary services	.876	.873	– .003
Wholesale trade	.934	.936	.002
Retail trade	.947	.959	.012
Finance, insurance, and real estate	.914	.905	– .009
Services	.920	.936	.016

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survey, therefore, represents another enhancement and expansion of BLS's productivity measurement program.

Major findings

Based on the first survey years, the major findings are:

• The overall change in the ratio of hours at work to hours paid from 1981 to 1982 was only 0.2 percent for production and nonsupervisory workers in nonagricultural business.

• The overall hours at work to hours paid ratio increased from 1981 to 1982, with the increases largely concentrated outside the manufacturing sector. There were decreases in 20 of 29 industries.

• There is a definite seasonal pattern in the hours at work to hours paid ratio; the ratio is largest in the first quarter of the year and smallest in the third.

• Some industries have hours at work to hours paid ratios which are significantly different from the average.

• There is an inverse relationship between establishment size (number of employees) and the hours at work to hours paid ratio.

Data for the successive years are not sufficient for indicating trends or cyclical behavior in the ratio of hours at work to hours paid. Nevertheless, the implications for the

BLS productivity measures in these years are important. The change in output per hour (labor productivity) for employees in nonfarm business during 1981–82 was 0.4 percent. This figure becomes 0.2 percent when adjusted for the change in the hours of work to hours paid ratio. The change in multifactor productivity for 1981–82 was −1.9 percent in nonfarm business; when adjusted for the ratio it is −2.0 percent.

Survey background

The Bureau of Labor Statistics has long recognized the need for timely data on hours at work, which do not include paid leave time or holidays, in order to measure change in productivity. The appropriate measure of labor as a factor input for productivity measurement is the total hours which workers spend on the production of goods and services—hours worked. For this purpose, the hours of vacation, holiday, or sick leave should not be included.

At present, total hours of labor input are calculated by aggregating measures of employment and average weekly hours at the two-digit Standard Industrial Classification (SIC) industry level. These measures of employment and average weekly hours are derived from two monthly surveys, the Current Employment Statistics survey and the Current Population Survey. Both surveys collect data for the week (pay period) which includes the 12th of the month.

Table 2. Ratio of hours at work to hours paid for production and nonsupervisory workers, by firm size and industry, 1981 and 1982

Industry	Size of firm (employees)							
	1981				1982			
	Fewer than 50	50–499	500–2,499	More than 2,500	Fewer than 50	50–499	500–2,499	More than 2,500
Nonagricultural business	.944	.925	.892	.866	.952	.926	.905	.863
Mining	.972	.928	.910	.897	.960	.933	.873	.815
Construction	.976	.986	(1)	(1)	.978	.983	.997	(1)
Manufacturing	.943	.925	.893	.880	.942	.920	.893	.876
Durable	.949	.922	.885	.878	.943	.917	.886	.876
Lumber and wood	.959	.928	.911	(1)	.947	.929	.882	.796
Furniture and fixtures	.957	.938	.939	.942	.950	.935	.912	.932
Stone, clay, and glass	.950	.904	.882	.855	.957	.891	.881	.871
Primary metals	.945	.924	.874	.866	.916	.909	.889	.829
Fabricated metals	.952	.928	.890	.846	.945	.920	.878	.864
Machinery (excluding electrical)	.946	.906	.880	.861	.942	.917	.889	.875
Electrical machinery	.961	.927	.877	.900	.940	.921	.886	.872
Transportation equipment	.919	.930	.882	.880	.954	.920	.875	.894
Instruments	.937	.915	.891	.903	.935	.904	.893	.903
Miscellaneous manufacturing	.940	.930	.912	.873	.940	.917	.903	.868
Nondurable	.933	.927	.905	.888	.940	.922	.902	.873
Food and kindred products	.955	.931	.908	(1)	.953	.928	.908	.841
Tobacco	.940	.913	.887	.865	.935	.941	.883	.796
Textile mills	.982	.940	.946	.908	.956	.948	.924	.927
Apparel	.950	.952	.921	.907	.957	.938	.927	.937
Paper	.916	.892	.866	.864	.938	.893	.879	.840
Printing and publishing	.895	.910	.911	.870	.932	.911	.908	.876
Chemicals	.924	.908	.873	.891	.904	.893	.872	.873
Petroleum and coal products	.947	.907	.891	.870	.960	.900	.876	.810
Rubber and plastic products	.955	.917	.902	(1)	.930	.903	.898	.892
Leather	.947	.934	.912	.916	.947	.931	.915	(1)
Transportation	.923	.894	.873	.794	.944	.910	.852	.781
Communications	.928	.901	.846	.860	.948	.899	.863	.869
Electric, gas, and sanitary services	.897	.889	.855	.860	.911	.869	.865	.870
Wholesale trade	.940	.931	.878	.824	.940	.931	.925	.865
Retail trade	.967	.920	.921	.896	.968	.953	.947	.933
Finance, insurance, and real estate	.932	.919	.879	.851	.917	.896	.897	.920
Services	.919	.927	.918	(1)	.952	.924	.937	.843

