

Productivity trends in the Federal Government

Output per employee-year climbed 1.5 percent annually among Federal agencies studied during 1967–83; in recent years, the trend shows a slightly larger increase

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Labor productivity continues to be a major concern in the U.S. economy. The Federal Government is no exception.¹ It employs roughly 5.1 million people (2.9 million civilians and 2.2 million military).

For a number of years, the Bureau of Labor Statistics has collected data from selected Federal agencies and computed productivity indexes.² These indexes now cover 16 years, 54 Federal agencies employing 1.9 million Federal civilian employees, 401 reporting organizations, and about 3,000 different output measures. This article reports some of the results of these data.

Overall trends

During the measured period, 1967–83, output per employee-year rose at an average annual rate of 1.5 percent in the Federal sector, compared with a rate of 1.4 percent in the private sector.³ Between 1977 and 1983, productivity increased 1.7 percent and for the preceding 5 years (1972–77), 1.5 percent.

The overall increase in Federal productivity reflects an average rise of 1.4 percent per year in output, coupled with a small decline in employee years (–0.1 percent per year). The year-to-year changes in productivity ranged from a decline of 0.5 percent in 1974 to an increase of 2.9 percent in 1977. Output increased annually at rates ranging from 0.2 percent in 1974 to 3.7 percent in 1968. Annual rates of

change in employee years ranged from a drop of 1.2 percent in 1973 to a 2.6-percent increase in 1968 (table 1).

Compensation per employee-year, which comprises salaries, wages, and fringe benefits, increased at an average annual rate of 8.3 percent between 1967 and 1983, with increases ranging from 11.6 percent (1971) to 4.7 percent (1983). Unit labor cost, which reflects the interaction of changes in employee compensation and productivity, increased at an annual rate of 6.7 percent between 1967 and 1983, as productivity lagged increases in compensation. The largest increase was 10.8 percent in 1970, the smallest, 3.0 percent in 1983.

While unit labor cost has increased every year, the rate of increase has slowed: 7.6 percent between 1967 and 1972; 7.3, between 1972 and 1977; and 5.6, between 1977 and 1983. This is a reflection of both increasing productivity and smaller increases in compensation during the 1967–83 period.

Sector comparisons

For purposes of policy analysis, it is helpful to examine the Federal statistics by major sector. A sector in this context is an aggregation of organizations which have a common bond. Two such sectors, enterprise services and defense, are examined here.

Enterprise services. The Postal Service and electric power are examples of enterprise services which are sold in the marketplace and are designed to be largely self-supporting

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through fees and charges. Their market focus and discrete outputs make their outputs easily identifiable and measurable, at least when contrasted with general government.⁴

Productivity in the Federal Government's enterprise services increased at an annual rate of 1.2 percent, while that in general government increased at a more rapid rate of 1.7 percent between 1967 and 1983. However, year-to-year shifts are quite comparable: In half the years during the period, enterprise services showed greater productivity gains; in half, general government showed greater gains. There were years, of course, when the two showed substantial differences. In 1982, for example, general government increased at 2.5 percent, but enterprise service productivity decreased 0.6 percent, the latter occurring largely as a result of the productivity drop in the electric power field.

More interesting, perhaps, is the long-term trend of compensation per employee-year for enterprise services, which increased at a somewhat greater rate than that of general government (9.4 percent versus 7.4 percent). This is a reflection of the rapid increase in average annual compensation in the Postal Service. The enterprise services' faster increase in average annual compensation and slower increase in productivity is reflected in higher unit labor costs of the enterprise services vis-à-vis general government (8.1 percent versus 5.9 percent).

Enterprise service employment accounts for about 40 percent of the Federal sample (1983), with the Postal Service alone accounting for 37 percent. In most years, and certainly over the long run, the Postal Service is the driving force behind changes in enterprise service productivity and related indexes.

Defense. The rapid increase in defense expenditures in recent years has led to calls for increased productivity in

this area. Currently, Defense employs about 1 million civilians, or about 38 percent of the total Federal civilian labor force. About 37 percent of the Defense Department civilian labor force is included in the sample measurements (military personnel are excluded from these ratios). Most of the measured activities are support-related, such as communications, food service, maintenance, and supply.