[1] No response.

Table 3. Ratio of hours at work to hours paid and change in the ratio for production and nonsupervisory workers, by quarter and industry, 1981 and 1982

Industry	1981				1982				Change, 1981–82			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Nonagricultural business	.934	.933	.915	.919	.941	.930	.908	.921	.007	-.003	-.007	.002
Mining	.955	.946	.924	.924	.947	.919	.904	.923	-.008	-.027	-.020	-.001
Construction	.983	.990	.980	.959	.989	.990	.981	.981	.006	0	.001	.022
Manufacturing	.933	.915	.894	.907	.934	.912	.888	.900	.001	-.003	-.006	-.007
Durable	.928	.911	.888	.902	.929	.907	.880	.896	.001	-.004	-.008	-.006
Lumber and wood	.959	.928	.923	.929	.955	.931	.914	.928	-.004	.003	-.009	-.001
Furniture and fixtures	.958	.939	.933	.939	.957	.930	.914	.921	-.001	-.009	-.019	-.018
Stone, clay, and glass	.916	.914	.901	.899	.924	.899	.881	.894	.008	-.015	-.020	-.005
Primary metals	.918	.893	.873	.885	.906	.875	.852	.864	-.012	-.018	-.021	-.021
Fabricated metals	.935	.913	.921	.919	.942	.904	.893	.908	.007	-.009	-.028	-.011
Machinery (excluding electrical)	.925	.912	.866	.889	.936	.924	.861	.894	.011	.012	-.005	.005
Electrical machinery	.929	.920	.866	.901	.918	.900	.872	.892	-.011	.020	-.006	-.009
Transportation equipment	.914	.892	.892	.888	.915	.896	.890	.886	.001	.004	-.002	-.002
Instruments	.927	.915	.875	.907	.928	.918	.867	.894	.001	.003	-.008	-.013
Miscellaneous manufacturing	.946	.925	.911	.927	.949	.916	.896	.920	.003	-.009	-.015	-.007
Nondurable	.941	.921	.903	.915	.941	.920	.900	.904	.000	-.001	-.003	-.011
Food and kindred products	.945	.930	.903	.928	.940	.927	.918	.905	-.005	-.003	.015	-.023
Tobacco	.951	.857	.895	.872	.933	.832	.844	.818	-.018	-.025	-.051	-.054
Textile mills	.970	.938	.929	.933	.967	.936	.918	.929	-.003	-.002	-.011	-.004
Apparel	.971	.950	.938	.938	.970	.956	.920	.932	-.001	.006	-.018	-.006
Paper	.897	.884	.876	.873	.921	.892	.867	.878	.024	.008	-.009	.005
Printing and publishing	.923	.918	.873	.907	.938	.924	.901	.906	.015	.006	.028	-.001
Chemicals	.917	.898	.883	.886	.907	.881	.862	.877	-.010	-.017	-.021	-.009
Petroleum and coal products	.917	.900	.890	.890	.905	.901	.884	.871	-.012	.001	-.006	-.019
Rubber and plastics	.939	.908	.908	.920	.937	.909	.886	.888	-.002	.001	-.022	-.032
Leather	.960	.934	.902	.931	.959	.928	.907	.927	-.001	-.006	.005	-.004
Transportation	.900	.895	.873	.876	.861	.847	.839	.846	-.039	-.048	-.034	-.030
Communications	.908	.902	.875	.889	.888	.885	.858	.864	-.020	-.017	-.017	-.025
Electric, gas, and sanitary services	.888	.891	.862	.858	.893	.889	.860	.852	.005	-.002	-.002	-.006
Wholesale trade	.943	.939	.925	.929	.959	.944	.922	.931	.016	-.005	-.003	.002
Retail trade	.958	.950	.931	.947	.974	.967	.951	.966	.016	-.017	-.020	-.019
Finance, insurance, and real estate	.919	.926	.903	.899	.915	.910	.870	.901	-.004	-.016	-.033	.002
Services	.913	.933	.920	.916	.947	.941	.915	.931	.034	.008	-.005	-.015