The rate of productivity growth in Defense organizations from 1967-83 is 1.3 percent, which is slightly less than the nondefense figure of 1.6 percent. However, the relative movements varied through time. With the winding down of the Vietnam War, Defense productivity increased at only one-third the rate of nondefense productivity (0.6 percent versus 1.5 percent). In 4 consecutive years (1970-73), productivity declined; there were large decreases in Defense employee-years but even greater cutbacks in Defense activity output.

Turning to the 1972-77 period, we find that Defense outputs continued to drop, but employee years fell even faster so that productivity increased at 1.8 percent annually. This was a slightly faster growth rate than the nondefense increase of 1.4 percent. In the most recent 6-year period (1977-83), Defense productivity has risen at a somewhat greater rate than the nondefense sector (2.1 percent versus 1.6 percent).

Throughout the 1967-83 period, nondefense compensation has risen faster than Defense civilian compensation, and Defense unit labor costs have dropped faster than those of nondefense. This is true for both long-term and medium-term trends.

Functional diversity

To better identify and understand the forces which affect Federal productivity, we divide the Federal organizational units into 28 functional groups based on similarity of tasks performed (for example, auditing, medical, personnel, and regulation). These functional aggregations also provide a standard for managers to compare their organizations' performance. Indexes of productivity, output, employee years, compensation per employee-year, and unit labor costs are routinely computed for each function.

Long-term productivity trends for the 28 functions range from 11.7-percent annual growth for communications to 1.7-percent annual decline for electric power generation and distribution. (The overall Federal productivity trend, as noted, is 1.5 percent annually.) Most functions (26 of 28) show productivity increases over the long term (table 2).

Shifts in program emphasis and delivery of government services over the past 17 years are reflected in both output and employee-year trends. In one-fourth (7 of 28) of the functional areas, output indexes have declined. Long-term output trends have ranged from an annual increase of 10.7 percent for communications to a 3.3-percent annual decline for supply and inventory control and military base services. Long-term employee-year trends ranged from 7.1-percent

Table 1. Productivity indexes for total Federal sample, fiscal years 1967-83

Fiscal year	Output per employee-year	Output	Employee years	Compensation per employee-year	Unit labor cost
1967	100.0	100.0	100.0	100.0	100.0
1968	101.1	103.7	102.6	105.1	104.0
1969	103.5	107.1	103.5	112.8	109.0
1970	104.0	107.4	103.3	125.6	120.8
1971	105.6	108.7	103.0	140.2	132.7
1972	106.3	109.0	102.6	150.3	141.4
1973	109.3	110.7	101.3	159.3	146.0
1974	108.7	110.9	102.1	172.4	158.6
1975	110.3	112.8	102.2	189.1	171.4
1976	112.2	113.7	101.3	209.1	186.3
1977	115.5	115.7	100.1	227.8	197.1
1978	117.5	118.4	100.8	243.4	207.1
1979	118.2	119.3	100.9	259.1	219.1
1980	120.8	122.7	101.6	280.5	232.3
1981	123.7	124.5	100.7	307.2	248.4
1982	125.4	126.0	100.4	327.1	260.8
1983	127.5	129.7	101.7	342.6	268.6
Average annual rates of change (in percent)					
1967-83	1.5	1.4	-0.1	8.3	6.7
1967-72	1.3	1.7	0.4	9.0	7.6
1972-77	1.5	1.1	-0.3	8.9	7.3
1977-83	1.7	1.8	0.1	7.4	5.6

Table 2. Average annual rates of change in output per employee-year and related data, by selected functions in the Federal civilian work force, fiscal years 1967-83

Function	Output per employee-year	Output	Employee years	Compensation per employee-year	Unit labor cost
Total Federal sample	1.5	1.4	-0.1	8.3	6.7
Audit of operations	1.4	-0.9	-2.2	7.3	5.8
Buildings and grounds maintenance	3.7	1.4	-2.2	8.4	4.5
Communications ¹	11.7	10.7	-0.9	7.8	-3.5
Education and training ²	2.0	-0.5	-2.4	7.7	5.6
Electric power production and distribution	-1.7	5.3	7.1	7.2	9.1
Equipment maintenance ²	0.8	-1.9	-2.6	7.7	6.9
Finance and accounting	4.3	1.9	-2.2	7.5	3.1
General support services	4.8	6.6	1.6	6.6	1.7
Information services	0.7	1.1	0.5	6.2	5.5
Legal and judicial activities	0.0	4.2	4.1	6.2	6.1
Library services	4.8	7.4	2.5	8.1	3.2
Loans and grants	3.5	4.1	0.6	7.6	4.0
Medical services	0.2	2.0	1.8	7.8	7.6
Military base services	0.4	-3.3	-3.8	7.2	6.7
Natural resources and environmental management	1.2	1.5	0.3	7.1	5.8
Personnel investigations	3.3	6.3	2.9	6.9	3.5
Personnel management	1.2	3.3	2.1	5.4	4.2
Postal service	1.3	1.0	-0.3	9.5	8.1
Printing and duplication	-0.4	-2.9	-2.5	8.4	8.8
Procurement	3.1	1.8	-1.3	5.5	2.4
Records management	3.6	0.0	-3.5	6.9	3.2
Regulation-compliance and enforcement	2.5	4.7	2.2	7.1	4.5
Regulation-rulemaking and licensing	3.0	5.5	2.4	7.0	3.8
Social services and benefits	2.3	5.4	3.1	7.3	4.9
Specialized manufacturing	3.2	0.1	-3.0	8.4	5.0
Supply and inventory control	1.7	-3.3	-4.9	7.0	5.2
Traffic management ³	2.5	-0.7	-3.1	5.7	3.1
Transportation	2.7	2.6	-0.1	8.0	5.1

¹Fiscal years 1973-83.
²Fiscal years 1968-83.
³Fiscal years 1972-83.

NOTE: Average annual percent changes based on linear least squares of the logarithms of the index numbers.

annual increase for electric power production and distribution to an annual decline of 4.9 percent for supply and inventory control.

Compensation per employee-year rose rapidly throughout the period, as discussed earlier, with the greatest annual percentage change in the Postal Service (9.5 percent) and the smallest in personnel management (5.4 percent). Unit labor costs ranged from a 9.1-percent annual average increase for electric power to an annual average decrease of 3.5 percent for communications. Communications was the only function that registered a long-term decrease in unit labor costs.

Because of the relative homogeneity in growth in hourly compensation, those sectors having the more rapid advances in productivity generally had slower increases in unit labor

costs.⁵ Communications, for example, had an annual average productivity increase of 11.7 percent and a decrease of 3.5 percent in unit labor cost. At the other extreme, electric power production and distribution had an average annual productivity decrease of 1.7 percent and a rapid rise in unit labor cost of 9.1 percent.

Output and input movements among functions

The underlying output and input movements differ by function, sometimes dramatically. In the case of communications, which shows the largest increase in long-term productivity (11.7 percent), there was a very large annual increase in output (10.7 percent) with a small annual decrease (-0.9 percent) in employee years. During this period, steps were taken to install automated message processing equipment and optical character readers, and consolidate telecommunication operations.

The military base service function, which includes such activities as housing, laundry, commissary, and fire protection, shows a sizable decrease in the average annual rate of output (-3.3 percent) and input (-3.8 percent) and a slight increase in the rate of growth of productivity (0.4 percent) over the long run. Output trends in the early part of the period reflect the winding down of the Vietnam War, and, more recently, the move to contract operations to the private sector. Other functional areas with substantial Department of Defense employment, such as auditing and equipment maintenance, also show decreasing trends in output and input, particularly in the early coverage years.

Finance and accounting, which includes internal government operations such as payroll and voucher operations, and final government operations, such as Treasury bill and bond sales to the public, has shown productivity improvement in all years except for 1972 and 1973. The long-term (1967-83) average annual percent change is 4.3 percent. This increase in productivity is a reflection of a moderate increase in output (1.9 percent) and a decrease in input (-2.2 percent). In 12 of the 16 measured years, employee years have decreased.

The printing and duplication function shows an average annual decrease in output, input, and productivity. The decrease in output (-2.9 percent) reflects greater use of self-service copy centers, contracting of services, and a cutback in the number of government documents published. In response to this drop in output, employment was reduced (-2.5 percent), but the cuts in employment lagged the drop in output, and productivity decreased (-0.4 percent).

While printing and duplication productivity shows a long-term (1967-83) average annual decrease, the midterm (1977-83) and short-term (1982-83) rates have increased. This increase is a reflection primarily in the change of output growth. Between 1967 and 1972, output decreased at an annual rate of 4.3 percent, between 1972 and 1977 the decrease was 3.2 percent, and between 1977 and 1983 the drop was 0.7 percent. While output has dropped in most

years, the rate of decrease has slowed in recent years, and in 1982–83 there was a sizable increase (9.1 percent).