Hours of employees covered by the Current Employment Statistics survey (which includes approximately 180,000 establishments) represent approximately 85 percent of the total hours used in the BLS measure of productivity in the business sector. These hours are hours paid, and because paid leave hours are not used in the actual production of output, a bias in the productivity growth rate can occur if there is a year-to-year divergence in the ratio of hours at work to hours paid.[3]

The remaining 15 percent of total hours in the private business sector which are not covered by the Current Employment Statistics survey (the farm sector, the self-employed, and unpaid family workers) come from the Current Population Survey data which are collected each month from approximately 65,000 households. In this survey, the number of hours "worked" during the survey week is requested for employed persons.[4]

Results

Nonagricultural business. The ratio of hours at work to hours paid for nonagricultural business establishments changed from .924 in 1981 to .926 in 1982. These ratios imply that the average production or nonsupervisory worker gets 19.5 days of paid leave per year, or slightly less than 4 weeks if 5 working days per week are assumed. This is, coincidentally, approximately equal to the number of national holidays (9) plus 10 days (two 5-day weeks) of paid leave.[5]

Industry. The hours at work to hours paid ratios also vary considerably by industry and size of firm. (See table 1.) For example, construction workers had a ratio in 1982 of .982, which indicates less than 1 week of paid leave per year. (The highest ratio recorded for either year is .990 for the second quarter of 1981 in the construction industry.) In contrast, the hours at work to hours paid ratios for nonsupervisory workers in the transportation (.871) and utilities (.873) industries represent more than 6 weeks of paid leave time.

The variation of the hours at work to hours paid ratio was less within manufacturing than for all manufacturing industries. In 1982, the ratios within manufacturing ranged from .940 in apparel to .853 in tobacco. The average for all manufacturing (.909) was slightly less than 5 weeks of paid leave time. The year-to-year changes in manufacturing extend from the -.039 in tobacco to .010 in printing and publishing.

While the change between 1981 and 1982 for the economy as a whole was positive (and small), the 1981–82 changes among the industries varied much more, ranging from -.039 in tobacco to .016 in services. Also, the change for the manufacturing sector was negative.[6] While this was a minute change (-.003), 16 of the 20 industries in manufacturing experienced decreases in the ratio between 1981 and 1982.[7] (The exceptions were machinery, transportation equipment, paper, and printing and publishing.)

Outside of manufacturing, the hours at work to hours paid

ratio also fell in most industries (5 of 9). However, there were large increases in the ratio in both the retail trade (.012) and the service industries (.016), which together account for more than 48 percent of employment outside manufacturing and 38 percent of nonfarm business employment. Also, the service industry was 1 of only 3 industries to experience an increase in employment in 1982 (the other two were mining and finance, insurance, and real estate). The construction (.004) and the wholesale trade (.002) industries also had increases in the hours at work to hours paid ratio.

Establishment size. Based on the survey results, there is also a clear inverse relation between firm size and the hours at work to hours paid ratio: employees of smaller firms receive less paid leave. (See table 2.) Furthermore, this relationship seems to hold for all industries. In 1982, 5 percent of the hours paid were paid leave in establishments with fewer than 50 employees; 7 percent of the hours paid were for leave hours in establishments having between 50 and 499 employees; 10 percent, for establishments with 500 to 2,500 employees; and 14 percent, for establishments with more than 2,500 employees. The pattern was the same in 1981.