Electric power production and distribution, which registered the largest drop in productivity of the 28 Federal functions, has been buffeted by oil embargoes, recessions, and cutbacks in power plant construction. Productivity dropped in 9 of the 16 measured years, and sometimes dramatically. In 1982, productivity dropped by more than 25 percent, but in 1983, it increased by almost the same percent as employment was cut, while output increased. The average annual decrease in productivity between 1977 and 1983 was 6.1 percent.

Diversity of movements within functions

Although the organizations within the functional groupings perform relatively homogeneous tasks, productivity movements of the individual organizations can vary considerably, and these individual organizational productivity movements can be masked by functional aggregations. Hence, it is helpful to examine individual organizational units when assessing the forces which shape Federal productivity. Also, individual government managers are often interested in examining their own organizations' movements.

There are 333 different reporting units included in the 28 functions listed in table 3.⁶ Each function, other than the Postal Service, includes 2 units or more. The function with the greatest number of individual units is regulatory com-

pliance and enforcement which contains 50 units drawn from 19 departments and agencies. The loans and grants function contains 32 units, legal and judicial and general support each have 20, and finance and accounting has 18. Records management contains only 2.

The communications function, which shows an average annual increase in productivity of 13.3 percent (1977–83), comprises 8 units, with average annual increases ranging from 0.1 percent to 15.5 percent. The communications unit, with the largest increase in productivity during this period, reflects a large increase in output, averaging 13.7 percent, and a steady decrease in employment, averaging 1.5 percent.

The military base services function, comprising 12 reporting units drawn from each of the 4 services (Army, Navy, Marine Corps, and Air Force), shows average annual changes in productivity ranging from 16.4 to –0.7 percent from 1977 to 1983. The overall average annual rate of change for this period is 1.6 percent. Most of the reporting units (10 of 12) show increasing productivity, a reflection of increasing output (8 of 12) and decreasing labor input (7 of 12). Each of the services reported on its commissary operations, and for 3 of the 4, productivity increased. For each of the 4 commissary units, output rose and in 3 of the 4 units, labor input also increased. Three of the 4 services reported on laundry and dry cleaning services, and each showed increasing productivity and decreasing labor input. According to defense supply analysts, the increasing productivity in this area is a reflection of consolidation, use of more efficient equipment, and in the case of laundry and dry cleaning, the new fabrics which require less work.

The finance and accounting function is made up of 18 units which show an average annual increase in productivity of 9.1 percent between 1977 and 1983. Most of the organizational units (13 of 18) reported positive productivity gains during this period with individual average annual productivity changes ranging from 30.5 to –2.5 percent. The index of the unit with the largest increase reflects a massive increase in output which was fostered by changing economic conditions which, in turn, prompted rapid mechanization of operations. In 1 year, output increased 111 percent. The average annual increase in output between 1977–83 is 31.1 percent. However, in 1983 the increase was only 6.4 percent. Several elements in this function reported moves to automate operations.

The 16 organizational units in the printing and duplicating function registered productivity changes ranging from 8.2 percent to –5.0 percent during 1977 and 1983, with the units roughly split between those registering positive and negative productivity change. The overall average annual rate of change is 1.9 percent. Productivity has increased for the majority of units (9 of the 16) with most outputs and inputs dropping. In 12 of the 16 organizations, output has decreased and in 14 of the 16, employment has decreased. (The two organizations registering an increase in output are

Table 3. Average annual rates of change in productivity and related statistics by selected function, fiscal years 1977–83

Function	Number of units	Rates of change	
		Overall	Range of unit rates
Audit of operations	6	–0.7	30.4 to –8.6
Buildings and grounds maintenance	10	5.2	21.5 to –3.0
Communications	8	13.3	15.5 to 0.1
Education and training	11	2.0	12.4 to –7.3
Electric power	4	–6.1	3.3 to –7.5
Equipment maintenance	10	1.5	9.8 to –1.1
Finance and accounting	18	9.1	30.5 to –2.5
General support	20	9.1	29.6 to –7.9
Information services	16	1.9	43.2 to –11.1
Legal and judicial	20	2.3	54.1 to –17.9
Library services	7	2.1	4.3 to –7.3
Loans and grants	32	2.2	13.2 to –8.2
Medical services	10	0.7	5.9 to –2.5
Military base services	12	1.6	16.4 to –0.7
Natural resources and environmental management	11	1.9	41.9 to –13.0
Personnel investigations	3	0.3	5.2 to –3.7
Personnel management	6	–1.0	31.6 to –7.2
Postal service	1	1.2	—
Printing and duplication	16	1.9	8.2 to –5.0
Procurement	14	3.9	8.1 to –7.9
Records management	2	3.3	(¹)
Regulation—compliance and enforcement	50	4.3	40.1 to –20.9
Regulation—rulemaking and licensing	7	7.3	26.9 to –23.7
Social services and benefits	6	1.4	13.8 to 1.3
Specialized manufacturing	8	5.7	9.7 to –9.2
Supply and inventory control	16	1.0	14.6 to –12.6
Traffic management	3	2.1	3.7 to –1.7
Transportation	6	2.2	12.0 to –4.9

¹Rates not presented to assure confidentiality.

part of the Defense Department.) One organization that registered a steady increase in productivity during this period (2.6 percent) showed a decrease in output (-3.9 percent) but an even greater decrease in employment (-6.3 percent). Another organization which showed a decrease in productivity (-3.7 percent) also showed a drop in employment (-3.6 percent) but an even greater decrease in output (-7.2 percent). Most organizations have been affected by the same factors—cutbacks in government publications, moves to self-service equipment, equipment modernization, and contracting out of government operations.

The electric power production and distribution function, which comprises 4 units, shows a negative productivity trend (-6.1 percent) between 1977 and 1983. Three of the 4 organizational units show increasing productivity during this period, but it is the fourth unit that drives functional performance because it accounts for most of the labor input. This unit showed a -7.5-percent annual change in productivity between 1977 and 1983, which is a reflection of cutbacks in the demand for electricity and cancellation of power plant construction. And while labor has been trimmed by this organization, particularly in 1982 and 1983, it has not been cut back as rapidly as output has dropped.

Productivity trends, such as those discussed in this section, are a result of a number of factors. In a few cases, the dramatic midterm shifts in productivity are a result of management actions (as in communications), but in most instances (for example, electric power) these shifts are due to external forces, sometimes accompanied by management actions, sometimes entirely devoid of management response. By examining individual organizational units, it is often possible to better understand cause and effect relationships and the impact of external forces on government productivity.

Federal-private sector trends

Comparisons of Federal-private sector productivity trends provide yet another perspective of productivity change in the Federal Government. With the increasing interest in contracting for government services and the discussion of the efficiency of government vis-à-vis the private sector, comparisons between the two sectors are inevitable. They can also be informative and helpful to managers and policy makers.

Comparisons can be made both by economic sector and by detailed industry level. The aggregate comparison presented here is of the total private business sector and the total Federal Government sample. But, such a comparison does raise several conceptual issues. First, the private output index is a net measure of all private business in the United States, while the Federal output index is a measure of the gross output of a nonrandom sample. Second, the output mix is quite different. The private business output reflects both goods and services, while the Federal output is comprised mostly of services. Third, private business outputs

reflect final organizational outputs from the perspective of the business sector, while the Federal output reflects both final Federal outputs, that is, those that are consumed by the public, and intermediate outputs, that is, those consumed within the Federal Government such as personnel operations.

With these limitations in mind, the overall statistics show little difference between Federal (1.5 percent) and private sector (1.4 percent) productivity trends between 1967 and 1983. However, the rates do vary by time period examined. Private business sector trends grew more rapidly in early years, and the Federal Government trend grew more rapidly in later years. Also, the growth in outputs and inputs differs between the two sectors. Federal labor inputs, as noted earlier in the discussion, have remained roughly constant (-0.1 percent) through the measured period, while the private business sector has increased at 1.4 percent per year. In the case of outputs, the private business sector has increased 2.8 percent annually, while the Federal Government increased at 1.4 percent.