Seasonal change. Another source of variation in the hours at work to hours paid ratio is seasonal change. (See table 3.) In general, the first and second quarters have higher ratios than the third and fourth quarters with the third quarter usually posting the lowest ratio. This is expected, as there are more holidays in the third and fourth quarters than in the earlier quarters (6 of the 9 holidays are after July 1) and during the third quarter (July through September) the majority of workers take vacations. In first-quarter 1982, for the nonagricultural sector, the ratio was .944; in the second quarter, .930; in the third, .908; and in the fourth, .921. The pattern was more pronounced in 1982 than in 1981. This seasonal pattern was also apparent in the manufacturing sector and the separate industries.

Productivity measures

The magnitude of the change in the hours at work to hours paid ratio, while it may be small when observed by itself, has an appreciable effect in relation to productivity growth. An annual change of 0.2 percentage point over several years would be a significant trend in relation to the currently measured annual rate of growth in productivity. Labor productivity (output per hour) increased at an annual rate of 2.4 percent from 1948 to 1983 in the business sector.

Table 4. Percent change in output per hour for nonfarm and manufacturing employees from same quarter a year ago, adjusted for change in hours at work, 1981–82

Industry	Quarter							
	I		II		III		IV	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Nonfarm business	-0.1	-0.8	0.3	0.6	0.1	0.8	1.5	1.3
Manufacturing	0.1	0.0	0.2	0.5	1.5	2.1	3.6	4.3
Durable	-0.3	-0.4	-0.2	0.2	1.4	2.2	3.4	4.0
Nondurable	0.7	0.7	0.7	0.8	1.6	1.9	3.9	5.0

A 0.2-percentage-point adjustment to this rate of growth of output per hour is a difference of over 8 percent.[8]

Change in the hours at work to hours paid ratio inversely affects productivity growth rates based on hours paid: an increase in the ratio means that hours at work rose faster than hours paid so that (given no change in output) productivity based on hours at work would increase more slowly. Conversely, a decrease in the ratio will cause the annual rate of growth of productivity to rise.

The effects of a change in the hours at work to hours paid ratio are different for a labor versus a multifactor productivity measure.[9] For the labor productivity measure (output per hour) the effect is equal to the percentage change in the ratio. For example, the 1981–82 change is 0.2 percentage point, so the annual rate of growth in output per hour for the nonfarm business sector would be 0.2 percentage point less then presently reported.

In contrast, the effect on the rate of growth of multifactor productivity is smaller than the change in the hours at work to hours paid ratio because labor (hours) is only one of two factor inputs. The change in the multifactor productivity growth rate is equal to the product of labor's share of income (about 65 percent) and the percentage change in the hours at work to hours paid ratio. From 1981 to 1982, this was about 0.1 percentage point.

Although sufficient data are not available to develop seasonal factors for the hours at work to hours paid ratios, the changes from the same quarter a year ago can be measured. Table 4 shows both the presently published and adjusted output per hour measures for the same quarter a year ago for both manufacturing and nonfarm business. As indicated by the table, there are substantial adjustments in the output per hour measures when the changes in the hours at work to hours paid ratio are applied to the growth rates from the same quarter a year ago. □

————FOOTNOTES————

[1] *Report of the Task Force on Hours Worked* (Bureau of Labor Statistics, 1976).

[2] *Trends in Multifactor Productivity, 1948–81* (Bureau of Labor Statistics, 1983), pp. 31 and 66–68.

[3] Early studies by the Bureau of Labor Statistics using data from the now discontinued Survey of Employer Expenditure for Employee Compensation showed that hours paid were increasing 1 percent faster annually than hours at work between 1967 and 1977. See *Report of the Task Force.*

[4] Though the Current Population Survey (CPS) hours are an hours "worked" concept, it has been noted that there is a great possibility of response error,

because the respondent is frequently a nonworking member of the household. Consequently, the Current Employment Statistics survey and not the CPS is the primary source of hours for productivity measurement. See *Report of the Task Force*, pp. 25–26.