More interesting, perhaps, are the 5-year trends which show measured Federal sector productivity rising at a faster rate while private business sector productivity is increasing at a slower rate. Compensation movements show the opposite. The productivity and compensation trends are reflected in unit labor costs, which show Federal increasing at a slower rate and private increasing at a faster rate.⁷

More meaningful comparisons, perhaps, can be made at the individual private industry-government function levels. That is, there are a number of areas, such as medical, printing, and electric power, where the Federal Government and private industry produce similar outputs. Productivity indexes are currently calculated and published by BLS for about 130 industries. The underlying output measures for these indexes use the same "gross" basis as those used for the Federal sector.

However, a problem with making this comparison is that most of the available industry productivity measures are in manufacturing while most Federal measures are in service areas. There are only two Federal functions, communications and electric power, that have identifiable private industry counterparts and for which productivity indexes are routinely calculated.

In the case of communications, Federal and private sector productivity have both increased rapidly during the measured period. Over the long run (1973-83), productivity in Federal communications rose 11.7 percent annually, while productivity in private sector communications increased 6.6 percent.⁸ Over the midterm (1977 to 1983), Federal communications also increased more rapidly (13.3 versus 6.0 percent), but in the short term (1982-83), productivity in the private sector increased more rapidly (12.7 versus 7.3 percent). In short, the Federal and private productivity trends in communications move in the same direction although the magnitude of the movements differs, favoring the Federal

Government in the long term, but most recently favoring the private sector.

Federal and private sector electric power productivity trends display a somewhat different pattern. Over the midterm (1977–83), productivity trends decreased for both while over the short term (1982–83), they increased. However, over the long term (1967–83), Federal productivity decreased (–1.7 percent) while in the private sector productivity increased (2.0 percent).⁹ Both outputs and inputs increased for the Federal Government and the private sector over the long run, and both have been affected by oil embargoes, inflation, recessions, high interest rates, and reductions in nuclear power plant construction.

Federal-private productivity trend comparisons such as these are interesting and can be illuminating, but they need to be used with caution for the reasons noted earlier. Such comparisons should be more meaningful and useful in the future as private sector industry measures are expanded into new areas, such as medical services and printing, and the measures and measurements are improved in the Federal sector.

Outlook

Insofar as the future is concerned, overall Federal trends should follow past patterns. Overall productivity is likely to continue its steady upward movement in response to relatively constant employment and steady increases in output. Federal employment is likely to remain fairly constant in the future as it has in the past as a result of the continuing interest in controlling the number of Federal employees. Federal personnel ceilings, elimination of some activities, contracting of other operations, and introduction of new technology all work to limit the number of Federal employees. Federal output, however, is likely to continue its steady, upward movement in response to growth in defense

programs and some of the domestic programs such as Social Security, Internal Revenue, and the Postal Service.

The overall annual rate of change in Federal compensation has paralleled the rate of change in the overall economy and this long-term trend can be expected to continue. Federal law requires comparability of pay between the Federal and private sector, and in several large Federal employment areas, including the Postal Service and the Government Printing Office, compensation is negotiated.¹⁰ Furthermore, general competition in the labor market helps ensure that Federal and private sector compensation move in the same general direction over time.

Projecting productivity trends of sectors, functions, and individual organizations is much more difficult than projecting overall Federal trends. Whereas the overall trends are influenced by a number of different, often conflicting factors, individual functions and units are often heavily affected by a single factor. For example, communications productivity has been heavily influenced by technological change; electric power has been affected by factor price shifts; printing operations have been reduced by internal government directives; and loans and grants have been influenced by revised laws and regulations. Because of the impossibility of foreseeing the size, scope, and timing of economic, political, and technological events, it is difficult to predict the movements of individual sectors, functions, and organizational units.

IN SUMMARY, it is probable that productivity will increase in most sectors and functions and many organizations, but there will be large annual fluctuations in each from time to time. These changes, of course, are masked in overall Federal productivity trends, which should continue in much the same fashion as they have in the past. □

FOOTNOTES

¹*Management of U.S. Government, Fiscal 1986* (Government Printing Office, 1985).

²For a discussion of past results and measurement concepts, see Joint Economic Committee, *Hearings: Federal Productivity* (Government Printing Office, 1974); Charles W. Ardolini, "Federal Sector Productivity Measurement," *Selected Papers from North American Conference on Labor Statistics*, May 1980, pp. 49–60; Jerome A. Mark, "Measuring Federal Productivity," *Civil Service Journal*, January–March 1979, pp. 20–23; Charles W. Ardolini and Jeffrey Hohenstein, "Measuring Productivity in the Federal Government," *Monthly Labor Review*, November 1974, pp. 13–20; Joint Economic Committee, *Measuring and Enhancing Productivity in the Federal Sector* (Government Printing Office, 1972); "Productivity Measures: Industries and the Federal Government," *BLS Handbook of Methods*, Bulletin 2134–1 (Government Printing Office, 1982).

³All average annual rates of change are based on the linear least squares trend of the logarithms of the index numbers.

⁴Because of their market orientation and discrete outputs, Federal enterprise services are included in aggregate private sector productivity cal-

culations as well as in the government indexes discussed here. See "Productivity Measures: Business Economy and Major Sectors," *BLS Handbook of Methods*, Bulletin 2134–1, pp. 93–7.

⁵The coefficient of correlation between productivity and unit labor cost is .93.

⁶These 333 units are all units reporting 3 or more years of data between fiscal 1977–83. A reporting unit may include more than one organizational unit; for example, the Air Force libraries are reported as one unit although there are more than 50 separate libraries included. Outside the Department of Defense, most organizational units are the same as the reporting unit.

⁷The periods examined here are 1967–72, 1972–77, and 1977–82.

⁸*Productivity Measures for Selected Industries, 1954–83*. Bulletin 2224 (Government Printing Office, February 1985), pp. 236–37.

⁹*Ibid.*, pp. 240–41.

¹⁰For the latest data from the survey of pay for professional, administrative, technical, and clerical occupations (PATC) in medium and large firms, see Carl Prieser, "Occupational salary levels for white-collar workers, 1985," elsewhere in this issue.

APPENDIX: Federal Government measurement techniques

The productivity indexes in this study are output per employee-year measures which show changes in the relationship between the output of the sample unit and the labor input associated with the production of the output. The output per employee-year index is derived by dividing the output index by the employment index.

The indexes of output per employee-year relate individual organizational output to the labor required to produce the output, but do not measure the specific contribution of labor, capital, or any other factor of production. Rather, they reflect the joint effect of many influences including changes in technology, capital investment, capacity utilization, office design and layout, skill and effort of the work force, managerial ability, and Federal legislation and regulation.

Federal output measures reflect final outputs of the organization being measured. These include outputs which leave the Federal Government, such as those of the U.S. Postal Service, and outputs that are consumed by other parts of the Federal establishment, such as personnel and supply services.

The Federal employment index represents the number of full-time-equivalent employees which is based on an hours paid equivalent of 2,080 hours per year. It includes all paid

time; overtime, vacation, holidays, and sick leave. Part-time or seasonal employment is included on a full-time-equivalent base. All employee years are considered homogeneous and additive, and, thus, the index does not reflect changes in the qualitative aspects of labor, such as skill and experience.

The Federal compensation index includes wages, salaries, and benefits including retirement, merit pay increases, incentive pay, health insurance, and the like. Private sector compensation indexes also include wages, salaries, and benefits. The unit labor cost index for both the Federal Government and the private sector is derived by dividing the index of compensation by the index of output.

The U.S. Government's fiscal year is the reference year for all data and indexes. Through fiscal 1976, the fiscal year was July 1–June 30; beginning with fiscal 1977, the period was shifted to October 1–September 30. Data for the "transition quarter," July 1–September 30, 1976, are excluded from all indexes and statistics.

Additional data and charts are available by requesting the *Fiscal 1983 Federal Government Productivity Summary Data* from the Office of Productivity and Technology, Bureau of Labor Statistics, Washington, DC 20212.

The greening of productivity analysis

The groundwork for a more sophisticated program of industry productivity measures was laid in 1926, when [BLS Commissioner Ethelbert] Stewart brought Ewan Clague from the University of Wisconsin to direct a special project. For data on output, the work drew on the biennial Census of Manufactures supplemented by more current figures available from the Department of Commerce. Employment data came from the Bureau's monthly series. In 1926, the Bureau published output per man-hour measures for the steel, automobile, shoe, and paper industries. In 1927, measures were published for 11 additional industries. More extensive case studies of particular industries, such as the glass industry, also included output per man-hour measures.

—JOSEPH P. GOLDBERG AND WILLIAM T. MOYE

*The First Hundred Years of the
Bureau of Labor Statistics,
Bulletin 2235 (Bureau of Labor
Statistics, 1985)*