[5] These ratios are not, however, adjusted for the number of days worked in a normal week or the composition of part- and full-time employees. Hence, for persons who work more or less than 5 days a week on average, the number of days of leave time will vary accordingly. That is, a person who only works 2.5 days a week could still have the same hours at work to hours paid ratio, but would, on average, get only half as many paid leave days.

[6] Even though the 1981 response rate was relatively low, an analysis of the establishments, which reported for both years, suggests that the findings of the first year are well within the acceptable range of possible error.

[7] The decrease in the hours at work to hours paid ratio for manufacturing industries may indicate that employees who earn the least amount of paid leave are laid off first, while firms retain the senior employees who receive the most leave. This may also account for the rise in the hours at work to hours paid ratio in the service industry which experienced an increase in employment and therefore an increase in the proportion of employees with little seniority.

[8] Considering that the annual growth rate of output per hour was only 0.9 percent between 1973 and 1983 in the business sector, the relative importance of the hours at work to hours paid adjustment may be even greater.

[9] For an explanation of the multifactor productivity measure, see Jerome A. Mark and William H. Waldorf, "Multifactor productivity: a new BLS measure," *Monthly Labor Review*, December 1983, pp. 3–15.

APPENDIX: Survey design

The establishments included in the Hours at Work Survey are a stratified random sample of the Unemployment Insurance reporting system: the ES–202 file. The file, which consists of approximately 4.5 million establishments, covers more than 95 percent of nonagricultural employment. Between 4,000 and 4,500 establishments are randomly selected for the survey. Sample stratification is by industry and number of employees at the establishment.

The Hours at Work Survey is conducted annually by mail.

Table A. Hours at work survey, usable response rate by industry, 1981 and 1982

(In percent)

Industry	1981	1982
Nonagricultural business	48	80
Mining	36	76
Construction	36	80
Manufacturing	53	83
Durable	57	85
Lumber and wood	56	88
Furniture and fixtures	64	86
Stone, clay, and glass	51	90
Primary metals	64	87
Fabricated metals	59	85
Machinery (excluding electrical)	61	83
Electrical machinery	50	80
Transportation equipment	62	77
Instruments	50	87
Miscellaneous manufacturing	51	84
Nondurable	49	80
Food products	47	79
Tobacco	54	76
Textile mills	54	88
Apparel products	42	74
Paper products	62	83
Printing and publishing	41	78
Chemicals	53	79
Petroleum and coal products	38	74
Rubber and plastic products	46	88
Leather and leather goods	52	82
Transportation	44	77
Communications	19	55
Electric, gas, and sanitary services	59	78
Wholesale trade	33	79
Retail trade	31	76
Finance, insurance, and real estate	34	72
Services	36	71

There are three mailings (beginning in February of each year) with selected telephone followup. Using two questionnaires (one for manufacturing, mining, and construction, and one for all other industries), establishments are asked to record the total number of hours paid and the total number of hours at work for the previous year, by quarter, for all production and nonsupervisory workers. Ratios of hours at work to hours paid are calculated by quarter, establishment size, and industry (two-digit Standard Industrial Classification (SIC) industries within manufacturing and one-digit SIC industries elsewhere).

In the first year (which is referred to as the 1981 survey, the year for which the information was collected), the usable response rate was 48 percent for all industries. The rate was much higher for manufacturing industries (53 percent) than for nonmanufacturing (table A). The lowest response was in the communications industry (19 percent); the highest was in primary metals and furniture industries (64 percent).

Following the first survey, a response analysis with followup interviews was conducted for 150 establishments. This consisted of a personal interview, by Bureau of Labor Statistics personnel, with the establishment's representative responsible for keeping the hours or payroll records. Questions asked concerned the nature and extent of the hours records. Information derived from this response analysis survey resulted in new questionnaires designed to aid respondents in reporting the correct data. Also, new followup procedures for contacting respondents were implemented which helped to increase the number of respondents and improve the accuracy of the responses. Consequently, for the second year, the response rate was a remarkably high 80 percent for all industries, and 83 percent for manufacturing. Again, the lowest response rate was in the communications industry (55 percent). The highest response was in the stone, clay, and glass industry (90 percent).